

## DEFRA - Call for evidence on voluntary and economic incentives to reduce littering of drinks containers and promote recycling

**Closes 20 Nov 2017 (at 23:45?)**

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Eunomia Research & Consulting Ltd. (Eunomia) is an independent environmental consultancy, with UK offices in Bristol (Head Office), London and Manchester.

Eunomia has undertaken numerous studies into beverage container deposit systems in recent years and thus has a very good understanding of the key design features, the costs of a well-designed scheme (and on whom these fall), and the effects in terms of increased quantity and quality of recycling, and in respect of litter reduction.

Importantly we have a very good understanding, drawing from our knowledge of overseas DRSS, as to which work well, which work less well, and why. Accordingly, we have a clear view of the way in which DRS could be implemented in order to minimise the costs and maximise the benefits.

In order to demonstrate our expertise in this area, we present below a selection of our relevant reports:

1. Eunomia Research & Consulting (2010) *Have We Got the Bottle? Implementing a Deposit Refund Scheme in the UK*, Report for CPRE, available at <http://www.eunomia.co.uk/reports-tools/have-we-got-the-bottle-implementing-a-deposit-refund-scheme-in-the-uk/>
2. Eunomia Research & Consulting (2011) *From Waste to Work: The Potential for a Deposit Refund System to Create Jobs in the UK*, Report for CPRE, available at <http://www.eunomia.co.uk/reports-tools/from-waste-to-work-the-potential-for-a-deposit-refund-system-to-create-jobs-in-the-uk/>
3. Eunomia Research & Consulting (2015) *A Scottish Deposit Refund System, Final Report for Zero Waste Scotland*, available at

[http://www.zerowastescotland.org.uk/sites/default/files/ZWS%20DRS%20Report\\_MAIN%20REPORT\\_Final\\_v2.pdf](http://www.zerowastescotland.org.uk/sites/default/files/ZWS%20DRS%20Report_MAIN%20REPORT_Final_v2.pdf)

4. Eunomia Research & Consulting (2011) Options and Feasibility of a European Refund System for Metal Beverage Containers, Final Report to DG Environment of the European Commission, November 2011, available at <http://ec.europa.eu/environment/waste/packaging/cans/deliverables.htm>
5. Eunomia Research & Consulting (2015) A Clean Sweep: Rethinking the Way we Tackle Litter, March 2015, available at <http://www.eunomia.co.uk/reports-tools/a-clean-sweep/>
6. Eunomia Research & Consulting (2014) Exploring the Indirect Costs of Litter, Report for Keep Britain Tidy, December 2014, available at <http://www.eunomia.co.uk/reports-tools/exploring-the-indirect-costs-of-litter-in-england/>
7. Eunomia Research & Consulting (2016) Study to Support the Development of Measures to Combat a Range of Marine Litter Sources, Report to DG Environment of the European Commission, available at <http://www.eunomia.co.uk/reports-tools/study-to-support-the-development-of-measures-to-combat-a-range-of-marine-litter-sources/>
8. Eunomia Research & Consulting (2016) Measures to Prevent Marine Plastic Pollution: The Trouble with Targets and the Merit of Measures, September 2016, available at <http://www.eunomia.co.uk/reports-tools/measures-to-prevent-marine-plastic-pollution/>
9. Eunomia Research & Consulting (2016) Plastics in the Marine Environment, available at <http://www.eunomia.co.uk/reports-tools/plastics-in-the-marine-environment/>
10. Eunomia Research & Consulting (2017) Impacts of a Deposit Refund System on Local Authority Waste Services, available at <http://www.eunomia.co.uk/reports-tools/impacts-of-a-deposit-refund-system-for-one-way-beverage-packaging-on-local-authority-waste-services/>

We are also involved in advising on system design in numerous countries both within the EU and beyond.

## Section 2 – Baseline information

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### **7. How many drinks containers are placed onto the UK market each year?**

Please breakdown into UK and England figures. Please specify by container type and whether you are reporting numbers/units or tonnages. Additionally, if you are a business which sells drinks containers directly to consumers, how many units/tonnes of these containers do you sell annually?

This is arguably something that Defra should already know, given that such market data is already available (albeit at a price). In the absence of such knowledge, Defra is thus dependent on estimates put forward by different stakeholders who might have their own interests best served by under- or over-estimating the number of beverage containers placed on the market.

It is difficult for us to precisely determine this information. At present, estimates of tonnages placed on the market are provided by some producer responsibility organisations (which do not necessarily, individually or collectively, cover the entirety of beverages placed on the market). However, there are also challenges in distinguishing from the weight based data, for PET bottles for example, between PET beverage bottles and other PET bottles that might contain other products.

It's worth noting in passing that in the Norwegian deposit scheme, for example, the precise number of beverage containers within the scheme placed on the market is known.

For a 2015 study for Zero Waste Scotland into the feasibility of a DRS in Scotland, Eunomia used market data purchased from Canadean, and other sources, to identify the number of beverage containers of different types placed on the Scottish market. Scaling this up to the UK as a whole, and to England, by relative populations gives the number of units of different beverage container types as indicated in Table 1.

**Table 1: Beverage Containers Placed on the UK Market Annually (million units)**

Beverage Container Type	Scotland	England	UK
Soft /Beer & Cider Bottles	250	2,550	3,030
Wine/Spirit Bottles	187	1,907	2,267
PET Bottles	744	7,588	9,018
HDPE Bottles	300	3,060	3,636
Ferrous Cans	148	1,509	1,794
Aluminium Cans	526	5,365	6,376
Beverage Cartons	237	2,417	2,873
<b>Total</b>	<b>2,392</b>	<b>24,396</b>	<b>28,994</b>

This would suggest that 24.4 billion beverage containers of the types detailed are placed on the market in England every year.

## 8. What percentage (%) of these drinks containers are collected (overall) via kerbside municipal waste, or commercial or industrial collection arrangements?

Percentage (%) of drinks containers collected (please specify by container type and whether number or tonnages). Please breakdown into UK and England figures if possible.

Again, this is something that ideally, Defra should not need to ask of stakeholders. If waste data were collected to a greater degree of resolution, with more detailed analysis of compositions, it would be a more straightforward question to answer.

It is difficult to determine precisely such figures, as the percentage reported as collected will vary based on the assumptions as to the amount placed on the market, and local authority doesn't allow a disaggregation of the reported material types collected (meaning that estimates have to be made of the proportion of such material types that are beverage containers).

An illustration of the former point is provided in Table 2, from Eunomia's feasibility study for Zero Waste Scotland. Producer compliance scheme Valpak reported lower tonnages placed on the market than calculated by Eunomia. Clearly, the lower the assumption as to the amount placed on the market, the higher the apparent recycling rate. It is therefore very important to seek a more definitive understanding of the amount placed on the market in each year. This would of course take place if a DRS were implemented as detailed data will be gathered on every beverage container within such a scheme.

**Table 2: Estimates of Tonnages Placed on the Scottish Market and the Effect on Reported Recycling Rates**

Data Type	Eunomia	Valpak
Glass Arisings	165 kt	127 kt
Glass Recycling	100 kt (61%)	89 kt (70%)
Plastics Arisings	39 kt	36 kt
Plastic Recycling	13 kt (34%)	19 kt (52%)
Steel Can Arisings	5 kt	3 kt
Steel Can Recycling	2.5 kt (48%)	2 kt (62%)
Aluminium Can Arisings	9 kt	6 kt
Aluminium Can Recycling	3.1 kt (31%)	3 kt (68%)

On the latter point, (disaggregating from the data the number of beverage containers collected) taking plastic bottles as an example, claims have recently been made that 74% of

plastic drinks bottles are already recycled – a figure attributed to Valpak (see <http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/environmental-audit-committee/packaging/oral/72015.pdf>)

However, as the full basis of this calculation has not been made public, it is not possible to examine in detail how it was derived (see <http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/environmental-audit-committee/packaging/written/70615.pdf> )

## **10. What percentage (%) of materials collected from street or other ‘on-the-go’ bins relate to drinks containers?**

Composition of street bin contents - what percentage (%) of materials collected from outdoor bins relate to drinks containers. (Please specify by container type, whether number or tonnages, and whether figures relate to UK or England).

Eunomia’s 2015 DRS Feasibility Study for Zero Waste Scotland identified that the average proportion of beverage containers in litter from four studies in Estonia, Czech Republic, Slovakia and Luxembourg was 46% by volume.<sup>1</sup> This is consistent with a recent study from New South Wales that noted that total beverage container litter accounted for 49% by volume.<sup>2,3</sup>

A conservative assumption might therefore be 40% of litter by volume being beverage containers, with this holding true both for litter on the ground and litter in bins.

## **11. Of the total drinks containers recycled, what percentage (%) would have been collected via street or other ‘on-the-go’ bins?**

Percentage (%) of drinks containers recycled, of those collected via street or other on-the-go bins. (Please specify by container type, whether number or tonnages, and whether figures relate to UK or England).

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<sup>1</sup> Eunomia Research & Consulting (2015) A Scottish Deposit Refund Scheme, Final Report to Zero Waste Scotland, available at <http://www.eunomia.co.uk/reports-tools/a-scottish-deposit-refund-system/>

<sup>2</sup> New South Wales Environment Protection Authority (2016) 2015–16 National Litter Index Results for New South Wales, available at <http://www.epa.nsw.gov.au/resources/litter/nsw-national-litter-index-results-160513.pdf>

<sup>3</sup> Beverage containers due to be included in the proposed DRS accounted for 43% of the total volume.

If this is taken to refer to on-street bins, it is likely to be very low indeed - probably zero for plastic bottles – with perhaps some cans being recycled post incineration.

In the course of the recent study for KBT on the financial effects of a DRS on local authority waste services, stakeholders indicated that street-based recycling on the go (ROTG) bins were not effective, and that the composition was no different from normal litter bins. Accordingly, everything collected from such ROTG bins was reported by the stakeholders to be destined directly for the residual waste stream. Indeed, removing such ROTG bins was identified as a financial saving that would result from implementation of a DRS (albeit not one that was included in our overall estimate of savings to local authorities).

## **12. What percentage (%) of drinks containers placed on the market annually in England are littered?**

Percentage (%) of drinks containers littered in England (please specify type and whether number or tonnages).

The following calculation estimates the number of plastic drinks bottles and metal beverage cans littered across the UK each day

A Zero Waste Scotland (ZWS) report from 2013 presents the composition (by weight) of litter in Scotland. This identifies the following proportions:

- Plastic bottles – 8.6%
- Packaging glass - 9.1%
- Metal cans – 4.0%

The ZWS report also puts a figure on the annual tonnage of litter dropped on the ground and subsequently cleared by local authorities in Scotland each year – at least 15,000 tonnes. This is a conservative figure as it does not include:

- litter dropped, and then cleared, on other public land (e.g. hospitals, schools and the transport network) or private land (e.g. stadiums and shopping centres);
- litter that is not picked up, and that either (a) accumulates over a long period of time – although, in due course, much of this might eventually be cleared – or (b) ends up being washed into water courses and ultimately to the sea; and
- litter that is correctly discarded in litter bins.

However, if we take 15,000 tonnes as an estimate of litter dropped and cleared each year in Scotland, the following tonnages can be calculated for specific littered items:

- Plastic bottles – 1,290 tonnes
- Packaging glass – 1,365 tonnes
- Metal cans – 600 tonnes

To understand what this means in terms of an item-specific littering rate we need to know what is placed on the market in Scotland annually. Eunomia's 2015 report for Zero Waste



Scotland on the key design features and feasibility of a potential Scottish Deposit Refund Scheme (DRS), and the appendix to the report, provide such figures: ,

- Plastic bottles – 39,000 tonnes
- Glass bottles – 165,000 tonnes
- Metal cans – 14,100 tonnes

On this basis, the following item specific littering rates, i.e. proportion of all items purchased that are littered, can be calculated:

- Plastic bottles – 3.3%
- Glass bottles – 0.8%
- Metal cans – 4.3%

However, alternative figures were put forward by Valpak for the number of items placed on the market each year. These figures were lower, at:

- Plastic bottles – 36,000 tonnes
- Glass bottles – 127,000 tonnes
- Metal cans – 9,000 tonnes

This, of course, would imply higher littering rates of:

- Plastic bottles – 3.6%
- Glass bottles – 1.1%
- Metal cans – 6.7%

We can further refine our estimates if we note that plastic bottles of two different polymer types are placed on the market. PET bottles are widely used for water and fizzy drinks and water, while HDPE is more commonly used for milk and household products like shampoo. , While the litter composition data does not distinguish by type of plastic, HDPE bottles are much less likely to be littered given that their contents are predominantly consumed at home.

Figures in the appendix to Eunomia’s DRS report show that approximately 60% by weight of the plastic bottles placed on the market is PET. Using a lower figure of circa 21,500 tonnes (60% of 36,000 tonnes) of PET placed on the market, and assuming that almost all littered plastic bottles are PET, the implied littering rate for PET increases to 6%.

Of course, this is all based on a very conservative estimate of the amount littered each year in Scotland of just 15,000 tonnes. The true figure could well be at least several thousand tonnes higher, meaning that the actual littering rates would be greater still.

It’s worth reflecting on the relative ordering of the calculated littering rate for the different items:

- Littering of glass, by weight, is relatively low, arguably reflecting the propensity for fewer ‘on the go’ beverages to be served in glass containers: rather, such containers tend to be used for beverages consumed at home or in pubs or restaurants.

- Plastic bottles are widely used in ‘on the go’ consumption, but they can be refilled, and so may be kept for reuse, or failing that, they can be compressed, and securely closed with a screw cap to prevent any dregs spilling out. That makes them relatively convenient to put in a bag or pocket and take home or to the nearest litter bin.
- Cans, however, have no such potential for a second use, and cannot be resealed. Putting them in a bag to take home is thus a less attractive prospect, and the incentive to just be rid of them is probably greater than for plastic bottles, which fits with the higher apparent rate of littering.

So what does this mean in terms of the number of items littered – not placed in litter bins, but genuinely littered. The appendix to Eunomia’s DRS feasibility report indicates that:

- 744 million PET bottles are placed on the market in Scotland each year. Applying a deliberately conservative assumption of just 3% being littered (less than calculated above) this would be over 60,000 littered PET bottles per day, every day.
- 148 million ferrous cans and 526 million aluminium cans are placed on the market in Scotland each year. Applying a littering rate of 4% (again a conservative figure, lower than any calculated above) would mean over 70,000 cans littered in Scotland daily.

There is insufficient data to be able to perform such a calculation for England, Wales, or Northern Ireland, but nor is there any evidence, to the best of our knowledge, that demonstrates that the littering behaviour of Scottish consumers is significantly different to that of consumers in other UK nations.

On that basis, it is possible to derive an estimate by scaling the above figures using relative population sizes (Scotland has circa 8.3% of the UK population). This would suggest that over 700,000 plastic bottles and nearly 900,000 cans are littered across the UK each day (1.6 million plastic bottles and cans in total).

### **13. What are the key environmental and/or social impacts of littered drinks containers, and how would you measure these?**

Environmental and social impacts of littered containers. If you already have a monetised impact assessment, please provide details.

The impacts of litter can be broken down into ‘direct’ and ‘indirect’ costs. Direct costs are those associated with clearing it up, while indirect costs are those wider impacts on society. Indirect costs can be further split into those that are ‘internalised’, i.e. experienced through market transactions (such as paying for repairs to a punctured bicycle tyre) and ‘externalities’, which are the costs that are not ‘internalised’ in market transactions (for example the sense of ‘welfare loss’ associated with the visual disamenity of a park being strewn with litter).

Eunomia undertook a study for Keep Britain Tidy in 2014 exploring the indirect costs of litter in England. These costs related to effects of a littered environment on factors such as mental wellbeing, crime, house prices (as a proxy for the perceived quality of a local area).

This included monetary estimates of the collective willingness to pay for a reduced level of litter based on Defra research. The best estimate was for a collective willingness to pay for a ‘one-step’ improvement in the amount of local litter of circa £5bn per annum in England. On the basis that beverage containers account for circa 40% of litter by volume, and that the visual disamenity of litter is likely to be more closely linked to overall volume than to the number of items, beverage container litter could account for £2bn of disamenity annually. It is worth noting that this was just for improvements in ‘neighbourhood’ litter. Of course this does not include any disamenity in respect of beverage containers in the marine environment which, given the current level of public concern, could be of an equivalent or greater magnitude.

- Eunomia Research & Consulting (2014) Exploring the Indirect Costs of Litter, Report for Keep Britain Tidy, December 2014, available at <http://www.eunomia.co.uk/reports-tools/exploring-the-indirect-costs-of-litter-in-england/>

Since that time, public awareness of, and concern about, litter, and plastics in particular, in the marine environment has increased considerably, such that this is likely to be the greatest single aspect of public concern, and thus valuations for marine disamenity could well be higher.

Beyond plastic in the marine environment, impacts specifically relating to other beverage containers include glass bottles smashing and therefore presenting an injury hazard – especially in parks and on beaches – and aluminium cans that get shredded by grass cutting machinery, meaning that sharp edges are exposed, creating further risk of injury, and potentially damaging equipment.

#### **14. How would you suggest quantifying, in economic terms, the value of the ‘disamenity’ (unpleasant qualities) presented by such littered items in England? Do you have any evidence to illustrate this?**

As described in response to Question 13, estimates of disamenity already exist based on willingness to pay for a specific improvement in litter (i.e. a reduction in litter) in the local area. Further research in this area would be useful to inform how disamenity might vary by item type and indeed by material type.

Eunomia undertook a study for Keep Britain Tidy in 2014 exploring the indirect costs of litter in England. These costs related to effects of a littered environment on factors such as mental wellbeing, crime, house prices (as a proxy for the perceived quality of a local area).

This included monetary estimates of the collective willingness to pay for a reduced level of litter based on Defra research. The best estimate was for a collective willingness to pay for a ‘one-step’ improvement in the amount of local litter of circa £5bn per annum in England. On the basis that beverage containers account for circa 40% of litter by volume, and that the visual disamenity of litter is likely to be more closely linked to overall volume than to the number of items, beverage container litter could account for £2bn of disamenity annually. It is worth noting that this was just for improvements in ‘neighbourhood’ litter. Of course this

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- Eunomia Research & Consulting (2014) Exploring the Indirect Costs of Litter, Report for Keep Britain Tidy, December 2014, available at <http://www.eunomia.co.uk/reports-tools/exploring-the-indirect-costs-of-litter-in-england/>

## Section 3 – Current situation

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**This investigation is looking at what regulatory or voluntary interventions, if any, could improve how England deals with drinks containers; namely to prevent littering and increase recycling.**

One approach could be to carry on 'as normal', without making any changes to existing systems and processes.

**15. Would you support the carry on 'as normal' approach? If so, what elements of continuing 'as normal' make you think this is the best approach?**

Would you support the carry on 'as normal' approach?

No

If you answered no to the question above, why do you feel further action is needed?

There is far too much beverage container litter (both terrestrial and marine) and recycling rates are well below where they could be. Simply continuing on current approaches will not deliver the reductions in litter and increases in recycling (both in terms of quality and quantity) that could be achieved under a DRS.

Furthermore, there is a pressing need for genuine Extended Producer Responsibility (EPR) for packaging and packaging waste in order to shift the financial burden from citizens/taxpayers to producers/consumers. Such EPR should cover the full end of life costs including that within the residual stream and that which is littered.

A deposit return scheme is a very effective form of EPR. The cost of the system is borne by the producer / consumer, those who act in an anti-social way by littering will forego their deposit, and good citizens who already pick up other people's littered beverage containers will be able to benefit from the redeemed deposit.

## 16. What aspects do you value in the current approach that you would not want to lose?

There is no reason why there should be any loss of beneficial aspects of the current approach to collecting beverage containers from households. For those who wish to place beverage containers in kerbside collections once a DRS is implemented, collections for plastics, glass and metals will still be available. Non-beverage plastic bottles, along with pots, tubs and trays will still be collected at kerbside, likewise glass containers such as jam jars, and metal tins. DRS will not mean the end of kerbside collections.

## Section 4 – Evidence on well-designed and well-run deposit and reward and return schemes

In the wider context of reducing litter and improving recycling, Ministers have asked the group to consider the advantages and disadvantages of different types of deposit and reward and return schemes for drinks containers.

There are many varieties of schemes; there are mandatory national schemes, industry-run schemes, schemes involving rewards and no deposits, local-level schemes run jointly by businesses and councils, and so on. We need to consider the full picture of costs and benefits of such schemes, including on wider society and economics.

**We need to build on existing evidence and potentially close gaps in our knowledge and understanding. We are particularly interested in receiving new and emerging evidence on costs impacts and/or benefits analysis.**

## 17. What impacts might a deposit or reward and return scheme have on:

Littering rates?

Recycling rates?

Based on evidence previously submitted to the EAC, and reproduced below, we estimate that a DRS could be expected to reduce littering rates of deposit-bearing beverage containers by circa 95%.

Recycling rates of 90% could reasonably be expected under a well-designed DRS

Deposit return schemes for beverage containers are successful at discouraging littering through providing a small financial incentive for consumers to return the container for

recycling. A 2005 peer review of a DRS study for Defra, which, in general terms, was not supportive of introducing a DRS, highlighted examples from the United States where reductions in beverage container litter in excess of 80% occurred once a DRS was implemented.<sup>4</sup>

Indeed a 2011 study from PwC reporting on the German Einwegpfand, or one-way deposit, noted that:<sup>5</sup>

*With a deposit system, there is practically no longer any littering of single-use beverage containers bearing deposits.*

Such an approach also leads to very high rates of collection and subsequent recycling (due to the high quality of the collected packaging). The same report states that:

*98.5% of the PET bottles bearing a deposit are collected in the deposit system and recycled, while only 25-31% of the PET bottles which do not bear a deposit are collected and subsequently recycled in the German green dot (kerbside) system.*

However, as shown below the estimate of an 80% reduction in littering from a DRS may itself be conservative.

### **Detailed Analysis of Litter Reduction Evidence**

Perhaps surprisingly, to the best of our knowledge, no specific research has been undertaken in the European context to identify the effect of a DRS on littering of beverage containers. It is therefore necessary to look to studies undertaken in the US. A 2005 peer review for Defra, by Perchards, of a study on DRS systems for packaging highlights a number of examples.<sup>6</sup> The peer review notes that:

*Mandatory deposits came into force in nine US states between 1972 and 1983 (the only deposit law adopted since then was in Hawaii in 2002, though a related measure was California's Advance Disposal Fee, adopted in 1986). The leading US authority on litter measurement, Dan Syrek of the Institute of Applied Research, conducted a series of litter studies in a number of US states during this period, including a series of "before and after" studies in the states where mandatory deposits were imposed on non-refillables, and "side-by-side" studies comparing results in adjacent deposit and non-deposit states.*

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<sup>4</sup> Perchards (2005) Deposit Return Systems for Packaging: Applying International Experience to the UK. Peer Review of a Study by Oakdene Hollins. Report to Defra, available at

[http://www.oakdenehollins.com/pdf/Deposit\\_Returns\\_2005\\_Peer\\_Review.pdf](http://www.oakdenehollins.com/pdf/Deposit_Returns_2005_Peer_Review.pdf)

<sup>5</sup> PWC (2011) Reuse and Recycling Systems for Selected Beverage Packaging from a Sustainability Perspective: An analysis of the Ecological, Economic and Social Impacts of Reuse and Recycling Systems and Approaches to Solutions for Further Development, available at

[http://www.duh.de/fileadmin/user\\_upload/download/Projektinformation/Kreislaufwirtschaft/PwC-Study\\_reading\\_version.pdf](http://www.duh.de/fileadmin/user_upload/download/Projektinformation/Kreislaufwirtschaft/PwC-Study_reading_version.pdf)

<sup>6</sup> Perchards (2005) Deposit Return Systems for Packaging Applying International Experience to the UK, Peer Review of a Study by Oakdene Hollins Ltd., Report to Defra 14 March 2005, available at

[http://www.oakdenehollins.com/pdf/Deposit\\_Returns\\_2005\\_Peer\\_Review.pdf](http://www.oakdenehollins.com/pdf/Deposit_Returns_2005_Peer_Review.pdf)

*These studies were carried out with a very robust methodology and they present an unsurpassed view of the effect of this policy measure on littering. We are unaware of any European studies of comparable comprehensiveness.*

The Perchards peer review highlights that one of Syrek’s studies, prepared for a Special Joint Committee of the Michigan Legislature to study the impact of the Beverage Container Deposit Law, collected samples in September 1978 and September 1979. The deposit law came into force on 3 December 1978. It appears that this may well be the *only* dedicated piece of research implemented on behalf of a state government specifically to determine the effects on littering of a DRS on beverage containers. Perchards notes, in respect of the Michigan study that:<sup>7</sup>

*It was found that while beverage container litter had declined by 85%-88%, the changes in total litter rates were not statistically significant*

Perchards then offers the data shown in Table 3.

**Table 3: Results presented in Perchards (2005) for Before-and-After Studies**

<b>IAR FINDINGS ON DEPOSIT LEGISLATION EFFECTIVENESS</b>				
	<b>Measurement Parameter</b>	<b>Beverage container Litter rate</b>	<b>Other Litter rate</b>	<b>Total Litter rate</b>
<b>BEFORE-AND-AFTER STUDIES</b>				
Michigan 1978	Visible items per mile	226.0	1447	1673
Michigan 1979	Visible items per mile	6.3	808	815
	<i>% change</i>	<i>-91.5%</i>	<i>+2.1%</i>	<i>-10.5%</i>
California 1986	Visible items per mile	70.0	1836	1953
California 1993	Visible items per mile	42.2	1970	2013
	<i>% change</i>	<i>-63.9%</i>	<i>+7.3%</i>	<i>+3.1%</i>

Source: Perchards 2005, reporting Syrek

The first thing to note about this table is that the 85%-88% reduction in beverage container litter reported in the text for Michigan is not matched by that shown in the table, which is a reduction of 91.5%. However, if the reported number of visible items per mile are accurately presented, then the 91.5% shown in the table is also inaccurate. A reduction in the beverage container litter rate from 226 to 6.3 visible items per mile is actually a 97.2% reduction in beverage container litter.

An error has also been made in presenting the ‘other litter rate’ and the ‘total litter rate’. For ‘other’, i.e. non-beverage container litter, the reduction from 1447 to 808 items is a decline of 44.2% rather than an increase of 2.1% as indicated. For total litter, the drop from

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<sup>7</sup> Perchards (2005) Deposit Return Systems for Packaging Applying International Experience to the UK, Peer Review of a Study by Oakdene Hollins Ltd., Report to Defra 14 March 2005, available at [http://www.oakdenehollins.com/pdf/Deposit\\_Returns\\_2005\\_Peer\\_Review.pdf](http://www.oakdenehollins.com/pdf/Deposit_Returns_2005_Peer_Review.pdf)

1673 to 814.3 visible items per mile is a reduction of 51.3%, rather than a reduction of 10.5% as in the table.

The key figure in respect of considering impacts of a DRS is the 97.2% reduction in beverage container litter. This is consistent with the findings from a study by PwC on the German Einwegpfand (one-way deposit) that stated:<sup>8</sup>

*With a deposit system, there is practically no longer any littering of single-use beverage containers bearing deposits*

Interestingly, the percentage changes calculated in the Perchards report based on the findings from the California studies are also incorrect. The number of visible items per mile that are beverage containers drops from 70 in 1986, to 42.2 in 1993, which is a reduction of only 39.7%, rather than the 63.9% indicated. The total number of visible items per mile in 1986 is also incorrect - it's overstated - and should be 1906 rather than 1953. This means that the total increase in visible items per mile between 1986 and 1993 is 5.6%.

Notwithstanding these errors, it's remarkable that the California scheme is presented as one of the two examples of 'before and after' studies that apparently, according to Perchards:<sup>9</sup>

*Present an unsurpassed view of the effect of this policy measure on littering*

Firstly, it's important to note that the level of the deposit in California, at only 2.5 cents (on beverage containers smaller than 24oz, 5 cents on those above this size), meant the financial incentive to return the beverage container was far smaller than in other schemes. For example, the deposit level in Michigan, upon scheme implementation in 1979, was 10 cents on non-refillables (i.e. one-way beverage containers). Even without accounting for the effect of inflation between 1979 and 1987, it is clear that a 2.5 cents payment on return is unlikely to lead to the same reduction in littering as a 10 cents deposit/refund.

Secondly, there are seven years between the 'before' and 'after' study. In this time, overall consumption of beverage containers will most likely have increased, and the value of the 2.5 cent or 5 cent payment for return of the beverage container will have been further eroded by inflation.

That the California example is presented here strongly suggests that the Michigan study, which as we can see showed a 97.2% reduction in beverage container litter, was the only credible 'before and after' study undertaken by Dan Syrek and the Institute for Applied Research.<sup>10</sup>

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<sup>8</sup> PwC (2011) Reuse and Recycling Systems for Selected Beverage Packaging from a Sustainability Perspective: An analysis of the Ecological, Economic and Social Impacts of Reuse and Recycling Systems and Approaches to Solutions for Further Development, available at [http://www.duh.de/fileadmin/user\\_upload/download/Projektinformation/Kreislaufwirtschaft/PwC-Study\\_reading\\_version.pdf](http://www.duh.de/fileadmin/user_upload/download/Projektinformation/Kreislaufwirtschaft/PwC-Study_reading_version.pdf)

<sup>9</sup> Perchards (2005) Deposit Return Systems for Packaging Applying International Experience to the UK, Peer Review of a Study by Oakdene Hollins Ltd., Report to Defra 14 March 2005, available at [http://www.oakdenehollins.com/pdf/Deposit\\_Returns\\_2005\\_Peer\\_Review.pdf](http://www.oakdenehollins.com/pdf/Deposit_Returns_2005_Peer_Review.pdf)

<sup>10</sup> Perchards, in their 2005 peer review, do not provide a reference for Syrek's work, although they do indicate that one of his studies was published in 2003. In fact in another paper by Perchards ('Peer Review of the Boomerang Alliance Report: National Packaging Covenant – Say No to the Waste Club', 3 March 2005,



The Perchards peer review also presents the findings from adjacent state studies by Syrek. These findings are reproduced in Table 4.

**Table 4: Results presented in Perchards (2005) for Adjacent State Studies**

<b>IAR FINDINGS ON DEPOSIT LEGISLATION EFFECTIVENESS</b>				
	<b>Measurement Parameter</b>	<b>Beverage container Litter rate</b>	<b>Other Litter rate</b>	<b>Total Litter rate</b>
<b>ADJACENT STATE STUDIES</b>				
California 1974	Visible items per mile	228.2	1998	2226
Oregon 1977	Visible items per mile	27.6	1930	1958
	<i>% difference</i>	<i>-87.9%</i>	<i>-3.4%</i>	<i>-12.0%</i>
Pennsylvania 1984	Visible items per mile	167.5	3117	3285
New York 1984	Visible items per mile	52.7	3485	3538
	<i>% difference</i>	<i>-68.5%</i>	<i>+11.8%</i>	<i>+7.7%</i>

Source: Perchards 2005, reporting Syrek

Assuming the number of visible items per mile are correctly reported, the percentage changes shown are accurate. Unfortunately it has not been possible to find the original analysis from which these figures are derived. Again, it does seem strange that studies that apparently present ‘an unsurpassed view of the effects of a DRS on littering’ includes a survey of two adjacent states, but taken three years apart (California 1974, and Oregon 1997).

It’s interesting to note that while the Perchards peer review reports on Pennsylvania and New York as adjacent states, it neglects to mention a 1986 study published in a peer reviewed journal, that compares the ‘before’ and ‘after’ situation in New York (either side of the September 12, 1983 implementation of the New York State Bottle Bill), with measurements, at the same time, in the adjacent state of New Jersey.<sup>11</sup> The study considered both highway exits and railroad tracks, where groups ‘tend to party’ according to the authors. For deposit-bearing beverage containers, the authors reported immediate reductions of between 95% and 99% depending on the location. Clearly not all beverage containers were deposit-bearing, and the authors report that the overall reduction in beverage container litter was more moderate – an initial 44% reduction at highway exits in New York, for example.

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available at [http://www.pca.org.au/application/files/5614/3769/2418/Oz\\_Boomerang\\_Report.pdf](http://www.pca.org.au/application/files/5614/3769/2418/Oz_Boomerang_Report.pdf) in which the same miscalculations are presented, the list of references include Syrek (1980) Michigan: After – a study of the impact of beverage container deposit legislation on street, roadside and recreation area litter in Michigan. The Institute for Applied Research; and Syrek (2003) What we now know about controlling litter – Findings pertinent to Michigan derived from thirty years of litter research. The Institute for Applied Research. It has not been possible to find either of these papers online

<sup>11</sup> Levitt, L. & Leventhal, G. (1986) Litter Reduction: How Effective is the New York State Bottle Bill? Environment and Behavior, Vol. 18 No. 4, July 1986, 467-479.

What's therefore important to note is that Syrek's figures reporting the number of visible beverage containers per mile, as presented in Perchards' peer review, may not distinguish between those that are deposit-bearing and those that are not deposit-bearing. The figures thus presented may therefore *understate* the reduction in littering of deposit-bearing beverage containers.

These findings strongly suggest that reductions in littering of deposit-bearing beverage containers in excess of 95% could reasonably be expected in the UK.

Recycling rates would increase to circa 90%, which are the sort of levels observed in places such as Norway.

## **18. What evidence is there that a deposit return or reward and return scheme may enhance or otherwise affect the value or quality of materials sent for recycling?**

### **Evidence on impacts of deposit return or reward and return scheme on the value or quality of materials sent for recycling**

Industry stakeholders indicate that the quality of material from deposit schemes is superior to that collected by other means. For example, incorporating high levels of rPET into drinks bottles requires a clean source of material, and sourcing this from deposit schemes gives assurance that the PET will only have previously been used for beverages. Where rPET is required, the preferred source is deposit schemes, and this enables high quality bottle to bottle recycling, rather than 'downcycling' into films, trays or into textile fibres.

All things being equal, the existence of a UK DRS will make UK reprocessing (into new bottles) a more viable prospect. Importantly, a DRS will also increase the quantity available for recycling.

## **19. What other benefits may accrue from a well-designed and well run deposit system?**

A number of key additional benefits include:

- Higher recycling rates
- GHG savings
- Further reductions in littering, of items not covered by a DRS
- Increased employment
- Savings to local authorities

These are described in more detail below:

### **Higher Recycling Rates**

Recycling rates in the order of 90% can be achieved under a DRS, with increased quantity and quality of material meaning that aspirations as to recycled content (especially for PET bottles) can more readily be met.

## GHG Savings

Eunomia's DRS feasibility study for Zero Waste Scotland, using the Scottish Carbon Metric, identified GHG savings of between 34 and 44 thousand tonnes CO<sub>2</sub>eq if assuming additional recycled material was diverted from incineration (an increasingly likely position given the move away from landfill). Scaled up to the UK on a population basis, this would mean savings of between 412 and 533 thousand tonnes per year.

In a 2010 study for CPRE, using a slightly different approach including different carbon intensity factors, Eunomia identified a net (i.e. accounting for additional emissions from transport) UK-wide GHG saving of 607 kt pa of CO<sub>2</sub>eq.

## Further reductions in littering, of items not covered by a DRS

That litter breeds litter is intuitive, and borne out by research. A DRS on beverage containers can be expected to reduce the littering of beverage containers by 95%. Given that beverage containers account for 40% of litter by volume, there will be a significant reduction in overall litter volume. In thus reducing overall litter volume, this can be expected to reduce the likelihood that people will litter other items – “a lightly littered environment breeds litter at a slower rate than a more heavily littered environment”. This expectation is supported by the academic literature. In fact, Cialdini et al. report this finding in their 1990 paper, as does a 2013 study by Schultz et al. This latter research identified that the level of pre-existing litter (which the researchers rated on a scale from 0-10) was predictive of observed littering behaviour. For every ‘unit’ increase in existing litter, the observed rate of littering increased by 2%.

- Cialdini et al (1990) A Focus Theory of Normative Conduct: Recycling the Concept of Norms to Reduce Littering in Public Places, *Journal of Personality and Social Psychology*, 58, 6, available at [http://www-personal.umich.edu/~preston/Downloads/DC/pdfs/Krupka\\_Oct13\\_Cialdinietal1990.pdf](http://www-personal.umich.edu/~preston/Downloads/DC/pdfs/Krupka_Oct13_Cialdinietal1990.pdf)
- Schultz et al (2011) Personal and Environmental Predictors of Littering Behavior, *Environment and Behavior* 45, 1, available at <http://journals.sagepub.com/doi/abs/10.1177/0013916511412179>

## Increased employment

Eunomia undertook a study for CPRE in 2011 that explored the potential employment impacts of a one-way DRS in the UK.<sup>12</sup> The report specifically examined the impacts of introducing a DRS on the number, type and location of jobs involved in the collection and processing of beverage containers. The calculations were based on the DRS system modelled for an earlier study for CPRE that considered the costs and benefits of a DRS.<sup>13</sup>

If it is assumed that all additional reprocessing jobs that result from higher separate collection of beverage containers under a DRS are created in the UK and are thus included in

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<sup>12</sup> Eunomia (2011) *From Waste to Work: The Potential for a Deposit Refund System to Create Jobs in the UK*

<sup>13</sup> Eunomia (2010) *Have We Got The Bottle? Implementing a Deposit Refund System in the UK*, Report for CPRE

the overall labour impacts, the introduction of a DRS leads to a 4,248 to 4,292 increase in full-time equivalent (FTE) posts, with a higher net increase in jobs from an 80% compared to a 90% return rate scenario.

Even without the inclusion of any FTE posts from reprocessing (i.e. assuming it all takes place overseas), there remains an overall increase in FTEs ranging from 3,062 to 3,156 for the 90% and 80% return rate scenarios respectively. The majority of jobs created are at a similar skill level to the existing jobs, though there is perhaps a slight increase in the total number of higher skilled jobs.

Another observed benefit of DRS, albeit one for which there is no data, is that bottles that are littered may sometimes be collected by the poorest in society who return them for recycling and redeem deposits. Indeed in Germany this approach has been 'formalised' as some litter bins have 'collars' in which used beverage containers can be placed if consumers cannot be bothered to return them, with the intention being that these are held in place until someone else picks them up.

### **Savings to Local Authorities**

Eunomia recently undertook a detailed study for Keep Britain Tidy exploring the financial impacts of a DRS on local authority waste services. Working with a selection of authorities, our headline findings were that overall, local authorities in England should make net savings of £35m per annum under a DRS. The report also notes where savings, and increased costs might occur, and the challenges for some, such as collection authorities, in securing their share of the savings that will accrue elsewhere, such as to waste disposal authorities. The report then identifies opportunities for revenue sharing to enable savings to be shared in an equitable manner.

The full report is available at:

- Eunomia Research & Consulting (2017) Impacts of a Deposit Refund System on Local Authority Waste Services, available at <http://www.eunomia.co.uk/reports-tools/impacts-of-a-deposit-refund-system-for-one-way-beverage-packaging-on-local-authority-waste-services/>

It's worth noting in passing that local authorities are currently shouldering a financial burden - in collecting and managing waste packaging - that shouldn't be placed upon them. It is estimated that the PRN system only covers about 10% of the net costs of the system. In other European countries the packaging EPR systems cover a far greater proportion of costs, up to 80% and in some cases 100%.

## **20. Have you any knowledge or direct experience that would give an indication of the set-up costs or the subsequent administrative and operational costs of a deposit or reward and return scheme?**

Evidence on set-up, administrative and operational costs of deposit or reward and return schemes (please reference any examples)

Eunomia calculated the set-up, administrative and on-going costs of a DRS for Scotland for ZWS as follows

- One-off / setup costs:
  - DRS Setup Costs **£15.0 million**
  - Change in labelling **£4.8 million**
  - Additional stock **£17.0 million**  
*(This figure would be recouped so might not be considered a cost, more a cash-flow issue.)*
- Ongoing / annual costs:
  - Net DRS operating costs (producer fees) **£5.7 to £17 million**
  - Cost to consumers (unredeemed deposits) **£35.9 to £23.9 million**
  - Beverage industry warehousing costs **£1.2 million**
  - Small retailers (time cost) **£1.8 million**
  - Local Authority kerbside services **-£4.6 million**
  - HWRCs **-£0.78 million**
  - Direct Costs of Litter **-£7.3 million**
  - Commercial waste services **-£7.9 to -£9.5 million**
  - Revenue associated with PRNs **-£2.3 to -£3.0 million**

From this analysis Eunomia calculated that a producer fee of circa 1p per beverage container placed on the market would be required.

It's worth noting that different schemes apportion costs across materials in different ways

## 21. What evidence exists on the best funding and management mechanisms of well-designed and well run deposit or reward and return schemes?

### Evidence on funding and management mechanisms for deposit or reward and return schemes

A DRS has a number of sources of funding. These are material sales, unredeemed deposits and producer fees. A DRS should be designed such that the operator is incentivised to achieve a high return rate (a role that is performed in Norway by the beverage container tax), meaning that the system should not be over-reliant on unredeemed deposits. Material prices may fluctuate, but materials from DRS will obtain a higher value than those from other forms of collection, and all other things being equal, the more that is collected, the higher the revenue from material sales. Producers then make up any shortfall in system operating costs through producer fees. In a well-designed DRS these should average out at circa 1p per container.

The DRS should have a single, not-for-profit system operator which should be industry owned, and independent of government, but with accountability to Government. The system operator should be incentivised to achieve a target recycling rate (specified by Government), either through taxation as applied in Norway, or through penalties from failing to reach the targets.

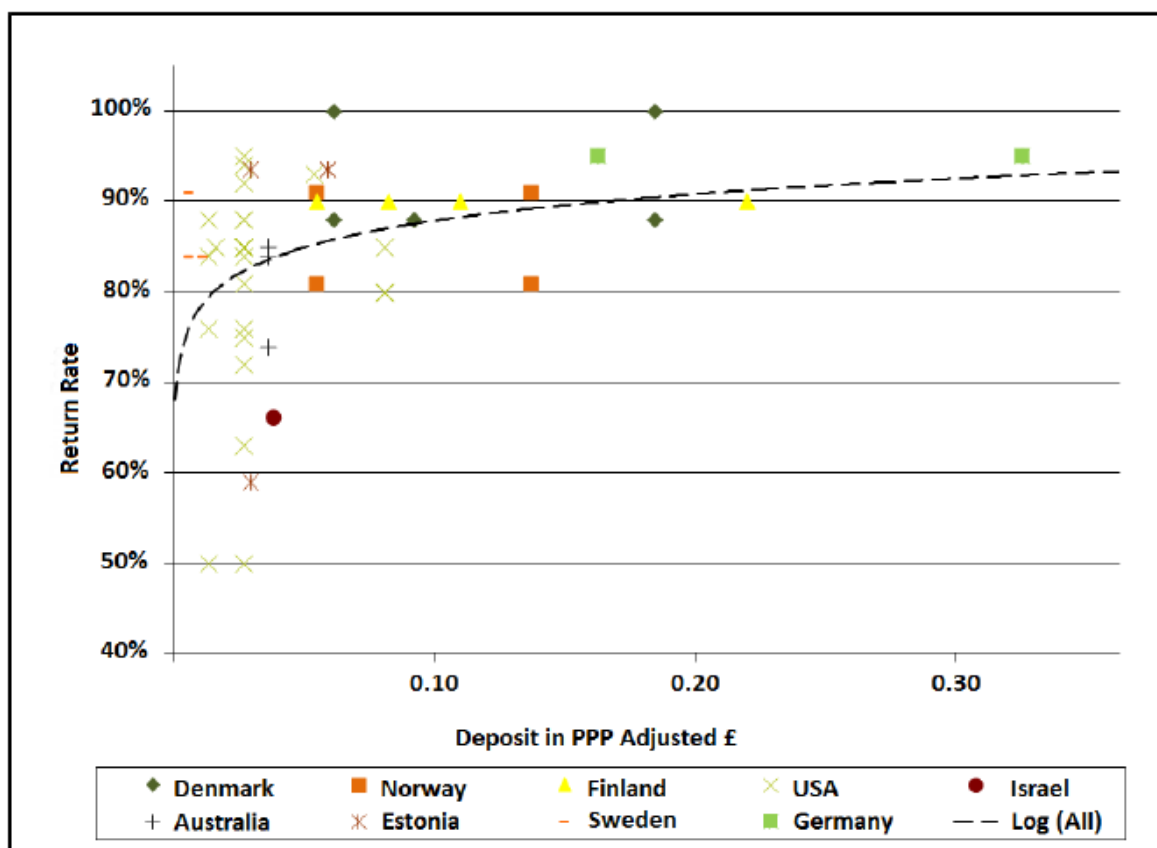
The system operator will be incentivised by its owners (the beverage industry and retailers in many European examples) to constantly seek improved efficiency of operation in order to keep the producer fee as low as possible. It should have the flexibility to increase deposit levels as required to meet recycling targets.

## 22. What evidence is there on the responsiveness of consumers in returning containers, in relation to the level of any up-front deposit? How do such incentives impact on wider littering and recycling?

Evidence on the responsiveness of consumers in returning containers, in relation to the level of any up-front deposit

All things being equal, the higher the level of the deposit, the higher the return rate. This is illustrated in Figure 1

**Figure 1: Return Rates as a Function of Deposit-Level in PPP-Adjusted £**



However, thanks to the quality of the data available to them, DRS operators do also have the ability to use additional means to increase return rates. For example, if return rates on energy drinks are lower than average, they can undertake specific advertising campaigns targeted at consumers of those drinks to boost the return rate.

What evidence is there on the locations in which consumers are most likely to return their empty containers? What does this tell us about the optimal location or distribution of collection points as part of any deposit or reward and return scheme?

Comparing European schemes, which are predominantly ‘return to retail’, against US schemes, which are predominantly ‘return to depot’, it can be seen that return rates in European schemes tend to be higher. While there are other differences such as the level of the deposit, which tends to be lower in US schemes, it is clear that return to retail is more convenient for consumers, as it does not require any additional journeys. For tackling on the go consumption, it is necessary to have a high concentration of return points in locations convenient to those consuming on the go, which would not be achieved under a return to depot format.

In very rural areas, there could be other collection options such as a small depot at a HWRC. If a system is set up with the intention of achieving high return rates (typically accompanied by reasonably high levels of deposit), retailers have a greater incentive to participate in the scheme, given that it will be a more significant driver of footfall than would be the case if it were a low performing deposit scheme. Accordingly, as explained in response to Q23, small retailers should not be excluded from participation.

### **23. What measures or regulations might be needed to minimise the potential for adverse effects of any deposit or reward and return scheme on:**

#### **Small retailers**

Small retailers should not be excluded from participating in take-back under a DRS. The National Federation of Retail Newsagents, which represents some of the smallest retailers, is supportive of a DRS. However, it may be appropriate to introduce thresholds (based on floor area) below which take back is not mandatory, but voluntary. This is the case in Estonia. In shopping centres, for example, it may be most appropriate to have a number of conveniently located return points instead of requiring every retailer to take back containers.

Against this, the return infrastructure needs to be sufficiently convenient to allow the target return rate to be met. Accordingly, the system operator would need to take the decision as to how to adequately incentivise retailers (through handling fees) to achieve the target return rate.

#### **Consumer behaviour**

As the deposit is refundable, consumers will get their money back when they return the container.

Accordingly, it would not be expected to lead to a change in consumption of a kind that might be seen if prices were to increase by 10p, as the actual cost of the item being purchased would only increase by circa 1p if producers pass through costs (i.e. producer fees) fully to the consumer.

### **Competition**

Some beverage containers might not be suitable for inclusion in a DRS, such as flexible pouches. In order to avoid such formats being unfairly advantaged relative to others such as cans, PET bottles and glass bottles, it may be necessary to introduce an accompanying measure such as a beverage container tax as is the case in Norway.

### **Fraud**

There are a number of ways in which the DRS can be designed to minimise the risk of fraud. This includes country specific barcodes, reducing the differential, if any, in deposit levels in neighbouring countries, and through the use of compacting RVMs which prevent any chance of seeking to redeem the deposit from the same container twice. The DRS system operator may therefore provide reduced producer fees for the use of country specific barcodes, along with higher handling fees for beverage containers collected by compacting RVMs (which also provide further efficiency savings to the overall system in terms of logistics).

## **What other adverse effects may occur with a poorly designed and run deposit system, and how might they be minimised?**

In a number of US schemes the level of deposit is fixed in law, and is therefore very difficult to amend. US schemes also see unredeemed deposits go to the State, and are thus not used to support the operation of the DRS. This means that the State may not be interested in increasing the recycling rate, as it will lose income from unredeemed deposits. Handling fees and producer fees may also be set by the State, and thus be very difficult to change.

Enabling flexibility to the system operator is important in allowing the DRS to adapt to circumstances. Therefore, aspects such as the deposit level, producer fees and handling fees should be readily amended by the system operator as circumstances require.

When Germany introduced a DRS, it had a 'loophole' whereby retailers only had to accept back beverage containers of the same shape they sold. This led to a wholesale switch away from cans (which are of a uniform shape) to plastic bottles crafted in a wide range of different shapes in an attempt to avoid a requirement to take back bottles sold elsewhere. This loophole has since been closed, and such a loophole should of course be avoided in the first place in a UK DRS.

All beverage packaging formats should be treated equally. Some beverage containers might not be suitable for inclusion in a DRS, such as flexible pouches. In order to avoid such formats being unfairly advantaged relative to others such as cans, PET bottles and glass bottles, it may be necessary to introduce an accompanying measure such as a beverage container tax as is the case in Norway.



## **24. What evidence is there that a deposit or reward and return scheme could sit successfully alongside existing waste management systems and regulations?**

For instance, what evidence is there that such schemes could sit successfully alongside Local Authority waste collection arrangements, Packaging regulations and the Packaging Waste Recovery Note (PRN) system, etc.)?

Eunomia recently undertook a detailed study for Keep Britain Tidy exploring the financial impacts of a DRS on local authority waste services. Working with a selection of authorities, our headline findings were that overall, local authorities in England should make net savings of £35m per annum under a DRS. The report also notes where savings, and increased costs might occur, and the challenges for some, such as collection authorities, in securing their share of the savings that will accrue elsewhere, such as to waste disposal authorities. The report then identifies opportunities for revenue sharing to enable savings to be shared in an equitable manner.

- The full report is available at Eunomia Research & Consulting (2017) Impacts of a Deposit Refund System on Local Authority Waste Services, available at <http://www.eunomia.co.uk/reports-tools/impacts-of-a-deposit-refund-system-for-one-way-beverage-packaging-on-local-authority-waste-services/>

If a DRS were to be implemented there would be no reason for beverage producers to pay fees to a compliance scheme – a factor which may lead compliance schemes to oppose the introduction of a DRS. There is widespread agreement that packaging producer responsibility in the UK requires wholesale reform, and there is no reason why this could not be designed to work alongside a DRS.

**What mitigating arrangements would be needed to ensure such schemes would not reduce the effectiveness or increase the costs of existing waste management systems and regulations in England?**

It would be important to give clear advance warning of the timing of forthcoming changes so that contracts can be renegotiated accordingly.

## **25. Do you have examples of other countries – with household and town centre recycling systems similar to England –**

## **where successful deposit return or reward and return schemes currently operate?**

In Germany, household collection (under the Green Dot scheme, funded by packaging producers) works alongside DRS. There are also kerbside collections in Finland, Norway, Estonia, The Netherlands and Sweden, all of which have DRS

### **26. If a well-designed and well run deposit system were to be introduced how do you think this intervention should be introduced in England to optimise its effectiveness and cost / benefit (e.g. direct regulation, co-regulation, voluntary agreement, etc.)?**

#### **a. Who would the key players be in implementing the intervention? What governance arrangements would need to be in place?**

The scheme should be industry owned and run, with government oversight – setting recycling targets.

Any English DRS should be harmonised with those in other countries – ideally it should be the same system operated by a single system operator.

#### **b. Who would be responsible for the costs, management and collection aspects of the scheme to make it self-sustaining? If relevant, please list known examples in other countries where your suggested operational model is in use.**

The system should be not for profit, with funding from material revenues, unredeemed deposits and producer fees to ensure the system costs are covered.

#### **c. What commercial arrangements would need to be in place to ensure the financial viability of the scheme, as well as ensuring value for money for the public?**

The system operator should arrange for sale of materials collected under the DRS. The operator could also arrange for bulk purchase or lease of RVMs to enable the best possible deal.