Title: Introducing a Deposit Return Scheme on beverage containers **IA No:** **Lead department or agency:** DEFRA **Other departments or agencies:**	Impact Assessment (IA) **Date: 15/02/2019** **Stage: Consultation** **Source of intervention :** Domestic **Type of measure:** Secondary legislation **Contact for enquiries:** Melanie Foster John Walsh
Summary: Intervention and Options	**RPC Opinion:**

Cost of Preferred (or more likely) Option				
Total Net Present Value	**Business Net Present Value**	**Net cost to business per year** (EANCB in 2016 prices)	**In scope of One-In, Two-Out?**	**Measure qualifies as**
£2,189m	-£5,722m	£665m	No	NA

What is the problem under consideration? Why is government intervention necessary? Max 7 lines

Drinks containers are often made of easily recyclable materials (PET plastic, glass, aluminium, steel), yet are frequently disposed of inappropriately, generating negative externalities including unsightly and unhygienic litter, and CO2 emissions from the use of virgin material to create new products. A Deposit Return Scheme is a system that encourages the return of the packaging to collection points through the incentive of a refundable deposit paid by consumers at the point of purchase. The pricing of drinks containers acts as an incentive against improper disposal, increasing the recycling rate and reducing the incidence of litter for these materials. Government intervention is necessary to achieve this step-change in behaviour as these litter benefits do not attract the engagement of the private sector.

What are the policy objectives and the intended effects? Maximum of 7 lines

The key objectives of introducing a DRS are: a reduction in litter and associated litter disamenity; increased recycling of drinks containers in scope of a DRS, especially those disposed of 'on-the-go'; higher quality recycling and; greater domestic reprocessing capacity through providing a stable and high-quality supply of recyclable waste materials. The intended effect of introducing a DRS is to change behaviour of consumers, producers and retailers to deliver a significant change in the capture for recycling of empty drinks containers and the incidence of litter.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base) Maximum of 10 lines

Option 1 – Do nothing

Option 2 – Introduce 'All-In' DRS alongside extended producer responsibility (EPR) reform for other packaging. DRS to cover PET bottles, steel cans, aluminium cans and glass bottles, with no restriction of the size/format of drinks containers in-scope.

Option 3 – Introduce 'On-The-Go' DRS alongside packaging EPR reform for other packaging. covering the same materials as proposed in Option 2 but restricting drinks containers in-scope to those less than 750ml in size and sold in single format containers, in order to target those most often sold for consumption outside of the home ('on-the-go'). Drinks containers not in-scope would be covered by the wider EPR reforms.

The Government does not have a preferred option and is consulting in an open way. The figures for the option with the highest NPV suggested by this analysis (Option 2) have been presented in the summary box above.

Will the policy be reviewed? It will/will not be reviewed. **If applicable, set review date:** Month/Year

Does implementation go beyond minimum EU requirements?			Yes / No / N/A			
Are any of these organisations in scope? If Micros not exempted set out reason in Evidence Base.	**Micro** Yes		**Small** Yes	**Medium** Yes	**Large** Yes	
What is the CO_2 equivalent change in greenhouse gas emissions? (Million tonnes CO_2 equivalent)			**Traded: -1.9mt**	**Non-traded: -1mt**		

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible SELECT SIGNATORY: ..... Date: .....

Summary: Analysis & Evidence Policy Option 1

Description: Option 1 – Do nothing / baseline packaging producer responsibility reform.

FULL ECONOMIC ASSESSMENT

Price Base Year 2018	PV Base Year 2023	Time Period Years 10	Net Benefit (Present Value (PV)) (£m)		
			Low:	High:	Best Estimate:

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	0	0		
High	0			
Best Estimate	0			

Description and scale of key monetised costs by 'main affected groups'

As this option represents the baseline and is included for comparative purposes, it has no incremental costs or benefits.

Other key non-monetised costs by 'main affected groups'

None

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	0	0		
High	0			
Best Estimate	0			

Description and scale of key monetised benefits by 'main affected groups'

None

Other key non-monetised benefits by 'main affected groups'

None

Key assumptions/sensitivities/risks **Discount rate** 3.5%

BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m:			In scope of OITO?	Measure qualifies
Costs:	Benefits:	Net:	No	NA

Summary: Analysis & Evidence Policy Option 2

Description: Option 2 – All drinks containers included in DRS

FULL ECONOMIC ASSESSMENT

Price Base Year 2018	PV Base Year 2023	Time Period Years 10	Net Benefit (Present Value (PV)) (£m)		
			Low: £1,313	**High: £3,083**	**Best Estimate: £2,189**

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	£194m	0	£805m	**£7,123m**
High	£215m		£823m	**£7,299m**
Best Estimate	£204m		£814m	**£7,211m**

Description and scale of key monetised costs by 'main affected groups'

One-off transitional costs of organisational set-up (£146m) and change in bottle labelling (£58m) were monetised. On-going annuals costs of loaning reverse vending machines (£439m), manual handling costs (£72m), logistic costs (£248m), counting centre costs (£26m) and central administration costs (£30m) were also monetised. All of these costs would incur in the first instance to the Deposit Management Organisation (DMO), and would be covered by material revenue from the sale of DRS material to be recycled, and by producers in the form of a Producer Fee (£847m in year 1, £642m thereafter).

Other key non-monetised costs by 'main affected groups'

The potential cost to consumers for the time required to return drinks containers to RVMs or manual take-back points.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	0	0	£1,101m	**£8,613m**
High	0		£1,186m	**£10,2016m**
Best Estimate	0		£1,093m	**£9,400m**

Description and scale of key monetised benefits by 'main affected groups'

The following annual benefits were monetised: net material revenue to the DMO (£37m); reduction of disamenity of litter (£986m); greenhouse gas emissions savings to society (£12m in year 1, rising to £28m by year 10); and reductions to the cost of litter clean-up for Local Authorities (£50m).

Other key non-monetised benefits by 'main affected groups'

The provision of a high-quality stream of waste for the domestic reprocessing market, and benefits to retailers of an increased flow of customers to shops hosting RVMs or manual take-back points.

Key assumptions/sensitivities/risks **Discount rate** 3.5%

Assumption that the return rate achieved by the DRS is 85%, and that will result in an 85% reduction in drinks container litter.

Assumption that some estimates based on Scotland can be scaled up via population to the UK as a whole.

Sensitivities around litter disamenity estimates as this is an uncertain area of research.

BUSINESS ASSESSMENT (Option 2)

Direct impact on business (Equivalent Annual) £m:			In scope of OITO?	Measure qualifies
Costs: £837m	**Benefits: £173m**	**Net: £665m**	No	NA

Summary: Analysis & Evidence Policy Option 3

Description: Option 3 – Only 'on the go' drinks containers, (i.e. 750ml, single format) DRS

FULL ECONOMIC ASSESSMENT

Price Base Year 2016	PV Base Year 2017	Time Period Years 10	Net Benefit (Present Value (PV)) (£m)		
			Low: -£121m	High: £637m	Best Estimate: £249m

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	£156m	0	£286m	**£2,618m**
High	£172m		£318m	**£2,909m**
Best Estimate	£164m		£302m	**£2,764m**

Description and scale of key monetised costs by 'main affected groups'

One-off transitional costs of organisational set-up (£146m) and change in bottle labelling (£18m) were monetised. On-going annual costs of loaning reverse vending machines (£153m), manual handling costs (£47m), logistic costs (£64m), counting centre costs (£8m) and central administration costs (£30m) were also monetised. All of these costs would incur in the first instance to the Deposit Management Organisation (DMO), and would be covered by material revenue from the sale of DRS material to be recycled, and by producers in the form of a Producer Fee (£430m in year 1, £265m thereafter)

Other key non-monetised costs by 'main affected groups':

A potential cost to consumers for the time required to return drinks containers to RVMs or manual take-back points.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	0	0	£324m	**£2,788m**
High	0		£378m	**£3,254m**
Best Estimate	0		£350m	**£3,012m**

Description and scale of key monetised benefits by 'main affected groups'

The following annual benefits were monetised: net material revenue to the DMO (£10m); reduction of disamenity of litter (£321m); greenhouse gas emissions savings to society (£4m in year 1, rising to £9m in year 10); and reductions to the cost of litter clean-up for Local Authorities (£13m).

Other key non-monetised benefits by 'main affected groups'

The provision of a high-quality stream of waste for the domestic reprocessing market, and benefits to retailers of an increased flow of customers to shops hosting RVMs or manual take-back points.

Key assumptions/sensitivities/risks **Discount rate** 3.5%

Assumption that the return rate achieved by the DRS is 85%, and that this will result in an 85% reduction in drinks container litter.

Assumption that some estimates based on Scotland can be scaled up via population to the UK as a whole.

Sensitivities around litter disamenity estimates as this is an uncertain area of research.

Assumptions around scaling an all-in DRS to manage a smaller scope of material.

BUSINESS ASSESSMENT (Option 3)

Direct impact on business (Equivalent Annual) £m:			In scope of OITO?	Measure qualifies
Costs: £321m	Benefits: £37m	Net: £284m	No	NA

Evidence Base (for summary sheets)

1 Policy background

The UK and Welsh Governments and the Department of Environment, Agriculture and Food in Northern Ireland (DAERA) have high ambitions for the resources and waste sector, as presented in the recently published Resources & Waste Strategy for England and in the 2010 waste strategy for Wales, Towards Zero Waste.

The UK Government has committed in its 25 Year Environment Plan for England to reform producer responsibility systems (including packaging waste regulations) to incentivise producers to take greater responsibility for the environmental impacts of their products[1]. Through the 25 Year Environment Plan, the UK Government has also committed to implementing voluntary and regulatory interventions that can cut the amount of commonly littered items, and improve recycling and packaging reuse[2] and outlines the UK Government's aim to create a better market for recycled plastic[3].

Similarly, in its Municipal Sector Plan, the Welsh Government committed to exploring whether it would be practical or desirable to introduce extended producer responsibility legislation with the outcome of delivering more recycling and with producers potentially bearing a greater degree of responsibility for funding the collection by Local Authorities of wastes for recycling. The Collections, Infrastructure and Markets Sector Plan (for Wales) further outlines Wales' aim to create a better market for recycled plastic.

Both the UK and Welsh Governments and DAERA want to achieve much more ambitious recycling targets and reduce littering. The only way we will achieve these is with a step-change in behaviour. It is anticipated that a DRS will help reduce the amount of littering in England, Wales, and Northern Ireland, boost recycling levels for relevant material, offer the enhanced possibility to collect high quality materials in greater quantities and promote recycling through clear labelling and consumer messaging.

The consultation seeks views on proposals to introduce a DRS for drinks containers in England, Wales and Northern Ireland. This impact assessment assesses the costs and benefits of a DRS across the UK as a whole.

1.1 The Litter Strategy for England

As part of the Litter Strategy for England, published in April 2017, the Government established a working group to report to Ministers with advice on different incentives to improve recycling and reuse of packaging, and to reduce the incidence of commonly littered items. In autumn 2017, this working group held a Call for Evidence on measures to reduce littering of drinks containers and promote recycling. The focus of this Call for Evidence was rigid and flexible plastic, glass or metal drinks containers that are sold sealed and used for the sale of alcoholic or non-alcoholic beverages, often for consumption outside the home ('on-the-go'). It included seeking evidence on the costs, benefits and impacts of deposit return and reward schemes.

In early 2018, UK Government received and reviewed the Working Group's report summarising its Call for Evidence outcomes and recommendations (in accordance with a commitment in the 25 Year Environment Plan to do so). The main conclusions of the group were that[4]:

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[1] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf

[2] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf

[3] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf

[4] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/694916/voluntary-economic-incentives-working-group-report-drinks-containers-final.pdf

- There is some evidence from other countries that well-designed and well-run deposit return schemes can deliver an estimated increase of around 20% in the reported amount of drinks containers collected for recycling.
- A DRS could be a mechanism to deliver additional collection of high-quality material for recycling from consumers outside their homes, particularly in areas of high consumer traffic.
- Changing behaviour in relation to recycling outside the home is also an area that, arguably, could have a large impact on reducing litter.
- The general assumption appears to be that receiving a monetary or other reward will encourage consumers to deposit drinks containers at a collection point instead of littering, and/or individuals/groups will be incentivised to collect 'in-scope' litter to claim the refund. Introduction of a DRS is therefore thought likely to reduce costs to local authorities associated with clearing litter.

The recommendation of the working group was that DEFRA further investigate the potential for using a well-designed DRS to encourage increased collection and recycling of drinks containers and that particular attention be paid to considering how to capture material that is consumed 'on-the-go'[5].

The report can be found at: www.gov.uk/government/consultations/drinks-containers-reducing-litter-and-increasing-recycling-call-for-evidence.

Following this report, the Government confirmed that it would introduce a DRS for drinks containers in England, aimed at boosting recycling rates and reducing littering, subject to consultation later this year. This is that consultation. The report highlighted that more work would be needed to assess the implications and impacts of a DRS before one were to be introduced[6]. This is discussed in more detail in the Methodology section below and accompanying Impact Assessment.

1.2 Wales Study on Waste and Recycling

In September 2017 the Welsh Government commissioned a study on extended producer responsibility options for key food and drink packaging types in order to reduce waste, increase recycling and reduce litter. This included drinks containers and a deposit return scheme was one of the options considered. The study included consultation with key stakeholders through a series of workshops. It concluded it would be preferable for the Welsh Government to work together with other UK countries in order to bring about a single UK-wide DRS for drinks containers. The Welsh Government subsequently agreed to consider a UK-wide DRS, taking account of the risks and benefits to existing provisions and recycling levels and to build on the progress in recycling already achieved in Wales.

1.3 Northern Ireland Options Paper on DRS

In 2015 a Departmental paper was commissioned on options on the desirability and feasibility of a DRS scheme in Northern Ireland. The paper looked at various aspects of the introduction of a DRS scheme including its impact on littering and its effect on waste management in general. The paper concluded that whilst DRS was desirable and had the potential to increase recycling and influence behaviour on a wider environmental scope, it was not feasible to introduce a scheme on a Northern Ireland only basis.

[5] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/694916/voluntary-economic-incentives-working-group-report-drinks-containers-final.pdf

[6] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/694916/voluntary-economic-incentives-workingFor-group-report-drinks-containers-final.pdf

2 Rationale for Intervention

There are significant and ongoing negative externalities arising from the inappropriate disposal of drinks containers, including those made of glass, plastic, steel and aluminium (cans). Consumers often do not place a value on drinks containers once used or are unable to find an appropriate or convenient route for disposal. Products that could have been recycled are as a consequence often disposed of via black-bag waste or littered. A deposit return scheme introduces a surcharge on drinks containers when purchased, which is rebated when returned after use. The availability of a rebate places a monetary value on empty drinks containers, reflecting the true social and environmental cost of disposal, and the DRS infrastructure provides consumers with a clear and easy method of disposal. Successful return ensures that the product can be recycled into secondary raw materials.

Recycled materials can replace virgin materials in production, thereby reducing the greenhouse gas emissions associated with creating new products. In addition, recycling minimises the waste going to landfill and incineration plants, avoiding further greenhouse gas emissions that would have been emitted. This is particularly significant when considering the incineration of highly polluting materials such as plastic. Increasing recycling and encouraging the use of recyclable and recycled materials in production also helps to move towards a circular economy, keeping resources in use for as long as possible and extracting the maximum value from them.

Collecting material via a DRS also allows for a high-quality, well-defined stream of material for provision to secondary reprocessing markets. Drinks containers collected in this way are less likely to become contaminated with non-target materials, in comparison to collecting the material via a mixed recycling kerbside collection, and pre-sorting the material allows for greater certainty of the materials present. This stable provision of high-quality waste materials has the potential to stimulate domestic reprocessing markets.

Reducing the amount of drinks containers littered would also have significant wider and indirect environmental benefits. Material that is littered tends to end up in black bin waste once collected, and is unlikely to be recycled due to high levels of contamination. If it is not collected, litter can harm wildlife, or enter the water system and cause a serious problem as marine pollution. It is estimated that 80% of man-made debris in the marine environment originated on land before being thrown, blown or washed into rivers, canals and the sea[7].

Keep Britain Tidy's Beacons of Litter research suggests that the presence of large items of litter (or 'beacons') such as drinks containers in an area may have a normative effect on littering, and that the presence of 'beacon' items at a site appears to encourage others to litter those same items, increasing the likelihood that other 'beacons' will accumulate[8]. The research found that littering of drinks containers rose drastically in sites with many 'beacons' of litter (in most cases drinks containers can be classified as 'beacons' as they are fairly large, often brightly coloured or branded[9]. This suggests that targeting drinks containers may have a knock-on beneficial effect on other forms of litter. The Independent Call for Evidence held by the Voluntary and Economic Incentives Working Group also highlighted the importance of encouraging behaviour change to stop littering at source, and to ideally also promote the capture of valuable resources that can be recycled[10]. In order to create a change in people's behaviour and deliver a long-term reduction in the amount of litter that is dropped, we also need to reduce the amount of visible litter and address the perception of England, Wales and Northern Ireland as being littered countries, because we know that people drop less litter in a clean environment[11].

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[7] Litter Strategy for England (2017): https://www.gov.uk/government/publications/litter-strategy-for-england

[8] http://www.keepbritaintidy.org/sites/default/files/KBT_CFSI_Beacons_Of_Litter_2017.PDF

[9] http://www.keepbritaintidy.org/sites/default/files/KBT_CFSI_Beacons_Of_Litter_2017.PDF

[10] https://consult.DEFRA.gov.uk/waste-and-recycling/call-for-evidence-drinks-containers/

[11] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/607747/litter-strategy-for-_england-2017.pdf

This would also reduce the burden on Local Authorities, and ultimately the tax payer, of collecting and disposing of this material, at the expense of other local services[12]. Responses to the HM Treasury Call for Evidence on single-use plastics (which ran from 13 March to 18 May 2018) also highlighted the negative impacts (disamenity) of litter on public spaces[13]. Living in a littered environment can have negative consequences on people's mental and physical health, creating further strain on local services[14]. Poor local environmental quality can also discourage inward investment and may suppress property prices, damaging local economic growth[15].

Attempting to determine a value for litter disamenity is a complex and under-researched area. The disamenity of litter has been monetised in this IA by looking at the amount that people would be willing to pay in increased council tax to reduce litter. This primarily captures the disamenity to the individual or households, and it is likely that many people would include environmental factors in this decision making, however factors such as reducing damage to local economic growth and avoided marine pollution may not be fully captured and act as further additional benefits.

As the deposit return scheme would require a fee from producers, it would also help to ensure the party responsible for producing pollution is responsible for paying for the damage done by it to the natural environment. This is in accordance with the 'producer pays' principle, which requires that producers placing products on the UK market pay towards the recycling and safe disposal of those products when discarded by the final user. Correcting these negative externalities would move towards the goal of a more circular economy and help to minimise avoidable waste.

2.1 Litter Statistics

Drinks container litter is a serious issue which needs targeted policy action to overcome. The most recent Local Environmental Quality Survey of England (2017/18) found alcoholic drinks related[16] litter at 25% of the sites surveyed, up from 19% in 2014/15[17], and non-alcoholic drinks related[18] litter was found at 52% of the sites surveyed[19]. Data recorded on the Love Clean Streets App during the Great British Spring Clean (March 2017) showed that 22% of the total number of items collected were alcoholic drinks related litter and 20% were non-alcoholic drinks related litter[20].

The Marine Conservation Society Great British Beach Clean 2017 Report showed drinks container litter was part of three of the top ten item categories found on beaches (plastic/polystyrene pieces (0-50cm),

[12] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/607747/litter-strategy-for-_england-2017.pdf

[13] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/734837/Plastics_call_for_evidence_summary_of_responses_web.pdf

[14] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/607747/litter-strategy-for-_england-2017.pdf

[15] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/607747/litter-strategy-for-_england-2017.pdf

[16] Taken from the LEQSE 2017/18 glossary: This includes cans, bottles, wine cartons, identifiable bottle tops and ring pulls etc.

[17] http://www.keepbritaintidy.org/sites/default/files/resource/National%20Litter%20Survey%20201718_0.pdf

[18] Taken from the LEQSE 2017/18 glossary: Non-alcoholic drinks related – all items associated with non-alcoholic drinks, including cans, bottles, cartons, identifiable bottle tops and ring-pulls etc.

[19] http://www.keepbritaintidy.org/sites/default/files/resource/National%20Litter%20Survey%20201718.pdf

[20] https://www.gov.uk/government/publications/litter-and-littering-in-england-2016-to-2017/litter-and-littering-in-england-2016-to-2017

Alcoholic drinks-related: All items associated with alcoholic drinks; this includes cans, bottles, wine cartons, identifiable bottle tops and ring pulls, labels from bottles and beer/spirit/shot glasses.

Non-alcoholic drinks-related: All items associated with non-alcoholic drinks for example cans, bottles, cartons, identifiable bottle tops and ring-pulls, straws and labels from bottles. This excludes those items arising from fast food outlets, which should be classified as fast food litter.

glass, and caps and lids). It also showed that litter from eating and drinking 'on-the-go' accounted for 20% of the litter on beaches[21].

In Wales, the 2017/18 Local Environmental Audit and Management System report recorded drinks litter on 43.3% of the streets surveyed with the majority of these being cans (13.8%) and plastic bottles (11.7%)[22].

Responses to the recent HM Treasury call for evidence on using the tax system or charges to address single-use plastic waste also highlighted drinks containers often used 'on-the-go' as commonly littered items[23].

2.2 Packaging Recycling Rates

Recent packaging recycling rates demonstrate that there are improvements that could be made in drinks container recycling rates, especially in relation to recycling 'on-the-go'. Material that is not recycled will generally either enter landfill via black bin waste collection, be incinerated in energy from waste plants, or be littered.

Data obtained by the Voluntary and Economic Incentives Working Group suggested that in 2016, around 74% of plastic drinks bottles in the UK were collected for recycling. This figure includes milk containers but does not include data from vending machines or other situations where drinks are consumed 'on-the-go'. It also does not account for the potential rejection of contaminants from the collected material tonnages. It is estimated that 1.3% of the material collected for recycling is rejected and ends up in landfill[24], with associated environmental and economic costs. For these reasons, the stated figure of 74% may be higher than overall actual recycling rates for plastic drinks bottles. For the purpose of this Impact Assessment, a baseline recycling rate of 70% for PET plastic bottles has been used.

Further data obtained by the Working Group estimated that in 2016, 70% of glass drinks bottles were collected for recycling. This figure does not include data from vending machines or hospitality. Alupro, the aluminium packaging industry body, state that in 2017 the recycling rate of aluminium drinks cans in the UK was 72%[25].

In the 2017/18 financial year, all English local authorities offered kerbside collection for metal drinks cans, 99% offered kerbside collection for plastic drinks bottles and 89% offered kerbside collection for glass drinks bottles[26]. The Welsh Government published its Collections Blueprint for consistency in Local Authority recycling services in 2011. In the 2017/18 financial year all Welsh local authorities offered kerbside collection for plastic drinks bottles, glass drinks bottles and metal drinks cans.

In addition to kerbside collections, some Local Authorities also provide recycling bin facilities 'on-the-go', such as on high streets. The RECOUP 2018 UK Household Plastics Collection Survey found that only 49% of the local authorities who responded to the question provided a recycling 'on-the-go' service[27]. Where 'on-the-go' recycling bins are provided, contamination of the material collected is often an issue. The Voluntary and Economic Incentives Working Group report on drinks containers highlighted a comment from the Local Authority Recycling Advisory Committee (LARAC) that the quality of material from 'on-the-go' or

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[21] https://www.mcsuk.org/media/GBBC_2017_Report.pdf

[22] https://www.keepwalestidy.cymru/surveys

[23] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/734837/Plastics_call_for_evidence_summary_of_responses_web.pdf

[24] Analysis based on Local Authority collected waste in 2016/17 (including household and non-household). Waste that was collected and sent for recycling but rejected at the gate of the Material Recycling Facility, material that underwent further processing/sorting, and incinerator bottom ash from rejects that were sent to incineration. Please note that reporting of these figures is uncertain so this should be considered an estimation.

[25] https://alupro.org.uk/aluminium-packaging-real-recycling-aluminium-drinks-cans-hit-72-recycling-rate-data-shows-almost-100-recycled-within-europe/

[26] Data provided by WRAP to DEFRA

[27] http://www.recoup.org/p/324/uk-household-plastics-collection-survey-2018

street bin recycling schemes is very low[28]. This is likely to mean that very little material in these bins actually gets recycled.

The WRAP, Valpak and Recoup 2019 report on consumption, recycling and disposal of 'on-the-go' drinks containers in the UK[29] estimates that 65% of PET plastic drinks bottles; 59% of drinks cans; and 51% of glass drinks bottles consumed 'away from home' are recycled. However, they suggested that recycling rates for on-the-go drinks consumed could be as low as 7% for plastic drinks bottles; 8% for drinks cans; and 8% for glass drinks bottles. WRAP's knowledge of disposable hot drinks cups Placed on the Market (POM) and recycling showed that for coffee cups the Away From Home (which includes on the go) levels of recycling were over-stated by 85% in consumer self-reporting. Due to the scale and availability of on-the-go recycling infrastructure, WRAP judged that it is reasonable to assume this level of over-stating also exists for plastic, metal and glass drinks containers consumed on the go, and so these lower figures are an adjustment based on assuming similar levels of over-stating. Notwithstanding this, the higher rates have been used in this IA to provide a conservative estimate of the benefits of introducing an on-the-go DRS.

3 Policy objectives

It is anticipated that a DRS will help reduce the amount of littering in England, Wales, and Northern Ireland, boost recycling levels for relevant material, offer the possibility to collect high quality materials in greater quantities and makes it easier for consumers to recycle through clear labelling and consumer messaging.

It is hoped that a DRS will help us to achieve the following outcomes:

- Reduction in litter;
- Reduction in the disamenity costs associated with litter;
- More recycling of drinks containers in scope of a DRS (PET plastic (polyethylene terephthalate, the most common plastic used for soft drinks and bottled water), glass and metals), especially those disposed of 'on-the-go';
- Higher quality recycling;
- Greater domestic reprocessing capacity through providing a stable and high-quality supply of recyclable waste materials[30].

3.1 Basic principles for a deposit return scheme

English, Scottish and Welsh ministers agreed on the below principles for co-operation on a deposit return scheme, should one be introduced[31]:

- Such schemes should seek to change behaviour of consumers, producers and retailers to deliver both a step change in the capture for recycling of empty drinks containers and reduce litter.
- DRS should form part of a coherent system for improving recycling and reducing use of virgin materials, alongside producer responsibility obligations, kerbside collection and consideration of other

[28] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/694916/voluntary-economic-incentives-working-group-report-drinks-containers-final.pdf

[29] Drinks Recycling On-the-Go', WRAP, 2019, Prepared by Valpak and Recoup: http://www.wrap.org.uk/sites/files/wrap/OTG%20Drinks%20Containers%20Final%20Report%20ENG017-012.pdf These figures are based on consumer survey of drinks consumption and disposal undertaken in July 2018. Figures include drinks containers disposed of by respondents and includes both consumer (retail) and non-consumer (hospitality) consumption.

[30] Resources and Waste Strategy, DEFRA, 'End of Life'

[31] In the absence of a NI Minister NI officials have worked with UK colleagues to consider DRS in a UK context, and are content with these principles which maintain the historic direction of Ministerial travel for a UK wide producer responsibility regime

appropriate fiscal measures. These measures should work effectively together in a way that is understandable and fair for consumers and industry.

- Schemes should be underpinned by legislation in order to maximise their effectiveness.
- The system should be clear and understandable for consumers, and provide convenient means of returning drinks containers and reclaiming deposits.
- There should be a clear definition of materials to be included within the schemes.
- The design of schemes should take into account the need to effectively serve both urban and remote and rural communities, and disabled people, and should also address other access challenges to make it as fair and equitable as possible.
- Schemes should ensure producers and retailers of products take responsibility for the material they put onto the market, while not creating unfair or unreasonable costs of compliance.
- Schemes should be underpinned by strong measures to promote compliance and limit the opportunities for fraud.

Other DRS principles which industry stakeholders have suggested and the UK and Welsh Governments and DAERA support:

- Schemes should be transparent in reporting on performance
- Schemes should be incentivised to manage costs and efficiencies
- The organisation managing the operation of the DRS should be not-for-profit
- Schemes should be operationally workable for those running return points

3.2 Deposit Management Organisation (DMO)

The institutional arrangements under which a DRS would be organised and managed is subject to further Government review and deliberation. However, without prejudice to the final outcome, it has been assumed for conducting the analysis in this IA that a quasi-autonomous public organisation would be given the responsibility for setting up and managing the DRS. This central body has been designated the Deposit Management Organisation (DMO) in this IA. Its functions would include managing financial flows (deposit values, unredeemed deposits, producer fees, handling fees and material revenue from recycling), logistics (ensuring collected material reaches the recycler), some DRS infrastructure (e.g. maintenance of RVMs) and reporting to Government on recycling rates.

Further information on the DMO and proposed methods of set-up, administration and operation are outlined within the DRS consultation.

4 Description of options considered

4.1 Do Nothing

The baseline is a 'do-nothing' option with no direct policy intervention for drinks containers, and current litter and recycling rates for DRS target materials (PET, glass, aluminium and steel drinks containers)[32].This impact assessment is the third part of a trio; along with 'Consistent Municipal Recycling Collection' and 'Reforming the Packaging Producer Responsibility' impact assessments.

A DRS would not be introduced, whilst other recycling policies, particularly reforms of producer responsibility for packaging and consistency of municipal recycling collections, would proceed. Please see Scenario 1 in the 'Reforming Packaging Producer Responsibility' IA for an assessment of the costs and benefits this.

4.2 'All-in' option

The first option is an 'All-In' DRS. This option would cover PET drinks bottles[33], steel drinks cans, aluminium drinks cans and glass drinks bottles. There would be no restriction on the size/format of drinks containers in-scope.

Drinks containers in-scope of the DRS would need to be returned by consumers to DRS return points for the deposit refund to be reclaimed. If consumers chose not to return their drink container to a designated return point, they could still place this in their kerbside collection for recycling but they would forfeit their deposit value.

The Deposit Management Organisation (DMO) is proposed to be responsible for setting up and running the DRS. Reverse Vending Machines (RVMs) are assumed to be the main method of take-back, primarily to be installed in supermarkets, with manual take-back points hosted in smaller convenience stores. The DMO will be responsible for covering the costs of these, as well as for transporting, sorting and selling the collected material. The sale of this material for recycling will part-fund the costs of the scheme, with the remainder to be covered by a fee from the producers of drinks containers in-scope. These costs are monetised in this Impact Assessment.

The main benefits are generated from the increased recycling rate for these materials (with an 85% capture rate assumed via the DRS, but likely to be higher overall when taking into account the containers still recycled through the kerbside collection), and from the reduction in litter, which results in smaller clean-up costs for Local Authorities and a fall in associated litter disamenity.

Some groups argue that, for greatest behaviour change (litter reduction and increased recycling rates), participation in a DRS has to become the 'norm' for consumers regardless of where they consume the drink and of the size/format of its container.

One risk with this option is that valuable material would be removed from kerbside collections. This policy is the third part in a trio of policy reform, and Scenario 2 in the Impact Assessment 'Reforming the Packaging Producer Responsibility System' considers the interaction between these policies, providing an assessment of the costs and benefits of removing the majority of drinks containers from the kerbside waste stream. It is proposed that producers of drinks containers would be not be charged for both systems, and the costs and benefits in this IA consider only the additional impacts of a DRS above and beyond what is

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[32] The current recycling rate for drinks containers has been held constant due to a lack of historical data to show a growth trend for these materials. As drinks containers are a small subset of packaging materials, this is still consistent with overall increasing packaging recycling rates.

[33] For both DRS Options, it is being proposed that HDPE is also included as an in-scope material. However, milk is not being proposed as an in-scope drink of a DRS, as it is viewed as an essential product. There is limited data available on how many HDPE drinks containers would therefore be in-scope of a DRS, though industry estimates suggest that most HDPE drinks containers are used for milk and would therefore not be in-scope. For this reason only PET drinks containers have been considered as part of this impact assessment.

achieved via kerbside. A second risk could relate to some consumers who might find it more difficult to access a DRS to claim back their deposits and therefore have the potential to be disproportionately impacted by a scheme. This is considered in the DRS consultation in order to gain more evidence on this distributional aspect.

4.3 'On-the-Go' option

The second DRS option is an 'on-the-go' DRS. An 'on-the-go' DRS would cover the same materials as the 'all-in' DRS option (described above) but would restrict the drinks containers in-scope to those less than 750ml in size and sold in single format containers, in order to target those most often sold for consumption outside of the home ('on-the-go'). This was decided based on data from WRAP's 'Drinks Recycling On-the-Go' report[34], which indicated that the majority of drinks consumed on the go were in containers of <750ml.

As with Option 2, the DMO is proposed to be responsible for setting up and running the DRS. They will incur similar costs and benefits, but on a smaller scale due to the more limited scope of material. Drinks containers consumed on-the-go have a lower recycling rate and a higher propensity to be littered, which means that the possible benefits are lower overall, but proportionally more significant than for an all-in DRS.

The Voluntary and Economic Incentives Working Group in their report which covered DRS stated "…the scope of a DRS could focus on smaller drinks containers more likely to be used outside the home. Changing behaviour in relation to recycling outside the home is also an area that, arguably, could have a large impact on reducing litter". This could also minimise the potential impacts of a DRS on kerbside collections for recycling, as people may more commonly dispose of drinks containers within this scope outside of their homes.

This option would mean that consumers would dispose of different drinks containers in different ways – some would have a deposit and be eligible for a refund on return and some would not. One risk with this option is the increased potential for confusion navigating the system with only some drinks containers in-scope.

As with Option 2, the costs and benefits of introducing a DRS on top of the other linked policy reforms are considered in the 'Reforming the Packaging Producer Responsibility IA'. Please see Scenario 3 for an assessment of the impact of removing this material from kerbside collection systems.

[34] Drinks Recycling On-the-Go', WRAP, 2019, Prepared by Valpak and Recoup: http://www.wrap.org.uk/sites/files/wrap/OTG%20Drinks%20Containers%20Final%20Report%20ENG017-012.pdf

5 Costs and Benefits of each option

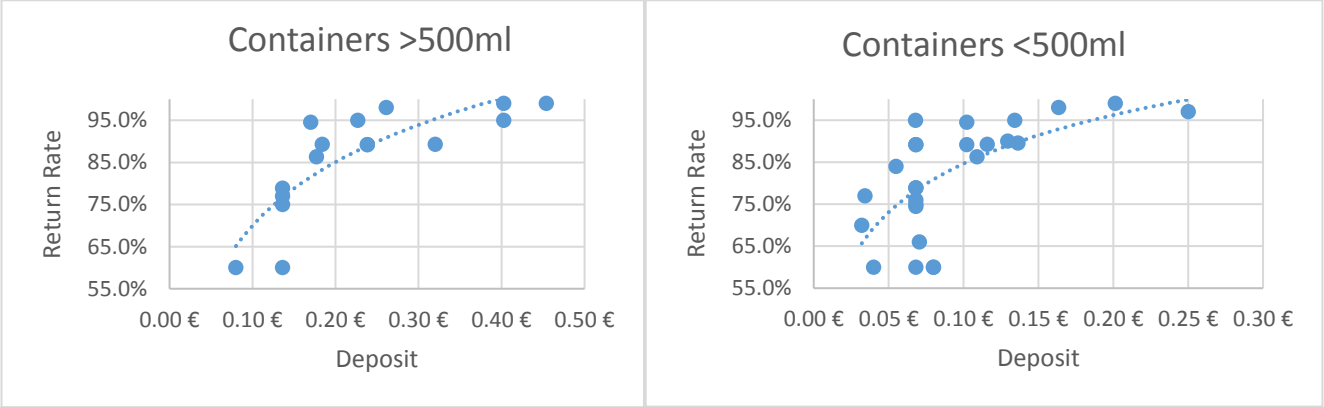
5.1 Option 1: Do Nothing

The option has no monetised or non-monetised costs or benefits as it represents the baseline. It is taken in comparison with the other options and therefore has no incremental costs and benefits in itself. Baseline levels of recycling are established for Options 2 and 3 in Tables 8 and 28.

5.2 Option 2: All-In DRS

This option covers all drinks containers PET bottles, steel cans, aluminium cans and glass bottles drinks containers placed on the market. The expected return rate for the scheme was estimated based on the capture achieved by other international deposit return schemes. The charts below show the interaction between deposit levels and return rates for international schemes[35].

Graphs 1 & 2 Comparison of deposit levels and return rates in international schemes



These graphs show a positive correlation between the deposit charged and the return rate achieved, with a stronger relationship at lower deposit levels. This indicates that there is likely to be a breakpoint, below which it will be difficult to achieve a high return rate, but above which subsequent increases will achieve marginal increases in returns. Experience from international schemes indicates a positive relationship between the deposit charged and the return rate achieved, and some international deposit return schemes show the potential to deliver high recycling rates for certain materials under certain conditions, for example, Germany, Norway[36] and the Netherlands all have a DRS as well as some form of kerbside or household recycling collection and achieve some of the highest reported rates of plastic drinks bottle collection/recycling in Europe at 98%, 95% and 95% respectively[37]. The average return rate achieved by international schemes with a deposit of more than or equal to $0.10USD is 86.7%[38].

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[35] The countries included in this comparison are Canada, Germany, Sweden, Norway and Denmark. Data from 'Options and Feasibility of a European Refund System' by Hogg, D, Elliot T and Corsdells, November 2011, Appendix 6

[36] In Norway, a deposit return scheme was combined with a declining environmental tax in accordance with recycling, which created a further incentive for achieving a very high return rate.

[37] Voluntary & Economics Incentives Working Group Report: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/694916/voluntary-economic-incentives-working-group-report-drinks-containers-final.pdf

[38] Comparison of 38 international schemes by CM Consulting and Reloop, Deposit Systems for One-Way Beverage Containers: Global Overview 2016: http://www.cmconsultinginc.com/wp-content/uploads/2017/05/BOOK-Deposit-Global-24May2017-forWebsite.pdf

For comparison, the current UK household recycling rate is 45.7%[39], with plastic drinks bottle collection/recycling estimated to be at 70%.

However, as the graphs show, there is variation within the return rate achieved by deposit return schemes[40], and hence there are risks involved with directly applying these findings to the UK. For example, due to factors such as differing attitudes to recycling and existing kerbside collection systems. For the purpose of the following analysis, a 15p deposit rate across all materials was estimated to incentivise an 85% return rate in the UK. Please see Section 6.3.2 for a sensitivity analysis taking into consideration the potential impacts if a lower than expected return rate is achieved.

Comprehensive data specific to England/Wales were unavailable for many variables, and hence the following figure relate to the UK unless otherwise stated.[41]

In order to establish the amount of material placed on the market in scope of an All-In DRS, estimations were gathered and provided to the UK Government by WRAP.[42] Comprehensive data specific to England/Wales were unavailable for many variables, and hence the following figure relate to the UK unless otherwise stated.[43]

Table 1 Containers placed on market in scope of DRS

Container type	POM (units per year)	POM (tonnes per year)
PET Bottles	10,582,396,518	317,427
Steel cans	1,092,675,800	34,760
Aluminium Cans	6,563,329,818	119,421
Glass bottles	5,541,142,943	1,835,931
Total	**23,779,545,079**	**2,307,538**

[39] UK household recycling rate for 2017, UK Statistics on Waste, DEFRA, 2019: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/778594/UK_Statistics_on_Waste_statistical_notice_Feb_2019.pdf

[40] For example, some studies suggest that a more important variable than deposit size in determining the return rate is the frequency and convenience of collection points. (Deposit Return Evidence Summary. Zero Waste Scotland, June 2017, p. 29)

[41] The Scottish Administration, whilst wishing to conduct its own consultation, has indicated that it is open to the possibility of having a single UK-wide deposit return scheme.

[42] 'Drinks Recycling On-the-Go', WRAP, 2019, Prepared by Valpak and Recoup: http://www.wrap.org.uk/sites/files/wrap/OTG%20Drinks%20Containers%20Final%20Report%20ENG017-012.pdf, pg.20

[43] The Scottish Administration, whilst wishing to conduct its own consultation, has indicated that it is open to the possibility of having a single UK-wide deposit return scheme.

5.2.1 Economic Costs of the DRS

The following key direct costs were estimated:

1. Set up and re-labelling costs
2. Reverse vending machines (RVMs)
3. Manual take back
4. Logistics
5. Counting Centre and Central Administration

Substantive evidence in this area is limited and further research is being undertaken by the UK Government to broaden the knowledge base for England, Wales and Northern Ireland, including evidence collected through consultation responses and further engagement with stakeholders. In order to tentatively estimate a number of costs for this consultation stage impact assessment, the feasibility study prepared for a consultation on a Scottish DRS was utilised as a starting point to cover the UK as a whole. This study was prepared for the Scottish Government and provides an empirical starting point based on overseas experience from which to further develop this analysis. Assumptions have been made about the ability to scale costs estimates for Scotland to the UK as a whole on a population basis[44]. Although measures have been taken to ensure the robustness of this approach, the associated estimation risks should be noted, such as discrepancies between Scotland and other parts of the UK, and factors such as economies of scale that may not be accounted for.

5.2.1.1 Set Up and Re-Labelling Costs

Set up costs include the construction and set up of counting centres & bulking points and for re-labelling of drinks containers.

Construction and building costs for the centres were taken from the Scottish consultation on a Scottish DRS[45], scaled up to the UK. The costs estimated for 'Example 3: Take back to any point of purchase' were deemed the most similar to the proposed DRS system in this IA[46]. This option assumes that consumers can take their drinks containers back to any retailer that sells drinks in disposable containers. For international comparison, Scandinavia and the Baltic States use this kind of system and see over 85% of drinks containers recycled[47].

In the Scottish consultation this cost was estimated at £12m; scaled to the UK population this gives approximately £146m. This scaling method may have limitations, for example, confidential industry analysis predicted that there would need to be at least 10 centres and additional depots for cities such as London due to the density of population and higher number of take-back points collecting drinks containers. These have not been accounted for in this estimate, however, it's also likely that there would be economies of scale in counting centre costs, meaning that overall this approach has been taken as a conservative estimate of the costs.

New label design and re-labelling would also be required so that drinks containers display information for consumers about how to return their bottles, as well as the deposit amount, and a barcode to allow containers to be scanned by RVMs. Eunomia estimated this cost at £4.8m for Scottish industry; this was

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[44] UK population is estimated at 66,040,200 and the Scottish population at 5,424,800 (mid-2017 estimates, https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates)

[45] https://consult.gov.scot/environment-forestry/deposit-return-scheme/supporting_documents/DRS%20%20Outline%20Business%20Case.pdf

[46] Other options considered in the Scottish consultation were: 'Take back to dedicated drop-off points'; 'Take back to dedicated drop-off points and some shops (with cartons and cups included)'; and 'Take back to any place of purchase (with cartons and cups included)'. The proposed UK-wide system in this analysis would allow consumers to return drinks containers in-scope to any point of purchase (primarily to be hosted in supermarkets and convenience stores).

[47] https://consult.gov.scot/environment-forestry/deposit-return-scheme

scaled up via placed-on-market (POM) data to give a labelling cost for all containers placed on market in the UK of £58m.

These costs are one-off transition costs that would occur in year 1 of the policy.

5.2.1.2 Reverse vending machines (RVMs)

As 'return to retail' is our proposed method of returning containers, retailers would be required through legislation to allow for take-back of empty containers from consumers and payment of redeemed deposits[48]. Therefore, some compensation is given to the retailers from the DMO for the costs they incur. In existing DRSs, this calculation is made by operators of the system in cooperation with retailers, and is negotiated to ensure all-party agreement. The handling fee is calculated by taking into account all the likely retail labour costs and floor space costs, i.e. the opportunity cost of housing take-back infrastructure. Reverse vending machines (RVMs) capable of accepting all of the materials in scope would be installed in retail outlets, generally in those outlets accepting above a certain threshold of containers per day. It is proposed that the DMO would have oversight of installing RVMs, with the costs included in the set-up cost calculated below. RVMs would be installed in retail outlets where it is assessed to be more cost effective than manually taking back and storing containers in the un-compacted state required for collection and counting.

The number of RVMs required was estimated by two methods. The first method used the supermarket data of number of stores and size of stores in the UK[49] and estimated RVMs per store based on their size[50]. This led to a total of 35,218 RVMs in the UK. A further 10% margin for error was added to this number to account for the RVMs required in on-the-go locations e.g. bus stops, train stations, parks etc. giving a total of 38,740. The second method used data from the main European DRS schemes and calculated that on average they allow 1 RVM per 1,900 people. Scaling this to the UK population gives an estimate of 34,758 RVMs for the UK. These two figures were used as low and high estimates, with the average providing a central estimate.

Costs of the RVMs were taken from evidence submitted to the call for evidence and corroborated with information from RVM manufactures and industry stakeholders. Capital costs were estimated at £30,000 per machine, and installation costs were a further £2,700 per machine. For the purpose of this analysis, it was assumed that machines would not be bought outright, but instead obtained on a loan scheme. The estimated life span of an RVM at 7 years was provided from stakeholder data, and following from Eunomia's estimates of a DRS for Scotland, a 7 year loan term at 5% APR was assumed. The annual capital and installation costs using the high and low RVM estimates are summarised in Table 2 below.

Operating and maintenance costs per annum (including, for example, the costs of replacing paper roll for receipts, and the costs of replacing compacting machinery) were calculated at 10% of the capital costs[51]. The total one off cost per RVM is therefore £32,700, with £3,000 per annum operating costs, and the total annual operating costs dependent on the number of RVMs required are summarised in Table 2 below.

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[48] The proposed DRS system currently suggests that Government will obligate retailers of a certain size to provide a return point (either via an RVM machine or manual take-back, section 5.2.1.3). There are questions in the consultation about a potential de-minimis which must be crossed for retailers to be obligated to host a return point.

[49] http://www.about.sainsburys.co.uk/~/media/Files/S/Sainsburys/pdf-downloads/sainsburys-ar-2017-strategic-report

https://www.tescoplc.com/media/474793/tesco_ar_2018.pdf

https://gain.fas.usda.gov/Recent%20GAIN%20Publications/UK%20Supermarket%20Chain%20Profiles%202016_London_United%20Kingdom_12-13-2016.pdf

[50] This calculation is based on assumptions about how many RVMs per shop will be required per square foot. On average: convenience stores are estimated to require 1 RVM; small supermarkets 2 RVMs; superstores 3 RVMs; hypermarkets 4 RVMs; and stores >100,000 sq ft 5 RVMs. Based on estimations by Eunomia.

[51] Based on communication with RVM manufacturer by Eunomia for 'A Scottish Deposit Refund System' http://www.eunomia.co.uk/wp-content/uploads/2015/05/ZWS-DRS-Report_APPENDIX_Final.pdf

Table 2 Annual cost of loaning RVMS

	Number of RVMs required	Annual capital + installation cost	Annual operating cost	Total
Population estimate (low)	34,758	£196,424,690	£104,274,000	£300,698,690
Supermarket estimate (high)	38,740	£218,926,670	£116,219,400	£335,146,070
Central estimate	36,749	£207,675,680	110,246,700	£317,922,380

Retailers would be compensated for the costs of hosting RVMs with a fee paid by the DMO. They would face a space cost of placing an RVM on the shop floor, and of storing bottles after unloading from machines[52]. This was estimated by applying the potential profits lost to the average floor space required. Based on Eunomia's calculations for a Scottish DRS, it is estimated that an average retailer will require an area of $5m^2$ to house RVMs, including the additional area required to store containers before collection by the DMO. The total value of the supermarket sector was divided by the estimated total square metres of the sector. This value was then applied to the $5m^2$ per RVM size to calculate the lost sales value. A 5% profit margin was applied to the sales loss to give a profit loss of £67m - £75m per annum. However, it should be noted that supermarkets could utilise outside space to house RVMs and store bottles before collection, so this is likely to be a conservative estimate.

Labour time would also be required for retailers to process receipts from RVMs and issue the required refunds to customers, in addition to emptying an RVM once full and storing containers for collections[53]. Costs were estimated using the national minimum wage of £8.21 an hour, plus 30% for on-costs. With an 85% return rate, it is assumed that 80% of the overall total of bottles returned are via RVMs (with the remainder being returned via manual take-back points, see section 5.2.1.3) [54]. It is estimated that approximately 4.5m hours will be required in the supermarket sector each year to handle these containers via RVMs. Per supermarket, this is an average of approximately 36 minutes a day processing receipts and 18 minutes a day clearing and storing bottles once RVMs are full[55]. With an 85% return rate, this gives an overall labour cost per annum of £48m[56].

[52] It is predicted that bottles will be transported relatively soon after emptying an RVM, for example by making use of back-filling supermarket delivery vans.

[53] Customers are assumed to return an average of 15 containers in one transaction, and the retailer to take 10 seconds to process the receipt and issue a monetary refund. It is assumed that an 'average sized' RVM has a storage capacity of 500 glass, or 800 plastic bottles, or 3,500 metal cans, and that it takes 5 minutes to empty a machine and store the containers once full. Assumptions based on: http://www.eunomia.co.uk/wp-content/uploads/2015/05/ZWS-DRS-Report_APPENDIX_Final.pdf

[54] National Minimum Wage for employees aged 25 and over: https://www.gov.uk/national-minimum-wage-rates. It is assumed that these tasks are likely to be undertaken by shop assistants rather than managerial level.

[55] Based a total of 13,838 supermarkets.

[56] The total annual labour cost is determined by the quantity of drinks containers returned; the number of RVMs will determine the intensity of use for each one and the distribution of these cost across retailers

Table 3 RVM handling fee

	Number of RVMS required	Annual space costs	Annual labour costs	Total cost per annum
Population estimate (low)	34,758	£66,809,221	£47,985,789	**£114,795,010**
Supermarket estimate (high)	38,740	£74,462,738	£47,985,789	**£122,448,527**
Central estimate	36,749	£70,635,979	£47,985,789	**£118,621,769**

These figures indicate an overall RVM cost to the DMO of between £415m-£458m.

5.2.1.3 Manual Take-Back

For some stores, RVMs will not be an economic solution (for example, small convenience stores). Such stores would be required to take back drinks containers manually instead. This would be done by collecting and scanning containers and placing them in provided bags to allow the DMO to collect these as part of their collection logistics. There was not enough data available to calculate the threshold number of bottles per day at which point a RVM would be economically viable, however convenience stores represent the most likely market, so manual take back costs have been estimated using data for the full convenience sector.

As with shops hosting RVMs, labour time would be required to process refunds and store containers. Again, costs were estimated using the national living wage, plus 30% on-costs, for the approximately 51,373 convenience stores in UK[57]. It is estimated that on average a convenience store will spend 1.3 hours a week on manual take-back[58]. This gives a labour cost of manual take back of £36m per annum.

Using the same method as described for RVMs for the opportunity costs of manual take-back, an average of 1m^2 floor space required for manual take back results in profit loss of £20m per annum across the sector[59]. There was a further estimated £17m costs of storage of un-compacted containers at the back of the shop[60]. This gives a total manual handling cost of £73m per annum which is approximately £1,423 per store per annum.

[57] 49,918 convenience stores in Great Britain, scaled to the UK via population; The Local Shop Report 2017: https://www.acs.org.uk/sites/default/files/local_shop_report_17_low_res.pdf

[58] It is assumed that 20% of bottles are returned to the DRS via manual take-back; that each DRS transaction will take approximately 45 seconds for a member of staff to process; and that the average number of containers returned in one transaction is 15. Assumptions based on: http://www.eunomia.co.uk/wp-content/uploads/2015/05/ZWS-DRS-Report_APPENDIX_Final.pdf and the Association of Convenience Stores response to the Call for Evidence.

[59] Eunomia estimate that no shop-front sales space will be lost to manual take-back, however the convenience sector in the Call for Evidence estimated that 1m^2 is likely to be lost. This has been taken into account in order to provide a conservative estimate, with storage costs calculated separately.

[60] Association of Convenience Stores response to the Call for Evidence: https://www.acs.org.uk/sites/default/files/lobbying/acs_submission_-_defra_deposit_return_scheme.pdf

Table 4 Manual take-back handling fee

Number of stores	Annual labour costs	Annual space costs	Annual storage costs	Total cost per annum
51,373	£35,954,870	£19,749,186	£17,393,227	**£73,097,283**

5.2.1.4 Logistics

Once bottles have been deposited in RVMs or manually collected by stores they will need to be collected and transported to bulking points and then further on to counting centres. There is possibility for backhauling or reverse supply chain logistics to be utilised to reduce the costs of transportation as is the case in some international DRS schemes. This is where delivery vehicles fill their empty space when returning to the depot with returned drinks containers, and is likely to be particularly effective for large retailers that are supplied by one distribution company, rather than a number of smaller traders.

Estimates from Eunomia on logistics costs[61] for Scotland gave an estimated cost of between £19.9m and £20.5m for a scheme with an 80% return rate. This includes the purchase of new containers to transport empty bottles/cans in[62], and assumes that larger stores will backhaul containers and smaller stores will use collection rounds direct to the retail outlets. Scaling was done via a population basis as this was deemed a suitable proxy for POM and therefore the number of units being transported. This resulted in total logistics costs of £245m per annum for the UK. This scaling does not allow for economies of scale so may be an overestimate of the true cost of logistics. With an 85% return rate, it is estimated that logistics costs will increase proportionally by 6.25% to £261m.

Confidential industry research into the potential cost of a DRS scheme estimated logistic costs of approximately £230m per annum, with approximately an 83% return rate. Scaled to 85%, this provides an estimate of £236m. These have been used as low and high estimates for transport costs respectively to calculate a central logistics cost estimate of £248m.

Because it is not possible to determine the extent of the mileage that will be involved in this operation, the effect that this aspect will have on GHG emissions is incapable of being estimated at this stage.[63]

5.2.1.5 Counting Centres and Central Administration

Counting centre running costs were taken from the Scottish consultation on a Scottish DRS scheme[64] scaled up to the UK. As above, the costs estimated for 'Example 3: Take back to any point of purchase' were deemed the most similar to the proposed DRS system in this IA. In the Scottish consultation it was estimated there were approximately £67m per annum costs to the system operator incorporating counting and bulking centres, logistics, cost of fraud, communications, staff employed directly by the system and handling fees paid to return point operators[65]. Of the £67m costs the handling fee was £42m. Deducting

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[61] http://www.eunomia.co.uk/reports-tools/a-scottish-deposit-refund-system/

[62] It is assumed that bottles/cans that have passed through an RVM will be able to be compacted for travel, whereas bottles collected manually will have to be preserved in terms of the barcode, size, weight, etc. and transported un-compacted in bags for use in counting centres.

[63] If a pattern were to emerge of consumers using their cars to return containers in bulk this would also generate GHG emissions, but it is not possible to quantify this.

[64] https://consult.gov.scot/environment-forestry/deposit-return-scheme

[65] https://consult.gov.scot/environment-forestry/deposit-return-scheme/supporting_documents/DRS%20%20Outline%20Business%20Case.pdf

this gave us £25m for costs to the system operator incorporating counting and bulking centres, logistics, cost of fraud, communications, staff employed directly by the system.

Taking the £25m and scaling this to the UK population gives an estimate of £304m however this would also include logistics costs. As a better estimate of UK-scale logistics costs was achieved based on both the Eunomia and industry estimates (calculated above), the high and low logistics costs were taken from this total to provide a central estimate of £56m for the ongoing costs counting centres and central administration costs.

Using the Eunomia estimate of central administration costs for a Scottish DRS, we scaled this to the UK level via population data as an estimate of POM in order to account for the larger number of containers, to give an estimate of £30m[66].Taking this from the remaining total provided a central estimate of £26m for the ongoing costs of the 10+ counting centres.

Table 5 Summary of logistics and central administration costs

	Low estimate	High estimate	Central estimate
Logistics costs	£236m	£260m	£248m
Central administration costs	£28m	£31m	£30m

Table 6 Counting centre costs

	Low estimate	High estimate	Central estimate
System operator costs for Scotland per year	£25,000,000	£25,000,000	£25,000,000
Scaled to UK	£304,343,939	£304,343,939	£304,343,939
Without logistic costs	£43,650,431	£64,801,770	£56,226,101
Total counting centre costs (i.e. without central administration costs)	£15,379,534	£37,554,989	£26,467,261

5.2.1.6 Non-Monetised Costs

In order to claim back their deposit, consumers will be required to bring used drinks containers to a take-back point and to physically return them via an RVM or over-the-counter transaction. The potential opportunity cost of time required is recognised but has not been included in the Impact Assessment Consumers are unlikely to behave as a homogenous group, and there may be a number of potential responses:

[66] The exact figure is £29,758,840

For many consumers, it is expected that returning drinks containers would form part of usual activity, such as during a shopping trip or transaction that would have taken place any way. In these cases, the incremental time required would be expected to be fairly minimal.

Consumers would likely treat the deposit as a form of recompense for their time involved. If they have more ‘time abundance’ with a relatively low value on a marginal unit of their time, the value of the refund may outweigh the opportunity cost of their time, and vice versa for those whose time is scarce and who thereby place a high marginal value on it. For consumers who judge that claiming back the deposit is not worth the time taken, they may make a rational decision not to engage in the transaction.

Some consumers may also participate in the DRS and return bottles for a civic duty or an altruistic motivation, for example due to a desire to contribute in reducing plastic pollution. This benefit would add to the monetary value of the returned deposit.

This potential time cost has not been quantified at this time.

5.2.1.7 Total Economic Costs of DRS

The total costs for this option are set out in Table 7.

Table 7 Total Costs of Option 2, £m

One-off costs		Year 1	Year 2 to 10
Organisational Setup	**Central**	**146**	**0**
	Low	139	
	High	153	
Change in labelling	**Central**	**58**	0
	Low	55	
	High	61	

Costs		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
RVM Costs	**Central**	**437**	**437**	**437**	**437**	**437**	**437**	**437**	**437**	**437**	**437**
	Low	458	458	458	458	458	458	458	458	458	458
	High	415	415	415	415	415	415	415	415	415	415
Manual Handling Costs	**Central**	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**
	Low	69	69	69	69	69	69	69	69	69	69
	High	77	77	77	77	77	77	77	77	77	77
Transport /Logistics	**Central**	**248**	**248**	**248**	**248**	**248**	**248**	**248**	**248**	**248**	**248**
	Low	236	236	236	236	236	236	236	236	236	236
	High	261	261	261	261	261	261	261	261	261	261
Counting Centres costs	**Central**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**
	Low	15	15	15	15	15	15	15	15	15	15
	High	38	38	38	38	38	38	38	38	38	38
Central Administration Costs	**Central**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
	Low	28	28	28	28	28	28	28	28	28	28
	High	31	31	31	31	31	31	31	31	31	31
Total Cost	**Central**	**1018**	**814**	**814**	**814**	**814**	**814**	**814**	**814**	**814**	**814**
	Low	999	805	805	805	805	805	805	805	805	805
	High	1038	823	823	823	823	823	823	823	823	823

Discounted Total Cost[67]		
	Central	**6,967**
	Low	6,880
	High	7,054

[67] Please note that this has been discounted using the standard 3.5% discount rate. The NPV on the summary sheet uses the EANCB calculator with 2016 base year prices.

5.3 Economic Benefits of the DRS

The following key benefits were estimated:

1. Net incremental Material Revenue to the DMO
2. Greenhouse gas emissions (GHG) reductions
3. Reduction in litter cleaning costs
4. Reduction in disamenity value/cost of litter

5.3.1.1 Net Incremental Material Revenue to the DMO

The material collected by the DMO would be sold to reprocessors for recycling. This sale of the recycling material stock has a value associated with it, and the DMO would use this income to partly fund the DRS operation. The remainder of the cost would be covered by a contribution from producers, covered below (see section 5.3.2.1).

In order to assess the increase in recycling caused by the DRS, a baseline amount of recycling had to be established for the DRS material in scope. To estimate this, POM and recycling data were taken from Valpak's flow reports and the 'On-the-go' drinks container reports, as well as figures provided to the UK Government by WRAP. The following rates and tonnage of recycling were established for the baseline 'do nothing' scenario.

Table 8 Baseline recycling (tonnes)

Container type	POM	Recycling Rate[68]	Recycled
PET Bottles	317,427	70%	222,199
Steel cans	34,760	65%	22,594
Aluminium cans	119,421	65%	77,623
Glass bottles	1,835,931	70%	1,285,151
Total	**2,307,538**	70%	**1,607,568**

This baseline level of recycling means that some of the material collected and sold by the DMO would not be additional recycling, but material diverted away from current waste management systems to the DRS. The revenue gained from the sale of this proportion of material is treated as a transfer between stakeholders rather than an incremental benefit of the system. Although the total material revenue received is used to part-fund the DRS, only the revenue from the incremental or additional recycling created by the DRS is treated as a national economic benefit of the system in the IA.

Table 9 DRS recycling (tonnes)

Container type	POM	Return Rate	DRS Recycling	Additional recycling
PET Bottles	317,427	85%	269,813	+47,614
Steel cans	34,760	85%	29,546	+6,952
Aluminium cans	119,421	85%	101,508	+23,884

[68] The baseline recycling rate is taken from Valpak estimations, and assumed constant over time due to a lack of data on packaging recycling rates.

Glass bottles	1,835,931	85%	1,560,541	+275,390
Total	**2,307,538**	85%	**1,961,408**	+353,840

In order to estimate the net material revenue from the sale of this additional recycled material, the recycled tonnages were valued using the average price of the material for 2018[69]: For the purpose of these calculations, material prices were assumed constant for these ten years, although it is recognised that this is a simplifying assumption and that prices are likely to fluctuate somewhat over this time.

Table 10 Net material revenue

Container type	Recycled	Material Value (£/tonne)	Material Revenue
PET Bottles	+47,614	£174.02	£8,285,870
Steel cans	+6,952	£126.41	£878,831
Aluminium cans	+23,884	£1,026.30	£24,512,402
Glass bottles	+275,390	£11.41	£3,143,033
Total	**+353,840**		**£36,819,091**

5.3.1.2 Greenhouse gas emissions (GHG) reduction

Greenhouse gas emissions reductions arise from this increase in recycling as a result of the DRS. As above, only the additional tonnages collected by the DRS system will be analysed and monetised as a benefit. This does not include material already being recycled via current collection systems before the introduction of a DRS.

Emission savings are calculated based on BIES Carbon Factor[70] and Carbon valuation[71] reports. This has been estimated in two parts. The first takes the per tonne emissions of closed–loop recycling; this is the carbon saving from replacing virgin materials in production with recycled materials. The second is the avoided emissions from materials no longer going to residual waste treatment such as landfill and Energy from Waste. This provides the following CO2e emissions per tonne on a traded and non-traded basis following HMT green book supplementary guidance on greenhouse gas emission appraisal.[72]

Table 11 UK Carbon Emissions (t CO2e)

Material tonne	Recycling vs. Residual (Traded)	Recycling vs. Residual (Non-Traded)
PET Plastic	**-1.29**	**-0.78**
Steel	**-1.27**	**-0.01**
Aluminium	**-4.03**	**-2.56**
Glass (mixed)	**-0.09**	**-0.01**

[69] All material price estimates from letsrecycle.com, WRAP Materials Pricing Reports (http://www.wrap.org.uk/content/materials-pricing-report), or discussion with stakeholders. Material prices are for the price of the full, compacted drinks containers sold to reprocessors for recycling after being sorted by material in DRS Counting Centres.

[70] https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2018

[71] https://www.gov.uk/government/collections/carbon-valuation--2#update-to-traded-carbon-values:-2017

[72] https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

Table 12 Total GHG emissions savings (t CO2e per year)

Container type	Tonnes	Traded (t CO2e)	Non-traded (t CO2e)	Total (t CO2e)
PET Bottles	47,614	-61,627	-37,113	-98,740
Steel cans	6,952	-8,838	-68	-8,906
Aluminium cans	23,884	-96,207	-61,236	-157,443
Glass bottles	275,390	-25,741	-1,808	-27,548
Total	**353,840**	**-192,413**	**-100,225**	**-292,637**

Using Carbon values from 2023 to 2032, we get the following GHG emission savings profile, including traded and non-traded emissions:

Table 13 Total GHG emission savings, £m

		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	Total
GHG emission savings	**Central**	**£12**	**£14**	**£15**	**£17**	**£19**	**£20**	**£22**	**£23**	**£25**	**£28**	**£195**
	Low	£6	£7	£8	£8	£9	£10	£11	£12	£13	£14	£96
	High	£19	£21	£23	£26	£28	£30	£33	£35	£38	£41	£294

5.3.1.3 Reduction in Litter Cleaning Costs

One of the main objectives of a DRS is to reduce the levels of litter in the UK. Local Authorities spend significant amounts of money on litter clean up and street sweeping costs every year, and a reduction in the level of litter could have beneficial cost impacts.

There are various ways of measuring litter (including by volume, count and weight). Count and weight were deemed the most appropriate metrics in this case, because litter clean up tends to occur due to the number of items in areas or streets, with their cost efficiencies based on the number of items to be picked up and weight to be transported. In contrast, volume is more related to the unsightly aspect of litter, but can be compressed when collected. Approximately 5% of the count of items would be DRS material and 22% by weight of litter[73].

Zero Waste Scotland estimated that Scottish local authorities spend £36m on direct litter costs per year[74]. In the absence of direct empirical data, scaling this to the UK on a population basis was utilised. This gave a UK spend on litter of £438m per annum. Using a count estimate, this would mean an estimated £22m is spent on litter clean-up of DRS scope material and £96m if using a weight estimate. Due to the disparity of estimates, a central estimate value has been taken.

It has been assumed that with a return rate of 85%, there will be approximately an 85% reduction in drinks containers being littered. The rationale behind this assumption is that a deposit on a container makes consumers more likely to return it in order to get their money back, and therefore less likely to litter. In addition, drinks containers that are littered are likely to be picked up by other people in order to gain the

[73] Zero Waste Scotland (2013) *Scotland's Litter Problem*: https://www.zerowastescotland.org.uk/sites/default/files/Scotland%27s%20Litter%20Problem%20-%20Full%20Final%20Report.pdf; Eunomia (2015) A Scottish Deposit Refund System: http://www.eunomia.co.uk/reports-tools/a-scottish-deposit-refund-system/

[74] https://www.zerowastescotland.org.uk/sites/default/files/Scotland%27s%20Litter%20Problem%20-%20Full%20Final%20Report.pdf

deposit[75]. The table below shows the cost-saving impact of diverting 85% of DRS-scope containers to the DRS:

Table 14 Direct costs of litter savings

	Cost of litter (UK)	Cost of DRS-scope litter	Reduction in costs
Count of litter (low estimate)	£438,255,272	£21,912,764	£18,625,849
Weight of litter (high estimate)	£438,255,272	£96,416,160	£81,953,736
Central estimate	£438,255,272	£59,164,462	**£50,289,793**

5.3.1.4 Reduction in Disamenity Value of Litter

Further to the reduction in the direct litter cleaning costs, a reduction in the amount of material being littered also reduces the disamenity associated with litter. As previously discussed, valuing the disamenity of litter is a complex and under-researched area. In order to estimate this potential benefit, stated willingness to pay to reduce litter via council tax has been used. This is a proxy that is likely to encompass a number of negative impacts, as people take into consideration factors such as a perceived impact on property prices and visual disamenity. However, it should be noted that this is unlikely to be a perfect approximation and that there are uncertainties associated with aggregating these findings over the whole population. In addition, there is likely to be an omission of some important impacts, such as the full impact of litter that reaches the oceans.

A study by the University of Leeds for DEFRA[76] on valuation of local disamenity found that people were willing to spend £3.95 per month on council tax for a 1 point improvement on a 10 point scale, and £39.50 for a move from the worst situation to the best. Since the survey was framing costs on a council tax basis, scaling has been undertaken using the number of households in the UK rather than an adult population estimation. On this basis, it is estimated that each household would be willing to spend an additional £47.40 on council tax per year to achieve a 1 point reduction of litter. As the levels of litter vary significantly from area to area in the UK, there is a question of aggregating this information to provide an accurate UK-wide average. Taking into account this uncertainty, a 4.5 point reduction was chosen as a conservative estimate, rather than using the central value of 5. Across the 27m households in the UK, this suggests that the disamenity of all litter is worth approximately £5.8bn.

For comparison, Eunomia's estimates for Scotland predict the value of total litter to be between £73m-£770m, with the most likely estimate between £513m and the upper bound. Scaled up to account for all UK

75 This assumption states that 85% of the bottles that people would have chosen to litter without a DRS, will be returned following the introduction of a scheme (either due to not being littered, or due to someone else actively picking up the litter in order to get the deposit). There is limited hard evidence in this area, however positive international achievements provide support. For example, research from the Danish Society of Nature Conservation reported that 95% of the cans collected on clean-ups were not part of their deposit system (DEFRA 2008 review of Packaging Deposit Schemes); and drinks containers make up just 2.8% of litter in South Australia (Keep Australia Beautiful National Litter Index). Research by Eunomia suggests that reductions of up to 95% of litter could be expected following the introduction of a DRS in England. https://www.mcsuk.org/media/eunomia-report-on-drs.pdf.

76 This study used a large sample size of 561 respondents, covering three cities, and a blend of inner-city, suburban and rural settings. Mark Wardman, Abigail Bristow, Jeremy Shires, Phani Chintakayala and John Nellthorp (2013) Estimating the Value of a Range of Local Environmental Impacts, Report for Dept. for Environment, Food and Rural Affairs, 1 April 2011

households[77], this provides a range of £807m-£8.5bn, with the most likely estimate between £5.7bn and £8.5bn.

Volume of litter was considered the most appropriate method for measuring disamenity, as this provides the best representation of the visual impact of litter. Estimates from various litter studies and international comparisons[78] have that found drinks containers are likely to make up approximately 40% of the total volume of litter. Applying this percentage to the overall disamenity above estimates approximately £2.3bn of disamenity from all drinks containers littered, which we will consider the baseline[79].

As above, with the introduction of a DRS, one may postulate that 85% of DRS-scope material currently littered will instead be diverted to the scheme. There is no relevant empirical data on the precise nature and strength of the relationship between litter and litter disamenity. For this analysis, a conservative 2:1 relationship has been assumed to account for this uncertainty[80]. The 2:1 relationship applied to the 85% diversion rates results in a 42.5% reduction in drinks container litter disamenity post-DRS, with the value of this shown in the table below:

Table 15 Disamenity of litter

Disamenity of Litter	85% return rate
Disamenity of **all** current litter	£5,801,760,000
Litter that is in the scope of the DRS (%)	40%
Disamenity of DRS litter	£2,320,704,000
Reduction in disamenity of DRS Litter (%)b	42.5%
Reduction in Disamenity value (£)	**£986,299,200**

5.3.1.5 Non-Monetised Benefits

It is expected that a deposit return scheme would allow for greater quality of material to be collected than via kerbside collection, which will likely translate into greater certainty that the materials will be recycled, rather than rejected due to contamination issues. This has associated environmental benefits with the avoidance of waste going to landfill or incineration sites, as well as providing a stable, high-quality stream of waste materials for secondary reprocessing markets. This has the potential to stimulate greater domestic reprocessing capacity, however the evidence was not available to quantify this benefit for the purpose of this Impact Assessment.

[77] Households in Scotland: 2.46 million (National Records of Scotland, 2017). Households in the UK: 27.2 million (Office for National Statistics, 2017)

[78] http://www.keepbritaintidy.org/sites/default/files/resource/National%20Litter%20Survey%20201718.pdf

https://www.gov.uk/government/publications/litter-and-littering-in-england-2016-to-2017/litter-and-littering-in-england-2016-to-2017

https://www.keepwalestidy.cymru/surveys

https://www.mcsuk.org/media/GBBC_2017_Report.pdf

[79] There is limited data and a lack of detailed studies in this area, therefore whilst it is recognised that proportion estimations from international comparisons are unlikely to be comprehensive, this methodology based on empirical findings was considered preferable to attempting to deduce the amount of litter from the overall POM or non-recycling tonnage, which would be highly speculative.

[80] This may be higher due to the 'litter beacon' effect of relatively large and brightly coloured drinks containers, as discussed in section 2.1

5.3.1.6 Total Economic Benefits of the DRS

The total benefits for this option are set out in Table 16

Table 16 Total Benefits of Option 2, £m

Benefits		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Net material revenue	**Central**	**£37**	**£37**	**£37**	**£37**	**£37**	**£37**	**£37**	**£37**	**£37**	**£37**
	Low	£35	£35	£35	£35	£35	£35	£35	£35	£35	£35
	High	£39	£39	£39	£39	£39	£39	£39	£39	£39	£39
Reduction of disamenity from litter	**Central**	**£986**	**£986**	**£986**	**£986**	**£986**	**£986**	**£986**	**£986**	**£986**	**£986**
	Low	£937	£937	£937	£937	£937	£937	£937	£937	£937	£937
	High	£1,036	£1,036	£1,036	£1,036	£1,036	£1,036	£1,036	£1,036	£1,036	£1,036
GHG emissions savings	**Central**	**£12**	**£14**	**£15**	**£17**	**£19**	**£20**	**£22**	**£23**	**£25**	**£28**
	Low	£6	£7	£8	£8	£9	£10	£11	£12	£13	£14
	High	£19	£21	£23	£26	£28	£30	£33	£35	£38	£41
Direct costs of litter clean-up savings	**Central**	**£50**	**£50**	**£50**	**£50**	**£50**	**£50**	**£50**	**£50**	**£50**	**£50**
	Low	£19	£19	£19	£19	£19	£19	£19	£19	£19	£19
	High	£82	£82	£82	£82	£82	£82	£82	£82	£82	£82
Total Benefit	**Central**	**£1,086**	**£1,087**	**£1,089**	**£1,090**	**£1,092**	**£1,093**	**£1,095**	**£1,097**	**£1,099**	**£1,101**
	Low	£997	£997	£998	£999	£1,000	£1,000	£1,001	£1,002	£1,003	£1,004
	High	£1,175	£1,178	£1,180	£1,182	£1,184	£1,187	£1,189	£1,191	£1,194	£1,197

Discount Total Benefit		
	Central	£9,085
	Low	£8,316
	High	£9,855

5.3.2 Differential impacts on stakeholders

5.3.2.1 Producers of Drinks Containers

In order to pay the costs of running the DRS, as detailed above, it is assumed that the DMO would rely on two revenue streams; the onward sale of material for recycling, and producer fees.

Producers that place DRS-scope material on the market would be required to join the scheme, and would be charged a fee to cover costs that are not met by the material revenue. In this way, the material revenue gained by the DMO acts as an indirect benefit to producers by reducing the fees they pay. We would expect to see this vary year-on-year dependent on the price for secondary materials, but in this instance have assumed constant prices based on current estimates.[81]

The material revenue gained by the DMO is dependent on the amount of material captured by the DRS, and hence on the return rate:

Table 17 Total revenue to the DMO from material to be recycled

Container type	Recycled	Material Value (£/tonne)	Material Revenue
PET Bottles	269,813	£174.02	£46,953,264
Steel cans	29,546	£126.41	£3,735,034
Aluminium cans	101,508	£1,026.30	£104,177,709
Glass bottles	1,560,541	£11.41	£17,810,523
Total	**1,961,408**		**£172,676,530**

The difference between the total costs and total material revenue would be covered by the producer fee. This is equivalent to approximately 4p per unit in year 1, falling to 3p per unit from then onwards, based on current POM figures. This would result in all the costs of the operation of the DRS being met from these revenue sources.

Table 18 Producer Fee, £m (central estimates)

	Total costs	Total material revenue	Producer fee
Year 1	£1,018	£173	**£846**
Years 2-10	£814	£173	**£641**

Producers may go on to buy the material recycled via the DRS off the market for use in drinks container production. This cost has not been taken into account as buying material forms part of their costs with or without a DRS. It is also expected that a DRS will generate the availability of a better quality of recycled material.

[81] It is likely that a DRS will allow the collection of higher quality and less contaminated material, which may command a higher price accordingly. This has not been accounted for in this analysis.

5.3.2.2 The DMO

It is proposed provisionally that the DMO would be responsible for running the DRS. As explained above, they would incur the economic costs of running the system and pay for this using the total material revenue and the producer fee.

The usage of unredeemed deposits varies across deposit return schemes in other countries. The proposed DRS system in this consultation suggests that the unredeemed deposits, held by the DMO, will be passed to the Government. The consultation will be used to identify the precise nature of how these funds are spend, though it is proposed they will not be used to fund the system. For this consultation stage IA it is assumed it acts as a transfer, which is equivalent to assuming any unredeemed deposits are spent in a way that is cost neutral to society. In practice, funds could be invested to deliver a net benefit to society.

Alternatively, in some international schemes, unredeemed deposits are used to part-fund the scheme. In this case, a 15p deposit and an 85% return rate would generate £535m in unredeemed deposits per year.

Table 19 Unredeemed deposits

Container type	POM (units)	Total deposits	Unredeemed deposits
PET Bottles	10,582,396,518	£1,587,359,478	£238,103,922
Aluminium Cans	1,092,675,800	£163,901,370	£24,585,206
Steel Cans	6,563,329,818	£984,499,473	£147,674,921
Glass bottles	5,541,142,943	£831,171,441	£124,675,716
Total	**23,779,545,079**	**£3,566,931,762**	**£535,039,764**

This would cover 52% of the costs of running the system in year 1, and 66% from then onwards, and reduce the producer fee to £312m in year one, and £107m from years 2-10. This is equivalent to 1p per unit, and 0.4p per unit. However, this would be variable depending on the performance of the scheme.

Table 20 Producer Fee (with unredeemed deposits, £m (central estimates)

	Total costs	Total material revenue	Unredeemed deposits	Producer fee
Year 1	£1,018	£173	£535	**£311**
Years 2-10	£814	£173	£535	**£106**

5.3.2.3 Local Authorities and Packaging Producer Responsibility Reform

DRS is proposed as an extension of the proposed packaging producer responsibility reform, with a specific focus on tackling drinks containers. Under this reform, the costs currently incurred by Local Authorities for dealing with packaging material waste (such as the cost of kerbside waste collection) will be covered by packaging producers. Please see the impact assessment on reforming packaging producer responsibility for a full explanation of this policy.

With the introduction of a DRS, it is predicted that the drinks containers in-scope will be diverted from current kerbside collection systems to the DRS. The main benefit of this for the current household system

would be lower costs of collection, due to the smaller amount of material needing to be dealt with. This has the potential to reduce the work for collection staff and reduce the frequency of vehicles needing to leave the collection round to unload, although this will depend on the local authority. Table 24 shows that in comparison to the collection system with consistent municipal collection (line 1), collection costs fall slightly when Producer Responsibility reform with modulated fees is introduced (line 2), and fall further again when DRS is introduced at the same time, due to the smaller amount of material collected and recycled via kerbside (line 3)[82].

Table 21 Net costs of kerbside collection following the introduction of DRS (recycling & residual waste)

	2023	2026	2032	Cost difference between policies (2032)
With Consistency of Municipal Collection	£1,251,359,284	£1,326,548,630	£1,370,638,512	
With Consistency + Packaging Producer Responsibility	£1,236,122,387	£1,310,771,316	£1,354,195,936	-£16,442,576
With Consistency + Producer Responsibility + DRS	£1,112,273,908	£1,194,622,293	£1,240,518,556	-£113,677,380

The main disadvantage would be a loss in revenue from the sale of material that would have previously been collected. To establish this loss, the material revenue generated from the baseline recycling was estimated, as this material would be diverted from kerbside to the DRS. Material price estimates from WRAP were applied to these tonnages to establish the lost material revenue of £31m per year.

Table 22 Loss of material revenue following the introduction of DRS

Container type	Baseline recycling rates	Tonnage from recycling	Material price[83]	Lost material revenue
PET Bottles	70%	222,199	£79	£17,553,693
Steel cans	65%	22,594	£72	£1,626,783
Aluminium cans	65%	77,623	£72	£5,588,890
Glass bottles[84]	70%	1,285,151	£4.5	£5,757,476
Total				**£30,526,842**

[82] Costings based on material from WRAP

[83] Net material price, taking into account the loss to Local Authorities and Material Recycling Facilities

[84] The glass material revenue is assumed under colour separated glass bottles. Currently, the majority of glass bottles collected from kerbside are collected by dry comingled recycling, facings on average gate fee costs of £13 per tonne. However, given that the 'Consistent municipal recycling collections in England' and 'Reforming the packaging producer responsibility system in Great Britain' assume the multi-stream dry recycling collections to be in place, we have assumed here that Local Authorities would lose revenue from colour separated glass of £4.5 per tonne.

Of the remaining 15% of DRS-scope material, it is assumed that some of this will still be recycled via kerbside, for example in instances where people are unable to visit a return point so choose to place the bottles in their recycling bins at home instead. This means that the overall recycling rates for DRS-scope materials is likely to be higher than the capture rate.

Local Authorities will gain from the introduction of a DRS due to the reduction in litter cleaning costs, amounting to approximately £50m per year, as discussed in section 5.3.1.3.

The full impacts of this on the kerbside collection system are explored in Scenario 2 of the packaging producer reform impact assessment. It is proposed that producers obligated under the DRS would not be obligated under a packaging producer responsibility reform for the same items, to avoid being charged twice.

5.3.2.4 Consumers

Consumers pay a deposit to the retailer, which is reimbursed when the container is returned. Whilst this might have an initial effect on consumer demand, it is difficult to apply standard demand price elasticity in this situation. One would expect to see the normal response only in the initial period of introduction on the DRS. Once the first deposit is redeemed one would anticipate that consumption levels would revert back to a considerable degree.

There is a possibility that producers might seek to pass on some or all of the producer fee cost to consumers in the form of higher prices for their products. It would be difficult to determine whether and if so, to what extent, this might be significant in practice, given gaps in market information, in particular on direct and cross price elasticities of demand. However, there are a number of relevant factors that suggest any such effects are likely to be minor:

- As described in section 5.3.2.1, if the full cost were passed onto consumers this would amount to around 3p per container (and less if the initial start-up year is excluded).
- Not all containers are included in the DRS. Therefore if an appreciable charge were passed onto consumers, there would be a counteracting response in switching to excluded products, such as drinks in cardboard cartons, milk-shakes, etc.
- Between drinks producers included in the DRS, competition would tend to generate restraints on any tendency to pass on more than a minor element of cost change

Unclaimed deposits are a loss to consumers. Experience from similar schemes abroad indicates that there will probably always be some proportion of consumers who will not return their containers for a refund regardless of the size of the deposit. Consumers that prefer to continue using existing household recycling infrastructure would lose the value of their deposit. An interesting question arises as to whether this return profile indicates market dysfunctionality, e.g. information failure, or alternatively economically rational decision making by consumers optimising over time and price[85]. Further research would be needed to distinguish the effects of psychological, and demographic determinants on consumer behaviour. A detailed analysis of these issues is beyond the scope of the present IA.

[85] There are reports that in some instances, e.g. South Australia, people who place a low value on their time (e.g. unemployed, or retired people) search out discarded items as a source of income, effectively cleaning up the environment, and once they have collected enough, they make one visit to a central collecting point to claim their refund. (Seminar, DEFRA, 21.11.2018)

5.3.3 Summary of Option 2

The total economic costs of running the DRS are £1,018m in year 1 and £814m per annum thereafter. This cost is covered by a transfer from producers in the form of producer fees, and the material revenue gained from selling materials to be recycled.

This gives a central total cost estimate, discounted with 2018 as the base year, of **£7,211m** over the first ten years of the scheme (assumed to be starting in 2023).

The economic benefits of running a DRS are gained from a number of sources. With an 85% return rate, the net incremental material revenue is estimated at £37m per annum; the reduction in disamenity of litter is estimated at approximately £986m per annum; greenhouse gas emissions savings are estimated to be around £12m in year 1, rising to £28m by year 10; the reduction in the cost of cleaning litter is estimated at approx. £50m per annum.

This gives a central total benefit estimate, discounted with 2018 as the base year, of **£9,400m** over the first ten years of the scheme (assumed to be starting in 2023).

This gives an NPV of **£2,189m**.

5.4 Option 3: On-the-Go (OTG) DRS

This option covers drinks containers less than 750ml in size, sold in single format PET bottles, steel cans, aluminium cans and glass bottles. Based on international comparison, a 15p deposit level is predicted to generate a return rate of 85%. As with Option 2, there are uncertainties surrounding the reliability of directly applying international findings to the UK, and further considerations such as whether 'on-the-go' consumers may be less inclined to retain bottles for return. This is not implausible in practical terms when people in transit and making transport connections may not have the time, the information nor retention capacity to return containers. Therefore, please see section 6.3.3 for analysis testing the "break point" at which the NPV would no longer be positive.

As with Option 2, in order to establish the amount of material placed on the market in scope of an All-In DRS, estimations were gathered and provided to DEFRA by WRAP:

Table 23 OTG DRS containers placed on market[86]

Container type	OTG POM (units)	OTG POM (tonnes per year)
PET bottles	4,539,253,466	118,540
Steel cans	57,644,218	1,497
Aluminium cans	1,257,005,743	16,723
Glass bottles	1,560,675,400	457,312
Total	**7,414,578,827**	**594,072**

5.4.1 Costs of On-The-Go DRS

The following key costs were estimated:

1. Set-up costs
2. Reverse vending machines (RVMs)
3. Manual take back
4. Logistics
5. Counting Centres and Central Administration

5.4.1.1 Set-Up and Re-Labelling Costs

The same methodology for set-up costs in Option 2 was applied for Option 3. The set-up costs were not reduced for the lower scope of material. The reason for this is that the required number of counting centre, depots and central administration are estimated as being the same in both options, with only the flow of material through these centres differing. This would therefore only impact the operational costs. There is a possibility for centres to be of a smaller size to compensate for the reduce scope of the DRS, but insufficient data were available to apply a reduction in the costs for this impact assessment.

The set-up costs are therefore estimated at £146m in year 1.

Re-labelling costs used the same estimates as Option 2, however these were reduced by the scope and smaller scale of this DRS. OTG material by unit makes up just 31% of the 'All-In' material[87]. Therefore, the costs for labelling in Option 2 were reduced to 31%, giving a labelling cost of £18m. It is possible that these costs may be higher if producers choose to extend their re-labelling to a wider range of bottles whilst

[86] OTG POM figures are the 'All-In' POM including only containers in these materials sold in single format and <750ml

[87] 23bn total POM (units per year), 7.4bn units in the scope of the OTG DRS which gives 31%.

undertaking a re-design, however this has not been taken account of, and these costs only apply to those bottles in-scope of the OTG DRS.

These costs are one-off transition costs that would occur in year 1 of the policy only.

5.4.1.2 Reverse Vending Machines (RVMs)

Following the same approach as described in section 5.2.1.2, the number of RVMs estimated to be needed for an OTG DRS was then reduced proportionately by the decreased number of drinks units (31%) in scope. However, the number of RVMs required for 'on-the-go' locations (such as public transport hubs, parks, etc.) was kept the same as in Option 2 in order to ensure customers the ability to return containers whilst on the move. This meant that the overall scaling down from Option 2 was to 34% rather than 31%. This also goes some way to account for the diseconomies of scale likely to be present in this option, in comparison to an 'all-in' DRS. All the costs per RVM were kept the same from Option 2.

The number of RVMs estimate by the population approach was 34,758 RVMs for Option 2. This was scaled down to give an estimated 10,838 RVMs, with an annual cost loan and operating cost of £94m.

Using the supermarket approach and discounting for the reduced scope gives 10,981 RVMs. The number of RVMs required for 'on-the-go' locations was kept consistent with Option 2, providing a further 3,522 RVMs. This gives a total of 14,503 RVMs, and an annual loan and operating cost of £126m.

These two figures were used as low/high estimates for the annual costs of loaning RVMs to give a central estimate of £109m per year.

Table 24 Annual costs of loaning RVMS

	Number of RVMS required	Annual capital + installation cost	Annual operating cost	Total cost per annum
Population estimate (low)	10,838	£61,246,182	£32,513,145	**£93,759,327**
Supermarket estimate (high)	14,503	£81,959,161	£43,508,836	**£125,467,996**
Central estimate	12,670	£71,602,671	£38,010,990	**£109,613,662**

As with Option 2, retailers would be compensated for the costs of hosting RVMs. This would include the space cost of the machine and storing drinks containers before transportation, and a labour cost for shop assistants to process receipts and issue refunds to customers. These were calculating using the same methodology and cost estimates as Option 2, to give the handling fee costs summarised in the table below:

Table 25 RVM handling fee

	Number of RVMS required	Total space costs	Total labour costs	Total cost per annum
Population estimate (low)	10,838	£20,831,443	£18,003,232	**£38,834,675**

Supermarket estimate (high)	14,503	£27,876,474	£18,003,232	**£45,879,705**
Central estimate	12,670	24,353,958	18,003,232	**£42,357,190**

These figures indicate an overall cost to the DMO of RVMs of between £133m-£171m.

5.4.1.3 Manual Take-Back

The same methodology as presented in section 5.2.1.3 was used for Option 3. The number of hours spent on manual handling was reduced proportionate to the material in scope, reducing the labour costs for this option. This was used as shops taking back drinks manually would collect and handle fewer drinks, taking up less time.

The assumption that all convenience stores will require 1m^2 of floor space to take bottles was kept the same. This gives a total manual handling cost of £48m per annum which is approximately £941 per store per annum.

Table 26 Manual take-back costs

Number of stores	Labour costs for the sector	Profit loss across sector	Storage costs	Total cost
51,373	£11,210,950	£19,749,186	£17,393,227	**£48,353,318**

5.4.1.4 Logistics

The same methodology as presented in section 5.2.1.4 was used to estimate the logistic costs under Option 3. The final costs were discounted by the reduced material in scope. However, as the cost of collecting and transporting materials depend more on the tonnage of material than the number of units, the scaling was done on a tonnage basis. Using the definition for 'on-the-go' as outlined above, the tonnage of material in scope is 594,072 tonnes (see table 28). This is 26% of the tonnage in scope under Option 2 (2,307,538 tonnes).

With an 85% return rate, this gives low and high estimates of £61m and £67m, with the average of £64m used as the central logistic cost estimate.

5.4.1.5 Counting Centre and Central Administration

To establish the on-going counting centre and central administration costs, the same methodology as section 5.2.1.5 was used. The counting centre costs were discounted by the reduced number of units in scope (31%), due to each counting centre having to process a fewer number of containers. This gives counting centre costs of £8m to £12m per annum.

The central administration costs were kept the same as Option 2, as the number of staff required to run the scheme would be very similar regardless of the reduced scope of DRS. Therefore the central administration costs are estimated to be £30m per annum.

There may also be additional central administration costs arising from having to cooperate with the packaging producer responsibility regulator to identify those materials that are in the scope of the DRS, and drinks containers >750ml that would be under the reform of packaging producer responsibility instead, but we do not have the data to estimate these at this time.

5.4.1.6 Non-Monetised Costs

As with Option 2, the potential time cost of physically placing bottles into an RVM or of giving them to a shop assistant has not been included for the Impact Assessment. For on-the-go consumers in particular, RVMs should be easy to access so that this transaction can replace a normal disposal method. It is also expected that consumers will make a rational decision as to whether receiving the deposit is worth the time taken to return the bottle, and can choose to avoid the transaction if they judge that it is not.

5.4.1.7 Total Economic Costs of OTG DRS

The total costs for this option are set out in Table 24:

Table 27 Total Costs of Option 3, £m

One-off costs		Year 1									
Organisational Setup	**Central**	**£146**									
	Low	£139									
	High	£153									
Change in labelling	**Central**	**£18**									
	Low	£17									
	High	£19									
Ongoing costs		**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
RVM Costs	**Central**	**£152**	**£152**	**£152**	**£152**	**£152**	**£152**	**£152**	**£152**	**£152**	**£152**
	Low	£133	£133	£133	£133	£133	£133	£133	£133	£133	£133
	High	£171	£171	£171	£171	£171	£171	£171	£171	£171	£171
Manual Handling Costs	**Central**	**£48**	**£48**	**£48**	**£48**	**£48**	**£48**	**£48**	**£48**	**£48**	**£48**
	Low	£46	£46	£46	£46	£46	£46	£46	£46	£46	£46
	High	£51	£51	£51	£51	£51	£51	£51	£51	£51	£51
Logistic Costs	**Central**	**£64**	**£64**	**£64**	**£64**	**£64**	**£64**	**£64**	**£64**	**£64**	**£64**
	Low	£61	£61	£61	£61	£61	£61	£61	£61	£61	£61
	High	£67	£67	£67	£67	£67	£67	£67	£67	£67	£67
Counting Centre Costs	**Central**	**£8**	**£8**	**£8**	**£8**	**£8**	**£8**	**£8**	**£8**	**£8**	**£8**
	Low	£5	£5	£5	£5	£5	£5	£5	£5	£5	£5
	High	£12	£12	£12	£12	£12	£12	£12	£12	£12	£12
Central Administration fee cost	**Central**	**£30**	**£30**	**£30**	**£30**	**£30**	**£30**	**£30**	**£30**	**£30**	**£30**
	Low	£28	£28	£28	£28	£28	£28	£28	£28	£28	£28
	High	£31	£31	£31	£31	£31	£31	£31	£31	£31	£31
Total Cost	Central	**£466**	**£302**	**£302**	**£302**	**£302**	**£302**	**£302**	**£302**	**£302**	**£302**
	Low	£428	£272	£272	£272	£272	£272	£272	£272	£272	£272
	High	£505	£332	£332	£332	£332	£332	£332	£332	£332	£332

Discount Total Cost	**Central**	£2,672
	Low	£2,415
	High	£2,929

5.4.2 Economic Benefits of On-The-Go DRS

The following key economic (national level) benefits were estimated:

1. Net incremental material revenue to the DMO
2. Greenhouse gas emissions (GHG) reductions
3. Reduction in litter cleaning costs
4. Reduction in disamenity value/cost of litter

5.4.2.1 Material Revenue and Net Material Revenue for the DMO

As with Option 2, the material collected by the DMO and sold to reprocessers for recycling would generate revenue, which would then be used to partly fund the DRS operation. The remainder of the cost would be covered by a contribution from producers (see section 5.3.3.1).

POM and recycling data were taken from Valpak's flow reports and the On-The-Go drinks container reports to establish the following baseline tonnage of recycling. This calculation also uses the consumer survey reported recycling rates from WRAP's OTG report. WRAP judge that this is likely to be an overestimate (due to predicted over-reporting of recycling) however, the original rates have been used to provide a conservative estimation of loss of material revenue to stakeholders.

Table 28 Baseline recycling (tonnes)

Container type	POM	Recycling Rate	Recycled
PET Bottles	118,540	65%	77,051
Steel cans	1,497	59%	883
Aluminium cans	16,723	59%	9,867
Glass bottles	457,312	51%	233,229
Total	**594,072**	**54%**	**321,030**

This baseline level of recycling means that some of the material collected and sold by the DMO would not be additional recycling, but material diverted away from current waste management systems to the DRS[88]. The revenue gained from the sale of this proportion of material is treated as a transfer between stakeholders rather than an incremental benefit of the system. Although the total material revenue received is used to part-fund the DRS, only the revenue from the incremental or additional recycling created by the DRS is treated as a national economic benefit of the system in the IA.

Table 29 OTG DRS recycling (tonnes)

Container type	POM	Return Rate	DRS Recycling	Additional Recycling
PET Bottles	118,540	85%	100,759	+23,708
Steel cans	1,497	85%	1,272	+389
Aluminium cans	16,723	85%	14,215	+4,348

[88] The greater quality in the materials collected by a DRS system in comparison to kerbside recycling is likely to translate into greater certainty that the materials will be recycled, rather than rejected due to contamination issues. This benefit has not been quantified in this Impact Assessment.

Glass bottles	457,312	85%	388,715	+155,486
Total	**594,072**	85%	**504,961**	**+183,931**

As in section 5.3.1.1, the additional recycled tonnages were valued using the average price of the material for 2018[89]:

Table 30 Net material revenue

Container type	Recycled	Material Value (£/tonne)	Material Revenue
PET Bottles	+23,708	£174.02	£4,125,705
Steel cans	+389	£126.41	£49,187
Aluminium cans	+4,348	£1,026.30	£4,462,407
Glass bottles	+155,486	£11.41	£1,774,570
Total	**+183,931**		**£10,411,869**

5.4.2.2 Greenhouse Gas Emission (GHG) Reductions

Greenhouse gas emissions reductions arise from this increase in recycling as a result of the DRS. As above, only the additional tonnages collected by the DRS system will be analysed and monetised as a benefit. This does not include material already being recycled via current collection systems before the introduction of a DRS.

As in section 5.3.1.2, per tonne emissions of closed–loop recycling were used to calculate the emissions for this increased recycling. These were then added to the avoided emissions from primary production and residual waste treatment e.g. landfill, incineration etc. This gave the following CO2e emissions per tonne on a traded and non-traded basis following HMT green book supplementary guidance on greenhouse gas emission appraisal.[90]

Table 31 UK Carbon Emissions (t CO2e)

Material tonne	Recycling vs. Residual (Traded)	Recycling vs. Residual (Non-Traded)
Glass (mixed)	**-0.09**	**-0.01**
Aluminium	**-4.03**	**-2.56**
Steel	**-1.27**	**-0.01**
PET Plastic	**-1.29**	**-0.78**

[89] All material price estimates from letsrecycle.com, WRAP Materials Pricing Reports (http://www.wrap.org.uk/content/materials-pricing-report), or discussion with stakeholders. Material prices are for the price of the full, compacted drinks containers sold to reprocessors for recycling after being sorted by material in DRS Counting Centres.

[90] https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

Table 32 Total GHG emissions savings (t CO2e per year)

Container type	Tonnes	CO2e (t) - Traded	CO2e (t) - Non-traded	CO2e Tonnes
PET Bottles	23,708	-30,685	-18,479	-49,165
Steel cans	389	-495	-4	-498
Aluminium cans	4,348	-17,514	-11,148	-28,662
Glass bottles	155,486	-14,533	-1,021	-15,554
Total	**183,931**	**-63,228**	**-30,652**	**-93,879**

Using Carbon values from 2023 to 2032, we get the following GHG emission savings profile, including traded and non-traded emissions:

Table 33 Total GHG emission savings, £m

		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	Total
GHG emission savings	**Central**	**£4**	**£4**	**£5**	**£5**	**£6**	**£6**	**£7**	**£7**	**£8**	**£9**	**£62**
	Low	£2	£2	£2	£3	£3	£3	£3	£4	£4	£4	£31
	High	£6	£7	£7	£8	£9	£10	£10	£11	£12	£13	£94

5.4.2.3 Reduction in Litter Cleaning Costs

The same methodology used in 5.3.1.3 was used to estimate the direct litter cleaning cost savings in Option 3. Given an 85% return rate, we assume that 85% of OTG DRS-scope material currently in litter will be diverted to the DRS. Litter count and weight were again used instead of volume to calculate the cost savings from reduced litter clean up.

Looking at litter composition in terms of the number of items, it is estimated that approximately 3% would be classified as OTG DRS-scope material, rising to approximately 13% when looking at litter composition in terms of weight[91]. Zero Waste Scotland estimated that Scottish local authorities spend £36m on direct litter costs per year[92] scaling this to the UK on a population basis gave a UK spend on litter to be £438m per annum. Using a count estimate this would mean an estimated £7m spent on litter clean-up of DRS in-scope material and a £25m if using a weight estimate. Due to the disparity of estimates, a central estimate of £16m was taken. The table below illustrates the cost-saving impact of diverting material under the two modelled return rates:

Table 34 Direct costs of litter savings

	Cost of litter (UK)	Cost of DRS-scope litter	Reduction in costs
Count of litter (low estimate)	£438,255,272	£6,832,507	£5,807,631

[91] http://www.keepbritaintidy.org/sites/default/files/resource/National%20Litter%20Survey%20201718.pdf discounted by 60%

[92] https://www.zerowastescotland.org.uk/sites/default/files/Scotland%27s%20Litter%20Problem%20-%20Full%20Final%20Report.pdf

Weight of litter (high estimate)	£438,255,272	£24,822,178	£21,098,851
Central estimate	£438,255,272	£15,827,342	**£13,453,241**

5.4.2.4 Reduction in disamenity value of litter

The same methodology for section 5.3.1.4 was used to estimate disamenity value reduction for Option 3.

It was estimated in Option 2 that 40% of litter was material in scope of the DRS. For Option 3, this has been scaled down by the smaller number of units under scope, providing the estimate that OTG material comprises 13% of total litter. Litter composition studies reveal that more OTG drinks containers are present in litter than larger drinks containers, but due to a lack of definite empirical data, this likely effect has not be taken into account in order to provide a conservative analysis. Using the same corresponding 2:1 reduction in litter disamenity as in Option 2 provides the below disamenity benefits of diverting OTG material away from litter to the DRS:

Table 35 Disamenity of litter

Disamenity of Litter	**85% return rate**
Disamenity of **all** current litter	£5,801,760,000
Litter that is in the scope of the DRS (%)	13%
Disamenity of DRS litter	£754,228,800
Reduction in disamenity of DRS Litter (%)b	42.5%
Reduction in Disamenity value (£)	**£320,547,240**

5.4.2.5 Non-Monetised Benefits

As with Option 2, it is expected that a deposit return scheme would allow for greater quality of material to be collected than via kerbside collection, which will likely translate into greater certainty that the materials will be recycled, rather than rejected due to contamination issues. This has associated environmental benefits with the avoidance of waste going to landfill or incineration sites, as well as providing a stable, high-quality stream of waste materials for secondary reprocessing markets. This has the potential to stimulate greater domestic reprocessing capacity, however the evidence was not available to quantify this benefit for the purpose of this Impact Assessment.

5.4.2.6 Total Economic Benefits of an OTG DRS

The total benefits for this option are set out in Table 33:

Table 36 Total Benefits of Option 3, £m

Benefits		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Net material revenue	**Central**	**£10**	**£10**	**£10**	**£10**	**£10**	**£10**	**£10**	**£10**	**£10**	**£10**
	Low	£10	£10	£10	£10	£10	£10	£10	£10	£10	£10
	High	£11	£11	£11	£11	£11	£11	£11	£11	£11	£11
Reduction of disamenity from litter	**Central**	**£321**	**£321**	**£321**	**£321**	**£321**	**£321**	**£321**	**£321**	**£321**	**£321**
	Low	£305	£305	£305	£305	£305	£305	£305	£305	£305	£305
	High	£337	£337	£337	£337	£337	£337	£337	£337	£337	£337
Greenhouse gas emissions savings	**Central**	**£4**	**£4**	**£5**	**£5**	**£6**	**£6**	**£7**	**£7**	**£8**	**£9**
	Low	£2	£2	£2	£3	£3	£3	£3	£4	£4	£4
	High	£6	£7	£7	£8	£9	£10	£10	£11	£12	£13
Direct costs of litter clean-up savings	**Central**	**£13**	**£13**	**£13**	**£13**	**£13**	**£13**	**£13**	**£13**	**£13**	**£13**
	Low	£6	£6	£6	£6	£6	£6	£6	£6	£6	£6
	High	£21	£21	£21	£21	£21	£21	£21	£21	£21	£21
Total Benefit	**Central**	**£348**	**£349**	**£349**	**£350**	**£350**	**£351**	**£351**	**£352**	**£353**	**£353**
	Low	£322	£322	£323	£323	£323	£323	£324	£324	£324	£325
	High	£375	£375	£376	£377	£378	£378	£379	£380	£381	£382

Discount Total Benefit		
	Central	£2,915
	Low	£2,688
	High	£3,142

5.4.3 Differential impacts on Stakeholders

5.4.3.1 Producers of Drinks Containers

As discussed in section 5.3.2.1, there would be contribution from producers required to cover the costs of the DRS set out above.

The methodology for this option is the same as for Option 2, with the DMO using the material revenue from the sale of collected material for recycling and then charging a fee to producers to cover the remaining costs, based on the packaging they place on the market. The total costs to the DMO are £302m per annum (£466m in year 1).

The material revenue gained is dependent on the amount of material captured by the DRS:

Table 37 Total material revenue for the DMO

Container type	Recycled	Material Value (£/tonne)	Material Revenue
PET Bottles	100,759	£174.02	£17,534,246
Steel cans	1,272	£126.41	£160,803
Aluminium cans	14,215	£1,026.30	£14,588,639
Glass bottles	388,715	£11.41	£4,436,425
Total	**504,961**		**£36,720,112**

The difference between the total costs and total material revenue would be covered by the producer fee:

This is equivalent to approximately 6p per unit in year 1 and 3p per unit from year 2 onwards in both scenarios, based on current POM figures. This would result in all the costs of the operation of the DRS being met from these revenue sources.

Table 38 Producer fee, £m (central estimates)

	Total costs	Total material revenue	Producer fee
Year 1	£466	£37	**£430**
Years 2-10	£302	£37	**£265**

Producers may go on to buy the material recycled via the DRS off the market for use in drinks container production. This cost has not been taken into account as buying material forms part of their costs with or without a DRS. It is also expected that a DRS will generate the availability of a better quality of recycled material.

5.4.3.2 The DMO

As discussed in section 5.3.2.4, it is proposed that the DMO is responsible for running the DRS, covering the economic costs of doing so with the total material revenue from the sale of materials to be recycled and the fee charged to producers. The proposed DRS system in this consultation suggests that the unredeemed deposits, held by the DMO, will be passed to the Government. The consultation will be used to identify the precise nature of how these funds are spend, though it is proposed they will not be used to fund the system. For this consultation stage IA it is assumed it acts as a transfer, which is equivalent to

assuming any unredeemed deposits are spent in a way that is cost neutral to society. In practice, funds could be invested to deliver a net benefit to society.

As in Option 2, if unredeemed deposits were used to contribute towards the running of the system, this would reduce the producer fee discussed in the section above. A 15p deposit and an 85% return rate would generate £167m in unredeemed deposits per year.

Table 39 Unredeemed deposits

Container type	POM (units)	Total deposits	Unredeemed deposits
PET Bottles	4,539,253,466	680,888,020	£102,133,203
Aluminium Cans	57,644,218	8,646,633	£1,296,995
Steel Cans	1,257,005,743	188,550,861	£28,282,629
Glass bottles	1,560,675,400	234,101,310	£35,115,196
Total	**7,414,578,827**	**1,112,186,824**	**£166,828,024**

This would cover 36% of the costs of the scheme in year 1 and reduce the producer fee to £263m, and 55% of costs from years 2-10, reducing the producer fee to £98m per year. The producer fee is equivalent to 4p per unit, falling to 1p per unit from year 2 onwards.

Table 40 Producer fee (with unredeemed deposits), £m (central estimates)

	Total costs	Total material revenue	Unredeemed deposits	Producer fee
Year 1	£466	£37	£167	**£263**
Years 2-10	£302	£37	£167	**£98**

5.4.3.3 Local Authorities and Packaging Producer Responsibility Reform

As discussed in section 5.3.2.2, DRS is proposed as an extension of the proposed packaging producer responsibility reform, under which it is proposed that the costs currently incurred by Local Authorities for dealing with packaging material waste will be covered by packaging producers.

With the introduction of a DRS, it is predicted that OTG drinks containers will be diverted away from the current kerbside collection systems to the DRS. The main benefit of this to the current household collection system would be lower costs of collection, as less material is collected and dealt with via kerbside. These benefits are smaller than in Option 2, as a smaller tonnage of material is removed with an OTG system.

Table 36 shows the difference in the net costs of collection and sorting between the different policies explored in this trio of Impact Assessments. Line 1 shows the annual costs following the introduction of consistency in municipal collection. Line 2 shows the decrease in cost when packaging producer

responsibility reform is introduced, and Line 3 shows the fall in costs described above, due to the material diverted from kerbside collection to the DRS[93].

Table 41 Net collection & sorting costs following the introduction of DRS (Recycling and Residual waste)

	2023	2026	2032	Cost difference between policies (2032)
With Consistency of Municipal Collection	£1,251,359,284	£1,326,548,630	£1,370,638,512	
With Consistency + Packaging Producer Responsibility	£1,236,122,387	£1,310,771,316	£1,354,195,936	-£16,442,576
With Consistency + Producer Responsibility + OTG DRS	£1,200,284,786	£1,269,656,434	£1,315,860,685	-£38,335,251

The main disadvantage to the current household collection system would be the loss of revenue gained from the sale of material for recycling. These losses are smaller than in Option 2, due to the smaller tonnage of material, and the fact that a higher proportion of material is captured by the DRS from current residual/littering rather than kerbside recycling (due to the comparatively lower recycling rates of OTG drinks containers). The same method was applied to establish this, giving an overall loss of £7.9m.

Table 42 Loss of material revenue following the introduction of the DRS

Container type	Baseline recycling rates	Tonnage from recycling	Material price	Lost material revenue
PET Bottles	65%	77,051	£79	£6,087,025
Steel cans	59%	883	£72	£63,572
Aluminium cans	59%	9,867	£72	£710,402
Colour separated glass bottles[94]	51%	233,229	£4.5	£1,044,866
Total		**321,030**		**£7,905,865**

[93] Costings based on analysis from WRAP

[94] The glass material revenue is assumed under colour separated glass. Currently, the majority of glass bottles collected from kerbside are collected by dry comingled recycling, facings on average gate fee costs of £13 per tonne. However, given that the 'Consistent municipal recycling collections in England' and 'Reforming the packaging producer responsibility system in Great Britain' assume the multi-stream dry recycling collections to be in place, we have assumed here that Local Authorities would lose revenue from colour separated glass of £4.5 per tonne.

Of the remaining 15% of DRS-scope material, one can envisage that some of this will still be recycled via kerbside[95].

Local Authorities will gain from the introduction of a DRS due to the reduction in litter cleaning costs, amounting to £13m per year, as discussed in section 5.3.2.2.

The full impacts of this on the kerbside collection system are explored in Scenario 3 of the packaging producer reform impact assessment. It is proposed that producers obligated under the DRS would not be obligated under a packaging EPR for the same packaging items, to avoid being charged twice.

5.4.3.4 Consumers

The same rationale as described for Option 2 applies for Option 3. It is expected that the higher price paid by consumers due to the deposit may have an effect on consumer demand, however once the first deposit is redeemed it is anticipated that consumption levels would revert back to a considerable degree. It is assumed that some consumers will choose not to return their drinks containers (for example, if they prefer to continue using existing household recycling) and would therefore lose the value of their deposit."

5.4.4 Summary of Option 3

The total economic costs of running the OTG DRS are **£466m** in year one, and **£302m** per annum thereafter. This cost is covered by a transfer from producers in the form of producer fees, and the material revenue gained from selling materials to be recycled.

This gives a central total cost estimate, discounted with 2018 as the base year, of **£2,764** over the first ten years of the scheme (assumed to be starting in 2023).

The economic benefits of running a DRS are gained from a number of sources. With an 85% return rate, the net material revenue is estimated at £10m per annum; the reduction in disamenity of litter is estimated at approximately £321m per annum; greenhouse gas emissions savings are estimated to be around £4m in year 1, rising to £9m in year 10; the reduction in the cost of cleaning litter is estimated at approx. £13m per annum.

This gives a central total benefit estimate, discounted with 2018 as the base year, of **£3,012** over the first ten years of the scheme (assumed to be starting in 2023). The gives a central Net Present Value of **£249m.**

[95] For example in instances where people are unable to visit a return point so choose to place the bottles in their recycling bins at home instead. This means that the overall recycling rates for DRS-scope materials are likely to be higher than the DRS capture rate.

6 Direct Costs and Benefits to Business

Calculations

6.1 Summary of NPV, Business NPV, EANDCB and BIT score for each option

The costs of running the DRS count as direct costs to business, as they will be covered by the Producer Fee. The material revenue gained by the DMO through the onward sale of material counts as an indirect benefit to business, by reducing the producer fee they pay. We therefore expect the producer fee to vary according to secondary material markets, with strong markets and high prices reducing the fee to be paid by producers. This is to be paid by drinks container producers, based on the material they place on the market.

Producers will also be affected via the costs they pay via packaging producer responsibility reform. The impact that the introduction of a DRS scheme will have on these costs is covered in Option 2 of this related impact assessment.

Table 43 Summary of NPV, BCR[96]

	Option 2 – 'All In'	Option 3 – 'On the Go'
NPV	£2,189m	£249m
BCR	1.3	0.9
Business NPV	-£5,722	-£2,445m
EANDCB	£665m	£284m
BIT Score	3,324	1,420

6.2 Small and Micro Business assessment

The DMO will optimise it's placements of RVM machines at the most economical locations therefore small and micro business that are unlikely to face the number of returns per day to make a RVM machine economically viable will instead collect manually. This will be a less intensive process and would be a cheaper opportunity cost to businesses. Retailers regardless of their size will be fully compensated for labour, time and space costs of collecting containers as outlined in previous sections on RVM and manual handling costs. Therefore the collection of containers would be a net neutral endeavour for small and micro business. Furthermore, there is the possibility of increased footfall as once consumer return containers they are likely to purchase new drinks. Evidence from Norway initially showed shopkeepers were hesitant to accept RVM machines placed in stores or take back drinks but once the handling fee reimbursements came in they were very happy to place even full sized RVMs in their stores as they could optimise their collections to achieve costs below the average handling fee netting such business a small profit.

[96] All figures shown in 2016 prices, with 2017 base year

6.3 Sensitivity Analysis

There are a number of risks and sensitives associated with this analysis, including areas where the data are uncertain and would benefit from further evidence. For transparency, the key areas that would benefit from further evidence have been listed below, and a number of questions have been asked in the accompanying consultation document and the UK Government is commissioning further research in order to establish a better evidence base in this area.

6.3.1 Key Evidence Gaps and Assumptions

- The scale and patterns of disamenity effects arising from the dispersion of litter
- The linearity of reductions in litter disamenity in accordance with reductions in litter
- The proportion of litter that comprises specifically 'on-the-go' type drinks containers (i.e. single format and less than 750ml)
- The UK total spend on litter clear-up by Local Authorities
- Evidence of retail transport costs, and the scale of efficiencies obtainable through backhauling
- The relationship between the number of counting centres required and the amount of material processed (i.e. how this would change in proportion to an 'on-the-go' system)
- The way in which a producer fee would be likely to be distributed across producers of different sizes
- Consumer behaviour responses to a DRS

In addition, sensitivity analysis has been undertaken to assess the impact of achieving a lower than 85% return rate in the two DRS scenarios.

6.3.2 Sensitivity Analysis: 'All-In' DRS with 70% Return Rate (RR)

For the 'All-In' Option 2 scenario, a significantly lower return rate of 70% would still generate a positive NPV and economic benefits. This is despite the fact that the return rate is approximately the same as the baseline recycling rate, which means that minimal material revenue or greenhouse gas emissions benefits are generated. The benefits are driven by the reduction in litter, based on the assumption that, even at a lower participation rate, a DRS would still disincentivise littering. This takes into account the fact that other people may choose to collect and return litter to receive the deposit, even if the original owner did not.

Below 70%, the recycling rate would start to fall below the baseline recycling rate for these materials. This is not presented here because a poorly performing DRS would be more likely due to consumers preferring to continue with existing behaviours than because recycling is actively discouraged. With a 70% return rate, the reduction in litter disamenity would need to fall from the predicted 35% to 33% for the NPV of an all-in DRS to be negative.

6.3.2.1 Economic Costs

Most of the economic costs of the DRS are predicated to remain constant with a lower return rate, due to the fact that they require a fixed investment regardless of how much material passes through the system. However, logistics costs are likely to go down, due to the smaller amount of material needing to be transported. This is unlikely to be exactly in proportion with the amount of material collected, due to fixed costs such as pre-set collections and transport vehicles travelling with an empty load. To approximate this effect and provide a conservative estimate of cost savings, the transport costs have been scaled down with a 2:1 relationship for the purpose of this sensitivity analysis.

Table 44 Total Costs with 70% RR

One-off costs		Year 1	Year 2 to 10
Organisational Setup	**Central**	**146**	**0**
	Low	139	
	High	153	
Change in labelling	**Central**	**58**	0
	Low	55	
	High	61	

Costs		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
RVM Costs	**Central**	**428**	**428**	**428**	**428**	**428**	**428**	**428**	**428**	**428**	**428**
	Low	449	449	449	449	449	449	449	449	449	449
	High	407	407	407	407	407	407	407	407	407	407
Manual Handling Costs	**Central**	**67**	**67**	**67**	**67**	**67**	**67**	**67**	**67**	**67**	**67**
	Low	63	63	63	63	63	63	63	63	63	63
	High	70	70	70	70	70	70	70	70	70	70
Transport /Logistics	**Central**	**221**	**221**	**221**	**221**	**221**	**221**	**221**	**221**	**221**	**221**
	Low	212	212	212	212	212	212	212	212	212	212
	High	230	230	230	230	230	230	230	230	230	230
Counting Centres costs	**Central**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**
	Low	45	45	45	45	45	45	45	45	45	45
	High	63	63	63	63	63	63	63	63	63	63
Central Administration Costs	**Central**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
	Low	28	28	28	28	28	28	28	28	28	28
	High	31	31	31	31	31	31	31	31	31	31
Total Cost	**Central**	**1,004**	**799**	**799**	**799**	**799**	**799**	**799**	**799**	**799**	**799**
	Low	992	797	797	797	797	797	797	797	797	797
	High	1,016	801	801	801	801	801	801	801	801	801

Discounted Total Cost[97]		
	Central	**£6,844**
	Low	£6,819
	High	£6,869

[97] Please note that this has been discounted using the standard 3.5% discount rate. The NPV on the summary sheet uses the EANCB calculator with 2016 base year prices.

6.3.2.2 Economic Benefits

The amount of material captured by the DRS, including the additional recycling above the baseline, is illustrated below. Although the DRS capture rate is equivalent to the baseline recycling rate for PET and glass bottles, in reality it is likely that a low DRS capture would be due to poor participation in the scheme, rather than people rejecting recycling altogether. Therefore, even with a 70% return rate it is likely that this would represent a higher overall recycling rate for these materials due to some material still being recycled via kerbside.

Table 45 DRS recycling (tonnes)

Container type	POM	Recycling Rate	DRS Recycling	Additional Recycling
PET Bottles	317,427	70%	222,199	0
Steel cans	34,760	70%	24,332	+1,738
Aluminium cans	119,421	70%	83,595	+5,971
Glass bottles	1,835,931	70%	1,285,151	0
Total	**2,307,538**	70%	**1,615,277**	**+7,709**

This would generate the following benefits, using the same methodology described for Option 2 above:

Table 46 Total Benefits with 70% RR

Benefits		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Net material revenue	**Central**	**£6.3**	**£6.3**	**£6.3**	**£6.3**	**£6.3**	**£6.3**	**£6.3**	**£6.3**	**£6.3**	**£6.3**
	Low	£6.0	**£6.0**	**£6.0**	**£6.0**	**£6.0**	**£6.0**	**£6.0**	**£6.0**	**£6.0**	**£6.0**
	High	£6.7	**£6.7**	**£6.7**	**£6.7**	**£6.7**	**£6.7**	**£6.7**	**£6.7**	**£6.7**	**£6.7**
Reduction of disamenity from litter	**Central**	**£812**	**£812**	**£812**	**£812**	**£812**	**£812**	**£812**	**£812**	**£812**	**£812**
	Low	£772	£772	£772	£772	£772	£772	£772	£772	£772	£772
	High	£853	£853	£853	£853	£853	£853	£853	£853	£853	£853
GHG emissions savings	**Central**	**£2**	**£2**	**£2**	**£2**	**£3**	**£3**	**£3**	**£3**	**£4**	**£4**
	Low	£1	£1	£1	£1	£1	£1	£2	£2	£2	£2
	High	£3	£3	£3	£4	£4	£4	£5	£5	£5	£6
Direct costs of litter clean-up savings	**Central**	**£41**	**£41**	**£41**	**£41**	**£41**	**£41**	**£41**	**£41**	**£41**	**£41**
	Low	£15	£15	£15	£15	£15	£15	£15	£15	£15	£15
	High	£67	£67	£67	£67	£67	£67	£67	£67	£67	£67
Total Benefit	**Central**	**£862**	**£862**	**£862**	**£862**	**£863**	**£863**	**£863**	**£863**	**£864**	**£864**
	Low	£794	£794	£794	£794	£794	£794	£795	£795	£795	£795
	High	£930	£930	£930	£931	£931	£931	£932	£932	£932	£933

Discount Total Benefit		
	Central	**£7,175**
	Low	£6,606
	High	£7,744

6.3.2.3 Producer Fee

Although costs would be slightly lower, producers would be required to fund a higher proportion of the DRS due to the reduction in material revenue:

Table 47 Producer fee, £m (central estimates)

	Total Costs	Total Material Revenue	Producer Fee
Year 1	£1,004	£142	**£861**
Years 2-10 (annual)	£799	£142	**£657**

6.3.2.4 Summary

A 70% return rate gives a central total cost estimate, discounted with 2018 as the base year, of **£7,082m** over the first ten years of the scheme (assumed to be starting in 2023). There is a central total benefit (discounted with 2018 as the base year, and assumed to be starting in 2023) of **£7,420m.**

This gives a Net Present Value (NPV) of **£339m.**

6.3.3 Sensitivity Analysis: 'On-the-Go' DRS with a 77% Return Rate (RR)

For an OTG DRS, the costs are proportionally higher due to diseconomies of scale (for example, the same set-up costs are required for an 'all-in' DRS), which means that the scheme becomes uneconomical at a lower return rate. Below a return rate of 77%, the NPV of this scheme would become negative.

6.3.3.1 Economic Costs

Table 48 Total Costs with 77% RR

One-off costs		Year 1	Year 2 to 10
Organisational Setup	**Central**	**146**	**0**
	Low	139	
	High	153	
Change in labelling	**Central**	**18**	0
	Low	17	
	High	19	

Costs		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
RVM Costs	**Central**	**150**	**150**	**150**	**150**	**150**	**150**	**150**	**150**	**150**	**150**
	Low	131	131	131	131	131	131	131	131	131	131
	High	170	170	170	170	170	170	170	170	170	170
Manual Handling Costs	**Central**	**47**	**47**	**47**	**47**	**47**	**47**	**47**	**47**	**47**	**47**
	Low	45	45	45	45	45	45	45	45	45	45
	High	50	50	50	50	50	50	50	50	50	50
Transport /Logistics	**Central**	**57**	**57**	**57**	**57**	**57**	**57**	**57**	**57**	**57**	**57**
	Low	55	55	55	55	55	55	55	55	55	55
	High	59	59	59	59	59	59	59	59	59	59
Counting Centres costs	**Central**	**17**	**17**	**17**	**17**	**17**	**17**	**17**	**17**	**17**	**17**
	Low	14	14	14	14	14	14	14	14	14	14
	High	20	20	20	20	20	20	20	20	20	20
Central Administration Costs	**Central**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
	Low	28	28	28	28	28	28	28	28	28	28
	High	31	31	31	31	31	31	31	31	31	31
Total Cost	**Central**	**£465**	**£301**	**£301**	**£301**	**£301**	**£301**	**£301**	**£301**	**£301**	**£301**
	Low	£429	£273	£273	£273	£273	£273	£273	£273	£273	£273
	High	£502	£329	£329	£329	£329	£329	£329	£329	£329	£329
		Central		**£2,661**							

Discounted Total Cost[98]	Low	£2,418
	High	£2,905

6.3.3.2 Economic Benefits

The amount of material captured by the DRS, including the additional recycling above the baseline, is illustrated below:

Table 49 DRS recycling (tonnes)

Container type	POM	Recycling Rate	DRS Recycling	Additional Recycling
PET Bottles	118,540	77%	91,276	+14,225
Steel cans	1,497	77%	1,152	+269
Aluminium cans	16,723	77%	12,877	+3,010
Glass bottles	457,312	77%	352,130	+118,901
Total	**594,072**	77%	**457,435**	**136,406**

This would generate the following benefits:

Table 50 Total Benefits with 77% RR

Benefits		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Net material revenue	**Central**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**
	Low	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
	High	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3
Reduction of disamenity from litter	**Central**	**290**	**290**	**290**	**290**	**290**	**290**	**290**	**290**	**290**	**290**
	Low	276	276	276	276	276	276	276	276	276	276
	High	305	305	305	305	305	305	305	305	305	305
GHG emissions savings	**Central**	**3**	**3**	**3**	**4**	**4**	**4**	**5**	**5**	**5**	**6**
	Low	1	1	2	2	2	2	2	2	3	3
	High	4	4	5	5	6	6	7	7	8	9
Direct costs of litter clean-up savings	**Central**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**
	Low	5	5	5	5	5	5	5	5	5	5
	High	19	19	19	19	19	19	19	19	19	19
	Central	**312**	**312**	**312**	**312**	**312**	**312**	**312**	**312**	**312**	**312**

[98] Please note that this has been discounted using the standard 3.5% discount rate. The NPV on the summary sheet uses the EANCB calculator with 2016 base year prices.

Total Benefit	Low	289	289	289	289	289	289	289	289	289	289
	High	335	335	335	335	335	335	335	335	335	335

Discount Total Benefit	**Central**	2,607
	Low	2,409
	High	2,805

6.3.3.3 Producer Fee

Table 51 Producer fee, £m (central estimates)

	Total Costs	Total Material Revenue	Producer Fee
Year 1	£465	£33	**£432**
Years 2-10 (annual)	£301	£33	**£268**

6.3.3.4 Summary

A 77% return rate gives a central total cost estimate, discounted with 2018 as the base year, of **£2,755m** over the first ten years of the scheme (assumed to be starting in 2023). There is a central total benefit (discounted with 2018 as the base year, and assumed to be starting in 2023) of **£2,695m.**

This gives a Net Present Value (NPV) of **-£60m.**

6.4 Annex 1: Abridged Comparison for Wales

A basic analysis has been undertaken to isolate the potential costs and benefits of introducing a DRS to Wales. This has been based on a simplified scaling down of the foregoing economic analysis by population size, and is intended as an indicative cost/benefit analysis only. This analysis assumes a 15p deposit, and an 85% return rate.

There are limitations to this approach due to potential inconsistencies between Wales and the rest of the UK. For example, the levels and patterns of recycling carried out by local authorities in Wales and the rest of the UK may well be quite different. Also, Wales has a higher number of convenience stores per head than any other part of the UK[99]. This has been accounted for in the cost calculations below, but there may be other similar discrepancies that have not be considered. Hence the following figures should be taken as purely preliminary framework numbers, which can be expanded and adjusted in due course.

This would give the following NPVs, with 2018 as the base year and assumed to start in 2023:

All-In: **£48.3m**

On-the-go: **£1.6m**

Table 52 UK population[100]

Region	Population	%
UK	66,040,200	100%
England	55,619,400	84%
Wales	3,125,200	5%
Scotland	5,424,800	8%
Northern Ireland	1,870,800	3%

Table 53 Total costs of an All-In Deposit Return Scheme in Wales, £m

One-off costs		Year 1	Year 2 to 10
Organisational Setup	**Central**	**£6.9**	**0**
	Low	£6.6	
	High	£7.3	
Change in labelling	**Central**	**£2.9**	0
	Low	£2.8	
	High	£3.1	

Costs		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
RVM Costs	**Central**	**£21**	**£21**	**£21**	**£21**	**£21**	**£21**	**£21**	**£21**	**£21**	**£21**
	Low	£22	£22	£22	£22	£22	£22	£22	£22	£22	£22
	High	£19	£19	£19	£19	£19	£19	£19	£19	£19	£19
Manual Handling Costs	**Central**	**£6**	**£6**	**£6**	**£6**	**£6**	**£6**	**£6**	**£6**	**£6**	**£6**
	Low	£5	£5	£5	£5	£5	£5	£5	£5	£5	£5
	High	£6	£6	£6	£6	£6	£6	£6	£6	£6	£6

[99] 'The Welsh Local Shop Report 2018' https://www.acs.org.uk/sites/default/files/welsh_local_shop_report_2018.pdf

[100] Based on 'Population Estimates for UK, England and Wales, Scotland and Northern Ireland: Mid-2017', Office of National Statistics

Logistics/Transport	**Central**	**£10**	**£10**	**£10**	**£10**	**£10**	**£10**	**£10**	**£10**	**£10**	**£10**
	Low	£9	£9	£9	£9	£9	£9	£9	£9	£9	£9
	High	£10	£10	£10	£10	£10	£10	£10	£10	£10	£10
Counting Centres costs	**Central**	**£8**	**£8**	**£8**	**£8**	**£8**	**£8**	**£8**	**£8**	**£8**	**£8**
	Low	£13	£13	£13	£13	£13	£13	£13	£13	£13	£13
	High	£3	£3	£3	£3	£3	£3	£3	£3	£3	£3
Central Administration Costs	**Central**	**£1**	**£1**	**£1**	**£1**	**£1**	**£1**	**£1**	**£1**	**£1**	**£1**
	Low	£1	£1	£1	£1	£1	£1	£1	£1	£1	£1
	High	£2	£2	£2	£2	£2	£2	£2	£2	£2	£2
Total Cost	**Central**	**£55**	**£46**	**£46**	**£46**	**£46**	**£46**	**£46**	**£46**	**£46**	**£46**
	Low	£61	£51	£51	£51	£51	£51	£51	£51	£51	£51
	High	£50	£40	£40	£40	£40	£40	£40	£40	£40	£40

Discount Total Cost	**Central**	**389**
	Low	435
	High	342

Table 54 Total benefits of an All-In DRS in Wales, £m

Benefits		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Net material revenue	**Central**	**£1.8**	**£1.8**	**£1.8**	**£1.8**	**£1.8**	**£1.8**	**£1.8**	**£1.8**	**£1.8**	**£1.8**
	Low	£1.7	£1.7	£1.7	£1.7	£1.7	£1.7	£1.7	£1.7	£1.7	£1.7
	High	£1.9	£1.9	£1.9	£1.9	£1.9	£1.9	£1.9	£1.9	£1.9	£1.9
Reduction of disamenity from litter	**Central**	**£49**	**£49**	**£49**	**£49**	**£49**	**£49**	**£49**	**£49**	**£49**	**£49**
	Low	£47	£47	£47	£47	£47	£47	£47	£47	£47	£47
	High	£52	£52	£52	£52	£52	£52	£52	£52	£52	£52
Greenhouse gas emissions savings	**Central**	**£.6**	**£.7**	**£.8**	**£.8**	**£.9**	**£1.0**	**£1.1**	**£1.2**	**£1.3**	**£1.4**
	Low	£.3	£.3	£.4	£.4	£.5	£.5	£.5	£.6	£.6	£.7
	High	£.9	£1.1	£1.2	£1.3	£1.4	£1.5	£1.6	£1.7	£1.9	£2.1
Direct costs of litter clean-up savings	**Central**	**£1**	**£1**	**£1**	**£1**	**£1**	**£1**	**£1**	**£1**	**£1**	**£1**
	Low	£.4	£.4	£.4	£.4	£.4	£.4	£.4	£.4	£.4	£.4
	High	£1.7	£1.7	£1.7	£1.7	£1.7	£1.7	£1.7	£1.7	£1.7	£1.7
Total Benefit	**Central**	**£53**	**£53**	**£53**	**£53**	**£53**	**£53**	**£53**	**£53**	**£53**	**£53**
	Low	£49	£49	£49	£49	£49	£49	£49	£49	£49	£49

	High	£56	£56	£56	£56	£57	£57	£57	£57	£57	£57

Discount Total Benefit	**Central**	£440
	Low	£410
	High	£471

Table 55 Total costs of an On-The-Go DRS in Wales, £m

One-off costs		**Year 1**	**Year 2 to 10**
Organisational Setup	**Central**	**£6.9**	**0**
	Low	£6.6	
	High	£7.3	
Change in labelling	**Central**	**£.9**	0
	Low	£.9	
	High	£1.0	

Costs		**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
RVM Costs	**Central**	**£7**	**£7**	**£7**	**£7**	**£7**	**£7**	**£7**	**£7**	**£7**	**£7**
	Low	£6	£6	£6	£6	£6	£6	£6	£6	£6	£6
	High	£8	£8	£8	£8	£8	£8	£8	£8	£8	£8
Manual Handling Costs	**Central**	**£3**	**£3**	**£3**	**£3**	**£3**	**£3**	**£3**	**£3**	**£3**	**£3**
	Low	£3	£3	£3	£3	£3	£3	£3	£3	£3	£3
	High	£4	£4	£4	£4	£4	£4	£4	£4	£4	£4
Transport/Logistics	**Central**	**£1**	**£1**	**£1**	**£1**	**£1**	**£1**	**£1**	**£1**	**£1**	**£1**
	Low	£2	£2	£2	£2	£2	£2	£2	£2	£2	£2
	High	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
Counting Centres costs	**Central**	**£3**	**£3**	**£3**	**£3**	**£3**	**£3**	**£3**	**£3**	**£3**	**£3**
	Low	£4	£4	£4	£4	£4	£4	£4	£4	£4	£4
	High	£1	£1	£1	£1	£1	£1	£1	£1	£1	£1
Central Administration Costs	**Central**	**£1**	**£1**	**£1**	**£1**	**£1**	**£1**	**£1**	**£1**	**£1**	**£1**
	Low	£1	£1	£1	£1	£1	£1	£1	£1	£1	£1
	High	£2	£2	£2	£2	£2	£2	£2	£2	£2	£2
Total Cost	**Central**	**£24**	**£16**	**£16**	**£16**	**£16**	**£16**	**£16**	**£16**	**£16**	**£16**
	Low	£25	£17	£17	£17	£17	£17	£17	£17	£17	£17
	High	£23	£15	£15	£15	£15	£15	£15	£15	£15	£15

Discount Total Cost	**Central**	**139**
	Low	149

	High	129

Table 56 Total benefits of an On-The-Go DRS in Wales, £m

Benefits		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Net material revenue	**Central**	**£.5**	**£.5**	**£.5**	**£.5**	**£.5**	**£.5**	**£.5**	**£.5**	**£.5**	**£.5**
	Low	£.5	£.5	£.5	£.5	£.5	£.5	£.5	£.5	£.5	£.5
	High	£.5	£.5	£.5	£.5	£.5	£.5	£.5	£.5	£.5	£.5
Reduction of disamenity from litter	**Central**	**£16**	**£16**	**£16**	**£16**	**£16**	**£16**	**£16**	**£16**	**£16**	**£16**
	Low	£15	£15	£15	£15	£15	£15	£15	£15	£15	£15
	High	£17	£17	£17	£17	£17	£17	£17	£17	£17	£17
Greenhouse gas emissions savings	**Central**	**£.2**	**£.2**	**£.2**	**£.3**	**£.3**	**£.3**	**£.3**	**£.4**	**£.4**	**£.4**
	Low	£.1	£.1	£.1	£.1	£.1	£.2	£.2	£.2	£.2	£.2
	High	£.3	£.3	£.4	£.4	£.4	£.5	£.5	£.6	£.6	£.7
Direct costs of litter clean-up savings	**Central**	**£.3**	**£.3**	**£.3**	**£.3**	**£.3**	**£.3**	**£.3**	**£.3**	**£.3**	**£.3**
	Low	£.1	£.1	£.1	£.1	£.1	£.1	£.1	£.1	£.1	£.1
	High	£.4	£.4	£.4	£.4	£.4	£.4	£.4	£.4	£.4	£.4
Total Benefit	**Central**	**£17**	**£17**	**£17**	**£17**	**£17**	**£17**	**£17**	**£17**	**£17**	**£17**
	Low	£16	£16	£16	£16	£16	£16	£16	£16	£16	£16
	High	£18	£18	£18	£18	£18	£18	£18	£18	£18	£18

Discount Total Benefit		
	Central	£142
	Low	£133
	High	£151