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

Final Report

Appendix 3: Impacts Associated with Incompatibility

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# 1.0 Impacts from Incompatibility of National Collection Systems with Privately Imported Cans

## 1.1 Introduction

The underlying rationale for this study is to investigate whether the lack of harmonisation of national collection systems for packaging across the EU, causes barriers to environmentally sound resource management. The key issues could be summarised as follows:

- Environmental – empty beverage cans not being recycled and / or being littered in the environment.
- Economic – high value material (especially aluminium) not being effectively recovered and thus not benefiting the economy, and trade barriers in the internal market for canned beverages.
- Social – consumers face differences in utilising national collection systems for beverage packaging purchased within the country of residence and from other EU Member States.

Indeed the Project Specifications required the contractor to:

- *‘identify and assess environmental impacts due to lack of compatibility of national schemes including assessing of the contribution of metal beverage cans to littering, the impacts on metal cans recycling rates and generally on metal recycling rates, the impact on raw material use.*
- *identify and assess the economic and internal market impacts due to lack of compatibility of national schemes including potential trade barriers, cross border competition issues, the impact on economic operators and local authorities, impact on budgetary revenues.*
- *identify and assess the social impacts due to lack of compatibility of national schemes including impacts on consumers and labour markets’*

The impacts are all assessed in relation to the main incompatibility issues determined in ‘Appendix 2 – Comparative Analysis of Collection Systems’:

- 1) Beverage cans privately imported are not recycled to as high a level as national cans;
- 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).

In-line with single market principles, private cross-border trade in products is not the problem *per se*, but its magnitude does influence the scale of any problems resulting from the management of the discarded packaging. Thus it is important to understand the scale of the border trade to assess the significance of the issues noted above and any problems that stem from them.

To understand the nature and scale of any impacts that may arise, a literature review was carried out, and two workshops were conducted in border regions where issues had previously been identified. Namely between:

- Denmark and Germany; and
- Finland and Estonia.

Summary reports from these workshops are included in 'Appendix 4 – Stakeholder Workshops and Consultation'. Data from these reports and the literature review are used to assess the significance of any impacts identified in the following sections of this report. Foremost, the key drivers of the border trade are discussed, this is followed by some analysis to estimate the scale of the border trade between all Member States, and finally this analysis is used to estimate the significance of any environmental, economic and social impacts that are identified.

## 1.2 Scale of Cross-border Flows of Products

In this section, we review the available data, including estimates, of the scale of the cross-border flows of beverages purchased in one country and consumed in another. This is followed by some analysis to estimate the total EU-27 flow of canned beverages.

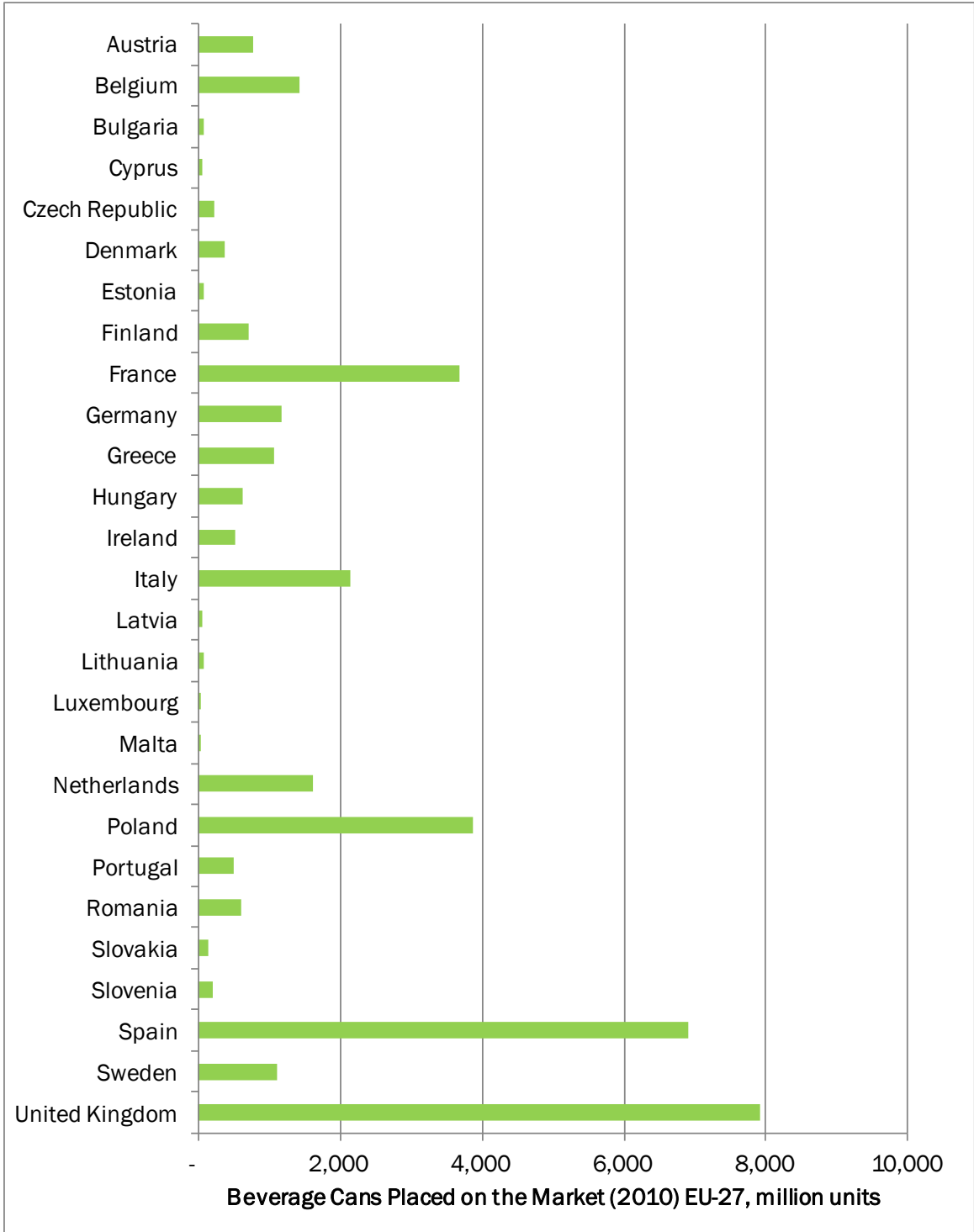
Firstly, however, to provide some context to the scale of the border-flows, the national consumption of canned beverages (both alcoholic and soft drinks) is given. Data on beverage sales was purchased from a beverage industry information specialist – Canadean.<sup>1</sup> Figure 1-1 shows the number of units placed on the market – this effectively represents consumer sales data for a given nation (not including private imports). Note that data for the following countries was not available, so estimates were made based upon population: Cyprus, Luxembourg and Malta. The data, presented in per capita sales, is also shown in Figure 1-2.

One can see that the total annual sales of beverage cans range from hundreds of millions to several billion across the EU-27. Countries with the highest per capita consumption of canned beverages are: Spain, Finland, Belgium, United Kingdom, Sweden, Ireland and Poland, all consuming over 100 canned beverages per year per person.

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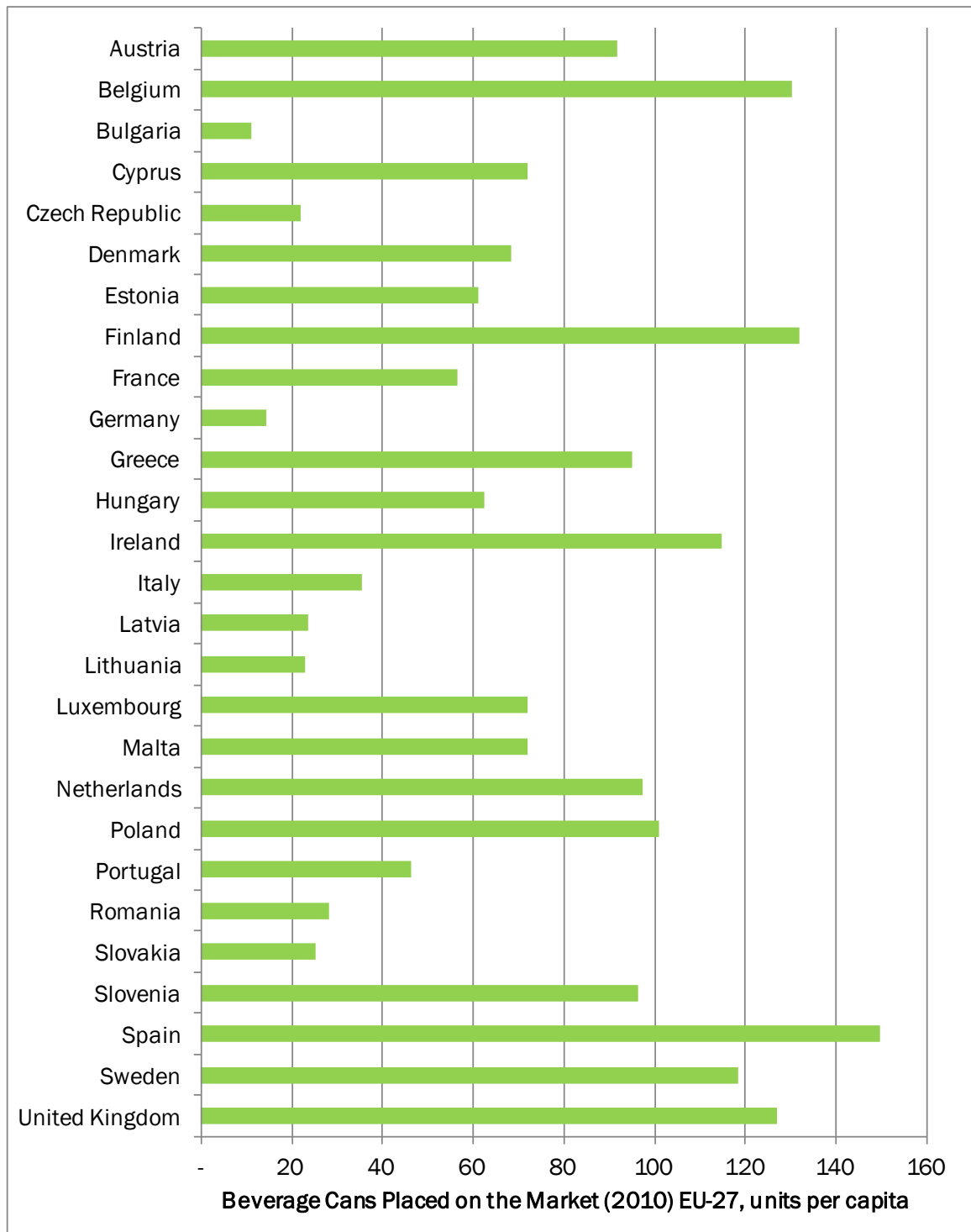
<sup>1</sup> <http://www.canadean.com/>

Figure 1-1: Beverage Cans Placed on the Market (2010) EU-27, million units



Source: Data purchased from Canadean, <http://www.canadean.com/>

Figure 1-2: Beverage Cans Placed on the Market (2010) EU-27, units per capita



Source: Data purchased from Canadean, <http://www.canadean.com/>



Table 1-1 shows a summary of cross border purchases in the Nordic/German area, compiled for the Swedish Government. It provides a useful background to the nature of border-shopping arrangements, the key drivers, and the scale of the trade.

Table 1-1: Cross Border trade (2009)

	1. DK/DE	2. DK/SE	3. NO/SE	4. FI/AX <sup>2</sup> /SE	5. FI/ES
Type of border	Land	Land, Water	Land	Water	Water
Price differences of alcoholic beverages	Large	Large / moderate	Moderate	Large / moderate	Large
Import quotas	No	No (indicative)	Yes	Yes	No
Severity of border control	None	Medium	Medium	Almost none	None
Direction of alcohol	DE → DK	DK → SE	SE → NO	FI/AX → (Tax Free) → SE	ES → FI
Border crossings/year	33.2 million	35.5 million	25–30 million	5.6 million	5.8 million
Infrastructure for traffic	Road, railway	Ferry, road, railway	Road, railway	Ferry	Ferry
Population living near the border area	Scarce (~ 160,000)	Dense (~ 3.6 million)	Moderate (~ 0.4 – 1million)	-(no coherent border region)	Dense (1.4 million)
Main types of cross border traffic	Shopping, leisure	Commute, leisure, shopping	Shopping, leisure	Leisure, shopping	Leisure, shopping
Commodities of interest	For Danes: Alcohol, foodstuffs, sweets, tobacco	For Swedes: Alcohol, clothes, foods	For Norwegians: Tobacco, meat, alcohol, sweets, soft drinks	For all travellers: Alcohol, tobacco, perfumes	For Finns: Alcohol, tobacco, consumer goods, services

Source: Karlson, T. and Osterberg, E. (2009) *Alcohol Affordability and Cross Border Trade*, Report for Swedish National Institute of Public Health, 1 June 2009, <http://www.fhi.se/PageFiles/7308/Alcohol-affordability-and-cross-border-trade.pdf>

<sup>2</sup> AX – country code for the Åland Islands, an archipelago in the Baltic Sea where there is a tax-free zone.

Figure 1-3 shows the major cross border alcohol purchases that result from current price differentials in the European Union.

Figure 1-3: Map of Major Cross Border Alcohol Purchases (direction of arrows shows movement of material from the country of purchase to the country of consumption)



Source: Karlson, T. and Osterberg, E. (2009) *Alcohol Affordability and Cross Border Trade*, Report for Swedish National Institute of Public Health, 1 June 2009, <http://www.fhi.se/PageFiles/7308/Alcohol-affordability-and-cross-border-trade.pdf>

We have sought to make an estimate of the main cross-border flows of beer purchased for private consumption using a range of sources. The data sources and methodology for each flow are described below in Table 1-2.

Table 1-2: Key European Beer Flows (Data Sources)

Direction of Flow	Source of Data
Germany - Denmark	A figure for canned beer was provided by the Danish Treasury.
Denmark - Sweden	The Danish Treasury's border trade report from 2010 estimates that Swedes buy 15% of their border trade alcohol in Denmark, with Germany as their preferred border country for beer trade. However, there is a limited extent to which these can be cans due to the 86% return rate – a maximum of around 15% x 380m = 57m would be possible. In addition, the flow of canned beer was estimated from the volume of beer indicated in a report by Oxford Economics for The Brewers of Europe. Assumptions were included to estimate the source of the flow (i.e. Germany or Denmark) and the proportion of cans vs. glass containers. It was noted by industry experts that the flow of beer from Denmark to Sweden is mostly in glass bottles, not cans.
Germany - Sweden	
Sweden - Norway	The flow from Sweden to Norway was estimated in a report by Jan Rehnberg. Many Norwegians return the cans to Sweden, however.
Sweden - Finland	The flow from Sweden to Finland was estimated at the Helsinki workshop undertaken as part of this study, and by speaking with industry experts. This flow is uncertain as many purchases occur on ferries.
Estonia - Finland	The flow from Estonia to Finland was estimated at the Helsinki workshop undertaken as part of this study, and by speaking with industry experts. An estimate of the volume from the ferries was also taken in addition to those purchased in Estonian shops.
France - UK	The volume of canned beverages from France to the UK was taken from estimates of personal imports made by the British Beer and Pub Association, and by estimating the likely flow relative to the price differential. Little information on the split between beer in cans or glass bottles was found, so a 50:50 ratio was used.

Sources:

Rehnberg, J.(2010), *Nordic Deposit Analysis, Report for Ministers for Nordic Cooperation*, 26 March 2010

Treasury (2010) *Status over grænsehandel*, Report for Danish Treasury, 1 May 2010, [www.skm.dk/public/dokumenter/samlet\\_graens\\_2010.pdf](http://www.skm.dk/public/dokumenter/samlet_graens_2010.pdf)

Oxford Economic Forecasting (2007) *The Consequences of the Proposed Increase in the Minimum Excise Duty Rates for Beer*, Report for Brewers of Europe, 1 February 2007, [http://www.brewersofeurope.org/docs/publications/Oxford\\_all.pdf](http://www.brewersofeurope.org/docs/publications/Oxford_all.pdf)

Rabinovich, L., Brutscher, P., de Vries, H., Tiessen, J., Clift, J. and Reding, A. (2009) *The affordability of alcoholic beverages in the European Union*, Report for European Commission DG SANCO, 8 April 2009, [http://ec.europa.eu/health/archive/ph\\_determinants/life\\_style/alcohol/documents/alcohol\\_rand\\_en.pdf](http://ec.europa.eu/health/archive/ph_determinants/life_style/alcohol/documents/alcohol_rand_en.pdf)

The figures we have arrived at are shown in Table 1-3. It is clear that that the flows are substantial in some cases, in particular, from Germany to the Nordic countries. The reasons for this are explored in the next section. Around the Nordic countries many cans are purchased on the ferries or other tax free areas, such as Aland.

**Table 1-3: Key European Beer Flows**

Direction of Flow	Flow of Canned Beer, units
Germany - Denmark	230,000,000
Denmark - Sweden	25,000,000
Germany - Sweden	250,000,000
Sweden - Norway	25,000,000
Sweden - Finland	50,000,000
Estonia - Finland	100,000,000
France - UK	50,000,000

*Note: some flows include sales from ferries – which are often difficult to distinguish from the sales that occur within the country consumers are travelling from.*

In addition, to the 230 million cans of beer privately imported from Germany to Denmark, the Danish Treasury also estimated there to be some 260 million cans of soft drinks moving across the border. No other sources of information relating to the volume of soft drinks moving across borders, due to private imports, were found.

In the EU-27, there are only a limited number of cross-border flows for which some estimates have been made; for many flows no estimates exist. However, to estimate the full scale of the problem one would ideally understand the full flow of beverages across the EU-27. As this is not possible, estimations are made after a discussion of the key drivers of the private trade in canned beverages.

### 1.3 Key Drivers of Cross-border Flows of Products

Consumers cross borders to other Member States to purchase beverages, amongst other goods (we call this the 'border-shopping' trade). One of the most influential factors on consumer behaviour is the price of goods and services. If there are price differentials in different locations for a particular product, consumers may choose to travel further than the nearest source of the items, if it is cost effective to do so (i.e. when the cost of transport does not outweigh the price differential). Some of the causes of price differentials in respect of canned beverages include:

- Differences in alcohol excise duty;
- Differences in Value Added Tax (VAT) rates;
- Differences in the rate at which other taxes (e.g. sugar tax) are applied;
- Differences in the costs of production, distribution and retailing;
- Differing levels of demand and supply for the products (market influences); and
- Variations in exchange rates.

In addition to the above, different countries make use of deposit refund schemes (DRSs) to incentivise return of packaging, and whilst these do not affect prices in the same way as, for example, excise taxes, they may exert some influence on demand. The exact nature of this effect is not clear.

Clearly some of these price factors are decided at the national level, by Government, and some are a consequence of the operation of the market. The intention of this discussion is not to weigh up the rationale for the implementation of some of these fiscal measures, but to ascertain the key influences on the magnitude of the price differentials for beverages between Member States. Some of the above mentioned factors will affect the price differentials of some types of beverages more than others. Alcohol excise duty and VAT are two of the largest contributors, but ex-factory prices and supply chain costs can differ significantly between countries and different types of retail outlet.

Alcohol excise duties are in place in all EU Member States. In fact, minimum rates on alcohol excise duty are set by the European Commission. However, there have been calls to update the minimum rate and link it to inflation so that it stays constant in real terms.

*On 8th September 2006, the Commission issued a proposal for a Council Directive on the approximation of the rates of excise duty on alcohol and alcoholic beverages. This follows a 2005 call from the Council of Finance Ministers to bring forward a proposal to adjust the minimum rates of excise duties to avoid a fall in the real value of the minimum rates. The Commission proposed revalorising the minimum rates on alcohol, intermediate products*

*and beer in line with inflation from 1993 to 2005, which is in the order of 31%, to take effect from 1 January 2008. The minimum rate for wine is set at zero and consequently a revalorisation of that rate is not applicable.<sup>3</sup>*

There were objections by some Member States and the proposals were not implemented. In 2010 London Economics conducted a study on possible changes in the minimum rates and structures of excise duties on alcoholic beverages to address the concerns raised by Member States.<sup>4</sup> In it they note:

*'The minimum rates set in 1992 are clearly out-of-date. Prices increased by 44% from 1992 to 2010 and minimum rates have remained constant. This means that the minimum rates are lower in real terms than they were in 1992.'*

The report also states:

*'There is a very wide dispersion of before-duty (pre-tax) prices of the alcohol beverages consumed within the EU and the current duties accentuate such differences further. In particular, for all beverages there is a wide disparity between the high rates charged by four Member States (FI, SE, IE, UK) and the rates charged by the rest of EU Member States. At present, because of their low level relative to the high rates charged by the four, the minimum duty rates contribute little to reducing such disparities.'*

Interestingly the authors also go on to discuss the issue of whether the differences between pre- and post-tax prices of products are likely to change the relative prices of alcoholic beverages (and hence potentially influence consumer behaviour). The outcome of the analysis did illustrate that:

*'taxation changes the relationship between products, so that consumers see significant differences when comparing the relative prices of pre- and post-tax products.'*

The relative pricing between Member States resulting from differences in alcohol excise duty is thus considered first, and followed by a discussion around VAT, ex-factory prices, and deposit prices. Note that the alcohol price index (API), discussed below, includes all taxes, but does not account for deposits.<sup>5</sup> Figure 1-4 shows the range of prices, as measured by the API, across the EU.

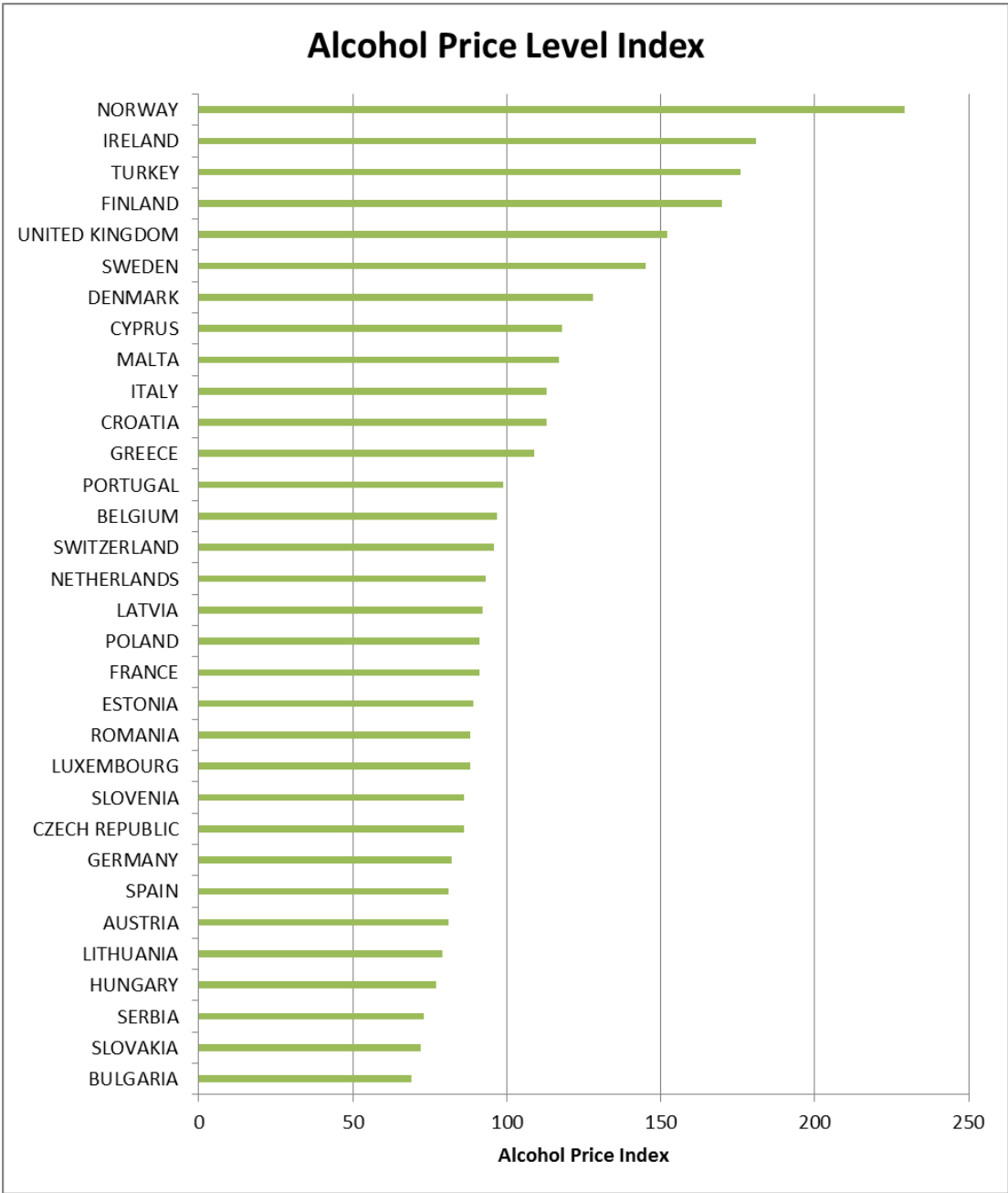
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<sup>3</sup> European Travel Retail Council (2011) *Excise Duties*, Accessed 18<sup>th</sup> May 2011, <http://www.etrcc.org/current-issue/excise-duties.php>

<sup>4</sup> London Economics (2010) *Study Analysing Possible Changes in the Minimum Rates and Structures of Excise Duties on Alcoholic Beverages*, Executive Summary to EC DG Taxation and Customs Union, May 2010, [http://ec.europa.eu/taxation\\_customs/resources/documents/common/publications/studies/min\\_rates\\_sum.pdf](http://ec.europa.eu/taxation_customs/resources/documents/common/publications/studies/min_rates_sum.pdf)

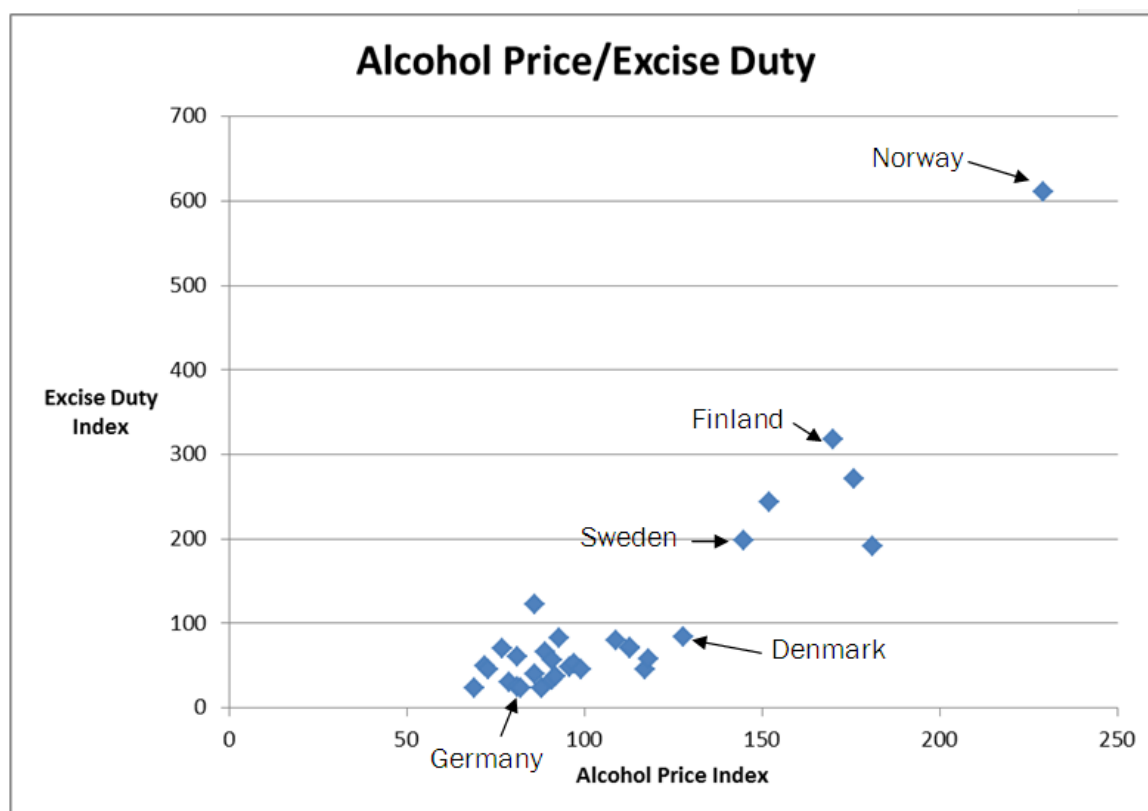
<sup>5</sup> This itself suggests that the deposit is not necessarily perceived as a component of price to the extent that it can be refunded at a later date.

Figure 1-4: Alcohol Price Level Index for EU Member States (2010) EU27 = 100



Sources: Borchert, E. and Reinecke, S. (2007) *Eating, drinking, smoking - comparative price levels in 37 European countries for 2006*, Report for Eurostat, 12 July 2007, [http://epp.eurostat.ec.europa.eu/cache/ITY\\_OFFPUB/KS-SF-07-090/EN/KS-SF-07-090-EN.PDF](http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-SF-07-090/EN/KS-SF-07-090-EN.PDF) ; Karlson T. and Osterberg E. (2009) *ibid.*; Brewers of Europe (2011) *ibid.*

Figure 1-5: Alcohol Price Index vs. Alcohol Excise Duty Index across the EU



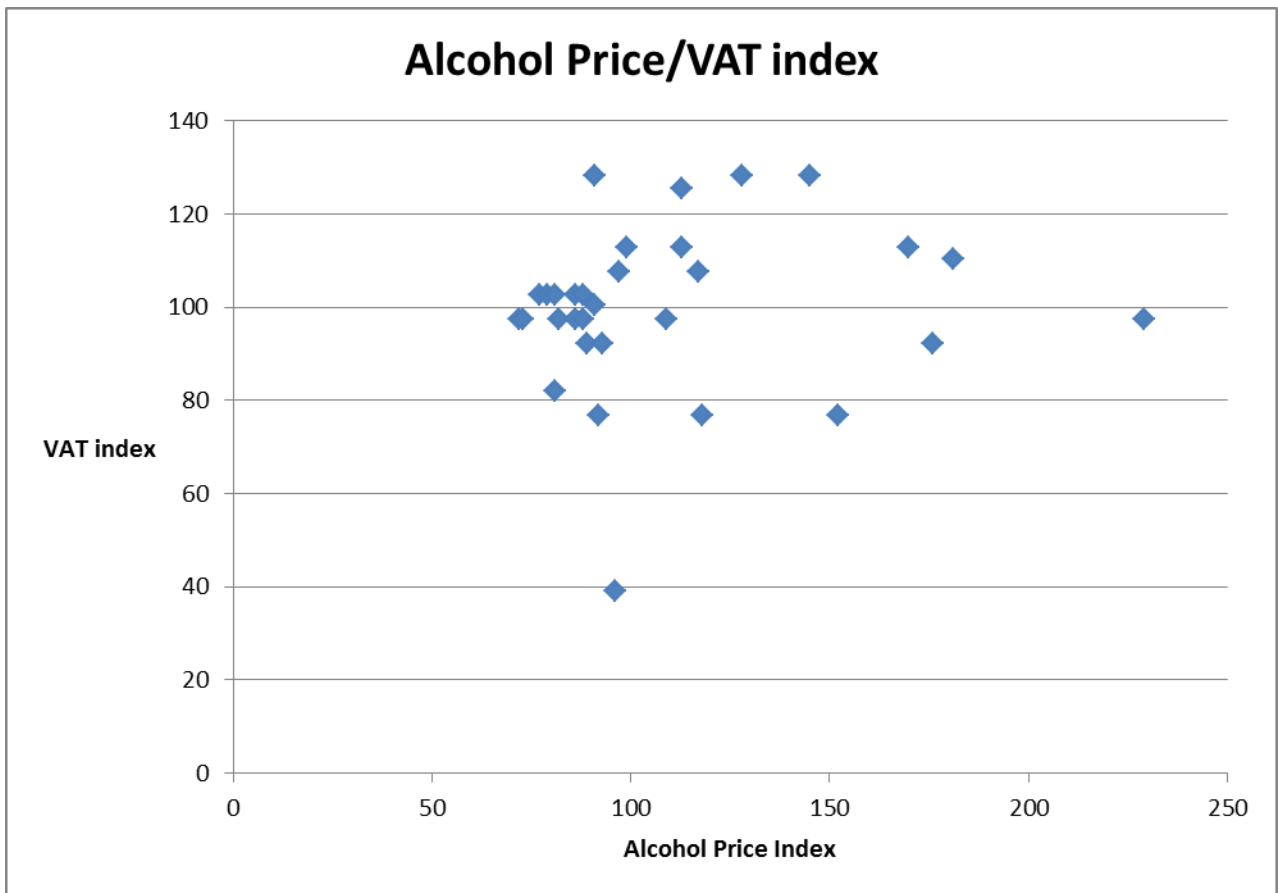
Sources: Borchert, E. and Reinecke, S. (2007) *Eating, drinking, smoking - comparative price levels in 37 European countries for 2006, Report for Eurostat, 12 July 2007*, [http://epp.eurostat.ec.europa.eu/cache/ITY\\_OFFPUB/KS-SF-07-090/EN/KS-SF-07-090-EN.PDF](http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-SF-07-090/EN/KS-SF-07-090-EN.PDF); Karlson T. and Osterberg E. (2009) *ibid.*; *Brewers of Europe* (2011) *ibid.*

Firstly the relationship between the API and alcohol excise duty is assessed to see whether the London Economics findings can be validated, or in other words, whether the alcohol excise duty contributes significantly to the price differentials of alcoholic beverages. Figure 1-5 shows that there is a strong correlation between alcohol excise duty and the API. Countries with higher duties, such as Norway, Finland, Sweden and others, have high prices for alcohol. Where alcohol excise duties are lower, then for perhaps obvious reasons, the influence of other factors becomes more important in determining the alcohol price.

Figure 1-6 below shows the relationship between VAT and the price of alcohol. It is clear that, in general, higher VAT relates to a higher price, but the relationship is not so strong. In fact, at a constant VAT index of 100, alcohol prices still vary by as much as 300%.



Figure 1-6: Alcohol Price Index vs. VAT Index across the EU



Sources: Karlson, T. and Osterberg, E. (2009) *Alcohol Affordability and Cross Border Trade*, Report for Swedish National Institute of Public Health, 1 June 2009, <http://www.fhi.se/PageFiles/7308/Alcohol-affordability-and-cross-border-trade.pdf>

Borchert, E. and Reinecke, S. (2007) *Eating, drinking, smoking - comparative price levels in 37 European countries for 2006*, Report for Eurostat, 12 July 2007, [http://epp.eurostat.ec.europa.eu/cache/ITY\\_OFFPUB/KS-SF-07-090/EN/KS-SF-07-090-EN.PDF](http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-SF-07-090/EN/KS-SF-07-090-EN.PDF)

Some further detail is reported in the Danish Treasury’s border report. Both VAT and alcohol tax is higher in Denmark. Moreover, ex-factory prices are expected to vary between countries (contrary to the assumption in the Table below), but the magnitude of the differentials in ex-factory prices is not known. For example, the wholesale price to the retailer selling to large discount stores (like the border shops) reflects significantly lower costs of marketing, sales support etc., and logistics costs, compared with those incurred by main-stream retailers who rely on smaller localised shops with a greater range of products.<sup>6</sup> Table 1-4 shows the costs of a case of 24 330ml cans of beer in Denmark and in the border shops. The taxes in Denmark alone are greater than the pre-tax prices in the border shops. Taking taxes into account, the retail prices are such that the price in Denmark is almost double the price in

<sup>6</sup> Personal communication with beverage industry.

Germany. The largest explanatory factors are the differences in excise duty, and the difference in pre-tax prices. However, as discussed above, the pre-tax price differentials are partly a function of the nature of the shopping experience, itself motivated by price differentials.

Table 1-4: Example of Danish/German Price Differential in Beer (Euro per case – 24 x 330ml)

	Denmark	Germany
Retail sales price	13,42	7,16
VAT	2,68	1,14
excise duty	2,49	0,65
packaging tax	0,32	-
before-tax price	7,92	5,36

Source: Personal communication with the Danish Ministry of Taxation – Skatteministeriet, October 2011

In terms of soft drinks in cans, there is also a European price level indicator. This indicator is shown below in Figure 1-7. One can see from comparing Figure 1-4 and Figure 1-7 (alcohol and soft drink price indices respectively) that the variation of soft drink prices across Europe is less pronounced than for alcohol. In Denmark, for example, the higher than average prices are a consequence of the tax on carbonated soft drinks (which are not sugar free). Currently the tax is around 108 øre per litre (around €0.14).<sup>7</sup> This price differential results in a flow of carbonated soft drinks from Germany to Denmark. Table 1-5 shows the price differentials for soft drinks purchased in Denmark and Germany. As with alcohol, there appear to be significant pre-tax differentials, but these are also widened by the tax systems in place in the two countries. The pre-tax price differential of €4.05 is somewhat higher than the difference in the countries' taxes, which is around €3.16. The German soft drinks are less than half the price of the Danish ones.

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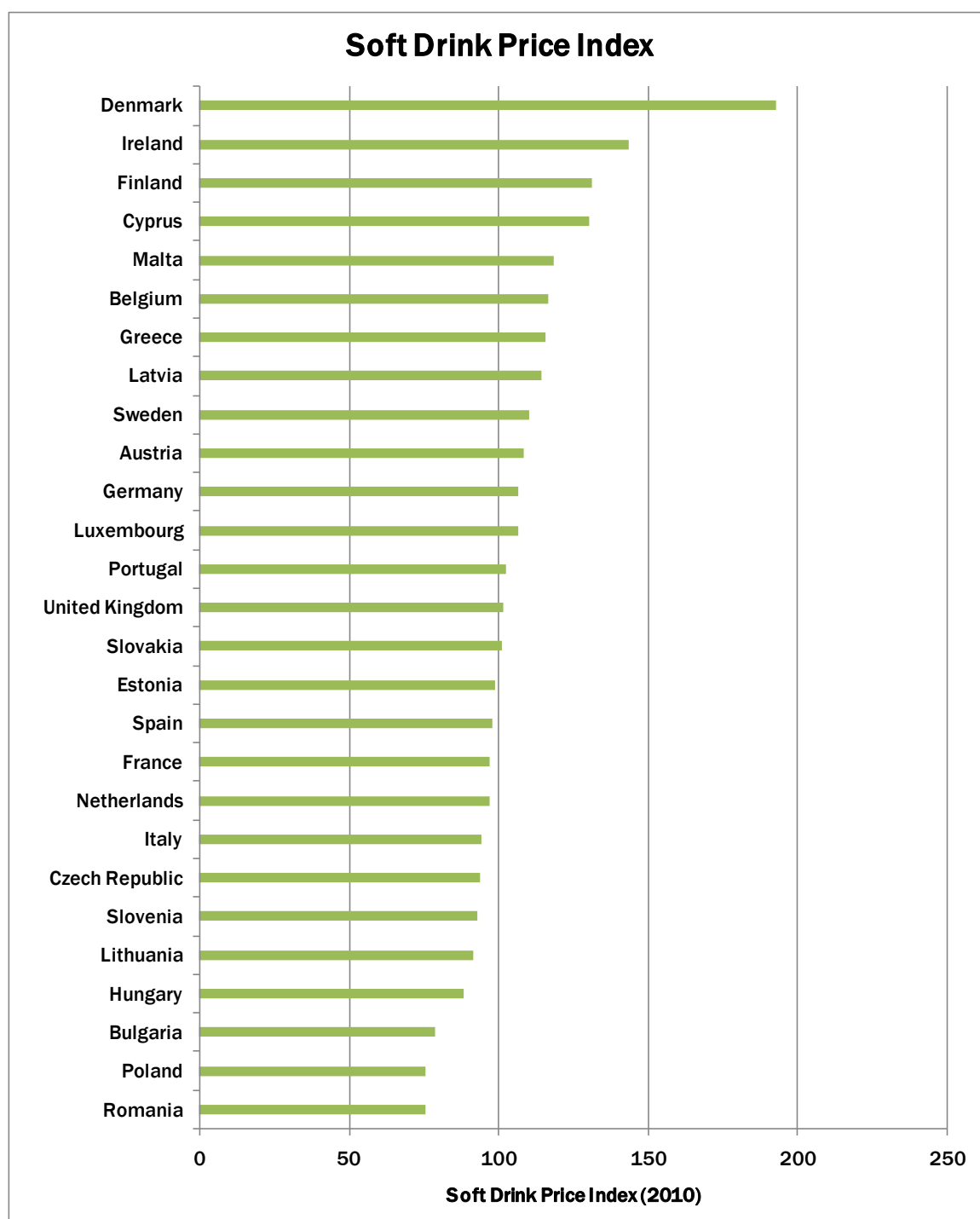
<sup>7</sup> <http://www.skat.dk/SKAT.aspx?old=1812920&vld=0&search=sukker%A4sodavand>

Table 1-5: Example of Danish/German Price Differential in Soft Drinks (Euro per case – 24 x 330ml)

	Denmark	Germany
Retail sales price	13,42	6,22
VAT	2,68	0,99
excise duty	1,15	-
packaging tax	0,32	-
before-tax price	9,27	5,22

Source: Personal communication with the Danish Ministry of Taxation – Skatteministeriet, October 2011

Figure 1-7: Soft Drink Price Index for EU Member States (2010) EU27 = 100



Source: Eurostat

It is clearly possible that, notwithstanding the fact that the deposit is a temporary payment (and is returned when the can is returned) that some consumers might perceive it as more beneficial to shop in other countries. In their position paper PRO-Europe states:

*“Consumers tend to try to avoid paying deposits by shifting to deposit free products. This includes shopping in stores across borders where mandatory deposits are not applied. Consequently, retailers in the border region are faced with tremendous losses due to ‘customer migration’.”*

Source: PRO-EUROPE Position Paper Mandatory Deposit Systems<sup>8</sup>

However, following the doubling of the Swedish deposit in 2010, no significant change in demand was seen.<sup>9</sup> In addition, the Estonian Government suggest that the introduction of the DRS has had no longer term impact on sales – though it is recognised that demand side drivers such as the economy and the weather have influences which may mask the direct impact of the deposit value alone.<sup>10</sup>

Of course the price differentials on alcoholic beverages themselves are not the only driver of border shopping. Differentials for other non-alcoholic beverages and other products, such as cigarettes, also encourage consumers to shop across borders. Indeed this may be the more significant driver for some, with alcohol simply being purchased on the same trip. Figure 1-8 shows a significant range in prices across the EU-27 for tobacco, larger than for alcoholic or non-alcoholic beverages.

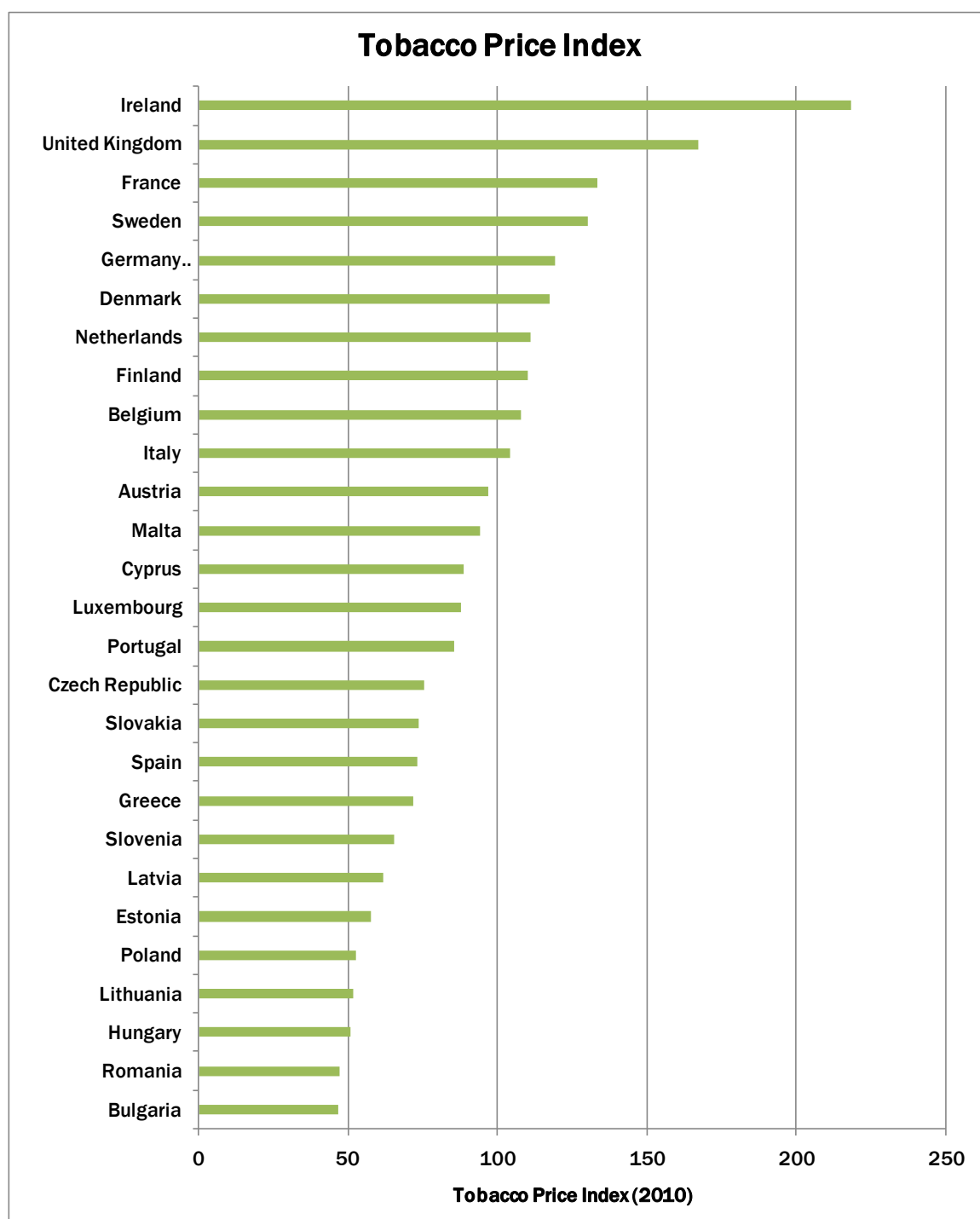
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<sup>8</sup> Pro-Europe (n/a) PRO EUROPE Comments on: Mandatory Deposit Systems for One-Way Packaging, [http://www.pro-e.org/files/08-11\\_Position\\_Paper\\_Mandatory\\_Deposit\\_RBVO1.pdf](http://www.pro-e.org/files/08-11_Position_Paper_Mandatory_Deposit_RBVO1.pdf)

<sup>9</sup> BCME / Returpack

<sup>10</sup> Personal Communication with Peeter Eek, Estonian Ministry of Environment

Figure 1-8: Tobacco Price Index for EU Member States (2010) EU27 = 100



Source: Eurostat

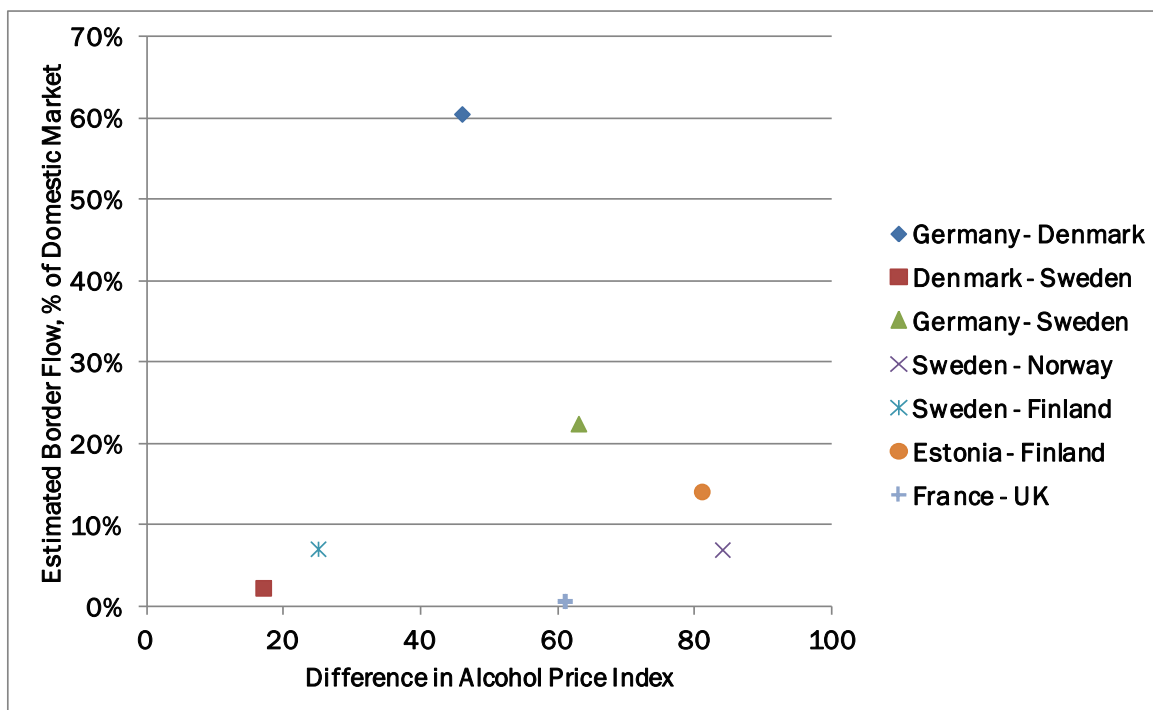
Any future changes in national taxation policies within the EU will also alter the behaviour of consumers. This may result in more border-shopping where people also purchase beverages in metal cans. The important point is that current differentials are not fixed and are subject to change, so effective waste management infrastructure ought to be sufficiently flexible to accommodate these changes in non-waste related policy.

## 1.4 Understanding Cross-border Flows

Figure 1-9 charts the relationship between the volume of the cross border flows of beer (represented as a % of the total domestic market of the country to which the cans are *imported to*) and the price differentials applicable to each border. There are other factors that will affect this relationship that complicate the relationship where metal beverage cans are concerned. The border between Sweden and Norway, which exhibits a very high price differential, is only moderately densely populated, and a maximum shopping limit is in force (4 litres per visit). In fact, perhaps because of this limit, the sales are higher in the border region than in the rest of Sweden but so are returns, as Norwegian border shoppers tend to make the trip frequently and can therefore return the cans in Sweden and redeem the deposit.<sup>11</sup>

One can see that, as a % of the domestic market, the flow between Germany and Denmark is significantly higher than the other key flows identified.

Figure 1-9: Relationship between Cross-Border Flows and Price Index

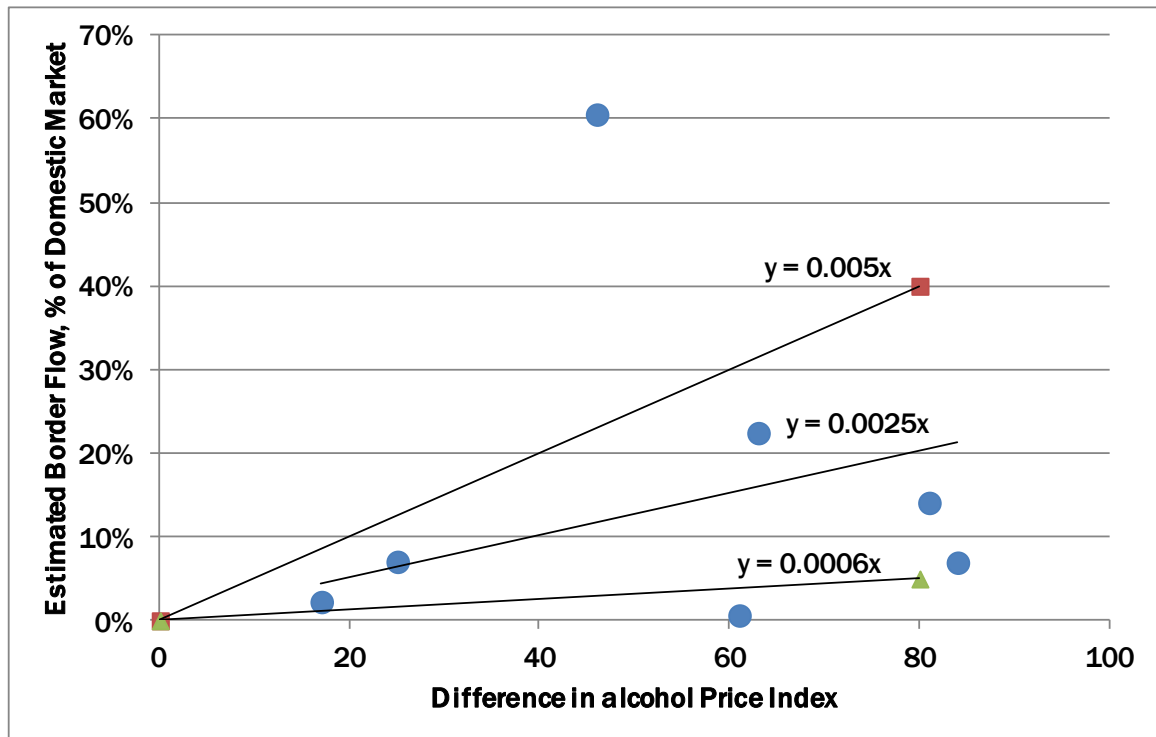


The border trade is also influenced by, for example, national trends in beverage sales, size of shared borders, population density close to the border, transport links, presence of dedicated border shops, culture, history and geography. However, based upon these data points, a simple relationship between the difference in alcohol price index and estimated cross-border flow was derived. As the small amount of data

<sup>11</sup> Information from the Copenhagen workshop, organised by Eunomia , 30 March 2011

points show a large range in the relationship, high, central and low scenarios are included.

Figure 1-10: Relationship between Cross Border Flows and Price Index (High, Medium and Low Functions)



From the lines of best fit mathematical functions can be obtained to relate price difference to estimated cross-border flow. The next step, then, is to understand the relevant borders across Europe. Figure 1-11 shows a matrix with the key internal borders across the EU-27. External borders have not been considered, although it is noted they may be relevant. In addition, it has been assumed that consumers will only travel from one country to the next, and not across more than one country for border-shopping. We are aware that shoppers do travel across multiple countries to Germany to purchase alcohol, for example, but to simplify the analysis we have not included this option; we do not believe this is of much concern in macro level analysis of this nature. In the matrix below the price indices are displayed on both axes. The numbers in the matrix show the difference in price index across the border. Where the cells are orange this indicates that the flow of containers would be into the country named on the left (vertical) side of the matrix.

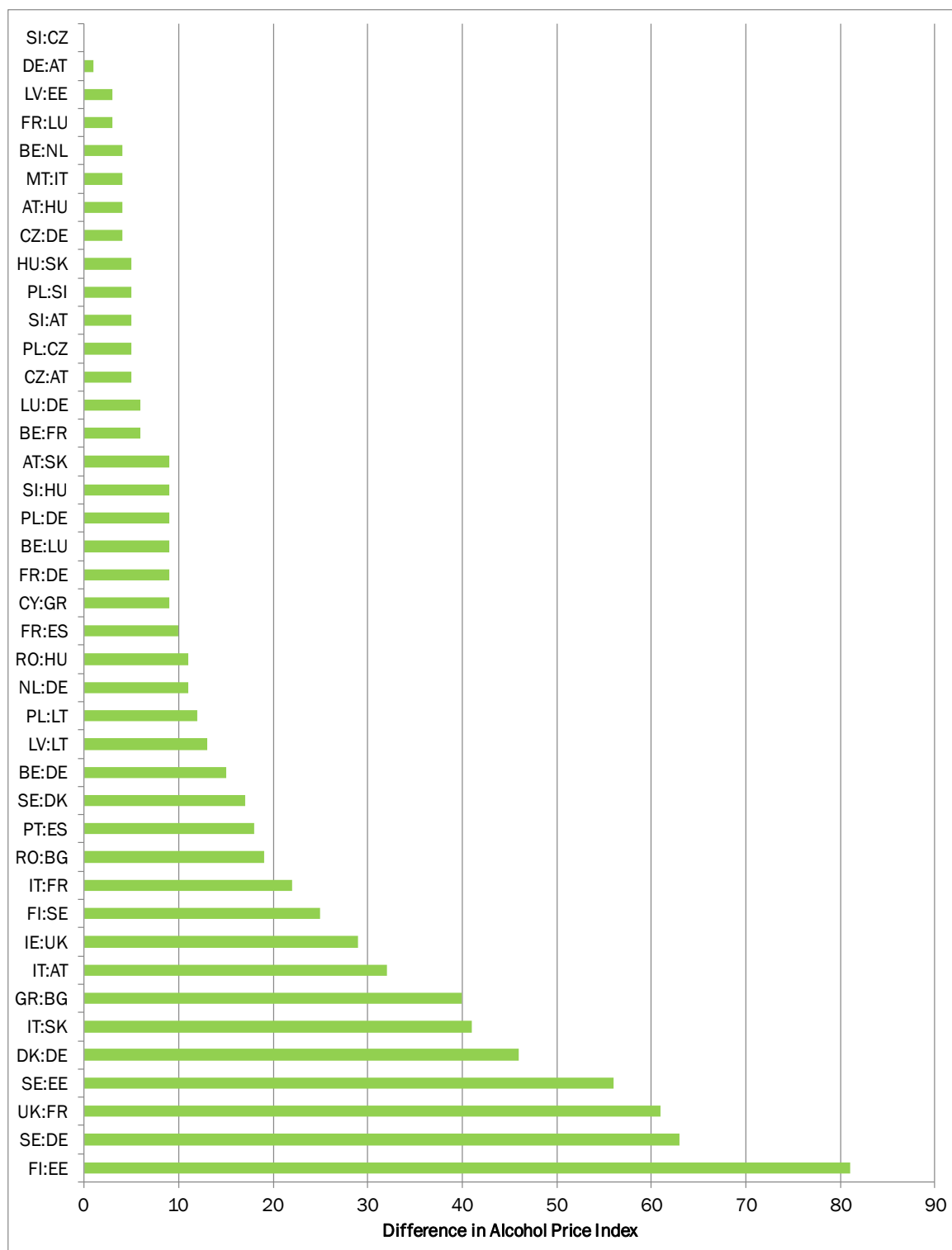


Figure 1-11: Border Matrix and Difference in Price Index

	AT	BE	BG	CY	CZ	DE	DK	EE	GR	ES	FI	FR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	RO	SE	SI	SK	UK	
AT	81																											
BE	97																											
BG	69																											
CY	118																											
CZ	86	5																										
DE	82	1	-15																									
DK	128																											
EE	89																											
GR	109																											
ES	81																											
FI	170																											
FR	91																											
HU	77																											
IE	181																											
IT	113																											
LT	79																											
LU	88																											
LV	92																											
MT	117																											
NL	93																											
PL	91																											
PT	99																											
RO	88																											
SE	145																											
SI	86																											
SK	72																											
UK	152																											

Figure 1-12 shows the absolute price differentials for beer between neighbouring countries in the European Union from the matrix above.

Figure 1-12: EU Neighbouring Countries' Price Index Differences (higher priced country : lower priced country )



The trend lines shown in Figure 1-10 can then be applied to all the European borders where no other data is available to suggest a cross-border flow of beer cans based upon trends in the countries for which there is some data available. Then, to take into account the range of other factors which may influence cross-border trade, the flow for each border was adjusted by a limiting factor. Some examples of this factor are given as follows to exemplify the approach:

- UK (Northern Ireland) / Ireland border – the full estimated flow was assumed to occur as a large proportion of the population is within relatively easy access of the border, there share relatively high proportion of their borders and there is a history of cross-border purchasing to take advantages in differentials of price;
- Poland / Germany border – only half of the estimated flow was assumed to occur as, although they share a significant border length and there is some reported history of border-shopping across this border, a large proportion of the population is not within easy travelling distance. In addition, the demand for beer sold in glass bottles, as opposed to cans, is higher in this region;
- Greece / Bulgaria – only a quarter of the estimated flow was assumed to occur as the border length is not significant, the geography of the area and transport links are restrictive and the market share of canned beer is much lower than the European average.

Whilst this type of analysis will obviously have relatively high margins for error, at a European level it gives an acceptable basis for understanding the relative magnitude of the border-trade and the quantity of beverage packaging, placed on the market in one Member State, which becomes waste in another. Using the methodology discussed above, we estimated the total figures for private cross-border trade within the EU-27 to be as in Table 1-6.

Table 1-6: Estimated EU-27 Private Imports of Canned Beer<sup>12</sup>

	Total Imports, millions	% Beer Cans Placed on Market
High	1,500	8%
Central	1,100	6%
Low	800	4%

Note: total beer cans placed on market ~18 billion

<sup>12</sup> Note, these estimates were revised following the submission of the consultation document.

A similar methodology was applied to soft-drinks, however, there is much less evidence regarding the flow of these beverages, so the figures must be treated as indicative only.

Table 1-7: Estimated EU-27 Private Imports of Canned Soft-Drinks<sup>13</sup>

	Total Imports, millions	% Soft Drink Cans Placed on Market
High	1,000	5%
Central	700	4%
Low	400	2%

Note: total soft drink cans placed on market ~18 billion

Table 1-8: Estimated EU-27 Private Imports of All Canned Drinks

	Total Imports, millions	% Cans Placed on Market
High	2,500	7%
Central	1,800	5%
Low	1,200	3%

Note: total cans placed on market ~36 billion

### 1.4.1 Summary

In summary, this section has presented the available data on the scale of border-shopping, and made some estimates on the scale of the cross-border flow of canned beer and soft drinks within the EU-27. The estimates show that there is a relatively small flow of canned beverages between Member States compared to the total number of canned beverages placed on the market (around 5%). Moreover, the majority of the cross-border flow is concentrated between a handful of countries, mostly in northern Europe. Flows to Denmark, Sweden and Finland account for over 1,000 million cans under the central scenario.

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<sup>13</sup> Note, these estimates were revised following the submission of the consultation document.

## 1.5 Environmental Impacts

As noted above, the Project Specifications required the contractor to:

*'identify and assess environmental impacts due to lack of compatibility of national schemes including assessing of the contribution of metal beverage cans to littering, the impacts on metal cans recycling rates and generally on metal recycling rates, the impact on raw material use.'*

Thus the environmental consequences of the lack of compatibility of national collection schemes with private imports of canned beverages have been assessed in relation to the fate of the empty containers (recycling, recovery, disposal or littering). Firstly, the implications for the recovery and recycling of metal cans are considered, followed by an assessment of the possible impacts on littering.

### 1.5.1 Impacts on Recycling

The extent to which there will be any impacts on the recycling of metal beverage cans relates to:

- 1) The difference in recycling rates for metal beverage cans between the countries where they were placed on the market and where they become a waste; and
- 2) The compatibility of national collection systems with privately imported beverage cans from the border-shopping trade.

The level of performance and compatibility of national collection systems for metal beverage cans was assessed during the comparative analysis carried out for this study. This analysis is reported on in Section 3.0 of the main report and 'Appendix 2 – Comparative Analysis of Collection Systems for Metal Beverage Cans'.

With regards to point 1), it should be made clear that differences in recycling rates for metal beverage cans are permitted by the Packaging Directive. The Directive allows Member States to implement collection systems which achieve varying capture rates, as long as minimum thresholds are met. Thus, varying recycling rates are not a problem per se, as long as the Member States are meeting their obligations set out under the Packaging Directive. It might be noted, however, that the enormous disparities in performance in recycling of such a common item as beverage cans would be expected to close as Member States implement the revised Waste Framework Directive, and notably, in respect of the application of the waste hierarchy as set out in Article 4.

Firstly, to assess the magnitude of any changes in recycling the total quantity of metal beverage can packaging is estimated. This was carried out using data on the number of beverage cans placed on the market, the proportion of cans which are aluminium or steel and the average weights of different sized cans.<sup>14</sup> The estimates for total

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<sup>14</sup> The proportion of steel and aluminium beverage cans placed on the market in the EU was supplied by Beverage Can Makers Europe (BCME).

weight of metal packaging from beverage cans placed on the market for each Member State are shown in Table 1-9 below.

Table 1-9: Tonnage of Metal Beverage Can Packaging Placed on the Market in Each Member State (rounded to 1,000), 2009<sup>15</sup>

Member State	Tonnage	Member State	Tonnage
Austria	11,000	Latvia	1,000
Belgium	25,000	Lithuania	1,000
Bulgaria	1,000	Luxembourg	1,000
Cyprus	1,000	Malta	1,000
Czech Republic	3,000	Netherlands	27,000
Denmark	6,000	Poland	67,000
Estonia	1,000	Portugal	1,000
Finland	11,000	Romania	1,000
France	72,000	Slovakia	2,000
Germany	21,000	Slovenia	3,000
Greece	14,000	Spain	142,000
Hungary	1,0000	Sweden	17,000
Ireland	9,000	United Kingdom	125,000
Italy	32,000		

The total weight of metal beverage cans placed on the market in Europe is estimated to be around 625 thousand tonnes per annum. This compares to around 4.9 million tonnes of metallic packaging waste generated in 2008 (around 13% of this total).<sup>16</sup>

<sup>15</sup> No data was available for Cyprus, Luxembourg or Malta. The total generation of metal beverage can packaging was pro rated based upon population. It is understood that there is a relatively significant flow of beverages from Luxembourg to surrounding countries, but no further details were obtained during the course of the study.

<sup>16</sup> Eurostat – Data from Reporting Obligations under the Packaging Directive

The recycling rate for metallic packaging waste in the EU-27 was around 70% in 2008. The total level of recycling of metal beverage cans can be estimated using the 'best estimate' recycling rates derived in the comparative analysis ('Appendix 2 – Comparative Analysis of Collection Systems for Metal Beverage Cans'). Best estimates were comprised of a range of data sources of varying quality and validity. For some Member States an accurate figure for the recycling of only metal beverage can is simply not available. Thus figures for all metallic packaging were used in a number of cases. Privately imported cans were included in the calculation of recycling rates to ensure that this activity was captured in the overall recycling rate for the EU-27. These rates are summarised as follows:

**Table 1-10: Best Estimates for Metal Beverage Can Recycling in all EU-27 Member States (latest year data is available)**

Member State	Recycling	Member State	Recycling
Austria	68%	Latvia	30%
Belgium	93%	Lithuania	38%
Bulgaria	34%	Luxembourg	77%
Cyprus	70%	Malta	30%
Czech Republic	20%	Netherlands	88%
Denmark	89%	Poland	64%
Estonia	59%	Portugal	40%
Finland	98%	Romania	34%
France	50%	Slovakia	56%
Germany	95%	Slovenia	26%
Greece	34%	Spain	76%
Hungary	42%	Sweden	91%
Ireland	45%	United Kingdom	56%
Italy	68%		

The level of accuracy of the data was assessed in Appendix 2, and high and low error margins were estimated to give indicative ranges for the recycling rates for all metal cans only. Although these margins are in themselves difficult to know, it was

considered appropriate to seek to show a range in the figures due to the large uncertainties in the data.

Using the data in Table 1-9 – and the high and low estimates – and Table 1-10 (total metal beverage can packaging waste generation and recycling rate) estimates of the average EU-27 recycling of metal beverage cans were calculated. These are shown in Table 1-11.

**Table 1-11: Estimates for Recycling of Metal Beverage Cans in the EU-27**

	High	Central	Low
Recycling Rate	70%	66%	51%

The Low figure is around 15% lower than the central because for many of the Member States generic figures for metal packaging recycling (which includes secondary and tertiary packaging) are used. The performance of the collection systems for metal cans, which are generally less well advanced than for packaging further up the supply chain, is thus lowered for those Member States where the generic figures are used.

The central figure is lower than the overall recycling rate for metallic packaging. This is again not surprising as the recovery of secondary and tertiary packaging is expected to be higher than for primary packaging. The central rate is slightly higher than the estimate made by the European Aluminium Association (EAA) for aluminium cans (64.3%).

To assess the impact on recycling of incompatibility of national packaging waste collection systems for metal beverage cans, incompatibility first has to be defined. In the comparative analysis, Section 3.0 of the main report, incompatibility was measured in four ways:

- 1) Privately imported beverages in metal cans are not recycled to as high an extent, or as high a quality, as national cans when reach the end of their use;
- 2) Privately imported beverages in metal cans are more commonly littered in the environment when they reach the end of their use as compared to deposit cans;
- 3) Consumers who have paid deposits on beverage cans in one Member State cannot claim them back in another;
- 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).

The only countries where 1) is the case are those which have deposit refund systems which do not pay deposits to consumers for privately imported cans (no deposit system currently does this). For all other collection system types, the rate of collection



for privately imported cans is assumed to be the same as for domestic cans. For this reason, we ignore the impacts of cross border trade in non-deposit countries.<sup>17</sup>

Thus the reasons for the difference in recycling level for 1) and 3) is much the same (i.e. the absence of a deposit). 2) is more difficult to quantify, and will be considered qualitatively, and 4) is more of an economic impact which is discussed below in Section 1.6. The change in recycling levels between existing arrangements and where imported cans are recycled to the same level as domestic cans in the country where they become waste, is now calculated.

The total weight of metal can packaging transferred from one Member State to another as a result of the border-shopping trade is around 31 thousand tonnes (around 5% of the total placed on the market in the EU-27). To calculate the recycling of the privately imported cans one must understand the level of recycling of cans which would occur independent of the incentives to recycle domestic cans (i.e. not including the incentive effect of the deposit). This recycling level is not easy to understand. In the Nordic countries, where most of the cans end up, the secondary collection systems that can be used are the same as those for other types of metallic consumer packaging (i.e. food cans, aerosols, foils etc.). We have very limited data on the performance of these systems, but nothing suggests the rate is much higher than 50%, although it could well be lower. In addition, there is some post-combustion sorting of metals after the remaining residual waste has been combusted. We have estimated the following recycling rates of the privately imported metal cans that eventually get recycled in countries with a deposit system. Again, we have assumed that all other countries recycle the privately imported cans to the same level as the domestic cans.

Table 1-12: Recycling of Privately Imported Cans

Member State	Recycling
Denmark	65%
Sweden	70%
Finland	60%
Estonia	50%
Germany	80%

The following Table shows our estimate of the recycling level for the privately imported border cans under a) the status quo, b) where they are recycled to the same level as domestic cans in the destination country, and c) for context, the recycling level if the cans were returned to the country where they were placed on the market.

<sup>17</sup> Of course, the recycling rate may be different between non-deposit countries.

Table 1-13: Level of Recycling of Border Cans

	Current	If as destination country domestic cans	If as source country domestic cans
Recycling Rate of Border Cans	63%	77%	80%

The environmental impacts of recovery and disposal of the metal beverage cans are now considered. The impacts relate mainly to greenhouse gas emissions and other air pollutants. For metals there are minimal direct or indirect emissions from landfilling or treatment of waste in incinerators (the only impact is vehicle movements on site). There are, however, clear greenhouse gas and other benefits from the recycling of waste materials. As the landfill / incineration impacts are negligible, only the recycling impacts are considered. If there is less recycling of steel and aluminium than there could otherwise be, there will be less greenhouse gas savings also. This is the key impact from the reduction in recycling.

The benefits from recycling accrue do to a reduction in greenhouse gas emissions and other air pollutants emitted to the atmosphere during the production of virgin material. The main material which beverage cans are made of in deposit countries is aluminium due to the higher value, but steel cans are also included in the mix to some extent. It is possible that some of the aluminium collected does go into production processes which are using recycled material already. Thus the benefits would be reduced. However, at the margin, it can be assumed that 100% of the material offsets primary production.

The approach to calculating the monetised savings from the greenhouse gas and other air pollutant emissions follows.

### GHGs - Steel

Table 1-14: Emissions Savings – Steel Recycling Compared to Disposal (WRAP)

Material	Disposal method	No. of scenarios considered	Average saving across scenarios (tonnes CO <sub>2</sub> eq)	Range of savings across scenarios (tonnes CO <sub>2</sub> eq)
Steel	Incineration	11	-0.90	-0.1 < x < 3.1
Steel	Landfill	8	-1.34	0.0 < x < 3.0

#### Notes

Negative numbers here represent scenarios that lead to a net contribution to climate change as a result of recycling that material

Source: WRAP (2006) *Environmental Benefits of Recycling: An International Review of Life cycle Comparisons for Key Materials in the UK Recycling Sector, Final Report to WRAP, May 2006*

Data from a report by the UK's Waste and Resources Action Programme is presented in Table 1-14.

The study found that the assumptions which had the highest influence on the results were those related to the interdependency of the steel waste handling system with the energy system of the surrounding technosphere – particularly with regard to the type of energy used within the primary and recycled scrap manufacturing systems. The study also cited assumptions regarding the effectiveness of steel reclamation from incineration processes as a further potential source of variation between studies.

ERM give a figure of 0.43 tonnes CO<sub>2</sub> equivalent per tonne of material recycled, while a later report by the same company gives minimum and maximum figures of 0.58 tonnes CO<sub>2</sub> equivalent and 0.83 tonnes CO<sub>2</sub> equivalent, respectively, albeit reportedly using the same database as in the previous study.<sup>18,19</sup>

The AEA report used the datasets from BUWAL 250 for production of tin plate from raw materials and from non-detinned scrap. This data includes all emissions associated with transport of materials, energy used in processes etc. It was assumed that 0.84 tonnes of tinsplate were manufactured from 1 tonne of scrap. This gave a figure of 1.521 tonnes CO<sub>2</sub> equivalent savings per tonne of steel collected for recycling. This figure is close to that reported in the USEPA report, which is slightly higher at 1.79 tonnes saved. The IWM2 model gives a figure of 1.75 tonnes CO<sub>2</sub> equivalent saved per tonne steel recycled.

We have used the WRAP figure of 1.34 tonnes CO<sub>2</sub> per tonne of steel recycled for the current analysis. This value is marginally higher than the mean of the other studies previously cited.

### GHGs - Aluminium

Almost all studies reviewed by the WRAP analysis attributed a clear benefit from aluminium recycling with regard to climate change. One outlier scenario considered very poor recycling rates and compared this to an incineration process where a very high recovery for the extraction of aluminium from the slag was assumed. The outlier scenarios were not, however, regarded as either typical or representative. Table 1-15 presents data from the WRAP study.

Two ERM studies gave similar values - a range from 12.3 tonnes of CO<sub>2</sub> equivalent avoided to 13.1 tonnes of CO<sub>2</sub> equivalent avoided per tonne of aluminium, and a figure of 11.6 tonnes of CO<sub>2</sub> equivalent avoided per tonne of aluminium.

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<sup>18</sup> ERM (2006) Impact of Energy from Waste and Recycling Policy on UK Greenhouse Gas Emissions, Final Report for Defra, January 2006

<sup>19</sup> ERM (2006) Carbon Balances and Energy Impacts of the Management of UK Wastes, December 2006

Table 1-15: Emissions Savings – Aluminium Recycling Compared to Disposal (WRAP)

Material	Disposal method	No. of scenarios considered	Average savings across scenarios (tonnes CO <sub>2</sub> eq)	Range across scenarios (tonnes CO <sub>2</sub> eq)
Aluminium	Incineration	10	6.92	-2.9 < x < 15.1
Aluminium	Landfill	6	6.33*	-0.4 < x < 15.1

Notes:

Negative numbers here represent scenarios that lead to a net contribution to climate change as a result of recycling that material

\*Excluding one outlier result (50.32 tonnes CO<sub>2</sub>eq)

Source: WRAP (2006) *Environmental Benefits of Recycling: An International Review of Life cycle Comparisons for Key Materials in the UK Recycling Sector, Final Report to WRAP, May 2006*

The AEA report used the datasets from BUWAL 250 for production of aluminium ingots from raw material and from recycled aluminium, and for production of tin plate from raw materials and from non-detinned scrap have been drawn from the BUWAL 250 data set. This data includes all emissions associated with transport of materials, energy used in processes etc. For primary aluminium production, emissions of the potent greenhouse gas carbon tetrafluoride (CF<sub>4</sub>), which has a global warming potential of 6,500, are included. Table 1-16 confirms the GHG emissions for the production of virgin and recycling aluminium indicated within the AEA study. It is further assumed that 0.93 tonnes of aluminium are produced from 1 tonne of recycled cans, and 0.84 tonnes of tinplate from 1 tonne of scrap. This gives a net savings figure per tonne of aluminium recycled of 9.108 tonnes CO<sub>2</sub> equivalent.

Table 1-16: Greenhouse Gas Emissions for Production of Virgin and Recycled Aluminium (AEA)

Material	CO <sub>2</sub> (kg)	CF <sub>4</sub> (kg)	Total kg CO <sub>2</sub> eq
1,000 kg aluminium ingot (virgin)	7,640	0.4	10,240
1,000 kg aluminium ingot (recycled)	403	0	403

Source: AEA Technology (2001) *Waste Management Options and Climate Change: Final Report, European Commission: DG Environment, July 2001*

The USEPA report gives a figure of 15.07 tonnes CO<sub>2</sub> equivalent per tonne of aluminium recycled. For aluminium, the USEPA and AEA data was incorporated into the dataset considered by the WRAP review.

Recent data produced by the European Aluminium Association (EEA) suggests the total global warming potential for ingot production in Europe to be 9,677 kg CO<sub>2</sub> equivalent per tonne of aluminium, whilst comparable emissions for producing ingot from recycled aluminium were given as 506 kg CO<sub>2</sub> equivalent. This suggests avoided emissions of 9.17 tonnes CO<sub>2</sub> equivalent per tonne of aluminium recycled.

We have used the EEA value (9.677 tonnes CO2 eq per tonne of aluminium) in the current analysis, which is slightly lower than an average obtained from the average ERM and WRAP values.

An average figure for GHG savings from aluminium recycling is around 9.7 tonnes CO2 eq. per tonne of waste recycled. Thus the potential GHG savings from the additional 4,000 tonnes of (mainly) aluminium would be around 40,000 tonnes CO2 eq. In context, the total GHG savings from collected and recycling all metal beverage cans would be around 6 million tonnes CO2 eq.

From this analysis the following observations are made:

- 1) Even under the current conditions the level of recycling of privately imported cans is comparable to the estimated average recycling rate for all metal beverage containers in the EU-27 (63% vs. 66%);
- 2) The current level of recycling of privately imported cans is most sensitive to the assumed recycling levels of privately imported cans in Denmark and Sweden;
- 3) If all privately imported cans were recycled to the same extent as domestic cans in the country where they become waste, recycling of metal beverage cans could increase by just over 4,000 tonnes per annum. To put this into the European context, the recycling rate for cans would increase marginally from **65.8%** to **66.4%**;
- 4) In carbon terms, this would equate to an additional saving of around 40,000 tonnes CO2 eq. per annum;
- 5) In terms of material quality, collection would be switched from mostly mixed metal bring banks and extraction from incinerator bottom ash, to source segregated collection through the deposit systems. This would improve the material quality and generate higher revenues for the collection systems.

### 1.5.2 Littering

The specifications state that Task 2 should include “*assessing of the contribution of metal beverage cans to littering*”. Having completed a significant UK based project on deposit-refund systems we note that this is a very difficult aspect to quantify. Some studies attempt to ‘count’ litter in certain areas, but none indicate how much is deposited on an annual basis. Furthermore, few studies really seek to understand the relevance of ‘count’ based assessments as compared with other approaches, or the relevance of ‘counts’ to our understanding of the impacts of litter. It could be argued that the disamenity effect of litter might be a function more of its volume (related to its visibility), and possibly its potential to persist, than the number of items (i.e. the counts). Given the relative insignificance – in volume terms – of chewing gum and cigarette ends, it could be the case that beverage containers actually contribute relatively significantly to litter-related disamenity (because of their disproportionate contribution, relative to count-based measures, to the visibility of litter).

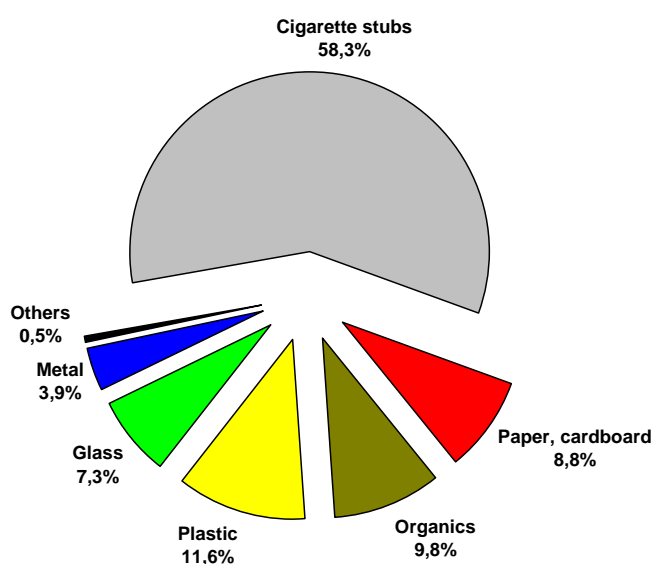
The following sections present information on littering in different Member States where studies have been reported on the activity. However, as will be seen there is little consistency in reporting methods, geographical areas of coverage and the level of detail investigated.

The contribution of metal as reported in litter counts would seem significant. Because there seem to be few other metal products that are often littered in the environment, the 'metal' category could be assumed a reasonable proxy for the prevalence of metal beverage cans in litter.

### 1.5.2.1 Austria

In Austria, littering is dealt with as a part of communal street-cleaning. Chewing gum and cigarette stubs are usually perceived as the most prevalent fractions. A study from 2003 compares littering in Vienna and four other European cities (Barcelona, Brussels, Frankfurt and Prague).<sup>20</sup> When counted on a unit basis cigarette stubs are the largest fraction in all cities (average values shown in Figure 1-13: Composition of Litter Material (by counted pieces) from Five European Cities). Packaging accounts for 4 to 10%, and beverage packaging only 0.5% (again note the methodology: neither by weight, nor by volume – but rather by count of individual units).

Figure 1-13: Composition of Litter Material (by counted pieces) from Five European Cities



There are no current studies on littering concerning beverage cans only.

### 1.5.2.2 Ireland

The National Litter Pollution Monitoring System carries out annual surveys of litter. However, it is a survey of the number of items of litter rather than the visual disamenity, volume or tonnage. The 2011 report showed that packaging items made

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<sup>20</sup> Ableidinger, M; Vogel, G (Publ. ARA AG and MA 48, the Municipal City Cleansing Department of Vienna): LITTERING - Evaluierung in Wien und anderen europäischen Städten.  
[http://www.ara-system.at/fileadmin/user\\_upload/downloaddoc/Littering.doc](http://www.ara-system.at/fileadmin/user_upload/downloaddoc/Littering.doc)

up 11.32% of litter. Beverage cans were 1.57% of all litter items. Given that cigarette ends (46.41%) and chewing gum (21.44%) make up such a high proportion of the total, the beverage cans are a relatively high proportion of the rest.<sup>21</sup>

### 1.5.2.3 UK

The English charity Keep Britain Tidy monitors litter rates on an annual basis and have reported that approximately 2.25 million pieces of litter are dropped every day across the UK.<sup>22</sup> Again, this charity uses different criteria for monitoring and assessing the prevalence of litter in the environment. The charity has adopted a count system and records the occurrence of litter at different sites, classified according to their land-use. According to the latest report the presence of non-alcoholic drink containers is the third most prevalent form of litter in the UK (these items were found at 53% of all the sites included in the study in 2009/10, up from 51% in 2008/9). Litter from alcoholic drinks is the sixth most littered item in England, being recorded at 19% of all sites in 2009/10 (down from 22% in 2008/9).<sup>23</sup> As these figures are based on counts, rather than volume or weight, and include both metal and plastic beverage containers, it is not possible to determine the exact contribution of cans to litter quantities on a mass or volume basis. Nevertheless, it is clear from Keep Britain Tidy's annual reports that alcoholic and non-alcoholic beverage containers are a persistent source of litter in England (Figure 1-14).

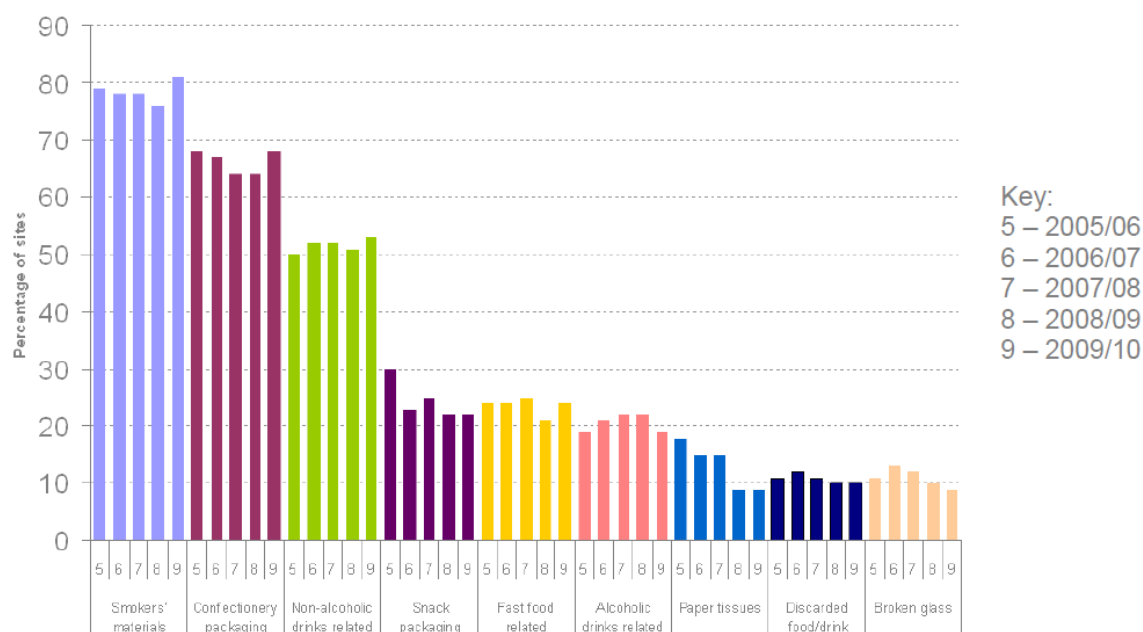
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<sup>21</sup> Litter Monitoring Body and TOBIN Consulting Engineers (2011) *The National Litter Pollution Monitoring System – Litter Monitoring Body: System Results 2010*, Report for the Department of the Environment, Heritage and Local Government, April 2011, [www.litter.ie/system\\_survey\\_results/index.shtml](http://www.litter.ie/system_survey_results/index.shtml)

<sup>22</sup> Keep Britain Tidy, *Knowledge Bank*, Accessed 10 October 2011, [www.keepbritaintidy.org/KeyIssues/Litter/Default.aspx](http://www.keepbritaintidy.org/KeyIssues/Litter/Default.aspx)

<sup>23</sup> Keep Britain Tidy (2010) *The State of England's Local Environment – A survey by Keep Britain Tidy 2009/10*, [www.keepbritaintidy.org/Expertise/Surveys/SurveyReports/Default.aspx](http://www.keepbritaintidy.org/Expertise/Surveys/SurveyReports/Default.aspx)

Figure 1-14: Incidences of Litter in England (2005 – 2009)



Source: Keep Britain Tidy (2010) *The State of England's Local Environment – A survey by Keep Britain Tidy 2009/10*, [www.KeepBritaintidy.org/Expertise/Surveys/SurveyReports/Default.aspx](http://www.KeepBritaintidy.org/Expertise/Surveys/SurveyReports/Default.aspx)

A 2008 litter survey by ENCAMS found that there were 44,040 counts of cigarette butts, but only 201 soft drink cans and 90 alcohol cans.<sup>24</sup> An article by Register suggests that 20 cigarette butts occupy a volume of 10ml.<sup>25</sup> The 44,040 butts would occupy, therefore, 22.02 litres. By contrast, soft drinks cans are most often 330ml and alcohol cans tend to be 440ml. Therefore the cans would occupy 105 litres – 4.8 times the volume of the cigarette butts. This highlights the fact that if count data is a poor proxy for perceived impact of litter, and if volume is a more appropriate one, then beverage packaging is a significant contributor to litter, this being disproportionately large relative to its prevalence in surveys based only on 'counts'.

In Scotland recent data on litter has shown the relative weight of metal cans to be approximately 3.6% of the weight of litter, as opposed to 1.9% by weight of municipal solid waste.<sup>26</sup>

<sup>24</sup> ENCAMS (2009) *Litter Composition Survey of England*, Aug-Oct 2008, Report for INCEPEN, March 2009

<sup>25</sup> Kathleen M. Register (2000) Cigarette Butts as Litter—Toxic as Well as Ugly, "Underwater Naturalist", *Bulletin of the American Littoral Society*, Volume 25, Number 2, August 2000, <http://www.longwood.edu/cleanva/ciglitterarticle.htm>

<sup>26</sup> WastesWork and AEA (2010) *The Composition of Municipal Solid Waste in Scotland*, Report for Zero Waste Scotland, April 2010 [www.zerowastescotland.org.uk/document.rm?id=8938](http://www.zerowastescotland.org.uk/document.rm?id=8938)



### 1.5.2.4 Czech Republic

In the Czech Republic field research was carried out in 2007 and 2008 by EKO-COM to ascertain the composition of litter in various locations. A summary of the findings, which relate to beverage containers, is shown in Table 1-17.

Table 1-17: Proportions of Beverage Containers by Type and Parameter in the Czech Republic

Average of all single researches		% frequency	% weight	% volume
TOWN AND MUNICIPALITY	PLASTIC in total	9,44	13,00	29,95
	PET up to 0,5l (incl.)	0,07	1,72	2,47
	PET over 0,5l	0,08	1,90	5,89
	METAL in total	3,89	12,00	5,22
	beverage cans	0,10	1,00	1,52
ROADS	PLASTIC in total	43,04	34,88	64,87
	PET up to 0,5l (incl.)	2,49	4,70	6,14
	PET over 0,5l	4,56	11,60	28,78
	METAL in total	6,60	9,88	6,56
	beverage cans	3,45	3,97	4,99
PROTECTED LANDSCAPE AREAS	PLASTIC in total	38,14	35,60	69,58
	PET up to 0,5l (incl.)	1,47	4,32	9,61
	PET over 0,5l	2,16	18,34	32,12
	METAL in total	3,91	9,97	4,09
	beverage cans	0,17	0,28	0,32

Source: EKO-COM (2008) Findings of analysing study on littering in the Czech Republic, Presentation provided to Eunomia

The figures for all beverage items that are considered in the table above (PET and cans) are summarised in Table 1-18.

Table 1-18: Summary of Proportions of Beverage Containers by Location and Parameter in the Czech Republic

	% frequency	% weight	% volume
Towns	0.3	4.6	9.9
Roadside	10.5	20.3	39.9
Protected landscape	3.8	22.9	42.1

Source: EKO-COM (2008) Findings of analysing study on littering in the Czech Republic, Presentation provided to Eunomia

Table 1-18 shows that by count, the proportion of beverage containers could be between 0 and 10%. However, when volume is considered, this increases to a range of around 10 to 40%. The frequency, or volume, is expected to be lower in towns where recycling services for this items are more available, compared to by the roadside or in protected landscape areas. It is not possible to calculate an average ‘% volume’ estimate, as the absolute quantities of littered beverage containers in the three main areas are not known.

#### 1.5.2.5 Germany

A 2007 report published by Prognos compared the litter counts in five European cities – Barcelona, Brussels, Frankfurt, Prague and Vienna.<sup>27</sup> Frankfurt had the highest percentage of packaging waste (9.9% in total) and beverage cans (0.5%). This study, however, used a count method and included cigarette butts; thus, making it difficult to compare actual disamenity caused by beverage cans in these cities (see discussion under the UK for more details on this point). Of all the cities included in the study Frankfurt had by far the lowest count of cigarette butts and biodegradable items (56.9%) compared to Brussels (64.9%), Prague (70.7%), Vienna (76.8%) and Barcelona (79.4%). As cigarette butts and biodegradable items account for such a large percentage of the total litter count a small change in the number of these items can have a significant impact on the relative proportions of the other litter fractions. Thus, it is very possible that differences in smoking policies between the five countries – ignoring other economic, social or political differences – is having a greater impact on the observed trends.

A second report published in 2007, cites a 1998 study that found that before the deposit was introduced drink cans accounted for 3.4%, by volume, of litter (drinks packaging accounted for 6%, by volume, in total).<sup>28, 29</sup> Again, they cite the five city

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<sup>27</sup> Prognos (2007) *Effects of Deposits on Beverage Packaging in Germany*, Report for The Association of European Producers of Steel for Packaging, Ball Packaging Europe Holding GmbH & Co. KG, and Stichting Kringloop Blik, November 2007

<sup>28</sup> AGVU and Roland Berger (2007) *European Packaging Policy: The Consequences of a Deposit System for Disposable Packaging Based on the German Example*, June 2007

study mentioned above, but comparisons cannot be drawn as they both used different methodologies (i.e. volume versus count).

#### 1.5.2.6 Slovakia

A study reported by CEPT (Centre for Sustainable Alternatives) reported that approximately 36% to 38% of litter in Slovakia is comprised of beverage containers.<sup>30</sup>

#### 1.5.2.7 Estonia

Before the introduction of deposit refund scheme in Estonia, a composition of litter along roadsides was analysed.<sup>31</sup> It was done as part of the clean-up campaign that was organised in 2003. Beverage containers made up to 80% (by volume) of the litter collected. Plastic bottles and aluminium cans constituted a major part of the beverage containers. Since the deposit was introduced in 2005, the amount of litter along roadsides has decreased significantly.

#### 1.5.2.8 Luxembourg

In 2009 ECO-Conseil conducted a comprehensive study of roadside litter in Luxembourg.<sup>32</sup> Litter impacts were studied along both country roads and motorways; however, as the greatest level of compositional detail exists for country roads the details of this will be discussed here. The study reports an average of 1.45 m<sup>3</sup> or 89 kg litter (covering a surface of 95 m<sup>2</sup>) per km of country road. Of this, plastic, metal and glass waste contributes 71% by volume and 61% by weight. The report also examines the occurrence of various litter fractions along country roads and the results are reproduced in Figure 1-15. From this it is evident that metal comprises 18.6% by volume – 13.7% by mass – of the total quantity of litter. However, it is not certain what proportion of the material fractions are indeed beverage packaging. The EKO-COM study gives some indication from their field research. It has therefore been assumed that PET beverage packaging accounts for around 50% of the plastic fraction, but this would be higher for cans and glass bottles. Thus we have assumed 75% of both metals and glass are beverage containers.

In consequence, the total volume of beverage packaging is estimated as 40%, and the total volume of metal cans 14%.

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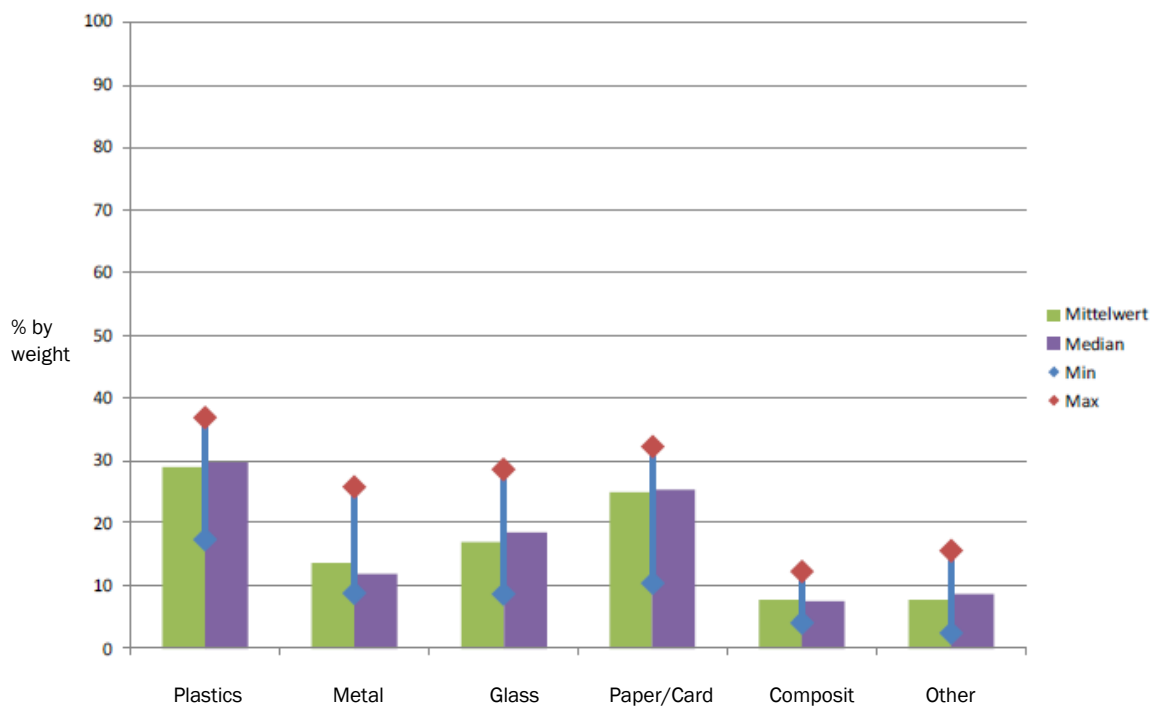
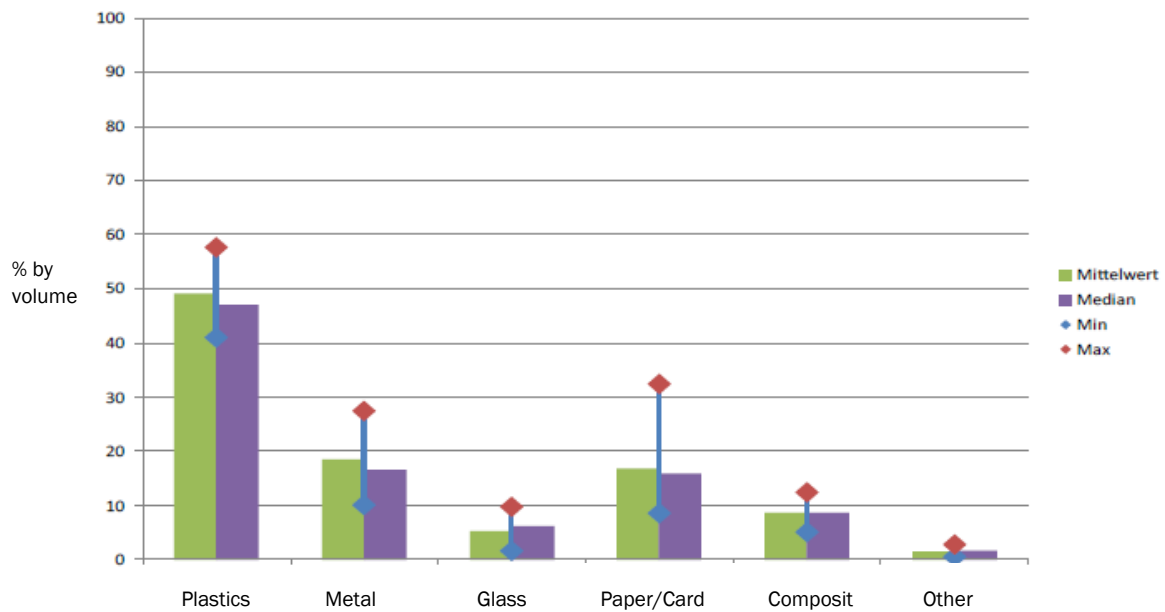
<sup>29</sup> Study conducted by RW TÜV Germany in 1998, full citation was not provided. This was a once off study of 590 locations in 167 towns and cities. It is worth noting that cigarette butts were not included in the study, although it is likely that they would constitute a relatively small volume relative to total litter volumes.

<sup>30</sup> CEPT (2010) *Zálohovanie Jednorázových Nápojových Obalov (Disposable Beverage Packaging)*, Date Accessed: 7 Mar. 2011, [www.cepta.sk/index.php?option=com\\_content&task=view&id=58&Itemid=204](http://www.cepta.sk/index.php?option=com_content&task=view&id=58&Itemid=204)

<sup>31</sup> SEI Tallinn (2003) *Pakendi ja pakendijäätmete kogumissüsteemide analüüs*, Report, 2003.

<sup>32</sup> ECO-Conseil s.à.r.l (2009) *Ausmaß, Qualität und Implikationen von Littering im Großherzogtum Luxemburg*, Report for Administration de l'environnement, January 2009, [www.environnement.public.lu/dechets/dossiers/littering/endbericht\\_littering.pdf](http://www.environnement.public.lu/dechets/dossiers/littering/endbericht_littering.pdf)

Figure 1-15: Average Volumes/Weight of Different Litter Fractions Found on Luxemburg Roads (2008)



Source: ECO-Conseil s.à.r.l (2009) *Ausmaß, Qualität und Implikationen von Littering im Großherzogtum Luxemburg, Report for Administration de l'environnement, January 2009*, [www.environnement.public.lu/dechets/dossiers/littering/endbericht\\_littering.pdf](http://www.environnement.public.lu/dechets/dossiers/littering/endbericht_littering.pdf)

### 1.5.2.9 Spain

A 2004 study by the Universitat Autònoma de Barcelona (Autonomous University of Barcelona) investigated littering on Barcelona's beaches. The study aimed to quantify the volume and composition of the waste and concluded that:

- by volume 82% (i.e. 3,390 m<sup>3</sup>) of all rubbish collected on the beaches during the high season was packaging waste; by weight, packaging waste accounted for 28.7% (84.75 tonnes) of all waste collected; and
- 32% (by volume) of all packaging waste collected was beverage cans (or 0.68% of the total litter sample collected).

Even though many beaches in Barcelona have containers for the separate collection of packaging waste, the study also found that the mean percentage of contamination (non-target items) in these containers was very high (55.5%). Beaches are increasingly provided with bins for the separate collection of packaging waste, but according to this study, the percentage of packaging collected in them is only 4% higher than that collected in bins designed for the collection of residual waste.

### 1.5.2.10 Denmark

Deposit refund systems have been operating in Denmark since the early 1980's, and have achieved continuously high return rates. Litter composition surveys show that metals (cans and other waste) amount to approximately 2-3% of litter in terms of numbers of units (in localised areas metal waste occasionally account for a greater proportion of litter arisings, e.g. villages and roads).<sup>33</sup> As with many other EU countries, chewing gum and cigarette butts account for the majority of the litter arisings on a per unit basis.

The Danish Society for Nature Conservation is the largest nature conservation and environmental organisation in Denmark. With the support of 140,000 members, they work to protect nature and the environment. A short summary of the main results concerning cans from this organisation's 'Clean Up Denmark' campaigns, which have been running since 2006 (one Sunday plus a week for schools), are given below:

- 2006: 70,000 cans;
- 2007: 170,500 cans;
- 2008: 154,400 cans, of this 7,800 (5%) with deposit;
- 2009: 153,000 cans, of this 10,000 (6.5%) with deposit; and
- 2010: 197,000 cans, of this 7,800 (3.9%) with paid Danish deposit.

The town of Sønderborg Kommune, in Southern Denmark, has started to collect cans in bring sites at shopping centres and campsites in response to the littering problem which is perceived to be worsened by the influx of non-deposit bearing cans from

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<sup>33</sup> Hold Danmark Rent [Keep Denmark Clean], Accessed 13<sup>th</sup> March 2011, [www.holddanmarkrent.dk](http://www.holddanmarkrent.dk)

Germany. In 2010 the Sønderborg arrangement collected 11.2 million cans.<sup>34</sup> An advantage of this is the revenue that accrues from sale of the recyclate (said to be worth 200,000kr per annum ~ €27,000).

There has been no analysis of the costs of cleaning up litter, and subsequently it is impossible to determine the cost that metal cans contribute to this. Litter reports illustrating that many municipalities do not have a complete understanding of the littering problem.

#### 1.5.2.11 Litter Impacts Resulting from Incompatibility

There is a relatively significant body of evidence suggesting littering is an issue in some parts of the EU. Studies in Austria, Ireland and the UK have identified significant amounts of litter when considering counts of the number of items littered. However, the UK study also calculated that beverage cans would take up a volume of nearly 5 times the amount of the highest item by count (cigarette butts). As noted above, the volume of litter will correspond to the disamenity value much more closely than the absolute number of items counted. Studies which considered the volume of littered items found the following contributions to litter from packaging waste:

- Estonia – 80% volume (beverage containers only);
- Czech Republic – 10 to 40% (beverage containers only);
- Slovakia – 37% (beverage containers only)
- Luxembourg – 40% volume (beverage containers only);
- Germany – 6% volume (beverage containers only);
- Spain – 82% volume (all packaging waste);

and for metal cans only;

- Czech Republic – 5% volume;
- Luxembourg – 14% volume;
- Germany – 3.4% volume;
- Spain – 32% volume.

The count and volume data from the studies given in the preceding sections are summarised in Table 1-19 below. It is clear that when considering the contributions of packaging to littering by volume, the figures are significantly higher than when considering counts. As noted above, volume of litter is likely to relate more strongly to disamenity valuations than counts, as it is the visual ‘annoyance’ of the items that cause the disamenity. However, it is also clear that the figures are highly variable and relate strongly to the location and methodology of the studies considered. For example, beverage packaging contributes a higher proportion on Spanish beaches,

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<sup>34</sup> DR Forside Web page, Accessed March 2011, <http://translate.google.co.uk/translate?hl=en&sl=da&tl=en&u=http%3A%2F%2Fwww.dr.dk%2FRegioner%2FSyd%2FNyheder%2FSonderborg%2F2011%2F01%2F28%2F173049.htm%26regional>

where tourists are likely to be consuming a higher than average proportion of beverages and because there are limited opportunities for disposal or recycling, but beverages appear to contribute much lower proportions in urban areas. This is likely to be influenced by the nature of the urban environment, which results in higher quantities of litter overall, and of more numerous types, than alongside roads or in other more rural areas (thus the proportion of beverage containers is lower), but also in countries where collection systems for these products are more common in urban areas (i.e. the convenience factor of alternative management pays an important role in behaviour).

Table 1-19: Estimates of Contribution of Various Packaging Groups to Littering

	Packaging	Beverage Packaging	Metal Cans
Count	5-30%	1-10%	0-1%
Volume	20-80%	10-80%	3-30%

Therefore, by analysis of the volume of metal cans in litter, the problem overall could be considered relatively significant in some areas, but not in others.

However, the scale of any impacts directly related to the incompatibility of national schemes with privately imported cans is more difficult to assess. Some evidence from Denmark suggests that beverage cans which are part of the national DRS only make up a small percentage of total can litter. (This is evident from the data cited above, which suggests that an annual litter collection campaign recovered 197,000 cans in 2010, of which only 4% could be returned for a deposit (6.5% in 2009 and 5% in 2008).) Whereas the remaining 96% must have been privately imported cans.

Although no other studies or examples were found which aim to quantify the proportion of privately imported cans in litter, the case in Denmark seems to clearly suggest that they can form a significant proportion of national littering, especially when the collection system for domestic cans is a DRS.

1.5.2.12 Disamenity Associated with Littering

Very few credible studies have been identified which seek to value the disamenity of litter. None explicitly assess the value of metal beverage cans alone. However, the fact that many people across the EU are prepared to use their leisure time to go out and collect litter from the environment, implies that the benefits associated with a reduction in litter are non-zero.

1.5.3 Summary

The following provides a brief summary of the environmental impacts which have been identified:

- 1) The initial analysis of environmental consequences shows that at the EU-27 level there are only likely to be marginal reductions in recycling resulting from the incompatibility of privately imported cans with national collection systems. In addition, we note that this outcome is sensitive to a small number of cross border

flows and the assumptions made regarding the efficiency of non-deposit collection systems for metal cans in countries with DRSs;

- 2) On a Member State specific level, the difference in collection efficiency between systems for private imports and domestic cans does appear significant in some cases.
- 3) Reports in Austria, Ireland, the UK, Estonia, Luxembourg, Spain and Denmark, for example, suggest that littering is likely to be a significant problem across the EU however, the contribution of metal beverage cans is uncertain and varies depending on the methodology employed. Moreover, evidence from litter picking activities in Denmark strongly suggests that privately imported beverage cans are littered to a significantly higher extent than domestic cans, where they are included in a DRS. Valuing the social cost of litter is not an easy task, and few studies have attempted to do this. Consequently, the impacts of littering due to metal beverage cans are hard to quantify.



## 1.6 Economic Market-based Impacts

The Project Specifications required the contractor to:

*'identify and assess the economic and internal market impacts due to lack of compatibility of national schemes including potential trade barriers, cross border competition issues, the impact on economic operators and local authorities, impact on budgetary revenues.'*

As a reminder the incompatibility issues that were identified are:

- 1) Privately imported beverages in metal cans are not recycled to as high an extent, or as high a quality, as national cans when reach the end of their use;
- 2) Privately imported beverages in metal cans are more commonly littered in the environment when they reach the end of their use as compared to deposit cans;
- 3) Consumers who have paid deposits on beverage cans in one Member State cannot claim them back in another;
- 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).

In this section, the scale of these incompatibility issues is discussed, along with how the impacts are distributed amongst a number of stakeholders.

### 1.6.1 Loss of a Valuable Resource

In Section 1.5.1 above, it was suggested that the incompatibility of national collection systems with privately imported cans resulted in marginally less recycling across Europe, than if the cans were recycled to as high an extent as domestic cans. However, it was also noted that the level of recycling does appear to be above the obligations of the Packaging Directive already. If this reduced recycling is considered a 'loss' then the economic impacts can be calculated. Firstly the value of the scrap materials is discussed.

There are well established markets for the recycling of steel and aluminium, but the price of the recyclate has still seen significant changes in recent history as demand from the manufacturing sector and energy costs fluctuate. Whilst recognising that lower prices have been seen over the last 3 to 4 years, it does seem realistic to use current pricing levels for this analysis as energy prices, and the like, are not expected to fall dramatically in the near future. The following prices were used to reflect recent trends in material price, although we do note some operators we see revenues in excess of these figures, especially for aluminium.

Table 1-20: Recyclate Material Revenues

Material	Price, € / tonne
Aluminium	900
Steel	150

The key cross-border flows of cans are mainly in northern Europe where the proportion of aluminium to steel in the cans produced is high.<sup>35</sup> Using a proportion of 90% aluminium and 10% steel, the prices quoted above, and the quantity of recycling calculated above in Section 1.5.1 (~4,100 tonnes), the estimated potential loss in revenue from the incompatibility of national systems is around 3.4 € million.

To put this into context the estimated value for all metal beverage cans placed on the market each year (~625 k tonnes) is around 500 € million. Moreover, the quality of the material collected through the existing secondary collection systems (through which the privately imported cans are managed) appears to be lower than if it could be collected through the system for domestic cans. This will, to some extent, affect the value of the recovered material.

Again, the impact of a lack of compatibility does not appear significant, but this does show that metal beverage cans are a valuable resource, and currently (with only 62% recycling) the foregone value of aluminium cans across the EU is about 160 € million each year (due to the disposal of the remaining 38%).

### 1.6.2 Loss of Deposits

One of the incompatibility issues identified was that some consumers purchase beverages in one country with a deposit system, pay the deposit, take them to another, and then they cannot claim back the deposit. Thus, for them, the presence of the deposit represents a loss of income. In border regions around Germany, between Norway and Sweden and in other areas, it has been made known that border shoppers purchase beverages with deposits in one country, consume them in another, but then take the empties back on the next shopping trip to claim the deposit back. For these consumers there appears to be no reason for concern. For others, who are travelling on less regular business or leisure trips, the potential to return the empty containers is limited. However, the magnitude of this activity, relative to the total national sales and consumption of beverage cans is likely to be limited.

In addition, the German border shops do not include the deposit on products which are being privately exported. Nor, are there deposits charged on other tax free areas such as ferries and the island of Åland. Thus it would appear as though the only flows where significant numbers of consumers may lose their deposit is from Denmark to Sweden and from Estonia to Finland, but it is uncertain how many cans actually move

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<sup>35</sup> Personal communication with Beverage Can Makers Europe.

from Sweden (where a deposit would be paid) to Finland as opposed to on the ferries during trips from Sweden, so the volume of cans may well be less. The magnitude of this loss is estimated as follows:

**Table 1-21: Loss in Deposits due to Incompatibility of National Systems**

Cross-border Flow	Magnitude, containers	Deposit	Total Loss, €
Denmark to Sweden	25 million	1 (DKK) 0.1343 (€)	3 million
Sweden to Finland	25 million	1 (SEK) 0.11 (€)	3 million
Estonia to Finland	40 million	0.08 (€)	3 million
<b>Total</b>			<b>9 million</b>

Source: Eunomia

In total, therefore, it is estimated the consumers lose around 9 € million. Of course this could be more if day trippers and tourists etc. were taken into account, but the loss of deposits for these consumers is very difficult to quantify. In context, the total value of consumer deposits paid on cans by consumers in all 5 countries with deposit refund systems is estimated at around 600 € million. This is calculated as follows:

	National Currency	Euro	Containers, M	Total Deposits, M
Germany	0.25 €	0.25 €	950	238 €
Denmark	kr 1	0.13 €	380	51 €
Sweden	1 kr	0.11 €	1,114	122 €
Finland	0.15 €	0.15 €	1,100	165 €
Estonia	0.08 €	0.08 €	134	11 €
			Total	596 €

Note: Cans sold to domestic market in Germany is estimated

However, the loss to consumers should also be judged in relation to the savings they make from the border-shopping, which they are incentivised to do by price incentives. Thus even with the lost deposits, the border shoppers are still saving money relative to purchases in their country of residence.

Of course if deposits are lost by consumers, someone else gains. In this case, the deposit systems in the country of purchase and the Ministries of Taxation benefit, the latter from claiming the VAT on the purchases where this is paid in the first instance.

We cannot find any evidence to suggest that the incompatibility of national systems, in terms of the inability to pay back deposits, causes any barriers to trade or results in cross-border competition issues, above those which are already investigated by the Commission.

### 1.6.3 Financing of Recycling Collections for Privately Imported Cans

The final issue relating to incompatibility of national systems that has been identified is:

*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).*

This becomes a problem insofar as the Member State in which the product is placed on the market, and to which PRO schemes or the like are paid fees by producers, differs from the Member State in which the collection of the packaging waste occurs. If waste policy was as harmonised as a single market then there would be a requirement on the producers to ensure packaging waste was collected, anywhere where it became a waste in the EU, not just in the Member State where it was placed on the market. Currently the financial burden of the management of waste packaging from privately imported beverages falls upon the municipalities or the PRO schemes (depending on the structure and financing of waste collection systems for consumer packaging), not the producer who placed it on the market.

In no cases has it been found that cross-border funding does occur, so the scale is EU wide, but the significance of the impact relates to the scale of the movement of products across borders and the value of the material collected for recycling. The greater the quantity of waste crossing borders the greater the problem will be, as long as the management of the additional material (which is not funded by the producers) implies additional costs to the collection systems. However, if existing infrastructure can accommodate additional material, then the marginal cost of collection is also likely to be low. If the material stream is high in value (like aluminium) then the additional revenue generated may equal out, or even exceed, the cost of collection. Thus the impact would appear low. However, if the volumes are high, and the existing collection infrastructure cannot manage the collection of the material (and so new infrastructure needs to be developed) the marginal costs of collection will be much higher, and consequently may outstrip the savings generated from the additional revenue. In this case the impact would be expected to be higher.

In addition, we note that there are many other services which are paid for nationally but can be used by any EU citizen – transport (especially roads), health, banking services, emergency services etc. The transfer of payments between Member States for these services is not currently considered a key issue. However, given the aims of the EU to move to a high recycling society, and concerns regarding the absence of a harmonising effect of the Packaging Directive, the appropriate financing of waste collection services for privately imported consumer products may become an issue of growing relevance. Moreover, there does indeed appear to be a good argument for co-operation between Member States to deal with impacts related to the management of privately imported beverage cans.

#### 1.6.4 Summary

In this section, the economic impacts resulting from the lack of compatibility of national collection systems for metal beverage cans have been considered. The following points summarise the main issues:

- 1) Out of the estimated 550 € million value of metal beverage cans placed on the market, around 3.4 € million is being lost per annum;
- 2) The material quality of privately imported cans collected for recycling is, on average, lower than that of domestic cans collected in the same country;
- 3) Out of the estimated 600 € million paid by consumers every year for deposits on cans, around 9 € million is being lost per annum. However, the border shoppers are still making savings on beverage sales despite this cost, and the cost of transport;
- 4) No evidence was found to suggest any barriers to trade or cross-border competition issues – in addition to those issues already expressed by the Commission in communications with Member States;
- 5) The financing of the collection of privately imported cans could be considered an issue, depending on whether the marginal cost of collection exceeds the additional revenue generated from the sale of the material, or not.
- 6) Given the free movement of products within the single market and the diversity of packaging collection systems across the EU, there does indeed appear to be a good argument for co-operation between Member States to deal with impacts related to the management of privately imported beverage cans. This is not necessarily a problem confined to countries with DRSs in place. In principle, where large cross-border flows occur (for example, between France and the UK), there could be issues arising for producers funding collection systems in the UK. Arguably, the only reason why this is not regarded as an issue in the UK

#### 1.7 Social Impacts

Finally, the Project Specifications also required the contractor to:

*‘identify and assess the social impacts due to lack of compatibility of national schemes including impacts on consumers and labour markets.’*

None of the incompatibility issues identified appears to impact on labour markets.

##### 1.7.1 Willingness to Pay for Recycling Services

Regarding consumers, some measure of the impacts of the lack of compatibility can be gained through understanding householders’ willingness to pay for recycling services. In instances where consumers are going from one Member State to another, and where the level of service available for the privately imported package is decreased, then to the extent that consumers are willing to pay for this service, there is a loss in welfare.

Consumers generally value the presence of recycling systems. Indeed some consumer surveys suggest that many consumers would welcome the inclusion of beverages currently sold in tax free areas within deposit systems, though the survey

gives no assessment of their willingness to pay for this (beyond, presumably, what they already pay in the existing system for Danish cans).<sup>36</sup> Personal communication with a number of key stakeholders suggests that Danish consumers are also willing to pay for recycling services such as deposit refund systems, and they see them as very much part of their culture. However, it was also noted that there would be a reduced willingness to accept deposits charged on border cans in Germany, if these deposits could not be refunded in Denmark (mainly for behavioural reasons, storage issues and the like).

Valuing the willingness to pay for recycling services is not an easy task to accomplish. In the case of recycling, there are a number of studies which have estimated, directly or indirectly, households' willingness to pay for recycling, and indeed, in cases where no provision from Municipalities has been on offer, in many cases, households will resort to paying for a service from private sector / third sector operators, thereby revealing a willingness to pay through their buying the service.

One way to measure the householder's willingness to pay for recycling services is the contingent valuation (CV) method. It is a tool used for placing monetary values upon environmental goods and services, and is recognised as credible within the EU and is a major evaluation method for non-market goods in the United States.<sup>37</sup>

In one CV study carried out in 2005 in the United States, Blaine et al measured the resident's willingness to pay to keep a recycling service operating, which was required to meet a 25% reduction in landfilling.<sup>38</sup> The participation rate of the existing service was 88.7% and the usage rate was 68% (weekly), 15% (fortnightly) and 8% (more than fortnightly). Two forms of contingent valuation method were used: a single bounded referendum and a payment card.

According to the payment card results, 57% of respondents are willing to pay at least \$1.00 for the program per month and only 34% of payment card respondents would pay at least \$2.00 per month. According to another CV methodology, a referendum, 52% would pay the \$2.00 while 79% would pay the minimal \$1.00 amount. In the end the city council decided to keep the service and bill the residents \$1.50 per household per month.

As the level of recycling of the service was known, it could be approximated that, per percentage point of recycling, residents were willing to pay \$0.72 per year for recycling services. The contribution of metal beverage cans is estimated to be around 10%. Taking inflation and US PPP \$, relative to the EU-27 zone, into account and the number of households in the EU (around 150 million), it is estimated that the

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<sup>36</sup> Survey carried out by Aland University – 86% consumers said they would be happy for tax free cans to be included in the national deposit systems.

<sup>37</sup> Lake, I. R., Bateman, I. J. And Parfitt, J. P. (1995) Assessing a Kerbside Recycling Scheme: A Quantitative and Willingness to Pay Case Study, *Journal of Environmental Management* (1996) 46, 239-254

<sup>38</sup> Blaine, T. W., Lichtkoppler, F. R., Jones, K. R. And Zondag, R. H. (2005) An Assessment of Household Willingness to Pay for Curbside Recycling: A Comparison of Payment Card and Referendum Approaches, *Journal of Environmental Management* 76 (2005) 15-22

willingness to pay for the collection of metal beverage cans is 9.7 € million per 1% of metal beverage cans recycled.

Blomquist et al also carried out a CV of willingness to pay in another area of the United States.<sup>39</sup> The conclusion was:

*'We estimate willingness to pay for curbside recycling for Lexington residents is between \$1.27 and \$3.31 per month with a mean of \$2.29 per month after using certainty statements to adjust for hypothetical bias. Our results are remarkably similar to those from the West'.*

Using the same method as above, it is estimated that the willingness to pay for the collection of metal beverage cans is 13.7 € million per 1% metal beverage cans recycled.

In another study carried out in Norfolk in the United Kingdom residents were questioned using a 'dichotomous choice' (DC) willingness to pay survey.<sup>40</sup> The collection system was already in place and was achieving 22.9% recycling. This was regarded as a notable strength of the study as it addressed an existing service which the householders understood well, thus mitigating the problem with some CV which present hypothetical changes in the provision of public goods and services (in such cases problems arise because of the respondent's ability to fully appreciate the nature of such a good without experience of it).

Across the 1,400 households the mean WTP estimate was considered by the authors to be £35.69 per annum. Again, the contribution of metal beverage cans is estimated to be around 10%. If inflation and exchange rate is taken into account, it is estimated that the willingness to pay for the collection of metal beverage cans is 39 € million per 1% recycled.

Covec carried out a CV of householder's willingness to pay for recycling services for the New Zealand Government as part of a cost benefit analysis in 2007.<sup>41</sup> A national sample of over 1,000 people was surveyed. The survey estimated that the mean value householders were willing to pay for recycling services was \$0.88/household/week for 4.8 kg/household/week collected. Given households generate around 1,000 kg/household/year, this equates to around 25% recycling efficiency. If the contribution of metal cans in recycling, exchange rate, PPP and number of households in Europe is taken into account, it is estimated that the willingness to pay for the collection of metal beverage cans is 18 € million per 1% recycled.

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<sup>39</sup> Blomquist, G., Hardesty, D., Hughes, M., Koford, B. And Troske, K. (2008) *Estimating Willingness of Citizens to Pay for Recycling*, <http://www.industrystudies.pitt.edu/chicago09/docs/Troske%202.7.pdf>

<sup>40</sup> Lake, I. R., Bateman, I. J. And Parfitt, J. P. (1995) Assessing a Kerbside Recycling Scheme: A Quantitative and Willingness to Pay Case Study, *Journal of Environmental Management* (1996) 46, 239-254

<sup>41</sup> Covec (2007) *Recycling Cost Benefit Analysis*, Prepared for the Ministry for the Environment. Wellington

Jakus *et al.* (1996) carried out studies to elicit willingness to pay for recycling, and estimated this at £5.78 per household per month.<sup>42</sup> Using the above methodology this equates to around 70 € million.

Whilst Tiller *et al.* (1997) report that in Tennessee, households would pay \$4 per month (on the basis of contingent valuation).<sup>43</sup> Again, this equates to around 31 € million.

In seeking to understand some measure of the value of household time used in separation activity, Bruvoll *et al* report that people in Norway on average would be willing to pay a significant amount for *others* to do the recycling as long as the same environmental benefits result.<sup>44</sup> The study finds that some households would not wish to see this happen even when it is free (suggesting they themselves gain some benefit from the activity) whilst others would be willing to pay for the activity to occur even though it was offered at zero cost. This is interpreted by the authors as a basis for estimating the cost of householders' time but other interpretations clearly exist and may be rather more valid. Not least of these is that this is a measure of the value of the activity of 'recycling', irrespective of who it is done by.

The following table summarises the figures for willingness to pay for 1% increase in metal beverage can recycling. We note that the study under taken by Lake *et al* in the UK was based in a rural area where willingness to pay is likely to be higher than the national average. However, the New Zealand study was conducted based upon a representative sample of the population. A range of figures could be chosen, but for the calculation here we select a nominal figure for willingness to pay at around 15 to € million per 1%.

The change in recycling rate which occurs as a result of an incompatibility of national collection schemes was calculated above as 0.6%. Thus the social cost of a loss of willingness to pay for recycling services is estimated at 9 € million.

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<sup>42</sup> Jakus P. M., *et al.* (1996) Generation of Recyclables by Rural Households, *Journal of Agricultural and Resource Economics*, Vol 21 (1), pp 96-108

<sup>43</sup> Tiller K. H., *et al.* (1997) Household Willingness to Pay for Dropoff Recycling, *Journal of Agricultural and Resource Economics*, Vol 22 (2), pp 310-320).

<sup>44</sup> Bruvoll, A., B. Halvorsen and K. Nyborg (2002), Households' Recycling Efforts, Resources, *Conservation and Recycling*, 36: 337-354.



Table 1-22: Willingness to pay for Metal Beverage Can Recycling Services

Study	Country	Willingness to pay per 1% recycling of metal beverage cans, €
Blaine et al	United States	9.7 million
Blomquist et al	United States	13.7 million
Tiller et al	United States	31 million
Lake et al	United Kingdom	39 million
Jakus et al	United Kingdom	70 million
Covec	New Zealand	18 million

In context, the social benefit of collecting all metal beverage cans (100%), using this approach, would be around 1.5 € billion.

### 1.7.2 Summary

In this section, the social impacts resulting from the lack of compatibility of national collection systems for metal beverage cans have been considered. The following points summarise the main issues:

- 1) No impacts related to labour markets could be found;
- 2) There appears to be a social cost of around 9 € million, reflecting householder's willingness to pay for recycling services, and the reduction in recycling seen as a consequence of the incompatibility of national collection systems.

## 1.8 Summary of Impacts and their Significance

The impacts resulting from a lack of compatibility of national collection systems for metal beverage cans, which have been identified, are as follows:

- 1) If all privately imported cans were recycled to the same extent as domestic cans in the country they become waste, recycling of metal beverage cans could increase by just over 4,000 tonnes per annum. To put this into the European context, the recycling rate for cans would increase marginally from **65.8%** to **66.4%**;
- 2) The material quality from privately imported cans collected for recycling is, on average, lower than that of domestic cans collected in the same country due to different collection methods used;
- 3) Out of the estimated 550 € million value of metal beverage cans placed on the market, around 3.4 € million is being lost per annum;

- 4) Out of the estimated 600 € million paid by consumers on deposits every year, around 9 € million may be being lost per annum. However, the border shoppers are still making savings on beverage sales despite this cost, and the cost of transport;
- 5) There appears to be a social cost of around 9 € million, reflecting householder's willingness to pay for recycling services, and the reduction in recycling seen as a consequence of the incompatibility of national collection systems;
- 6) Littering of metal beverage cans may be a significant problem across the EU. However, valuing the social cost of litter is not an easy task, and few studies have attempted to do this. Consequently, the impacts of littering due to metal beverage cans are hard to quantify;
- 7) The financing of the collection of privately imported cans could be considered an issue, depending on whether the marginal cost of collection exceeds the additional revenue generated from the sale of the material, or not.

A number of these impacts are a consequence of whether lower levels of recycling of privately imported cans, as opposed to domestic cans, is likely. This matter needs to be placed in some context. The levels of recycling of metal cans in different EU Member States vary significantly. To this end, the loss of environmental benefit has to be considered as small relative to the environmental improvement which would be generated by a more generalised improvement in recycling performance across the EU.

The problem of focus in this study is that of the (in)compatibility of national collection systems and interoperability, not the magnitude of recycling of metal cans which may be aspired to across the EU. In this light, the following issues identified could be considered as problematic:

- Lower recycling of privately imported cans;
- Littering of privately imported cans;
- Loss of consumer deposits;
- Financing of the management of privately imported cans.

The significance of each of these problems is considered in Table 1-23.

Table 1-23: Significance of Problems Identified

Problem Identified	Scale	Importance
Lower recycling of privately imported cans	Significant at Member State level, in EU context not widespread.	Important, as clear environmental, economic and social benefits from recycling.
Littering of privately imported cans	Significant at Member State level, in EU context not widespread.	Difficult to assess, public opinion appears to suggest this is an important issue.
Loss of consumer deposits	Only around countries with DRS.	Important to consumers who lose out, but they do not outweigh financial savings from border-shopping. There are real losses that result from single-trip travellers (e.g. business and tourism), but the magnitude of this problem is not known, and may relate more to plastic bottles than cans.
Financing of the management of privately imported cans	EU wide issue as there are no existing cross-border financing arrangements for privately imported cans.	Depends on the material value and marginal cost of collection, as well as (politically) where the burden falls in the receiving country.

The development of interoperability options to address these problems is discussed in 'Appendix 4 – Options Development'.