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Options and Feasibility of a European Refund System for Metal Beverage Cans

Final Report

Appendix 2: Comparative Analysis of Collection Systems for Metal Beverage Cans

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1.0 Introduction

The Project Specifications required the contractor to carry out a comprehensive literature review of the organisation and performance of collection and recycling systems for metal beverage cans in all 27 Member States and of the impacts of the lack of harmonisation of these systems. This would give the evidence base to:

- *‘provide an overview of the collection and recovery schemes for metal beverage cans across the EU presenting the different existing schemes, their functioning including finance flows, their performance in terms of recycling rates’;*
- *‘provide a comparative analysis of the systems for collection and recovery of metal beverage cans in terms of performance and efficiency’; and*
- *‘Identify the obstacles that fragment the market in terms of metal beverage cans return, with particular attention on border regions’.*

In addition, the following objectives of the study relate to this section of the report and the analysis which was carried out. In relation to collection systems for metal beverage cans:

- 1) *Each system should be briefly described with a focus on its compatibility with cross-border flows of products.*
- 2) *The systems should be clustered into groups of implementation systems of similar characteristics, as appropriate.*

Eunomia carried out a comprehensive literature review of the packaging collection systems in each of the 27 Member States. This work included input from a number of sub-contractors based across the EU, as identified in Table 1-1.

Table 1-1: Contributors to Member State Literature Review

Consultancy	Based in...
Eunomia Research & Consulting	United Kingdom
Scuola Agraria del Parco di Monza (SAPM)	Italy
TBU - Austria	Austria
ekokonsultacijos	Lithuania
LDK Consultants	Greece
ENT - environment & management	Spain
Satsuma Media	United Kingdom

The result of the literature review was a compilation of Member State reports, which can be found in 'Appendix 1 – Member State Reports'. The structure of each report is as follows:

- Description of Primary Collection System for Metal Cans
- Additional Recovery Routes for Metal Cans
- Fees Paid by Obligated Parties
- Proportion of Total Recovery Costs Covered by Fees
- Recycling Rate for Metal Cans

From this evidence base a detailed comparative analysis of the costs and performance of packaging collection systems for metal beverage cans was carried out. In addition, compatibility of the collection systems with cross-border flows of metal beverage cans was considered. This comparative analysis can be found in the Sections below, and is structured as follows:

- Policy Background;
- Collection and Recovery Schemes for Metal Beverage Cans;
- Recycling Performance;
- Financial Flows;
- Commentary on Cost Effectiveness of Producer Responsibility Systems;
- Obstacles that Fragment the Market in terms of Beverage Can Return; and
- Compatibility of Systems with Cross-border Flows of Products.

2.0 Policy Background

To provide some context to the approach taken in this study, and to the development of interoperability options later on, it is important to discuss the policy background within which the assessment takes place. This study is primarily related to waste policy. However, to understand the reasons why products, which later become wastes, move between Member States some of the key financial drivers of cross-border movements of products are also discussed.

First, we note some of the key principles of EU policy making that has, and continues to, shape the formation of waste, and other, policy.

2.1 Principles of EU Policy Making

Two of the underlying principles of the European Union are that of subsidiarity and proportionality.¹ These mean, respectively, that policy making should be devolved to the lowest level of governance as appropriate, and that the magnitude of the measure used should be in relation to the outcomes being sought. Union level policies should only be implemented when the benefits are clear. In addition the following two aims are sought in the development of policy:

1. Delivering a high level of environmental quality; and
2. Ensuring the smooth functioning of the internal market.

The principle thus far has been for the European Union to establish the framework (definitions and targets) for policy, but to allow Member States to implement systems with a national focus.

2.1.1 Subsidiarity in Respect of Tax Policy

Another important area where subsidiarity principles are largely maintained is in respect of tax policy, albeit that there are some instances of tendencies towards tax harmonisation (for example, in respect of energy products, or VAT). Even here, however, Member States are generally free to set tax rates within certain specific constraints, so that the tax rates are not completely specified at the European level. In general, there is not, at the EU level, harmonisation in respect of tax policy, which is a matter left for Member States to determine.

The relevance of this relates to the basic fact that the lack of harmonisation of different Member States' policies in respect of the recycling of packaging is only problematic to the extent that packaged goods move across borders in large quantities. The rationale for such movement is rarely attributable to differences in packaging policies *per se*, but is more usually motivated by the different approaches

¹ Protocol on the Application of the Principles of Subsidiarity and Proportionality, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2004:310:0207:0209:EN:PDF>

taken by Member States to setting levels of excise and other duties (such as VAT) for packaged goods, notably, in the case under examination, alcoholic beverages. These differences in tax policy lead to differences in prices faced by consumers. Cross-border movements of packaged goods take place in greatest quantities where price differentials are sufficient to justify such movements. As we shall see, it is not so much different packaging policies which drive these price differentials and the movement of goods across borders, but instead, it tends to be differences in tax rates. The reality, therefore, is that where packaged goods are concerned, and specifically, where beverages in metal containers are concerned, the Single Market is actually one in which different prices for the same good prevail in different Member States owing to the freedom which Member States have to determine their own excise duty and VAT rates.

2.2 Directive 2008/98/EC on Waste and Repealing certain Directives

One of the key pieces of EU waste policy is:

DIRECTIVE 2008/98/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 November 2008 on waste and repealing certain Directives

referred to henceforth as the “revised waste framework directive (RWFD)”.² The following describes its aims:

‘This Directive lays down measures to protect the environment and human health by preventing or reducing the adverse impacts of the generation and management of waste and by reducing overall impacts of resource use and improving the efficiency of such use.’

The RWFD includes specific guidance on the re-use and recycling of wastes under Article 11. It states that:

‘Member States shall take measures to promote high quality recycling and, to this end, shall set up separate collections of waste where technically, environmentally and economically practicable and appropriate to meet the necessary quality standards for the relevant recycling sectors.’

The issue of material quality is a key concern as the waste management industry shifts from offering ‘end-of-pipe’ solutions to a system of resource management. Market volatility can affect the willingness of reprocessors to accept material of lower quality, potentially influencing the viability of collection systems for recycling. In terms of metal beverage cans, different collection systems can result in varying qualities of material sent to material reprocessors, so considering quality is relevant for this study also.

² DIRECTIVE 2008/98/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 November 2008 on waste and repealing certain Directives, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:312:0003:0003:EN:PDF>

In addition, the RWFD sets out that, by 2015, Member States shall setup separate collection for at least paper, metal, plastic and glass. It also provides a requirement for the level of collection:

'2. In order to comply with the objectives of this Directive, and move towards a European recycling society with a high level of resource efficiency, Member States shall take the necessary measures designed to achieve the following targets:

(a) by 2020, the preparing for re-use and the recycling of waste materials such as at least paper, metal, plastic and glass from households and possibly from other origins as far as these waste streams are similar to waste from households, shall be increased to a minimum of overall 50 % by weight;'

Thus metal beverage cans fall within the category of materials for which targets have been set.

More generally, the Directive implies that Europe is moving towards a recycling society with a high level of performance of separate collection systems for waste.

2.3 Directive 94/62/EC on Packaging and Packaging Waste

The principle policy driving the collection of metal beverage containers in the European Union (EU) is Directive 94/62/EC on Packaging and Packaging Waste, as amended (known from here on as “the packaging directive”).³

The history of the packaging directive is of some interest. Per capita limits of packaging volume and a binding waste hierarchy were dropped from consideration of a revised directive following Directive 89/339/EEC on the management of packaging of liquid beverage containers, implemented in the early 1980s (some environmental reforms appeared, but the market started to become fragmented).⁴ The key problem with the discussions around the new directive is summarised by the EEA pilot study on packaging systems:

*“Developing policies for the management of packaging waste means reconciling several different sets of objectives. **Environmental aims** involve reducing resource and raw material use, minimising greenhouse gas emissions and reducing sources of pollution. **Internal market aims** include taking the necessary steps to encourage the development of a viable market for recyclables, avoiding distortions of trade and fostering the necessary stability. These sets of aims are not only different: they are potentially conflicting, particularly when the best country-level solution does not fit with the ideal EU-level solution.”*

³ European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31994L0062:EN:HTML>

⁴ EEA (2005) *Effectiveness of packaging waste management systems in selected countries: an EEA pilot study*, EEA Report No 3/2005, ISSN 1725-9177

This comment highlights some of the tensions which have been observed over recent years. The desire to maintain subsidiarity inevitably leads to different policies in different countries. This is likely to lead to differences in implementation across borders. Those differences may or may not be problematic, and the question is whether the consequences of any differences are sufficiently serious to justify changes to existing policies, and if so, at what level. Evidently, if the desire for harmonisation across countries is expressed to its fullest extent, the concept of subsidiarity will start to lose much of its meaning.

The more comprehensive Directive 94/62/EC on Packaging and Packaging Waste was, however, adopted, repealing the previous Directive. It follows the familiar waste hierarchy principles of prevention, reuse, recycling and other forms of recovery and, hence, reduction of the final disposal of packaging waste. It attempts to harmonise national measures to ensure the functioning of the Internal Market. The 1994 Directive was revised through the following amendments:

- A minor amendment in 2003, Council Regulation (EC) No 1882/2003 adapting to Council Decision 1999/468/EC, introduced how the Commission shall be assisted by a committee;
- A more major amendment in 2004, Council Directive 2004/12/EC, clarified the definition of 'packaging' and increased the recovery and recycling targets;
- In 2005, Council Directive 2005/20/EC allowed transitional periods for attaining the new targets.

The Directive covers primary (sales to consumer), secondary (grouped packaging of a certain number of items) and tertiary packaging (transport packaging designed to facilitate handling and transport). It sets out recovery and recycling targets for this packaging, including a minimum for any packaging material. In 1994 the targets to be achieved by 2001 were set as follows: ⁵

- Between 50% as a minimum and 65% as a maximum by weight of the packaging waste to be recovered;
- Within this general target, and with the same time limit, between 25% as a minimum and 45% as a maximum by weight of the totality of packaging materials contained in packaging waste to be recycled with a minimum of 15% by weight for each packaging material.

The 2004 revision added the following targets for December 2008:

- 60% as a minimum by weight of packaging waste will be recovered or incinerated at waste incineration plants with energy recovery;
- between 55% as a minimum and 80% as a maximum by weight of packaging waste will be recycled;

⁵ European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste, with amendments up to 2005, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:1994L0062:20050405:EN:PDF>

- the following minimum recycling targets for materials contained in packaging waste will be attained:
 - 60% by weight for glass;
 - 60% by weight for paper and board;
 - 50% by weight for metals;
 - 22.5% by weight for plastics, counting exclusively material that is recycled back into plastics;
 - 15% by weight for wood.

Thus the current EU wide target for metals, within which the separate collection of metal beverage cans falls, is 50% by weight – albeit some Member States have derogations so the year for achieving the targets varies. However, there is no specific requirement for each of the individual metallic packaging waste streams (which make up metal packaging in total) to be collected such that the 50% target is met. Hence, to a considerable degree, this target may be achieved through the collection of secondary and tertiary packaging. Thus, different Member States may recycle metal cans to varying degrees, even where their overall performance in terms of metal packaging recycling may be similar.

We also note that Article 7 of the Packaging Directive includes the following paragraph which relates to the requirement of Member States to manage waste packaging from imported products:

*These systems shall be open to the participation of the economic operators of the sectors concerned and to the participation of the competent public authorities. **They shall also apply to imported products under non-discriminatory conditions**, including the detailed arrangements and any tariffs imposed for access to the systems, and shall be designed so as to avoid barriers to trade or distortions of competition in conformity with the Treaty.*

However, it is unclear whether ‘imported’ refers to packaging imported by producers for sale on the national market, or privately imported by consumers. The latter definition would indeed cover waste packaging from privately imported beverage cans resulting from the border-trade.

Since the introduction of the Packaging Directive, Member States have chosen a range of systems and policies to meet the recycling and recovery targets.^{6,7} These systems are fully reported in ‘Appendix 1 – Member State Reports’ and are summarised below in Section 3.0.

⁶ Argus (2001) *European packaging waste management systems*, European Commission DGXI.E.3, Final Report February 2001, http://ec.europa.eu/environment/waste/studies/packaging/epwms_xsum.pdf

⁷ The Regional Environmental Center for Central and Eastern Europe (2001) *Waste Management Policies in Central and Eastern European Countries: Current Policies and Trends*, Final Report 2001

In the last decade the focus has been on considering whether the packaging directive is meeting the objectives it promotes. A number of studies have been carried out on the effectiveness of national systems, and importantly whether the harmonising effect of the directive is working.^{8,9} Following the publications of these studies the European Commission has released a Communication, specifically focused on beverage packaging, deposit systems and the free movement of goods. This highlights the relevant articles in the Packaging Directive which have been challenged by national measures implemented in the EU, and provide guidance around the introduction of such systems, especially around the smooth functioning of the internal market.¹⁰

2.4 Summary of Policy Background

From this overview of EU policy, it is clear that EU Directives have been designed to give Member States the freedom to design their own measures to meet the targets specified in Directives, taking national circumstances into account. The principles of subsidiarity and proportionality under-pin the development of this policy, and are likely to continue to be used as a guide to policy development unless the evidence strongly suggests that EU harmonisation is required.

In terms of waste policy, Member States need to implement collection systems for packaging waste, including the management of metal beverage cans waste. Member States have freedom to choose the nature of the collection system they put in place, as long as a minimum of 50% by weight of metal packaging (of which metal cans are a part, but certainly not the only part) is collected for recycling. The year by which the target has to be met varies between Member States, depending upon whether a derogation was permitted or not. However, the harmonising effect of the Directive has been called into question, and some specific concerns around deposit refund systems have been raised, especially around the smooth functioning of the internal market.

The comparative analysis of collection systems for metal beverage cans now follows in the next Section.

⁸ COM(2006) 767 final, Brussels, 6.12.2006. Report from the Commission to the Council and the European Parliament on the implementation of Directive 94/62/EC on Packaging and Packaging Waste and its impact on the environment, as well as on the functioning of the internal market.

⁹ EEA (2005) *Effectiveness of packaging waste management systems in selected countries: an EEA pilot study*, EEA Report No 3/2005, ISSN 1725-9177

¹⁰ Communication from the Commission — Beverage packaging, deposit systems and free movement of goods (2009/C 107/01), <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2009:107:0001:0009:en:PDF>

3.0 Collection and Recovery Schemes for Metal Beverage Cans

Metal beverage cans are not a major component of industrial waste. People will, of course, consume beverages in the workplace, so that for businesses, there will be cans in the waste stream. Beverages contained within cans are, however, generally consumed by individuals, with some of them consumed 'on the go'. They will, therefore, tend to be found principally in household and commercial waste streams, with a proportion of them being found in 'litter bins'. Some cans are also found in street sweepings as they are collected through this route having been discarded into the environment.

In different countries, the approach to collecting / extracting cans for recycling is somewhat varied. One can distinguish, broadly, five different types of country through reference to their infrastructure provision:

1. Cans are collected primarily through 'bring systems', or 'eco-points', or 'road containers' (we refer to these henceforth as **bring systems**). Example countries are Slovenia, Greece and Portugal. In these cases, the containers are usually sited on the street pavement so that they can be collected periodically (as required) by a vehicle collecting a specific material type. The containers may be large wheeled bins, or 'igloos', designed specifically for the purpose. In these cases, cans are usually collected as a pre-segregated stream (the collecting vehicle collects *only* cans);
2. Cans are collected primarily through 'door-to-door', or 'kerbside' systems (henceforth referred to as **kerbside systems**) in which households / businesses sort their cans for collection into either boxes, bins or sacks. A vehicle then services each household / commercial property to collect the segregated material. In these instances, it is very unusual for the collection vehicle to collect *only* cans. In some cases, for example in Belgium, the collection system may collect a small range of materials, so the system may include only metal cans along with plastic (sometimes only plastic bottles). In other situations, for example, in the UK, the collection system may target a wide range of materials, including cans, plastics (most types), paper, card, textiles, glass, and other materials besides.¹¹ Typically, there is a requirement for the material to be sorted mechanically, although equally, in some systems, the sorting of materials is carried out at the point when the material is collected;
3. Cans are collected through a mix of these systems across the country (henceforth referred to as **hybrid schemes**). In parts of Italy, for example, the

¹¹ In some such systems, segregated food waste is also collected in separate compartments on the same vehicle.

predominant system used is the bring system. In others, the door-to-door, or kerbside system dominates;

4. Cans are collected through a deposit refund system in which the purchase of cans entails paying a deposit which is refunded when the can is returned to a relevant store, or other receiving point (we refer to these systems as **deposit refund systems, or DRSs**). Where countries operate deposit systems, they may also operate collection systems of one of the types 1-3 discussed above alongside the deposit system. For example, Germany operates a kerbside system alongside the DRS, whilst Denmark operates a bring system alongside its DRS;
5. Cans are essentially left in the residual waste. In countries where the vast majority of residual waste is incinerated (typically, where landfill bans are in place), the possibility exists to extract cans from the residual waste stream (we refer to these systems henceforth as **residual waste sorting systems, or RWSs**). The Netherlands provides the principle example of this approach. This can either happen at the front end of incineration / MBT facilities, or where thermal treatment takes place, the material can be extracted from bottom ash. In a number of cases, RWS systems are used as a backstop to capture additional material that does not get segregated through the primary collection systems.

These characterisations are intended to capture the main approaches. It is accepted that countries might not have completely uniform provision across the country, and that in some countries with kerbside schemes, for example, there may be locations where bring systems are the collection approach of choice. Furthermore, it is also true that in some countries where a particular approach is *dominant*, it might not necessarily be *widely implemented*. The intention here is to give a basic description of the collection approach in the different countries.

It should be noted that in most countries, a network of 'litter bins' exists whose purpose is to enable people to deal with waste which is generated 'on the move'. These litter bins may be designed to accept segregated streams of material, for example, cans, plastic bottles and paper, or they may be designed only to accept 'all waste'. In the latter case, recycling of metal beverages becomes difficult (though not impossible). In the former, recycling is made more likely.

Using this characterisation, we have classified the different Member States as shown in Table 3-1. The final rows indicate that the highest number of countries, 13 of the 28 considered, are reliant upon networks of bring banks for the collection of aluminium cans. 6 use kerbside systems whilst 6 make use of DRSs. One uses an RWS and 2 use a 'hybrid' mixture of bring and kerbside systems.

Table 3-1: Classification of Member States According to Predominant Approach to Collection of Beverage Cans

Country	Code	Predominant Collection System for Beverage Cans	Country	Code	Predominant Collection System for Beverage Cans
Austria	AT	Bring (for majority, +RWS)	Latvia	LV	Bring (+informal sector)
Belgium	BE	Kerbside	Lithuania	LT	Bring (+informal sector)
Bulgaria	BG	Bring (+informal sector)	Luxembourg	LU	Kerbside (+bring, + RWS)
Cyprus	CY	Kerbside	Malta	MT	Kerbside
Czech Republic	CZ	Bring	Netherlands	NL	RWS
Denmark	DK	DRS (+bring)	Poland	PL	Bring (+informal sector)
Estonia	EE	DRS (+bring)	Portugal	PT	Bring (+RWS)
Finland	FI	DRS (+bring)	Romania	RO	Bring (+informal sector)
France	FR	Bring	Slovakia	SK	Bring
Germany	DE	DRS (+kerbside)	Slovenia	SI	Bring
Greece	EL	Bring	Spain	ES	Bring (+RWS)
Hungary	HU	Bring (+informal sector)	Sweden	SE	DRS (+bring)
Ireland	IE	Kerbside	United Kingdom	UK	Kerbside (+bring)
Italy	IT	Hybrid	Norway (not EU)	NO	DRS
COUNTS:					
	Bring	13			
	Kerbside	6			
	Hybrid	2			
	DRS	6			
	RWS	1			

Source: based upon country reports – ‘Appendix 1 – Member State Reports’

A diagrammatic representation of the information on country collection systems is given in Figure 3-1.

Figure 3-1: Diagrammatic Representation of Collection Systems for Metal Beverage Cans across Member States

Beverage can collection	Deposit refund system	Kerbside collection	Bring systems	Identified informal sector / waste picker separation	Residual waste sorting / recovery
Austria			████████████████████		████████████████████
Belgium		████████████████████			
Bulgaria			████████████████████	████████████████████	
Cyprus		████████████████████			
Czech Republic			████████████████████		
Denmark	████████████████████		████████████████████		█
Estonia	████████████████████		████████████████████		
Finland	████████████████████		████████████████████		
France			████████████████████		█
Germany	████████████████████		█		█
Greece			████████████████████		
Hungary			████████████████████	████████████████████	
Ireland		████████████████████			█
Italy		████████████████████			█
Latvia		█		████████████████████	
Lithuania			████████████████████		█
Luxembourg		████████████████████			████████████████████
Malta		████████████████████			
Netherlands			█		████████████████████
Poland				████████████████████	
Portugal			████████████████████		████████████████████
Romania				████████████████████	
Slovakia			████████████████████		
Slovenia			████████████████████		
Spain			████████████████████		████████████████████
Sweden	████████████████████		████████████████████		████████████████████
United Kingdom		████████████████████			█
Norway (not EU)	████████████████████				█

Note: The extent of the bars in the first three categories is intended to indicate the approximate geographic coverage of collection systems. For example, in Latvia, the North Vidzeme (Ziemeļvidzeme) region operates a sack-based kerbside collection for recyclables from individual houses; this comprises 8.2 % of Latvian population, hence the small bar under this category for Latvia. For the last two categories, the extent of the bars is intended to indicate the effective contribution of these elements to recycling. In Denmark for instance, incineration is widely implemented for residual waste, but due the deposit scheme, the effective contribution to beverage can recycling is minimal. Conversely, the contribution from metals recovery from residual waste and incinerator bottom ash in Austria is thought to be significant.

4.0 Recycling Performance

Different approaches to the collection of materials for recycling tend to give different results, as might be expected. Where metal beverage cans are concerned, it has not always been possible to gain information regarding the extent to which these, specifically, are being recycled. The main reason for this relates to the fact that Member States tend to report – in line with what they are required to report for the purposes of the Packaging Directive – the recycling rate for all ‘metal packaging’. Hence, to make a comparative assessment of performance across all Member States regarding the recycling of metal beverage cans is very difficult on the basis of information reported by the Member States.

Where Member States report figures for ‘metals’, it might be suggested that some form of estimation could be made regarding the rate of recycling of metal beverage cans. In fact, this is not possible. The reasons for this are as follows:

1. Metal packaging includes steel packaging, much of which is used in industrial purposes. Steel packaging rates may, therefore, be heavily influenced by the efforts of industry in recycling steel strapping and the like;
2. Steel cans weigh more than aluminium ones. This means that a weight-based recycling rate, even if it applied only to cans, would tend to be disproportionately affected by the recycling rate for steel cans, especially if the share of steel cans in total cans (i.e. including cans for food and beverages) is high. Generally, steel cans are more likely to be used in food packaging, whilst the market for beverage cans tends to be dominated now by aluminium, although this shows some variation across countries;
3. Both steel and aluminium packaging rates should also include figures for foils. Where aluminium is concerned, this may be a reasonable proportion of the overall quantity of packaging material.

For these reasons, deriving a recycling rate for metal beverage containers from that which is given for metal packaging is not possible in all cases, and would require a considerable body of information for each country which is not generally available.

It is also worth adding that the stated recycling rates for metal packaging as reported to Eurostat would merit some close interrogation of the derivation of the rates in the different countries. It seems likely, for example, that different countries may be reporting different things, and moreover, that the basis for deriving the figures being reported varies in the extent to which it could be considered robust. The basis for the estimation of both the numerator (what is recycled) and the denominator (what is the total amount of targeted material in the waste stream) varies across countries, whilst it is also likely to be affected by figures on imports and exports, not just of packaged products, but also of waste destined for recovery.

In the ideal world, countries would know:

1. What products are actually being purchased, and privately imported / exported;
2. The weight of the packaging materials containing the products;
3. The amount of the material arising as waste;

4. What is actually collected for recycling,
5. What proportion of this collected fraction is rejected at sorting / reprocessing facilities;
6. What remains in the residual waste streams. These streams would need to include not simply standard refuse streams, but also the flows of residual waste into litter, as well as material which simply resides in the environment; and
7. In countries where RWSs play a role, the composition of the waste stream entering the facility (so that, for example, at least some estimation could be made of the extent to which recovered metals were actually 'packaging' as opposed to other metallic items).

This is a significant challenge, and most Member States therefore fall back on simplified methods of calculation, sometimes being heavily reliant on data from industry to understand what the performance is at any given moment in time. Indeed, data sometimes comes from the industry upon which the producer responsibility obligation rests, raising the prospect of moral hazard in the reporting of performance.

In what follows, we show:

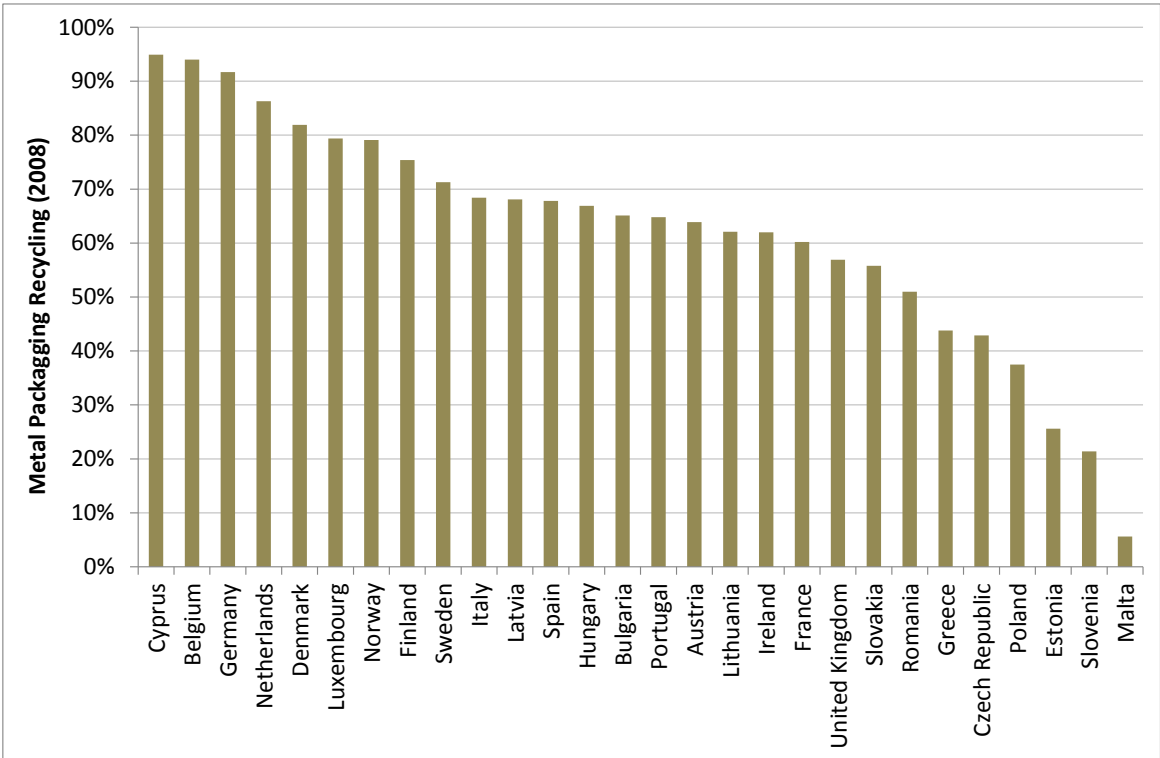
1. Officially reported recycling rates for metal packaging recycling (as reported to Eurostat);
2. Figures for steel and aluminium packaging recycling where these are reported separately;
3. Figures reported by the EEA for aluminium can recycling; and
4. Our best estimate of can recycling rates from all available evidence (including the information in the country review appendices).

It is worth stating that it is rare to find recycling rates which simply cover 'all beverage cans' outside countries with DRSs, where return rates are routinely reported. As such, we are conscious to consider of the degree of confidence we can hold in the data presented for individual countries.

4.1 Total Metal Packaging Recycling

The figures which Member States have provided to the European Commission for the year 2008 for metals recycling are shown in Figure 4-1. Some countries report very high rates, the highest being in Cyprus (95%) and Belgium (94%). As discussed above however, these rates are not directly informative for deriving the performance of recycling systems for metal beverage containers, but merely give a guide to the degree of success of producer responsibility systems *in-the-round*.

Figure 4-1: Recycling Rates for Metal Packaging in 2008



Source: Eurostat

4.2 Aluminium and Steel Packaging Recycling

The figures which Member States have provided for recycling of aluminium and steel packaging are shown in Table 4-1. For all countries reporting (with the exception of Poland, the Czech Republic and potentially Portugal) the aluminium packaging figures are all lower than those reported for all metal packaging. This most likely reflects the weighting of steel in overall packaging figures (which includes industrial strapping – a product which is easily and commonly recycled), as well as the ease with which it can be sorted and recovered, even from mixed wastes (as the Netherlands experience indicates – see Box 2 below).

It should be noted, that to compile the data for this table, information from various sources and various years had to be used which limits the effective data compatibility. There are clear issues with the data for the Czech Republic, which shows higher recycling rates for both steel and aluminium packaging than the official rate for all metal packaging; no obvious explanation is forthcoming since the high aluminium figure is a year previous to the steel and all metal packaging data. The indication from Poland is that steel packaging recycling rates may have increased from 2007 to 2009. Finally, the data from Malta appears particularly suspicious, and may be disregarded.

Table 4-1: Eurostat Recycling Rates for Metal Packaging in 2008, Plus Aluminium and Steel Data Where Reported Over Recent Years

Country	Recycling of Metal Packaging (2008)	Recycling of Steel. Packaging (2009, 2008, 2007)	Recycling of Aluminium Packaging (2009, 2008, 2007)
Cyprus	95%	55%	
Belgium	94%		
Germany	92%	92%	
Netherlands	86%		
Denmark	82%	91%	74%
Luxembourg	79%	80%	
Norway	79%		
Finland	75%	79%	
Sweden	71%	70%	69%
Italy	68%	78%	54%
Latvia	68%		
Spain	68%	77%	
Hungary	67%		
Bulgaria	65%	71%	
Portugal	65%	48%	
Austria	64%	79%	
Lithuania	62%		
Ireland	62%	65%	
France	60%	71%	40%
United Kingdom	57%	60%	31%
Slovakia	56%	72%	
Romania	51%		
Greece	44%	54%	34%
Czech Republic	43%	47%	61%
Poland	38%	48% / 21%	82%
Estonia	26%		
Slovenia	21%		
Malta	6%	69%	

Sources: All metal packaging data = Eurostat 2008 data. Steel packaging data= APEAL statistics from various years referenced to "Official Member States figures and PRO's / APEAL members", www.apeal.org/en/statistics. Aluminium packaging data = Eurostat 2007 data.

Although recycling data for both steel and aluminium packaging is only available for a small number of countries, the mean and median levels of recycling for steel packaging are consistently higher than the figures for aluminium and total metal packaging (as shown in Table 4-2). The mean and median aluminium recycling rates are generally around 10 percentage points lower than for those for steel, both when

compared to the whole sample, and when compared to those for which data is available for both.

The suggestion is, therefore, that this finding – that aluminium is recycled at lower rates – is probably reasonable to generalise across the different countries. Poland, however, appears an exceptional case and is discussed in Constituent data is not generally available to break this data down further, but a snapshot from the UK is shown in Figure 4-2. Of all these packaging items, since beverage cans are a high proportion of the total and also tend to be the more systematically targeted materials for recycling, the indication is that the aluminium packaging recycling rates reported in Table 4-1 are, for the most part, propped up by beverage can recycling (especially from households).

Box 1 below.

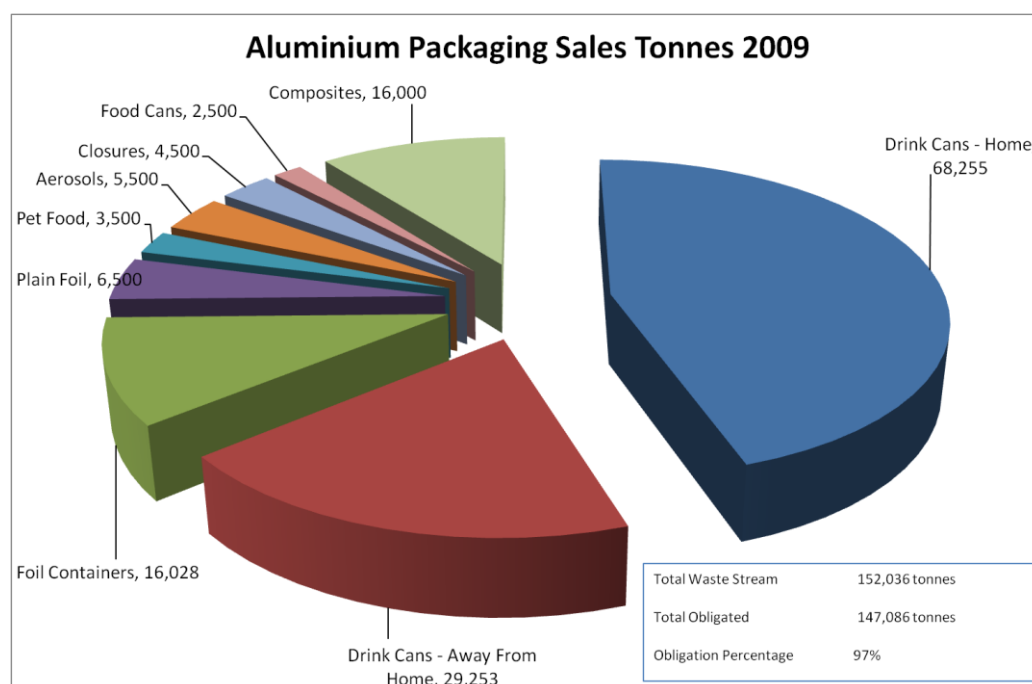
Table 4-2: Summary Statistics Regarding Recycling Rates for Metal, Steel and Aluminium Packaging, calculated from data in Table 4-1

	Median Level (for all countries where data is available)	Mean Level (for all countries where data is available)	Median Level (of countries for which data is presented for both steel and aluminium)	Mean Level (of countries for which data is presented for both steel and aluminium)
All Metal Packaging Recycling	65.1%	64.4%	58.6%	57.9%
Steel Packaging Recycling	71.0%	68.0%	65.0%	64.9%
Aluminium Packaging Recycling	57.3%	55.5%	57.3%	55.5%

Note: Malta data excluded from calculations.

Again, it remains not directly possible to infer the rates of beverage can recycling from the total aluminium packaging recycling data. However, these statistics give a better indication since beverage cans often tend to be a high proportion of the total aluminium stream (as opposed to steel packaging where steel strapping – although variable from country to country – may be expected to dominate, and food cans further diminish the proportion of beverage cans).

Figure 4-2: UK Aluminium Packaging Sales 2009 – Constituent Breakdown



Source: Alupro

Constituent data is not generally available to break this data down further, but a snapshot from the UK is shown in Figure 4-2. Of all these packaging items, since beverage cans are a high proportion of the total and also tend to be the more systematically targeted materials for recycling, the indication is that the aluminium packaging recycling rates reported in Table 4-1 are, for the most part, propped up by beverage can recycling (especially from households).

Box 1: Metals Recycling in Poland

The case of Poland, shown by the data in Table 4-1, appears to be an exceptional one. Here, total aluminium packaging recycling is the highest of all reported recycling figures, but steel the lowest. Considerations surrounding these two materials are as follows:

- Cans are predominantly aluminium in Poland. Here, it is common for small companies or private persons to collect cans (and other clean waste materials) either from residents directly, or by sorting refuse, and to sell to scrap metal dealers. Scrap dealers operate in each town for purchasing aluminium, steel, paper etc. The selling of collected waste materials to scrap dealers by individuals is commonplace due to the high market price of aluminium and the low average salary; under these conditions it can be financially rewarding work, or a profitable business. In addition, used beverage cans are increasingly separated in municipal sorting plants from residual waste. Cans then pass to a network of material preparation plants situated in different towns in Poland; the majority of these are owned by Recan or Koba – producers of aluminium packaging. Some smaller companies are active in the

market but represent about 3-5% of collected quantities. This established infrastructure combined with the high aluminium market price and low wages drives aluminium recycling to the observed high rates beyond packaging recovery targets in the country.

- The situation for steel is different. The selective collection of steel is not very well developed. Separated material comes mainly from sorting plants and from industrial sources (constituted by steel barrels and other steel packaging wastes produced in industry or trade). The profitability of steel collection and recycling is much lower than for aluminium, As such, recycling rates have tended to track targets without going further.

Source: Personal communication with Joachim Quoden, Pro-Europe, 5/10/11, and Jakub Tyczkowski, Rekopol, 6/10/11

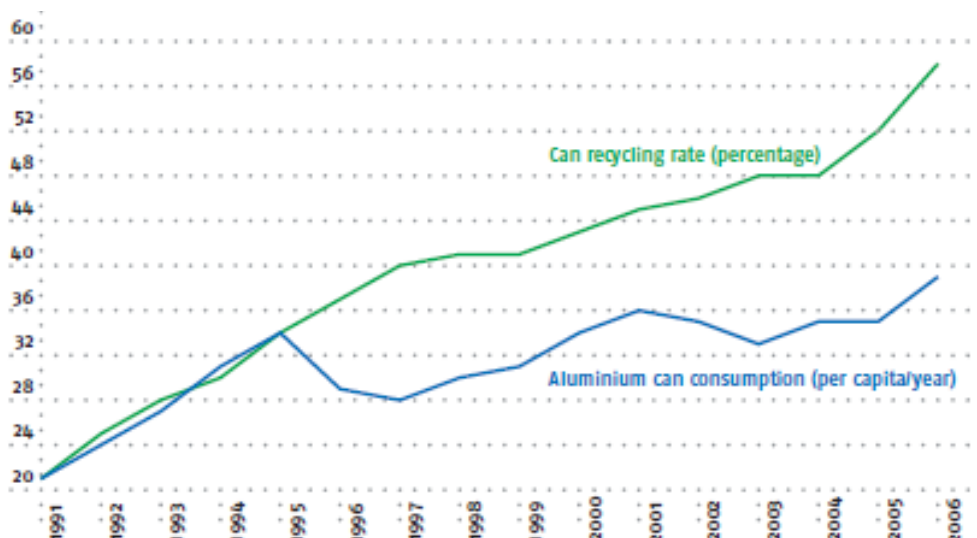
4.3 Aluminium Can Recycling

We focus here solely on aluminium can recycling because all aluminium can data can be attributed to beverages, whereas steel can usage extends to foodstuffs (and thus data on steel cans does generally not help inform the beverage can recycling rate).

The European Aluminium Association (EAA) figures for recycling of aluminium cans are reported by the EEA. No similar such datasets are generated in respect of steel can packaging by APEAL (the Association of European Producers of Steel for Packaging) or other organisations, and would be less useful anyway due to the use of steel for food cans.

The progression in recycling rates for aluminium beverage cans for 'Western Europe' over the period 1991-2006 is shown in Figure 4-3. This indicates how, over the period, the recycling rate has more or less trebled.

Figure 4-3: Aluminium Beverage Can Usage and Recycling Rates in Western Europe 1991-2006



Source: European Aluminium Association and Organisation for European Aluminium Refiners and Remelters (2008) Collection, Sorting and Recycling of Aluminium Packaging Makes a Lot of Sense!

Combined EEA figures for different Member States are shown Table 4-3, including the EEA data for the proportion of cans which are aluminium (as opposed to steel/tinplate) in different countries. It will be noted, however that the figures given for some Member States do not relate to aluminium cans per se, but to metal packaging, or all cans, or all beverage containers. Very few of the figures actually refer to what it is that is being referred to. This highlights the points made above regarding the quality of the data.

Table 4-3: EEA Data on Recycling Aluminium Beverage Containers

Country	Code	Alu Cans Market Share (% of total) 2007	Recycling Rate 2009	Comments on the recycling results (based on final consumption)
Austria	AT	(87%)	50%	Green dot scheme (whole metal packaging). Note: country report appendix data suggests 70% alu cans.
Belgium (+Lux.)	BE	41%	93%	Green dot scheme (all beverage containers)
Bulgaria	BG	97%*	34%	(Data given as for Romania)
Cyprus	CY	unknown	70%	Green dot scheme (whole metal packaging)
Czech Republic	CZ	97%*	47%	Combined average results green dot scheme (metal packaging)
Denmark	DK	100%	88%	Deposit scheme (all beverage containers)
Estonia	EE	100%	59%	Deposit scheme, exports excluded (many go to Finland)
Finland	FI	100%	95%	Deposit scheme (cans only)
France	FR	32%	51%	Green dot scheme (est. whole metal packaging)
Germany	DE	60%	96%	Deposit scheme (cans only)
Greece	EL	91%	34%	Green dot scheme + industry collection data
Hungary	HU	97%	42%	Incentive based collection, reports local scrap dealers + green dot scheme
Ireland	IE	82%	47%	Green dot scheme (extrapolations for cans)
Italy	IT	92%	57%	Whole aluminium packaging stream
Latvia	LV	97%*	30%	Green dot scheme + industry report for cans only
Lithuania	LT	97%*	38%	Green dot scheme + industry report for cans only
Luxembourg	LU	41%	93%	(Data given as for Belgium)
Malta	MT	unknown	30%	Green dot scheme (estimate for cans only)
Netherlands	NL	21%	87%	Mainly bottom ashes at incinerators
Poland	PL	97%	66%	Incentive based collection, combined industry reports
Portugal	PT	28%	40%	Green dot scheme (whole metal packaging)
Romania	RO	97%*	34%	Incentive based collection (interpreted as the informal waste sector), extrapolation industry + green dot data
Slovakia	SK	97%*	47%	(Data given as for Czech Republic)
Slovenia	SI	97%*	50%	Green dot scheme (estimate for cans only)
Spain	ES	17%	59%	Green dot scheme + data industry study
Sweden	SE	100%	91%	Deposit scheme (cans only)
United Kingdom	UK	78%	55%	Packaging Recovery Notes (PRN) aluminium trading only
Norway +Iceland (not EU)	NO	100%	92%	Deposit scheme (cans only)

Source: EEA (2009 & 2011) Aluminium Beverage Can Recycling, EEA Press Release, Brussels, 16 June 2009 {2007 data} and 26 July 2011 {2009 data}.

*Note: Other Central & Eastern Europe aluminium cans market share (% of total) 2007 = 97%.

4.4 Best Estimates of Can Recycling Data

The data proposed here (which includes both aluminium and steel beverage cans) compares all available data sources and proposes the most likely recycling rate. Where we are able to do so, we have sought to attribute a level of confidence to the accuracy of the data. The sources of data and description of how the best estimates have been arrived at are given in 'Appendix 1 – Member State Reports'.

Table 4-4: Best Estimates of Steel and Aluminium Can Recycling Rates

Country	Code	Best Estimate of Beverage Can Recycling Rate (%)	Year for which data relates to	Level of confidence in data accuracy	Source of data and comments on the recycling results
Austria	AT	45% (68% inc. RWS*)	2007	High (medium for RWS figure)	Includes recycling from residual waste of 80% remaining steel cans and 25% aluminium cans. Calculated from detailed data (presented in appendices) from the Austrian Chamber of Commerce and the Austrian MoE.
Belgium	BE	93%	2009	Medium	EAA data (Green dot scheme - average for all beverage containers), supported by World Steel Association data, although no primary data assessed.
Bulgaria	BG	34%	2009	Low	EAA extrapolation for Bulgaria and Romania combined. Includes informal (waste picker) collection.
Cyprus	CY	Unknown (metal packaging = 70%)	2009	n/a	Data only available for whole metal packaging from green dot scheme.
Czech Republic	CZ	20%	2009	Low	EKO-KOM claim 64% metal packaging recycling in 2010, though PRO Europe suggests the figure from Eurostat is a best estimate - 56%. However, aluminium only recycling figure of 20% is used as more likely to reflect can recycling than for steel or all metal packaging.
Denmark	DK	85% 86%	2009 2010	High	All beverage containers.
Estonia	EE	85%	2009	Medium	Deposit scheme data for cans returned = 59%, low figure due to many cans exported. Accounting for cans going to Finland leads to a figure of 85% recycling, though the true figure may be higher still as cans may be exported to other countries besides (especially other Scandinavian [DRS] countries).
Finland	FI	94%	2010	High	Figures from Palpa with imports and exports of cans accounted for.
France	FR	Unknown (metal packaging = 50%)	2009	n/a	Data only available for whole metal packaging. Majority collected through bring sites / drop off centres (i.e. suggesting lower captures than kerbside approaches).
Germany	DE	95%	Un-	Medium	Estimates made by Ball Packaging.

Country	Code	Best Estimate of Beverage Can Recycling Rate (%)	Year for which data relates to	Level of confidence in data accuracy	Source of data and comments on the recycling results
			known		
Greece	EL	34%	2009	Medium	EAA data from green dot scheme combined with industry collected data.
Hungary	HU	42%	2009	Low	EAA data from green dot scheme and scrap dealer reports. Data in appendices not sufficient to confirm.
Ireland	IE	41-47%	2009	Medium	41% = Alupro calculated data. 47% = EEA data (extrapolation for cans).
Italy	IT	Unknown (metal packaging = 68%)	2011	n/a	Data only available for whole metal packaging.
Latvia	LV	30%	2009	Medium	EAA data "Green dot scheme + industry report for cans only". Source and accuracy of data not determined.
Lithuania	LT	38%	2009	Medium	EAA data "Green dot scheme + industry report for cans only". Source and accuracy of data not determined.
Luxembourg	LU	Unknown (metal packaging = 50%, 77% inc. RWS*)	2009	n/a	Data only available for whole metal packaging.
Malta	MT	Unknown	n/a	n/a	No data reported to Eurostat
Netherlands	NL	88%	2009	Medium	Linked to metal packaging recycling rate as almost entirely recovered via incinerators. (High proportion of steel cans.)
Poland	PL	64%	2009	Medium	Rekopol Recovery Organisation data for aluminium cans from 'combined industry reports'. Poland's high recovery rates are discussed in Section 4.2 above.
Portugal	PT	Unknown (metal packaging = 40% inc. RWS*)	2009	n/a	Data unclear. This figure is EAA data for whole metal packaging.
Romania	RO	34%	2009	Low	EAA extrapolation for Bulgaria and Romania combined. Includes significant informal (scavenger) collection.
Slovakia	SK	Unknown (metal packaging = 56%)	2008	n/a	Data unclear. This figure is Eurostat data for whole metal packaging.
Slovenia	SI	26%	2009	Low	All metal packaging from PRO Scheme SLOPAK.
Spain	ES	33% (76% inc. RWS*)	2009	Medium	Calculated from the Association of Beverage Cans [of Spain and Portugal] 2011 report (refer to member state report

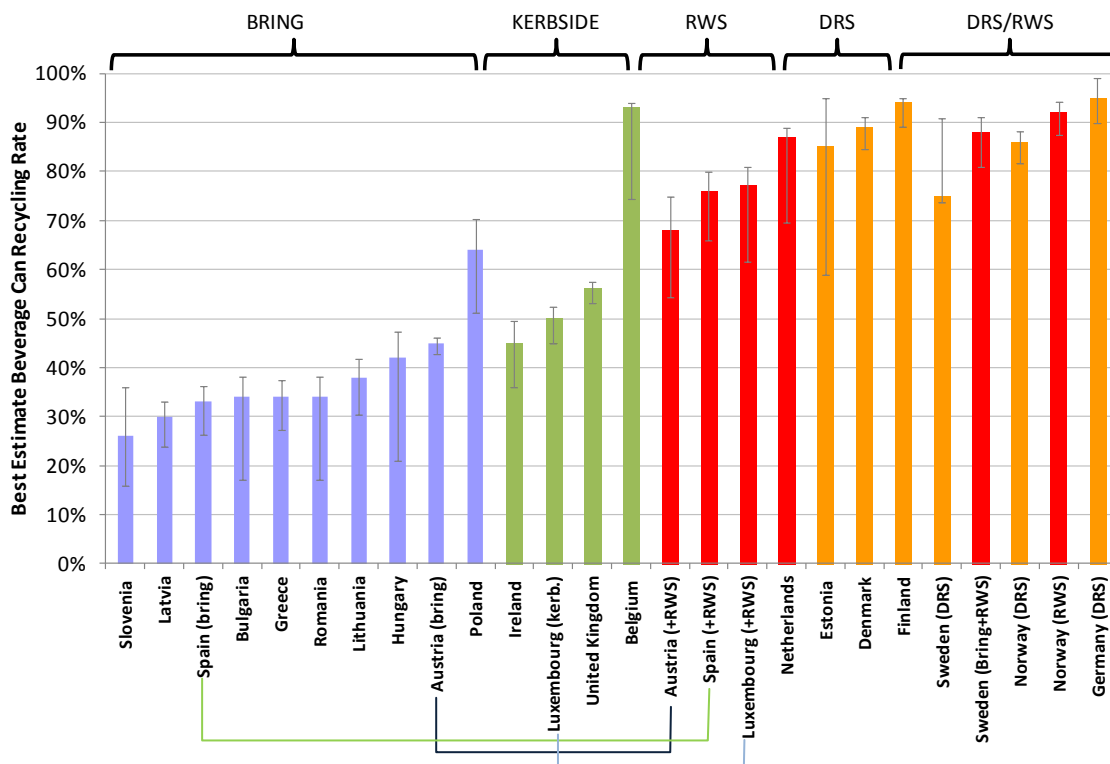
Country	Code	Best Estimate of Beverage Can Recycling Rate (%)	Year for which data relates to	Level of confidence in data accuracy	Source of data and comments on the recycling results
					appendices).
Sweden	SE	75% (88% inc. RWS*)	2009	High	Calculated from data provided by Returpack. In this calculation cans from private imports are not included in the recycling figure, as they do not appear in the denominator (i.e. the quantity of cans placed on the market). Otherwise, the recycling rates would appear artificially higher.
United Kingdom	UK	56%	2009	High	EAA data from PRN trading corroborated by analysis in appendix.
Norway (not EU)	NO	88% (92% inc. RWS*)	2009	High	EAA data from deposit scheme and calculations from Norsk Resirk data.

*RWS =Residual Waste Sorting system (recycling from MBT or thermal processes)

Source: Eunomia

The recycling performance of countries from Table 4-4 (where data is available for cans) is grouped by the type of system used and shown in Figure 4-4. In cases where both the source separation and final RWS recycling rates are known (Austria, Spain, Luxembourg, Norway and Germany) then the data for such countries is shown in two bars within the chart. Error bars are shown in proportion to the level confidence in the data as identified in Table 4-4.

Figure 4-4: Best Available Data on Beverage Containers Recycling



Note: DRS = Deposit Refund System / RWS = Residual Waste Sorting i.e. mechanical separation of metal cans from residual waste, or extraction from incinerator bottom ash.

As shown by Figure 4-4, the system which most commonly delivers high recycling rates is the DRS. One country (Belgium) using a kerbside system has a similarly high rate of recycling, whilst another which uses a RWS has a high rate also (the Netherlands – discussed in more detail in Box 2). The highest rate achieved overall (Germany) involves a DRS, with additional metals recovery via kerbside and residual waste sorting systems.

In all cases, the reasons why individual countries perform as they do are distinct and complex. The DRS and other PRO type systems are considered independently in the following sections where we attempt to draw lessons from individual countries.

Box 2: Can Recycling in the Netherlands

In the Netherlands, there is no system for collecting metal beverage cans. Metal is separated from residual waste in waste to energy plants in both pre- and post-combustion treatment steps. The technology used at these plants has developed to the extent that high levels of metals recycling can be delivered (around 85%). The facilities tend to be very large.¹² Three of the thirteen energy from waste plants in the Netherlands use pre-combustion separation, and the rest separate metals from the

¹² Taken from AEB's website, <http://www.aebamsterdam.com/en/About-us/Facts-and-figures.aspx>

combustion residue. With pre-combustion separation, over 95% of steel and 80% of aluminium cans can be recovered, whilst post-combustion yields 80% and 50% respectively.¹³ This leads to the reported beverage can recycling rate of 87%.

Partly owing to the prevalence of waste to energy as the residual waste treatment technology and the lower efficiency of aluminium recovery in incinerators, steel is the predominant metal in beverage cans for domestic consumption (79% of the total as shown in Table 4-3), and with around 90% of the metal packaging market share.¹⁴ Aluminium cans are mostly put on the export market (e.g. by Heineken).¹⁵ This material choice for beverage cans is maintained by the relative packaging taxes levied in the Netherlands – €877/tonne for aluminium, compared to €142/tonne for steel (as investigated in Section 5.2 below).

The above considerations suggest that the Netherlands aluminium can recycling rate might not be as high as the steel recycling rate, with high rates of steel recovery combining with the high market share of steel in the overall can market to enable the Netherlands to report high metal packaging recovery rates. Given the estimated separation efficiencies and their prevalence in the treatment market, however, it seems likely that the rates for aluminium cans would not be as high as reported by EEA. It should also be considered that excess capacity for incineration in the Netherlands is leading to material being imported into the country for incineration. This implies that effectively, metal packaging, in residual waste, is being imported to the Netherlands, so that the recycling rate may be overstated if the basis for the recycling calculation is what is sold in the Dutch market.

4.5 Quality of Recovered Material

The quality of the material will vary depending on the type of collection system used to recover it and the nature of any sorting system used to separate the material.

Material qualities for cans collected separately (through deposit, kerbside collection or other source segregation systems) are very high, and prices that these materials attract are also high – typically over €1,000 per tonne of aluminium at market prices from the time of writing. An indication of material quality is given by the photographs in Figure 4-6 and Figure 4-7.

Metal fractions not collected separately (but processed from commingled waste in mechanical treatment plants, or incinerators) show much higher levels of contamination compared to the output of plants sorting separately collected metals streams (with or without other recyclables):

¹³ Stichting Kringloop Blik (2007) *Feiten En Wetenswaardigheden Over De Kringloop Van Blik*, Report for Stichting Kringloop Blik www.kringloopblik.nl/Documenten/Blikdossier%202007.pdf

¹⁴ Stichting Kringloop Blik (2007) *Blikdossier Feiten En Wetenswaardigheden Over De Kringloop Van Blik*, <http://www.kringloopblik.nl/Content/www.kringloopblik.nl/Documenten/Blikdossier%202007.pdf>

¹⁵ Personal communication with Maarten Labberton, European Aluminium Association

- Metal fractions from MT/MBT systems (see Figure 4-8) tend to attract material values under half as great as the purer source segregation streams.

Metals recovered from thermal treatment (see *Source: Martin Steiner, TBU*

- Figure 4-9) suffer similar a quality impact. The monetary value of metals from incinerators represents the lowest on any scrap dealer’s price list due to the adherence of significant quantities of minerals to the metal.

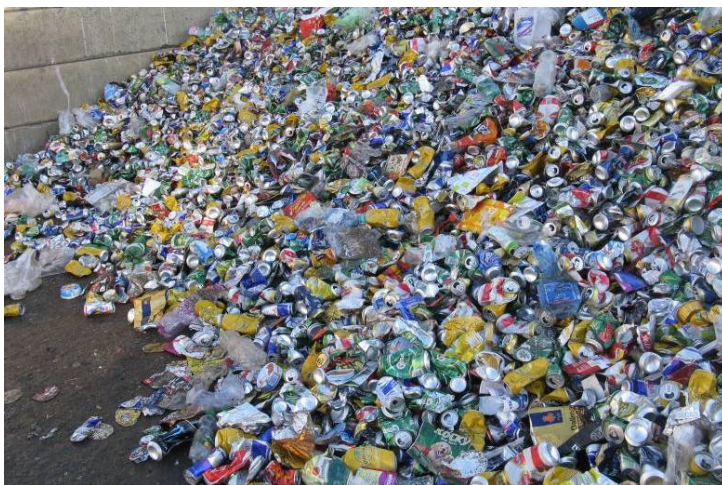
Generally, reprocessors view materials collected through DRSs very favourably because of the high quality (low level of non-target materials) of the stream, and because it is generally a well-defined stream (in terms of the metals present). This quality is indicated in the photograph in Figure 4-5.

Figure 4-5: Beverage Cans Collected Via a Deposit Refund System



Source: Tomra’s DeWitt sorting facility, New York,
http://www.syracuse.com/news/index.ssf/2009/11/new_yorks_bottle_deposit_creat.html

Figure 4-6: Aluminium cans separated from “Yellow Bag” collection (comprised of plastic and metal packaging) by means of a Eddy Current separator



Source: Martin Steiner, TBU

Figure 4-7: Ferrous Metal Cans Separated from “Yellow Bag” Collection (same Collection Material as shown in Figure 4-6) by means of a magnet



Source: Martin Steiner, TBU

Figure 4-8: Ferrous Metals Separated in a Mechanical MSW Treatment Plant by Means of a Magnet (ferrous content by weight about 80 %)



Source: Martin Steiner, TBU

Figure 4-9: Ferrous Metals Separated from the Slag of a MSW Incinerator by Means of a Magnet



Source: Martin Steiner, TBU

5.0 Financial Flows

Different countries operate different approaches to the organisation of their packaging recovery systems. Where metal beverage cans are concerned, there are two principle ways in which financial flows are organised:

1. Financial flows are largely made the responsibility of the organisation responsible for operating the collection system – this represents a typical DRS approach;
2. Funds to support the packaging collection / recycling are channelled through producer responsibility organisations (PROs) or other compliance schemes.

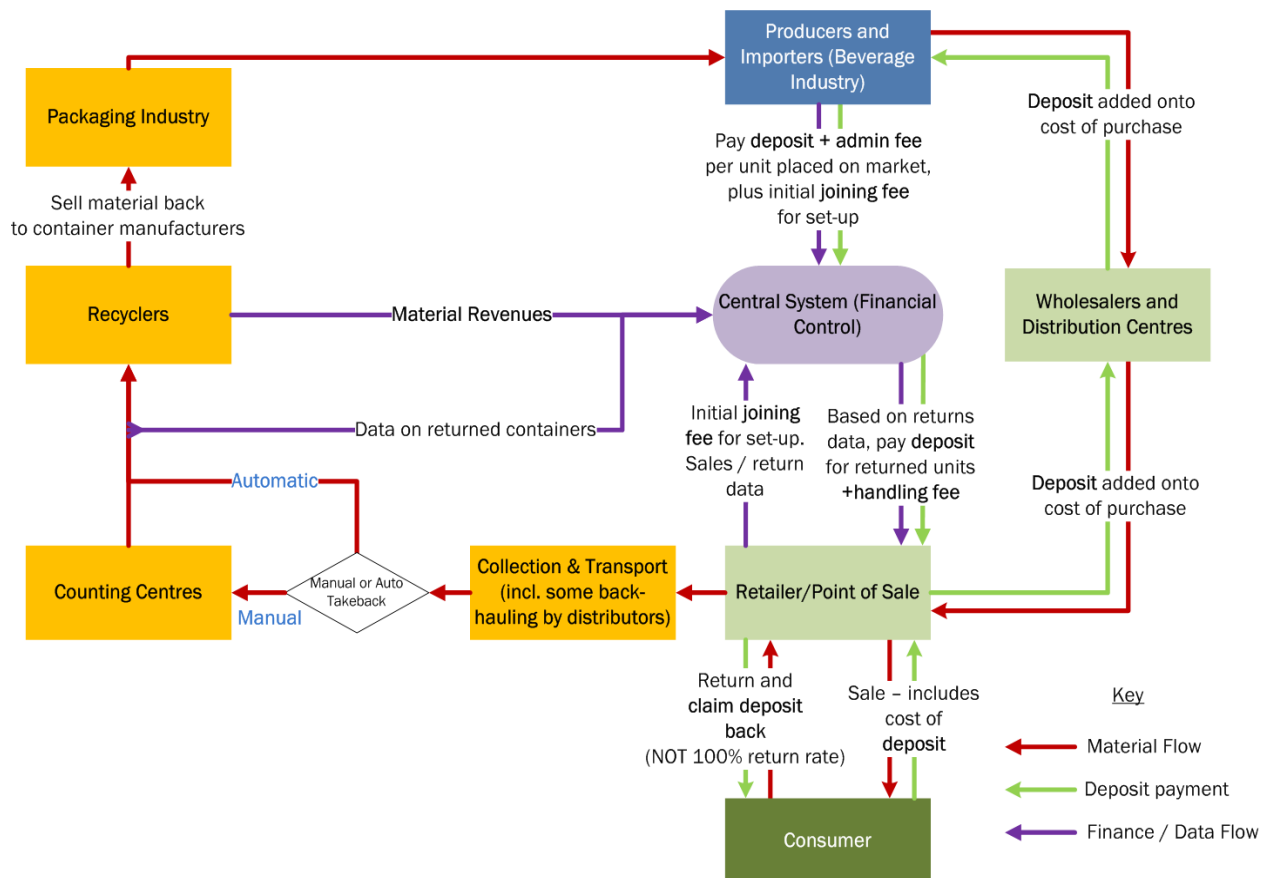
In the DRS case, there are a range of different models for the way in which money flows through the system, but in essence, the majority of the systems share the following features:

- a. A central system takes financial responsibility for the system;
- b. The system contracts with logistics companies / sorting companies or carries out the work itself. The logistics are required to take back containers from the points where they are returned;
- c. Fillers and importers sell beverages to wholesalers / distribution centres / retailers with the deposit included in the price;
- d. Fillers and importers surrender to the central system the deposits that they have received from retailers;
- e. Consumers pay for the beverages, inclusive of the deposit, at the point of purchase;
- f. Stores surrender deposits when containers are returned;

- g. The central system reimburses stores for the deposits surrendered to the central system, and equally, the central system reimburses stores for the deposits paid out;
- h. The central system also pays (not in all cases) handling fees to those stores who agree to take back containers (often with varying rates for those using, and those not using, RVMs);
- i. The central system generates revenue from sales of materials and from the unclaimed deposits; and
- j. The fillers and importers are charged an administrative fee, which may vary by material (reflecting the flows of costs and revenues), to cover the remaining 'gap' between the overall costs of the system net of the revenues received.

The typical DRS system is described diagrammatically in Figure 5-1.

Figure 5-1: Schematic of Flow of Funds, Deposits and Materials in a Centralised DRS



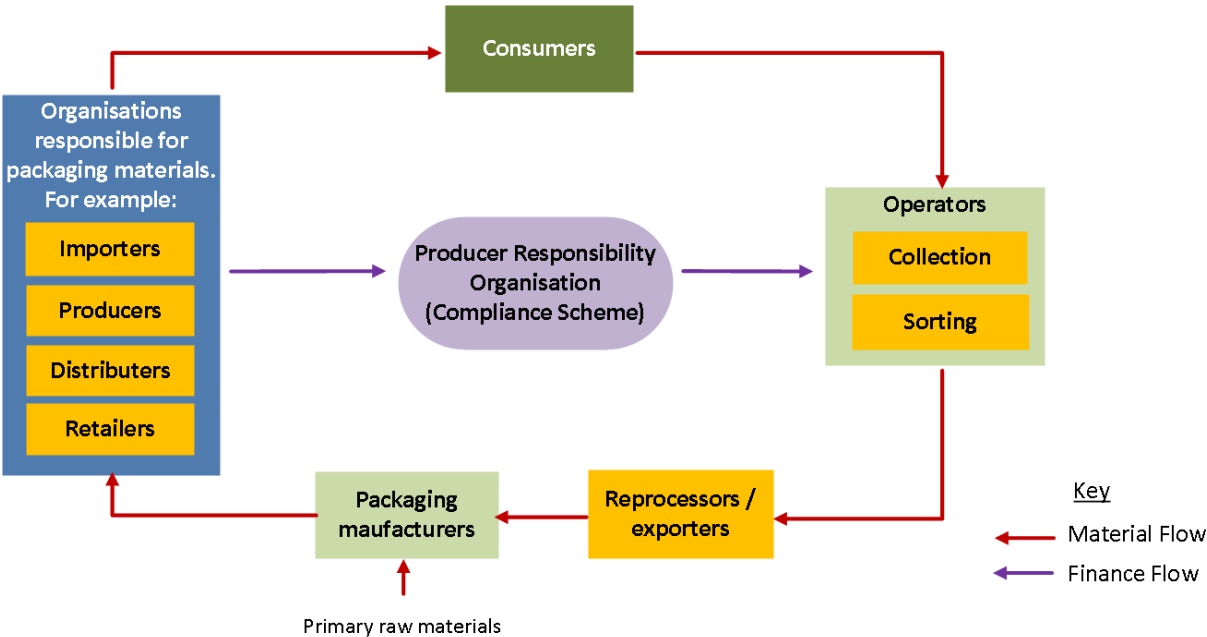
Source: Eunomia

In the case of PROs or other compliance schemes, funds are collected from obligated companies (exactly who these are varies from country to country) to support packaging collection / recycling. The extent of this support, however, in terms of the proportion of the full costs which are supported by the PROs, varies. This means that in different countries, commercial businesses, or local authorities (and hence,

households) pay for a varying proportion of the costs of the collection and recycling of material. The proportion of the total costs of collecting and recycling packaging which are supported by these types of approach is not always known for any given country.

In some countries, such as Germany and Belgium, the scheme is expected to cover the full costs of packaging recovery. Typically the collection systems may be owned by the producer responsibility organisation, or they may be involved in the tendering and organisation of the collection services. A simplified example (based loosely on FostPlus in Belgium) is shown in Figure 5-2. Collection often tends to be for the light packaging fraction which includes beverage containers.

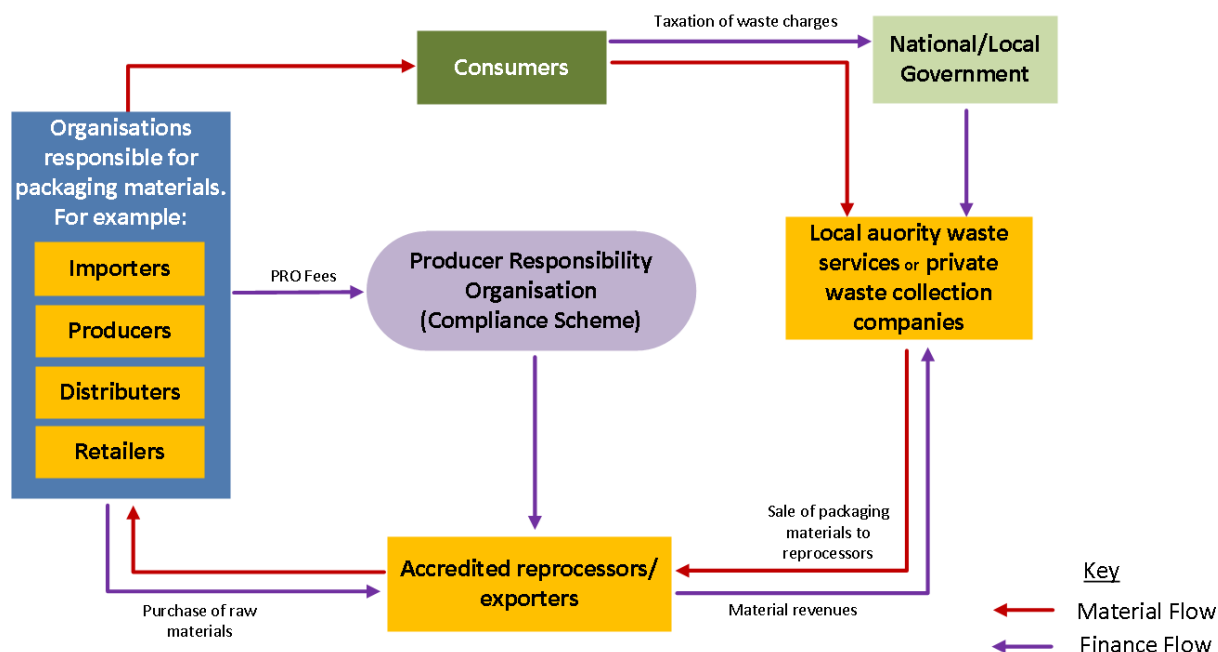
Figure 5-2: Example Flow of Materials and Finance for Producer Responsibility Schemes with Full Financial Responsibility



Source: Adapted (and generalised) from Fost Plus (2010) *Managing Household Packaging Waste in Belgium*, http://www.fostplus.be/SiteCollectionDocuments/Publicaties/FOST_Plaquette_EN.pdf

In other countries, where this is not the case, different approaches are applied. The degree to which all costs are covered is not always independently estimated or verified. Consequently, the full costs of collection are not always known. Often local authorities organise collection operations and are to some degree compensated, either directly or indirectly, by PROs – often with the system being financially supported by public money. Such an approach is shown in Figure 5-3.

Figure 5-3: Example Flow of Materials and Finance for Producer Responsibility Schemes with Indirect Financial Impact on Recycling Systems



Note: Based on the UK tradable compliance scheme – price support given to recycled materials.

A specific depiction of financial flows is not easily achieved under either of the producer responsibility organisation approaches presented in Figure 5-2 or Figure 5-3. This is especially true as one seeks to identify these flows specifically for aluminium cans. In practice, this would require engineering analyses to disaggregate the aluminium-specific costs associated with each of the logistics, sorting, and recycling (including revenues from material sales). This is not a straightforward exercise. Some analyses have been attempted to estimate the additional costs of adding metals to existing recycling schemes.¹⁶ However, this obviously presumes the existence of a certain type of scheme in the first place: the incremental costs of adding a given material to an already existing scheme will have a certain 'path-dependent' logic (the additional costs will depend upon what is already there). In other schemes, the collection of specific fractions – for example, the PMD stream (Plastic bottles and flasks, Metal packaging, and Drinks cartons) in Belgium – is relatively well known because of monitoring of contracts by appointed experts.

5.1 Financial Assessment of Deposit Refund Systems

The availability and nature of financial information concerning deposit refund systems varies from country to country. The sub-sections that follow seek to identify and interrogate the available financial information concerning such systems in the

¹⁶ Eco Alternatives (2004), *Evaluation of the Costs and Benefits of Collecting Metal Packaging in Multi-Material Kerbside Collections*, Final report for the Department of Trade and Industry, December 2004.

individual countries. The financial assessments given seek to give a simple and comparable overview of DRS system costs net of material revenue received for recycled cans.

5.1.1 Denmark – Dansk Retursystem

Producer fees, as reported in the country appendices, are charged at €0.014 per aluminium can.

To evaluate true system costs, it is necessary to also consider the costs borne by the end consumer through unclaimed deposits. We calculate these contributory costs as the unrecycled cans suggested by the data in Table 4-4 above. With Denmark achieving an aluminium can recycling rate of 89%, and the deposit costs of €0.13 per can, this leads to an overall cost of €0.028 per can (or approximately €2,150/tonne of can packaging), as is summarised in Table 5-1.

Table 5-1: Estimate of Denmark DRS System Costs

Cost Element	Figures Per Can Onto The Market
Unclaimed deposits	1.4 eurocent
Producer administration fee levied*	1.4 eurocent
Total: Estimated collection / sorting / recovery system cost per can onto market	2.8 eurocent

**Note: Producer fees are given different labels in different countries.*

5.1.2 Germany - DPG Deutsche Pfandsystem GmbH

The German deposit refund system has historically been decried as being expensive. This may not be entirely surprising in the German situation, where:

- The deposit system operates only for one way (disposable) beverage packaging. The market penetration of such items is much lower than other countries due to longstanding policies promoting the use of refillable containers, and the resulting strong market prevalence of these. Beer containers in Germany are 85% refillable. The figure for carbonated soft drinks is 38%. Thus the density of collection is lower, and less cost effective;
- Germany also operates alternative well developed collection systems. As well as the systems that recover and reuse refillable containers, general packaging is collected from households in the ‘dual system’ at the kerbside. Bring systems and residual waste recovery also operate in Germany (see Figure 3-1). Even though capture rates are particularly high, having more than one well developed collection system consequently increases the costs of each system (this goes both ways – the relative absence of cans and plastic bottles from the dual system could be a factor in costs of this system also being relatively more expensive than other countries).

However, the system was set up over 8 years ago, so the financing of system set up costs (purchasing of RVMs in particular) can now for the most part be considered to have been paid off. Ongoing costs of maintaining and running the system are now reduced – we are led to believe that upkeep of RVMs has so far been incurring quite limited financial resources.

Very limited financial data for the Germany DRS is available. One 2010 study by the Bayerisches Institut für Abfallforschung (Bavarian Institute for Waste Research) includes some data based upon studies from Roland Berger and Prognos in 2007.¹⁷ The analysis suggested that the total collection, sorting and recovery system costs were around 640 to 800 € million, or over 14 billion units, 4.6 to 5.7 eurocents per item.

A recent study by PricewaterhouseCoopers (PwC) indicates that these costs have fallen since the introduction of the system in 2003:¹⁸

This analysis shows that the results of the industry survey indicate 45 to 70% lower operational costs for beverage producers than assumed in the Roland Berger study.

In addition, costs to the retail trade were found to be ‘between 18 to 24% lower than in the Roland Berger Study’. Clearing and labelling costs for the beverage producers were found to be, on average, 0.1 eurocents per can. Logistics and clearing costs for automated take-back (90%) were around 1 eurocent per can, and for manual return clearing varies between 1.64 and 2.7 eurocents per can and logistics between 2 and 4 eurocents per can. However, there are additional costs associated with the costs of RVMs (depreciation, maintenance, staffing, space costs etc).

Overall the total cost of the system were estimated at between 545 and 606 € million. Over a revised figure of units sold of 13.2 billion units which PwC took from Canadean (a beverage industry data supplier) unit costs could be somewhere between 4.1 and 4.6 eurocents per can. The proportion of metal cans collected out of the total covered by DPG is low (around 5% or less). Thus these costs are more likely to reflect the costs of PET collection, however, much of the infrastructure and clearing procedures would be common. Thus a lower figure of 4 eurocents was used as an approximation reflecting the reduced logistics costs resulting from the higher bulk density of compacted cans than can be achieved for PET.

This implies that the equivalent fees which are needed to prop up the system (together with unclaimed deposits) are around 2.7 eurocent per can.

¹⁷ bifa Umweltinstitut GmbH (2010) *Validation of the Packaging Regulation Part 1: Evaluation of the Refund Obligation*, Project number 3708 93 303, UBA-FB 001 363 / 2; funded by the Federal Environment Agency (translated from German), www.umweltbundesamt.de/uba-info-medien/mysql_medien.php?anfrage=Kennnummer&Suchwort=3931

¹⁸ PricewaterhouseCoopers (2011) *Reuse and Recycling Systems for Selected Beverage Packaging from a Sustainability Perspective: An Analysis of the Ecological, Economic and Social Impacts of Reuse and Recycling Systems and Approaches to Solutions for Further Development*, Final Report to Deutsche Umwelthilfe e.V. & DUH Umweltschutz-Service GmbH, http://www.duh.de/uploads/media/PwC-Study_reading_version_01.pdf

Table 5-2: Reproduction of Estimated Data for Germany DRS System Costs

Cost Element	Figures Per Can Onto The Market
Unclaimed deposits	1.3 eurocent
Implied equivalent producer fee	2.7 eurocent
Total: Estimated collection / sorting / recovery system cost per can onto market	4.0 eurocent

5.1.3 Finland – PALPA

Producers are obliged to pay a joining fee, a bar code fee (for each new product registered on the system) and a recycling fee per can. Registration fees (a one off €7,600 or annual fee of €1,500 for 5 years) appear expensive compared to other countries. However, such costs are only a fraction of the overall system costs – Palpa reports that 30 can-producing companies partake in the system, leading to revenues (if all companies were to pay the annual fee) of under €50,000 per year. In comparison, the costs associated with the €0.01 per can recycling fee levied on producers equates to over €7million per annum. The bar code fee (€350 per product) is also a negligible contributor to overall system running costs.

The country report annex data gives reasonable assurance that the 94% return rate is an accurate figure for Finland’s Palpa system, and this has not benefited from an uplift from recycled imported cans. This means that unclaimed deposits inject a further €0.009 into the system (€0.15 per can × 6%). This suggests that the total system running costs are €0.019, i.e. around 2 euro cents per can. The financial data are summarised in Table 5-3.

Table 5-3: Estimate of Finland DRS System Costs

Cost Element	Figures Per Can Onto The Market
Unclaimed deposits	0.9 eurocent
Producer administration fee levied	1 eurocent
Total: Approximate collection / sorting / recovery system cost per can onto market	1.9 eurocent

Note: The system costs shown here are net of approximately 1.3 eurocent of material revenues.

5.1.4 Estonia – Eesti Pandipakend System Financial Assessment

The deposit refund system in Estonia demonstrates a return rate of only 59% (2009 figure). Compared to the other deposit packaging materials in Estonia, the return rate is low – glass return rates stand at 91%, and plastic bottle return rate 96%. The reason for the low rate for metal cans is that a significant amount of alcoholic

beverages in metal cans (believed to be over 35 million per annum) are taken by individuals out of the country from Estonia to Finland which, due to tax levels there, has one of the highest alcohol prices in Europe. This effect includes alcohol smuggling as well as private purchase of alcohol products from Estonia.¹⁹ Accounting for cans exported to Finland would mean the return rate of cans that may remain in the country (assuming exported cans are not returned) could be around 85%. The Ministry of Environment reports that low income people actively collect all deposit packaging in settlements and return to the system. This effect is likely to support the high return rates for deposit schemes in countries across Europe, and supports a true return rate of 85% or higher for Estonia.²⁰

Due to the effective low return rate in the country, around 40% of the 6 euro cent per can (€0.024) remains in the DRF system. These unclaimed deposits together with material revenues are sufficient to cover the full system costs and, as such, no producer administration fee is imposed on metal cans.

Handling fees are paid from the system to retailers – from 0.9 euro cent (manual take back) up to 2.7 euro cent (RVM with compression). Sufficient data is, however, not available to determine the precise average payment per can to retailers but accounting for the 59% return rate, these costs therefore lie somewhere between 0.5 and 1.6 euro cent per can onto the market.

Using a round figure of €1,000 per tonne of aluminium from collected cans (99% of cans in Estonia are aluminium), the material revenues from the 59% of returned cans (assuming 14g per can) equate to 0.8 euro cent per can onto the market.

Systems costs are, therefore, as shown in Table 5-4. The costs of supporting the system are met by consumers through unclaimed deposits. The handling fee may be considered generous, but is a product of the fact that the system is self-sustaining through the unclaimed deposits.

¹⁹ Finnish Customs (2010) *Finnish Customs Intelligence and Investigation Report 2009*, July 2010
http://www.tulli.fi/en/finnish_customs/publications/annual_reports/rikostorjunta_09_eng.pdf

²⁰ Peeter Eek (2008) *Mandatory Deposit on drink packages in Estonia – Why and How? Backgrounds and results*, Ministry of the Environment (Waste Department) presentation from 8/12/2008
www.envir.ee/orb.aw/class=file/action=preview/id=1092013/P-Eek-Deposit-EST-pres-Riga-8-12-2008.pdf

Table 5-4: Estimate of Estonia DRS System Costs

Cost Element	Figures Per Can Onto The Market
Unclaimed deposits	2.5 eurocent
Producer administration fee levied	Zero
Total: Estimated collection / sorting / recovery system cost per can onto market	less than 2.5 eurocent

Note: The system costs shown here are net of approximately 0.8 eurocent of material revenues. Within the total system costs shown, handling fees of 0.5 to 1.6 eurocent are paid to retailers; note in Sweden in Table 5-6 below, the figure is 0.4 eurocent. We suggest here that costs are less than the evaluated 2.5 eurocent because potentially significant profit may result from the large number of unclaimed deposits – equivalent to around €2.1million per annum in total.

5.1.5 Sweden – Returpack

Returpack has provided detailed data on recycling performance in Sweden. This is shown in Table 5-5. The data shows how imported cans can distort the figures if not accounted for. If the total number of cans recycled in Sweden is divided by the official number of cans (those with deposits) sold within the country then a figure close to 90% recycling is generated. However, with imports excluded, the true rate of recycling for the Returpack system is around 75%.

Table 5-5: Beverage Can Consumption and Recycling in Sweden

Numbers of cans in millions	2007	2010
Cans sold onto Swedish market	1069	1114
Imported cans	Unknown	Unknown
Returpack recycling, deposit reclaimed	782	824
Private imports recycled through RVMS	45	55
Private imports recycled through other recycling systems	116	96*
Deposit cans recycled through other recycling systems	12	
Private imports not recycled	Unknown	Unknown
True return / recycling rate for deposit cans	74.3%	74.8%
False recycling rate with recycled imported cans added to numerator	89.3%	87.5%

**Note: The data for cans recycled in 2010 through the FTI collection systems does not identify the split between deposit and non-deposit cans. For this analysis we assume that 10% are deposit cans, based on the sorting analysis conducted prior to 2007.*

Source: Data provided by Returpack

Following the format for the previous countries, a summary of the financial assessment of the Swedish DRS is given in Table 5-6. Again, an annual registration fee (around €1,100, as detailed in the country report appendices) is payable. Unique bar codes need to be purchased from third party organisations (the country report

appendices suggest that costs are believed to be around €195). However, Returpack report that 135 importers / breweries are registered with Returpack and 250 unique barcodes are registered. This confirms that these costs (around 0.02 eurocent per can) are negligible in comparison to the overall system costs assessed below.

The 0.50 SEK (6 eurocent) deposit on metal cans has been phased out in favour of a 1 SEK (12 eurocent) deposit. No producer fees are currently payable for aluminium cans. The evaluated system cost summary is shown in Table 5-6 for Returpack.

Table 5-6: Estimate of Sweden DRS System Costs

Cost Element	Figures Per Can Onto The Market
Unclaimed deposits (at 75% return rate)	2.4 eurocent
Producer administration fee levied	Zero
Approximate collection / sorting / recovery system cost per can onto market	2.4 eurocent

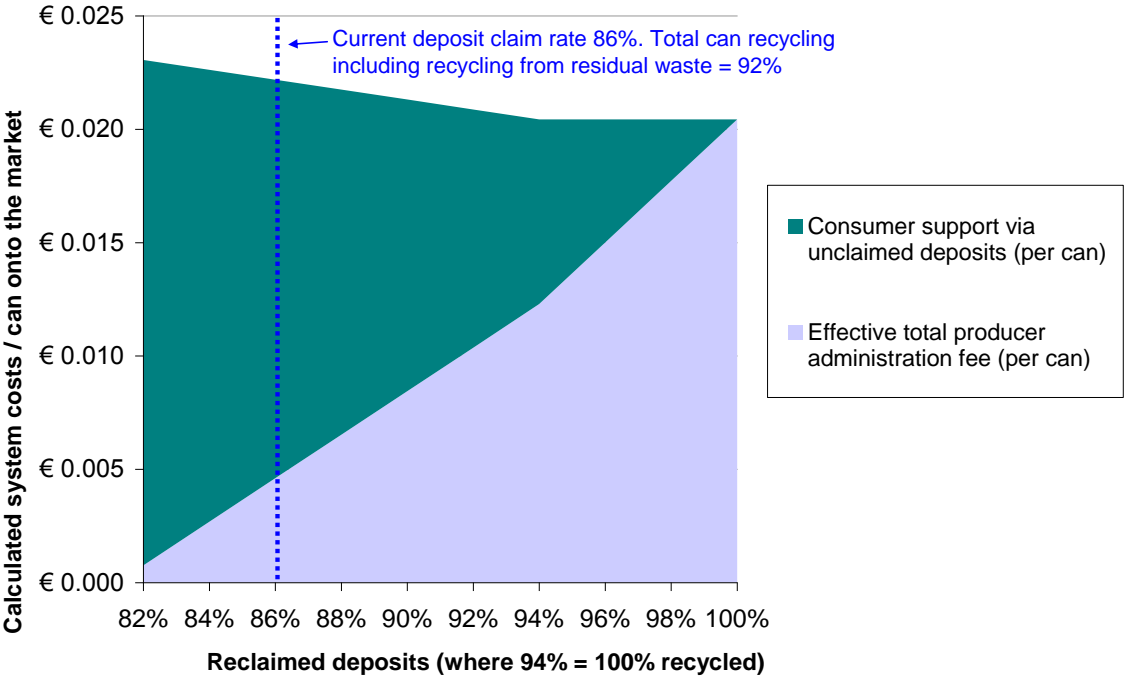
Note: Data from Returpack indicates that of these total costs, 0.4 eurocent per can onto the market is paid to retailers as the handling fees. The remaining 2 eurocent per can, together with revenues generated on the sale of materials, can be assumed to cover all costs relating to the business and operating the collection and sorting systems.

5.1.6 Norway – Norsk Resirk

Although not a member of the EU, Norway remains a useful case study when reviewing the cost and performance of deposit systems. Detailed data on costs and performance of Norway’s DRS is available within Norsk Resirk’s annual report.²¹ Data from the annual report allows us to effectively model what would happen at different claim rates. The modelled system economics are shown in Figure 5-4. The 2008 deposit claim rate of 86% leads to an income of 1.7 eurocents from lost deposits, which leaves 0.5 eurocents needing to be funded by producers to support the costs of the system. At higher claim rates, the effective consumer contribution falls away, but system costs reduce due to increased material revenues. The modelling assumes that effectively 100% beverage can recycling is achieved at a 94% deposit reclaim rate due to the recovery of metals from residual waste. At higher deposit reclaim rates, the theoretical system cost remains constant but the balance of costs increasingly shifts directly across to the producers.

²¹ Norsk Resirk (2010) *Annual Report*, http://www.resirk.no/Files/Billeder/resirk_bilder/PDF_til_lpaper/resirk_aarsmelding_2010_web.pdf

Figure 5-4: Modelled System Costs of DRS Based on Norsk Resirk Accounts Data

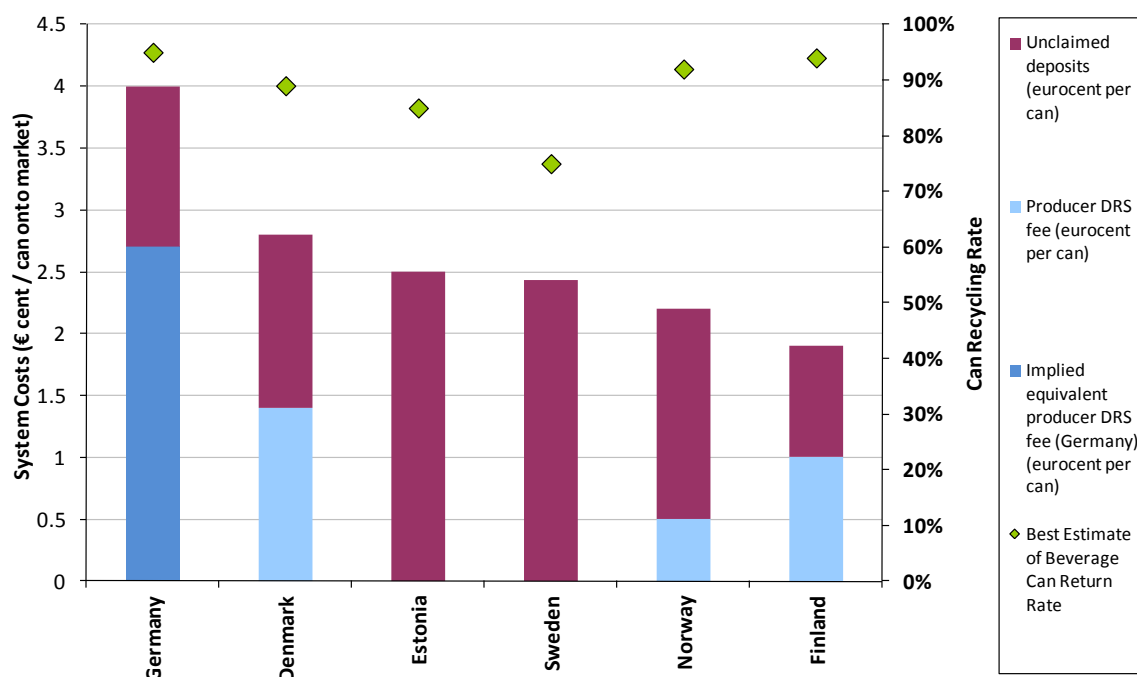


5.1.7 DRS Financial Summary

A summary of the calculated financial costs of the individual deposit systems in the different deposit countries is given in Figure 5-5. The costs are shown in euro cents per can onto the market on the left hand axis and euros per tonne of beverage can packaging on the right hand axis (assuming 14 grams per can²²). Although there is some variance in the costs, especially in relation to the German data, the conclusion is that systems can be run for under €2,000 euros per tonne to achieve the overall recycling rates of typically 90% and over, as seen in these countries.

²² Note: Data gathered in the country report appendices suggests the weight per aluminium can varies from country to country (and we could expect from brand to brand).

Figure 5-5: Producer Fees, Consumer Costs and Material Income for the Deposit Refund Systems



Note: return rates do not include privately imported cans in the numerator, or privately exported cans in the denominator.

5.2 Fees Paid by Obligated Parties in PRO Schemes

Producer responsibility schemes for packaging have been identified in all 27 MS. Table 5-7 below focuses on the fees paid by producers in those schemes where obligated companies discharge their obligations through ‘Green Dot’, or other producer compliance schemes. The ‘Green Dot’ approach generally involves a logo being included on packaging to make consumers aware that the producer contributes to the cost of recovery and recycling of the packaging. Producers generally pay a fee to join the scheme, together with ongoing fixed and variable fees. Significantly, ‘licence fees’ are paid by producers, based on the tonnages of packaging material they place on the market. The broad aim of such schemes is to encourage producers to cut down on packaging in order to reduce the fees they pay to the scheme, as well as to cover, albeit sometimes only partially, the costs of collection, sorting and recycling of the packaging once it becomes waste.

One has to be careful when compiling and attempting to interpret data relating to producer responsibility fees for a number of reasons:

- Producer responsibility systems fund different types of systems in different countries. A low density street-corner collection scheme is likely to be cheaper than a high frequency door to door collection system;
- The performance of a scheme will influence the level of fees. If performance is low, then the fees for packaging placed on the market will not need to be high to cover the costs of the low performing system;

- The fees cover all the costs of the recycling scheme in some countries, but only a small proportion in some others;
- Charging structures both for packaging producers and for waste generators (householders etc.) also vary widely across the EU;
- Fees differ for different packaging materials. For the work here we only consider metal packaging fees, but overall [collection] system costs include expenditure and revenues relating to other packaging materials. Fees for metals alone may be distorted by the interaction with the broader system;
- The maturity of a system can also affect costs. Setup and one-off capital infrastructure costs are likely to negatively affect system costs in early years.
- Producer responsibility fees are significantly impacted by material prices. As such, the year of any licence fee data is important.

Trends that may be associated with system maturity and material prices are observable in the average packaging fee profile for the ARA System in Austria as shown in Figure 5-6 (the organisation was founded in 1993). The general reduction in cost over time may be associated with efficiency improvement and reduction in development costs as the system matures, as well as greater material revenues being generated from higher recycling rates (the Appendix indicates 32% increase in recycling tonnage between 1995 and 2009). The impact from material revenues is also important and can clearly be seen in Figure 5-6. The collapse of the revenues for recycling materials in 2007 is said to have led to the heavy raise of the license fees in 2009.

Figure 5-6: Example of Changing License Fees Over Time: The Austria ARA System from 1995 to 2011, average costs in € per tonne packaging material



Source: ARA (2010) *Leistungsreport (Performance Report)*, page 4, http://www.ara.at/fileadmin/user_upload/ENGLISH/Downloads/2011/ARA_Leistungsreport2010_ENG.pdf

Despite the complications discussed above, Table 5-7 compiles the producer responsibility fees charged across Europe for aluminium and steel together with an indication of the proportion of the can recycling system costs which the fees seek to fund.

Table 5-7: Overview of Fees Paid to Producer Responsibility Organisations

Member State	Aluminium PRO fee	Steel PRO fee	Year of data	Proportionate share of recycling system costs on producers	Notes
AT ²	€450	€270	2011	100% (industry operated collection)	Fees cover all costs including collecting, sorting, recycling, marketing and sales revenue of the materials. These costs from ARA AG system (the PRO) covers beverage containers from both households and non-household sources.
BE ²	€183	€62	2011	100% (industry operated collection)	Fost Plus pays the full cost of collection and sorting and receives the proceeds from the sale of recycled materials. The net cost is financed by its member companies
BG	€144	€41	2011	Low – informal sector supporting recycling rates	Significant informal waste management sector, waste pickers selling to buy-back centres. Low green dot fees due to effectively zero (formal) system cost for waste picker recycling.
CY ³	€21	€95	2010-2011	Reportedly 80%	Local authorities cover the remaining 20% of costs for collecting and sorting non-packaging paper which is also collected through the collection systems.
CZ ²	€87	€65	2011	Low	Sorting costs alone absorb 80% of these rates, i.e. very little is spent on collection (see country report appendices). Collection funded in the main by municipalities. (Note: limited beverage cans, they mostly retail in plastic bottles).
DK	DRS in place for beverage containers				
EE	€256 (PRO)	€256 (PRO)	2011	N/A, DRS system in place	DRS in place for beverage containers, see Section 5.1.4
FI	DRS in place for beverage containers				
FR ¹	€121 €186	€60 €63	2010 2011	Committed to funding 80% from 2012	In 2009 Eco-Emballages and has committed to funding 80% of the national average optimised cost for separate collection of packaging waste from households in the period 2011-16. Source: Eco-Emballages (2011) <i>Entreprises</i> , Date Accessed: 22 August 2011, www.ecoemballages.fr/entreprises/actualites/nouveau-bareme-2012/ and personal communication with Joachim Quoden, PRO Europe, 18/10/2011.
DE ³	€858 (PRO)	€627 (PRO)	2011	100% (industry operated dual system, but DRS for cans)	DRS in place for beverage containers. High rates of reusable beverage containers. Dual [packaging waste collection] system. High fees for metals may be expected due to lower metal content.
EL	€37	€34	Unkno	Low	Costs cover only materials sorting facilities (22 in the country), municipalities

Member State	Aluminium PRO fee	Steel PRO fee	Year of data	Proportionate share of recycling system costs on producers	Notes
			wn		fund collection. Fees quoted include the weight based fee plus unit fee of 0.04 euro cents per unit for cans (assuming 14g for alu. and 31g for steel cans).
ES	€102	€85	2010	Unknown.	Local authorities paid compensation for the additional costs due to separate packaging collection, according to several parameters such as the population and the tonnes of waste collected.
HU ³	€24.40	€12.50	2011	Unknown	Green Dot Fees from Öko-Pannon but variation of other systems available. Waste systems and regulation in state of flux.
IE	€94	€89	2010	Under 5% of door to door collection costs (net of revenues)	Costs stated here include the fees per tonne imposed on the material manufacturer, the converter, the brand holder / importer, the distributor and the retailer.
IT	€52	€31	Unknown	Unknown, but only partial funding	<i>“Through the environmental contribution, paid by companies for packaging placed on the market, CONAI-Consortia system mainly supports and participates in the cost of separate packaging waste collection.” [Source: Conai website]</i>
LV	€65-68	€65-68	2008	Recycling supported by informal sector.	Legislating to extend bring system coverage – this is limited at present. Metal commonly collected by lower income population and sold to scrap collectors.
LT ³	€93 / €59 €52 / €33 €45 / €28	as alu.	2009 2010 2011	Minimal – reprocessor evidence notes based system.	Producers can pay a tax to the MoE (€753/tonne onto market) or demonstrate compliance either by paying collection companies or reprocessors or a compliance organisation for ‘evidence notes’. Evidence suggests large quantities of cans collected by the population (informal collection) and sold via local scrap dealers, in addition to sorting from residual waste at landfill. There is also no distinction between household, commercial and industrial packaging so the cleaner and greater bulk C&I sources are more targeted. First figure = cost per tonne recovered. Second figure = equivalent cost per tonne onto market using 2009 packaging recycling rate.
LU ³	€160 €149	€58 €23	2001 2011	100% (industry operated dual system)	Dual collection system for packaging for about 80% of households, additional bring systems. Recycling rates supported by material recovery via incineration.
MT ³	€29	€65	2011	Unknown	GreenPak ‘Green Dot’ Fees
NL	€877	€142	2009	Not applicable. Metals generally not collected but recovered through incineration.	Minimal source separation of metals, significant separation at incinerators. Cans are mostly steel to fit with this system. Rates are payable as a national packaging tax which totals €365M/yr [for all materials]. Of this, €115M is transferred to the Waste Fund and used to cover the costs of producer

Member State	Aluminium PRO fee	Steel PRO fee	Year of data	Proportionate share of recycling system costs on producers	Notes
					responsibility for packaging including littering, prevention, communication and remuneration of municipalities for selective collection. (Note: DRS for plastic.)
PL	€30	€10	2011	Recovery organizations generally cover only a small part of collection costs. No subsidy needed to support aluminium communication.	Beverage can recovery in Poland is very much driven by incentive based collection. Informal collection (waste pickers) collect cans and sell to scrap dealers, thereby bypassing more formal collection systems. Aluminium collection needs no subsidy and is funded entirely by the material value. For other materials, PRO funds prop up collection services as necessary to meet targets similar to the UK PRN system. Glass collection costs are ¼ funded by PRO fees, for other materials the subsidy is scanty. <i>[Personal comm.: Rekopol]</i>
PT	€165	€96	2011	Unknown. Urban collection directly funded, but not so for non-urban recycling.	Fees quoted are for household primary packaging. Secondary, tertiary and industrial packaging has different fees. The PRO (Sociedade Ponto Verde) provides direct funding for urban recycling, but a pays much smaller incentive rate for non-urban recycling. (Note: Plastic DRS)
RO ³	€23	€11	2011	Recycling supported by informal sector.	Recycling aided by significant informal waste management sector (waste picker collection).
SE	DRS in place for beverage containers				
SI	€79	€79	2011	Low	Collection services are charged to residents, including a fixed fee to cover the costs for recycling eco points. Packaging fees are used to fund only the transport from collection centres of public waste companies to sorting plants and the sorting costs (by privately owned subcontractors of the PRO).
SK ³	€28 €40 €140	€28 €26 €40	2011a 2011b 2010	Low/Unknown.	2011a = Envi-Pak (add joining fee). 2011b= Natur-Pack (no joining fee). 2010 = Recycling Fund (can reclaim these fees by demonstrating recycling rate compliance either individually or via a compliance scheme).
UK	€56 / €19	€30 / €19	2008	Known to be a low proportion of the system costs.	Tradable compliance scheme. Local authorities fund collection, PRN income tends to be a small fraction of overall costs. First figure = cost per tonne recovered (average over 3 years). Second figure = equivalent cost per tonne onto market.

¹ Scheme(s) known to cover only household packaging waste

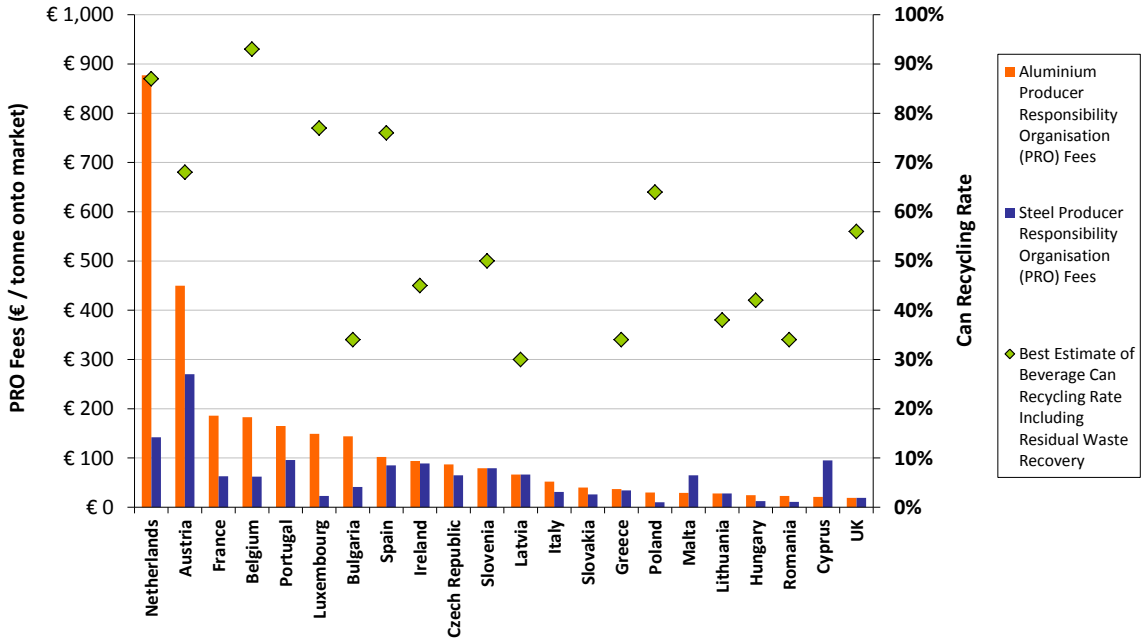
² Scheme(s) known to cover household and commercial packaging waste

³ Scheme(s) known to cover household, commercial and industrial packaging waste

A summary of the producer fees is shown alongside our figures for the beverage can recycling rate in individual countries in Figure 5-7, with the data ordered by the fee for aluminium. Strong correlations are not necessarily to be expected for the reasons discussed above – most notably because producer responsibility fees cover more than just beverage cans, producer responsibility systems incorporate various other materials, and especially because other actors contribute to the costs of collection. Although higher investment in recycling systems ought to aid recycling rates, the data shown here does not include the financial contribution from other sources (local authorities, central government funds or direct household financing of collection systems).

Only the Austrian, Belgian and Luxembourg systems are believed to be fully supported by the producer responsibility fees. These three countries are amongst the top six most expensive countries for aluminium packaging fees, but their recycling rates also score within the top five from the available data. (We may note that the particularly high cost for aluminium in the Netherlands is due to the prevalence of incineration there – this is discussed in Box 2 above).

Figure 5-7: Summary of Producer Responsibility Fees and Material Income for the Deposit Refund Systems



We should be careful to draw too many conclusions from this summary chart, as the reasons which can be said to lead to the recycling rates shown are numerous and no direct correlation can be expected. Nevertheless, a fairly broad observation appears to be that the countries levying lower producer fees have generally lower recycling rates. Clear exceptions are Poland where there are strong established systems for the informal sector to collect and recycle materials (hence less need for system support

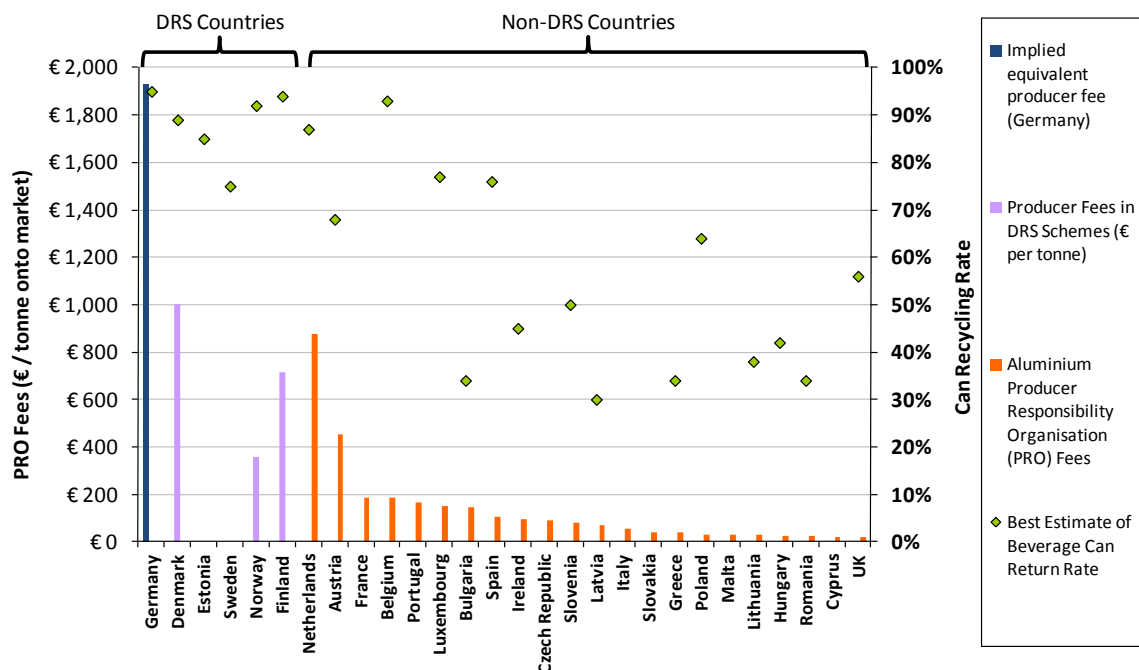
fees), and the UK, where collection is largely funded by local authorities. A further general point may be drawn that the lower fee levying countries are often associated with bring systems, where material captures are similarly low.

5.3 Summary of Fees Paid by Obligated Parties

There are no publicly available figures which give a clearly identifiable cost for aluminium cans in each of the systems being used. The closest one comes to truly valid measures of this are those cases where the principle upon which the scheme is founded are such that 100% of all the costs of the selective collection are funded by the relevant scheme. These include the deposit schemes (though the unreturned deposits are used to reduce these costs) and the producer responsibility schemes in selected countries, including Belgium, Germany, Luxembourg and Austria, where 100% of relevant costs are funded by producers.

There are fees paid by relevant parties either to a DRS or a relevant producer responsibility organisation (PRO) which arranges for compliance with the terms of the company's obligation. These fees, summarised from the above sections (but without including the effective contribution from unclaimed deposits) are shown in Figure 5-8. We include here only the aluminium PRO fee since beverage cans in deposit countries tend to be aluminium. We strongly caveat the presentation of this data, as the PRO fees are not strictly comparable (for some reasons alluded to above, and further described below). However, there is no other cross-country data that is comparable, and some trends are discernible.

Figure 5-8: Fees Paid by Relevant Parties for Aluminium and Steel Packaging Recycling



Note: for DRSs return rates do not include privately imported cans in the numerator, or privately exported cans in the denominator.

As can be seen from Figure 5-8, the implied German fees are by far the highest. It is also notable that the fees for Denmark, Finland and Norway are also high, and that these are all countries with DRSs (for convenience, these are shown grouped to the left of the Figure). On the other hand, Estonia and Sweden both charge nothing to the relevant parties for aluminium. In these countries, the revenues from unreturned deposits are sufficient to cover the costs of operation for aluminium. It is noted that the return rates for domestic cans are lower in these countries, compared with the other DRS countries, where indeed producer fees are paid. Modelling based upon data from Norway suggests that at deposit claim rates of around 80% and under, system costs are covered without charging fees to producers.

The aluminium packaging tax in the Netherlands is notably high, though the steel tax is low. This can be interpreted both as a deliberate deterrent to force producers to use steel (which achieves higher rates of recovery from the country's incineration waste infrastructure), as well as reflecting the economics of recovering steel as opposed to aluminium from incinerator bottom ash.

Countries with traditional producer responsibility systems, in the main, levy lower fees than in DRS countries. In many cases, however, the full costs of operating waste management systems are not charged to the producers. Instead, residents or the general tax payer effectively support service costs. This may also be said of DRSs – consumers contribute by way of unclaimed deposits and so producers themselves are, again, not funding full system costs. Nevertheless, the general conclusion is that systems that are more heavily funded by producers tend to achieve better results. Countries which include a deposit refund system as part of their waste management portfolio appear to deliver consistently high performance, other than in the case of Estonia, where the cross border purchase of cans influences the quantity of material available within the country for collection. This does raise the interesting point that if, hypothetically, Estonia was required to meet a much higher rate of recycling specifically for cans, it might need to consider either a higher deposit to increase return rates, or further excise tax harmonisation to prevent cross border purchases from Finnish consumers.

It may also be noted that across all the systems studied, the true concept of Producer Responsibility is not wholly realised. To claim such a title, producers would have to take possession of all costs associated with the recycling of their packaging, **as well as** the costs associated with collection and disposal of their unrecycled packaging. Although this would give the strongest incentive to design and operate systems which lead to high rates of recycling, such an approach has not been witnessed here. Evidently, the closer countries come to achieving a 100% recycling rate, the closer the scheme comes to being 100% funded by producers.

6.0 Commentary on Cost Effectiveness of Producer Responsibility Systems

Because of the lack of reliable cost and performance data, and the numerous interrelating considerations that affect how waste management systems perform in different countries, the cost effectiveness of each country's scheme cannot be

evaluated on the basis of the data available. Consider, for example, the following cases under a standard PRO-type model:

1. Case A: The fees paid represent 100% of all relevant costs and the recycling rate is high. Here, the fee base (the amount of metals beverage cans on the market) is approximately the same as the amount collected. In this case, the material-specific unit fee (e.g. the fee per tonne of aluminium placed on the market) may approximate to the actual costs, though even here, this depends upon how overall costs are apportioned across the different material streams;
2. Case B: The fees paid represent 100% of all relevant costs and the recycling rate is around 40%. Here, the fee base (the amount of metal beverage cans on the market) is much larger than the amount actually collected for recycling. In this case, the material specific unit fee may be much lower than the actual costs of the recycling because the base for generating revenue is much higher than the level of performance achieved. Again, the fee will also depend upon how overall costs are apportioned across the different material streams;
3. Case C: The fees paid represent 30% of all relevant costs and the recycling rate is around 40%. Here, as with Case C. the fee base (the amount of metals beverage cans on the market) is much larger than the amount actually collected for recycling. In this case, however, the material specific unit fees need to cover only a proportion of the costs associated with the recycling activity. Hence, the fees may be even lower relative to the actual costs of the recycling because the base for generating revenue is much higher than the level of performance achieved and the revenue which is required to cover costs is only a fraction of the true costs incurred in carrying out the activity. Again, the fee will also depend upon how overall costs are apportioned across the different material streams;

Each of these cases exists.

A problem with comparing fees under the conventional PRO-based model, therefore, is that different countries require the systems to cover varying proportions of the overall cost. It is not always clear, even where these costs are underpinned by calculations (and in some countries, the accuracy of these is disputed), what is the *actual* percentage of the overall cost which the scheme covers. Consequently, lower fees do not necessarily imply more efficient systems. Indeed, this might simply reflect low performance, or more precisely, a low requirement to raise revenue (which might reflect one or more of low performance and a low level of cost recovery from producers). In the past, comparisons have been made between completely different schemes which cover completely different costs. For example, the House of Lords in the UK compared the costs of the UK's PRN system, which in any given year covers only a fraction of the overall cost of delivering recycling services, with the costs of the German DSD system, which covers all the costs of the household packaging recycling system. Such comparisons are simply not valid since the financial data used in the comparison cover enterprises with activities of completely different scope.

7.0 Obstacles that Fragment the Market in terms of Beverage Can Return

Before the compatibility of private imports of metal beverage cans and national packaging waste collection systems is considered the key obstacles which fragment the market, in terms of beverage can return, are summarised to provide some context.

The policy landscape for packaging is clearly not uniform across Member States (or between Member States and non-members with whom they share borders). This variation exists in terms of:

1. The recycling rates set by Member States:
Directive 94/62/EC on Packaging and Packaging Waste gives Member States some latitude in setting their own recycling rates. These tend to determine how far Member States must go in terms of recycling packaging. In respect of metal packaging, some Member States may make significant contributions to targets for recycling metal packaging through recycling steel strapping and other materials used principally in industry;
2. The proportion of costs covered by schemes operated in different countries:
As discussed above, fees payable to PROs vary quite considerably across Member States, so that even countries with similar systems request quite different fees from producers. Between Ireland and the UK, where the schemes function quite differently, the costs which are born by producers are considerably different on the two sides of the border;
3. The nature of schemes operated in different countries. Some countries make use of PRO-based approaches, others make use of DRSs, whilst the UK uses a system of tradable allowances. Alongside these schemes, several countries also make use of packaging taxes; and
4. Some schemes are designed such that producers pay fees into the system which make no distinction between household packaging, and packaging from other streams, including industry. In others, specific schemes related to specific waste streams are in place. In the latter cases, it can be expected that, other things being equal, fees will be higher for producers in the household-related schemes, where the costs of collecting and recycling packaging are higher.

In short, there is not a harmonised market for packaging recycling and recovery, still less, the products contained within them, which are affected by the lack of harmonisation of excise taxes.

8.0 Compatibility of Systems with Cross-border Flows of Products

Cross-border flows of products occur due to the private border-trade. Consumers travel across borders for a number of reasons to purchase products in other countries. The key drivers and scale of the border trade for canned beverages are

discussed in ‘Appendix 3 – Incompatibility Impacts’. (This becomes important when seeking to assess the scale of any problems which have been identified). However, this section of the report is more concerned with the compatibility of the private imports with national waste management systems.

In the literature review the range of collection systems for metal beverage cans in each Member State was described (See ‘Appendix 1 – Member State Reports’ and Section 3.0 of this report. (Note, for some Member States there are multiple systems for metal cans to be collected and recycled.) The collection systems have been grouped into the following broad categories:

- Bring – bring banks, igloos etc
- Kerbside – collection from the kerbside / doorstep of properties
- Hybrid – mixture of the above
- DRS – Deposit Refund System
- RWS – residual waste sorting, by mechanical processes

Table 8-1: Compatibility of Collection Systems with Recycling of Non-national Cans





System Type	Compatibility with Recycling of Non-national Cans	
Bring		Bring systems seek to distinguish between material types, but not by product types. Thus there are no constraints to accepting non-national cans and are therefore compatible.
Kerbside		Kerbside systems seek to distinguish between material types, either through manual sorting at the kerbside or through some form of mechanical sorting post co-mingled collection, but not by product types. Thus there are no constraints to accepting non-national cans and are therefore compatible.
Hybrid		As per Bring and Kerbside.
DRS	Mostly	All deposit refund systems operate by distinguishing between product types. Thus take-back mechanisms will check every returned container to assess whether a deposit needs to be paid out or not. Primarily this is to ensure the consumer has the correct deposit value paid back, but this is also to stop fraud i.e. paying back deposits to consumers who did not pay a deposit upon purchase. Most deposit refund systems do accept non-national cans at take-back locations – but do not pay out any deposit. In some retail outlets in Denmark proprietors do not accept non-national cans. Although the Danish Government notes that “only very few of more than 2000 retailers with RVMs have asked Dansk Retursystem to set their RVM to reject foreign cans”. Thus DRSs can be said to be compatible with non-national cans, as long as they are accepted by the retail trade at take-back locations.
RWS		Most wastes can be placed in refuse bins for collection – including any empty cans purchased nationally or abroad. These processes do not distinguish by product type and are therefore compatible with non-national cans.

Table 8-1 shows the system for capturing the material for recycling, along with a summary of its compatibility with the capture and recycling of non-national cans from the border-trade.

Capacity issues are also potentially a constraint, and relate to all collection system types. For example, if the border trade increases significantly and the national system has only been setup to manage the volume of containers placed on the national market, capacity issues could arise. Bring banks could fill up, collection vehicles could reach maximum capacity (either by volume or weight) before the end of the collection round, or reverse vending machines used to take-back deposit bearing containers could reach maximum throughput / operating capacity at peak times.

This constraint would appear to be most pronounced for DRSs, which require manual or automated take-back operations, which check the validity of every empty container which is returned. For all other systems empty containers are not treated individually, and thus benefit from the potential to be deposited at collection points in bulk. This situation appears to be exemplified in Denmark. Personal communication with a number of stakeholders, including the Danish Government retail trade and reverse vending industry, suggests that in some locations there are constraints to consumers being able to take-back cans because of peak-time queues (especially on Saturdays when many people do a large weekly shop). However, this point is disputed by other stakeholders including the German border shopping association IGG, thus indicating the problems are likely to be localised. Nevertheless, the DRS may cause some constraint to the recycling of non-national cans because:

- 1) Capacity issues may cause queues for returning national cans and therefore make it less likely that this route would be used for depositing non-national cans for recycling;
- 2) The absence of a deposit on non-national cans makes it even less likely that consumers would queue, simply to recycle the empty containers.

However, the volume of material collected for recycling is not the only issue of concern. Each system type will, by its nature, collect material of varying quality. This is discussed above. Table 8-2 represents the key factors for each system type.

Table 8-2: Key Features of the Different Recycling Systems

System Type	Rejects	Material Value	Quality
Deposit Refund Systems	Low	High	High
Bring / Kerbside	Low	Medium/High	Medium / High
RWS	Low to High	Low	Low

Note: For the degree of metals extracted from incinerator bottom ash the views of industry stakeholders varies considerably. Reported extraction rates range from 20% to 85%.

In addition to material quantities and quality, DRSs make use of a financial incentive which seeks to ensure high levels of empty containers are returned for recycling. The final comment to make on compatibility, therefore, is how differing collection systems

deal with deposit payments, and thus whether or not the consumer is affected. Table 8-3 below shows a number of cross-border trade scenarios. At this time there are no systems which are setup to pay a deposit back to a consumer in a different country. Thus any collection system type could be said to be incompatible with cross-border cans in relation to the return incentive (the deposit).

Table 8-3: Cross-Border Trade Scenarios

Scenario	Country of Purchase		Country of Consumption		Impact
	DRS?	Deposit Paid?	DRS?	Deposit Redeemed?	
1	✓	✓	✗	✗	Management of cans is as for domestic consumption through non-deposit system Consumer sacrifices deposit
2	✓	✓	✓	✗	Management of cans depends on: a) whether deposit system accepts non-deposit bearing cans and b) whether there is a system run in parallel to the deposit scheme for convenient return of beverage cans Consumer sacrifices deposit
3	✓	✗	✓	✗	Management of cans depends on: a) whether deposit system accepts non-deposit bearing cans and b) whether there is a system run in parallel to the deposit scheme for convenient return of beverage cans Consumer never pays or redeems deposit

If secondary collection systems deliver lower performance or lower quality material from privately imported cans, as opposed to domestic cans, then they are not fully compatible with cross-border flows of products. For all collection systems other than DRSs there appears to be no difference in the management of non-national cans from the border-trade to cans placed on the market nationally. In other words, there is no reason to suggest a difference in collection efficiency or quality for border cans. However, for deposit refund systems the presence of the DRS has a strong influence on the design and performance of the national system, so that non-national cans are unlikely to be expected to be captured at the same rate as national cans with deposits (the evidence from the comparative analysis of efficiency supports this view). In addition, other barriers, such as retailer acceptance and capacity issues have been identified.

Finally, there appears to be some incompatibility with the funding of beverage can collection. In no cases is the collection of privately *imported* cans funded by the producers in the country in which they become a waste. Equally, there appears to be no situation in which a transfer of revenue takes place from the country where the cans are purchased to the country where they become waste. If PRO fees, or deposits, are paid in one country and the can is moved to another, there is no mechanism for funding to support the collection and recycling of privately imported containers.

The main incompatibility issues, with privately imported metal beverage cans and national packaging waste collection systems, are as follows:

- 1) Beverage cans privately imported are not recycled to as high a level as national cans. Not only do more arise as residual waste, but evidence suggests that a higher proportion arise as litter;
- 2) Beverage cans privately imported are not recycled to as high a quality as national cans;
- 3) Deposits on beverage cans are not paid back to consumers outside the country in which they are paid; and
- 4) The management of waste packaging from privately imported cans is not funded by the producers who placed the packaging on the market (in the country of purchase).