

REPORT ON THE PROPOSED DEPOSIT AND RETURN SYSTEM FOR BEVERAGE CONTAINERS IN IRELAND

Prepared for:

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Executive Summary

Introduction and Overview

This report has been prepared for Repak by Dr. Pat McCloughan, Managing Director of PMCA Economic Consulting, in association with Gill Bevington, an independent consultant in recycling policy and compliance based in the UK. It considers the need for, and implications of, the beverage container deposit system in Ireland as proposed in The Waste Reduction Bill 2017, under consideration in the Oireachtas. The Bill is being sponsored by the Green Party together with the Labour Party. The sponsors have not indicated the scope of the deposit, but it is understood that its focus is on drinks bottles (glass and plastic) and cans, and the proposal's sponsors see it as a way to reduce waste, increase recycling and lower litter.

The report updates and extends a previous report prepared for Repak in 2008, authored by Gill Bevington who at that time was based at Perchards consultancy in the UK. That report concluded that a deposit system for non-refillable beverage containers would not be the optimal solution for Ireland. This was because of factors including that kerbside collection was already available to many Irish households and that the environmental benefits from a deposit were marginal, particularly considering the cost of establishing and running such a system.

This new report considers updated information from countries with a deposit system and reviews relevant research studies carried out since 2008. It also contains the results of quantitative analysis to assess whether a deposit is warranted in the first place – is there a market failure to be addressed by such a system?

Ireland has achieved a very strong performance in packaging recycling over the years and today ranks in the upper echelons of EU countries in this regard. The overall recycling rate for all packaging waste materials increased from 54.5% in 2006 to 67.5% in 2015. In the early years following the introduction of Ireland's packaging waste compliance scheme in 1997, which saw the establishment of Repak, the growth in the country's packaging recycling was driven primarily through Repak's members in the commercial sector. While commercial members continue to be fundamentally important today, recent years have also seen strong growth in packaging waste recycling by households, also funded by Repak.

Household recycling increased by 7.4% between 2013 and 2016 and the average cost per tonne of packaging materials recycled in this sector fell by 13% over the period. About half of all households now have access to kerbside collection of mixed dry recyclables (bins or bags). Kerbside's share of household packaging waste recycled (compared with through bring arrangements) has also increased, from 60% in 2013 to 63% in 2016. The EPA expects that Ireland will achieve the target, set in the EU Waste Framework Directive 2008, to recycle or prepare for reuse 50% of paper, metal, glass and plastic household waste by 2020. As the tonnage handled increases, the cost per tonne will also decrease. A deposit system would adversely affect the scale economies from which Ireland's packaging recycling infrastructure now benefits because the new system would compete with the existing arrangements.

The extent of litter in Ireland has decreased, where our analysis of the official independent data shows that the country has made the transition from being 'moderately polluted' during 2002-2005 to being 'slightly polluted' since 2006 through to the latest year (2016), with the extent of improvement in litter reduction increasing over that period of time. The improvement in Ireland's litter prevention and control reflects the various policy and voluntary initiatives over the years, which in turn reflect the importance of litter prevention and control to the performance of the national economy.

The quantitative analysis also reveals that beverage containers (including beverage cans for both alcoholic and non-alcoholic drinks plus beverage bottles for these drinks but excluding drinks cartons, which tend not to be included in deposit schemes) had a share of just 3% of all litter pieces in Ireland in 2016. When drinks cartons are included (for completeness), the share of beverage containers of all litter items is slightly higher (3.5% in 2016) but in both instances (i.e. including and excluding drinks cartons) the share of all litter due to beverage containers in Ireland has decreased over time, meaning that litter due to beverage container items has lessened through the years.

The downward trend in the share of all litter due to beverage containers since 2002, and since 2008, when the Perchards report for Repak was published, is a particularly important finding of this study because, according to the OECD, the only justification for introducing a beverage container deposit system in a country with an already-established infrastructure for beverage container and other packaging materials recycling (in the household and commercial sectors) is to control or reduce litter. The evidence presented in this report indicates clearly that there is no significant litter problem due to beverage containers that cannot be addressed by the existing packaging waste compliance system and improvements therein.

In addition to the quantitative evidence, we also consider relevant research and the experiences of other European countries with deposit systems.

Two major reviews of waste policy commissioned by the Irish government, one in 2009 and the other in 2014, came out against introducing a deposit. Both reviews concluded that the projected costs of a establishing and operating a deposit system were too high relative to the anticipated benefits.

Only one EU country, Lithuania, has introduced a mandatory deposit system for beverage containers in recent years, although several countries have considered doing so. None has introduced a deposit, including Austria, Belgium, France, Spain and the UK. They all have producer responsibility initiatives for packaging similar to those in Ireland. One US state (Delaware) has repealed its deposit legislation.

Overall, the empirical evidence and reviews considered in this report lead to the conclusion that there is no rationale or justification for introducing a deposit system in Ireland and that the costs involved would be significant, including the effects on Ireland's existing packaging waste compliance infrastructure.

Review of International Studies on Beverage Container Deposit Systems

Our review of international studies, including one commissioned by the European Commission and one written by OECD, did not provide any evidence that would support the introduction of a deposit in Ireland.

The 2011 study by Rademaekers *et al.* for the European Commission that considered the Danish and German deposit systems in particular concluded that, although these systems had been successful in achieving high return rates for drinks containers, they have been very expensive. The report also pointed out that Germany was already achieving good recycling rates for packaging waste in 1988, before the mandatory deposit was introduced. Both countries had *voluntary* systems for refillable drinks containers in place when the *mandatory* deposit took effect (in 2003) so there was already “*a good base of consumer acceptance and established behaviour to build from*”.

A 2004 study by OECD on waste management argued that “*mandatory deposits are an expensive anti-litter program when there is no recycling, and mandatory deposits become more expensive when and where there is kerbside recycling*”. The same report also considered that a mandatory deposit is a very “*indirect and second-best way of encouraging recycling*”, because “*it initiates a new, separate and high-cost collection system – instead of utilising the already-installed, cheaper kerbside collection system.*”

Based on the above conclusion, the OECD went on to argue that, where recycling infrastructure has become widespread, the only justification for introducing a mandatory deposit on beverage containers is to tackle beverage container litter.

Quantitative Analysis to Justify a Deposit

The rationale for introducing a deposit system in countries such as Ireland with an established packaging recycling system is litter abatement and enhanced recycling. The empirical evidence in our report makes clear that a deposit would not be justified in Ireland for either reason:

- *The incidence of beverage containers in litter is very low (only around 3-3.5%) and the proportion of beverage containers in total items littered has decreased since the data were first compiled, in 2002. Cigarette-related items and chewing gum represent a far higher proportion of litter than beverage containers. Thus, even if a deposit significantly reduced the number of beverage containers littered, its effect on total litter could be no more than minimal.*
- *A deposit would not significantly increase recycling rates for packaging. Recycling rates in European countries with a deposit system in place are not statistically significantly higher than countries, such as Ireland, that do not have a deposit. Of the 31 countries in the European Economic Area, only nine (9) have a mandatory deposit system for non-refillable drinks containers, namely Croatia, Denmark, Estonia, Finland, Germany, Iceland, Lithuania, Norway and Sweden. The Netherlands has a deposit only on large plastic bottles (over 0.5 litres), not on cans, small PET or glass. The two countries with the highest recycling rates for all packaging waste in 2014 were Belgium and the Czech Republic, neither of which has a deposit system. Both countries are meeting the recycling targets for packaging waste through systems that are very similar to Repak. Germany is in third place, where a mandatory deposit does operate. As our review of international studies points out, Germany was already achieving high recycling rates in 1998 before the mandatory deposit took effect in 2003. Only four of the 10 countries with the highest recycling rates (or four if Netherlands' partial deposit is included) have a deposit.*

International Review of Deposit Systems

The report reviews mandatory deposit systems in several European countries which provide possible models for Ireland. It also briefly reviews the deposits in place in some US states, which are relatively simple systems and could provide an alternative approach for the State to consider. This part of the report identifies the following 'success' factors for a deposit for non-refillables, but none applies in Ireland:

- *Most mandatory deposits were introduced when refillables were still common in the retail trade. Refillables have long disappeared from the retail trade in Ireland, so consumers have lost the habit of returning their 'empties' to the store and retailers have no facilities to accept them.*
- *Most mandatory deposits were introduced before the kerbside collection of recyclables was commonplace and before the introduction of producer responsibility for packaging. Kerbside collection is already established and growing in Ireland, so many consumers have become used to the convenience of a kerbside bin or bag. They may consider it a retrograde step if they now have to take their containers back to a grocery store or depot.*
- *Deposit systems need the support of industry to be successful, because individual businesses need to make significant investment in infrastructure (return facilities etc.) and adjusting production. While Scandinavian businesses saw the mandatory deposit on non-refillables as an extension of their existing refill arrangements, German business opposed the deposit and made imaginative use of a loophole in the law to reduce their costs. Irish business would also have to make significant investments to implement the deposit.*

- *Cross-border shopping can have a significant effect on deposit arrangements.* Differences in retail prices and excise duties between neighbouring countries (as in Northern Ireland and Ireland) make drinks a popular cross-border purchase, so deposit containers are not always disposed of where they were purchased. It would be essential for containers sold in Ireland to be marked differently from those sold in NI to prevent a deposit being claimed in the Republic on containers bought in the North.

The Market Context for a Deposit in Ireland

Based on the international review of deposit systems, the report considers the issues and challenges that Ireland would encounter in designing a mandatory deposit. A successful deposit arrangement (i.e. one that achieves a good return rate at reasonable cost) would have to be carefully designed around Irish market conditions. This means that it would not be possible simply to copy deposit arrangements from another country.

The structure of the drinks market is significant because the deposit must be charged by each producer or importer to his customers, through all stages of distribution to the final consumer. Thus, the greater the number of market operators, the more complex and expensive it is to operate a deposit, and the harder it is for the authorities to enforce.

To guide the design of an Irish deposit, the Irish authorities should first undertake a thorough analysis of the *supply context* – production and import of drinks, including the size of the market, by container type and drinks category, the number/size of producers and importers, the significance of imports (EU implications), the extent of integrated arrangements on both sides of the NI/RoI border, and an estimate of cross-border purchases with NI.

It should also analyse *grocery retailing* – the number and size of grocery retailers. Small independent retailers would not have the financial or management resources to operate a deposit correctly and would not have space to provide adequate return facilities and to store returned containers.

Options Requiring Consideration by the Authorities in Ireland

Irish legislators could not enact a simple regulation saying that a deposit must be charged on certain drinks containers. Experience in Germany, where market chaos followed the imposition of a mandatory deposit, shows how important it is to consider carefully how a deposit system will operate and to design corresponding legal obligations. The aspects that need to be considered include:

The scope of the deposit, which must:

- Be clear to consumers and retailers – if the scope is confusing, the deposit is unlikely to achieve good return rates.
- Avoid competitive distortions between different pack types and drinks. Consumers may choose a non-deposit alternative because the deposit makes deposit drinks look more expensive and producers may change pack types or reformulate drinks to avoid the deposit.

Container types – cans and PET bottles are the most likely to be in a deposit. But what about drinks cartons (incompatible with most return vending machines) and non-refillable glass too?

Drinks categories – beer, waters and carbonated soft drinks are likely to be in a deposit system. But what about still soft drinks, milk/juice and milk and fruit based drinks? Wines are spirits are rarely deposit bearing in Europe but what about ‘alco-pops’?

Sales channels – all drinks sold through retailers would be deposit bearing. But what about pubs and restaurants? Drinks are usually for on-premise consumption but pubs can also sell drinks for consumption off-premise and could undercut grocery stores.

The level of the deposit – the deposit needs to be high enough to yield a high return rate, but a high deposit requires careful management: would Irish consumers used to the convenience of kerbside collection bother to return containers if the deposit was only 5 or 10 eurocent? But a higher deposit of, say, 20-25 eurocent provides a greater incentive to fraudulent redemption so deposit containers must be stored securely. A higher deposit makes a clearing arrangement essential to avoid individual operators gaining or losing from imbalances between the deposits charged and refunded. But at the same time a high deposit makes drinks look more expensive, so could encourage cross-border shopping in NI.

The management system – whether a ‘simple’ deposit or a centrally managed system:

- A ‘simple’ deposit, without a clearing arrangement, avoids the cost of a system operator and is common in the US. But, despite the low deposit, US retailers are permitted to refuse containers of brands that they do not stock so it is harder for consumers to return containers.
- A centrally managed system, in which deposits are paid and then refunded *via* a system operator. This is common in Europe – the system operator co-ordinates the system and ensures that consumers can get their deposit refunded at any store.

For Ireland, the most practical option would seem to be a centrally managed system, which handles deposit clearing, the flow of handling fees from producers/importers to retailers and the transport of returned containers from retailers to recyclers.

Most European system operators are companies formed by the drinks producers and retail sectors affected. The Irish authorities and industry would need to discuss who would act as system operator. The sponsors of the Waste Reduction Bill have suggested that the deposit would be “integrated” into the Repak system. We found no precedent for this as European deposit system operators are separate legal entities from the producer responsibility organisation and the two systems operate separately and in parallel to each other. The tasks to be undertaken and the economics of each type of system are very different.

The return options – whether return at retail stores (as in Europe), to return depots (more common in North America) or through a combination of both?

- Return in-store is more convenient for consumers so it is likely to yield the best return rate. However Irish retailers may be unwilling to provide facilities because of space and hygiene problems, particularly given the smaller average size of Irish grocery stores.
- The Scandinavian deposit systems are increasingly complementing in-store return with other collection points that are more convenient for consumers. These include bins aimed at on-the-go consumption (music festivals, special attachments for litter bins etc.) where consumers do not get their deposit refunded. Fast, large capacity RVMs are being trialled at civic amenity sites.

Cost Implications

The literature review has highlighted the high cost of establishing and operating a deposit system, which requires a significant investment in new infrastructure. Many producers and retailers would have to pay fees to the deposit system and to Repak for non-deposit packaging. Producers would also have costs associated with marking containers, adjusting logistics arrangements etc. Costs for retailers would include installing return facilities such as RVMs, staff time handling returns. Higher costs for Irish industry would undoubtedly be passed on, at least in part, to consumers as higher retail prices.

Implications for Small Business

The deposit could call into question the *de minimis* exemption from packaging requirements. Ireland currently exempts small producers (turnover below €1m and less than 10 tonnes of packaging) from recovery obligations. They cannot be exempted from the obligation to charge the deposit, which must be charged consistently on all specified containers. Would deposit containers, which are packaging, be included or excluded in the *de minimis* thresholds?

The special fees offered by Repak to smaller retailers and caterers, which are based on turnover not tonnage of packaging, would need to be reviewed, and they could be unworkable alongside a deposit.

Producers just above the *de minimis* thresholds already have a competitive disadvantage compared with competitors below the thresholds, and there is a risk that the deposit could magnify this competitive distortion.

The authorities would have to decide whether to exempt small retailers from the return obligations, balanced against the need to ensure a good network of return facilities, including in rural areas. Small retailers could lose business to their larger competitors because consumers would have to go to larger stores to get their deposit refunded and may buy their groceries there at the same time.

Implications for Repak and the Existing Recycling Regime

Kerbside/bring arrangements would collect less material and become more expensive, because deposit containers would be diverted into a parallel collection system, which would reduce economies of scale. Moreover drinks containers are among the easier pack types to recycle and have the highest secondary market values, which would affect the cost of meeting recycling targets through Repak.

Repak would receive less fee income, because deposit containers would no longer participate in the system. However some deposit containers would undoubtedly end up in kerbside/bring collections, and would be subsidised by Repak without any fee having been paid. Thus, Repak may have to increase its fees in respect of non-deposit packaging.

A deposit would call into question Repak's shared fee structure, with each stage of the supply chain paying a share of the fees. How would producers other than 'brand-holders' calculate what share of their obligations related to deposit containers?

Conclusions of the Study

A deposit is neither suitable for Ireland nor necessary to achieve the objectives sought by those who are seeking to introduce it:

- *A deposit is not justified by the need to reduce litter.* The empirical evidence shows that the incidence of beverage containers in litter is very low. The extent of littering has declined in recent years, and Ireland already has a range of measures in place to tackle litter.
- *A deposit would not increase recycling rates for packaging.* Recycling rates in European countries with a deposit system in place are not statistically significantly higher than countries, such as Ireland, that do not have a deposit. Only seven of the 28 EU member states have a mandatory deposit on cans and non-refillable plastic bottles, five of which also have a mandatory deposit on non-refillable glass. These countries also have a separate system to ensure that non-deposit recyclable packaging waste is collected and recycled or recovered. Ireland is already achieving good recycling rates through its existing recycling regime.
- *The factors associated with success in our international review of deposit systems do not apply in Ireland.* These include that refillable drinks containers have disappeared in the retail trade so consumers are no longer used to returning them and retailers no longer have facilities to handle returned containers. Kerbside collection is now well-established in Ireland and would compete with in-store return.
- The introduction of a deposit system for non-refillable containers in Ireland would be *complex and would require careful planning and implementation.*
- The international studies reviewed conclude that deposit systems are associated with high costs. These *high costs would be borne by producers and retailers*, some of these costs would be passed to consumers in higher retail prices.

Recommendations

If policymakers decided to proceed with a deposit, then we recommend the following preparatory steps:

- **Robust market research** – to establish the size of the market for drinks likely to be deposit-bearing and the number of operators likely to be affected. This is essential to assess the market implications and costs of the various deposit options.
- **Consumer research** – to determine consumer preference for returning deposit containers either in-store or to return depots. This exercise should also investigate whether those with access to kerbside collection would be willing to take containers elsewhere for deposit refund, and at what deposit rates.
- An **environmental impact assessment** of various deposit options compared with existing collection arrangements.
- A **full cost-benefit analysis** (CBA) should be undertaken before coming to a decision, because the experiences of other countries with systems for non-refillable beverage containers indicate that the costs are very considerable in relation to the benefits.
- A **legal assessment** to ensure that the proposed deposit legislation and deposit system are compatible with EU requirements, particularly with the Directive on Packaging and Packaging Waste (94/62/EC), and relevant case-law of the European Court of Justice (CJEU). The new system would need to be accessible to the imported drinks affected on equal terms with those produced in Ireland. Nor must it give rise to barriers to trade or distortions of competition.

- **Discussions with the relevant sectors of Irish industry** on the deposit arrangements. Draft regulations should be devised around the arrangements agreed with industry. Any **Draft regulations** would then need to be put out to wide **consultation** in Ireland. Individual stakeholders may be able to highlight potential loopholes or other problems.

Glossary of Terms

€	Euro.
A fortiori	Latin term used in economics and scientific discourse to mean or imply ‘in practice’ (compare with ‘in principle/from first principles’ or <i>a priori</i>).
A priori	Latin term meaning ‘from first principles’ – in economics, what an economist would expect to find in empirical data analysis from economic principles and/or prior experience <u>before</u> conducting the empirical analysis. Reasoning based on principles/theory (compare with <i>a fortiori</i>).
ATM	Automated teller machine.
Backdoor	Refers to Repak’s activities in respect of packaging waste compliance among the producers of packaging and packaging waste in Ireland, including through the business/commercial sector importing packaging for their products. In addition to funding recycling of commercial/backdoor tonnes, Repak also funds packaging waste recycling in the household sector in Ireland and waste-to-energy (note that when consumers import packaging into the country, including due to online purchases from overseas sources, the additional packaging entering the country is extra to the officially recorded tonnes and is effectively being paid for by compliant producers and households – Repak has recently commissioned a study of the packaging waste implications of this rapidly growing form of e-commerce).
Bill	Waste Reduction Bill (Bill Number 80 of 2017).
BIM	Bord Iascaigh Mhara.
BPFI	Banking & Payments Federation Ireland (previously the IBF or Irish Banking Federation).
c	Cent (100 cent in one euro, €).
C&D	Construction and demolition (waste).
c.	Latin term <i>circa</i> , meaning ‘around’, ‘about’ or ‘approximately’ (traditionally used in regard to dates but more commonly used as an abbreviation for the aforementioned terms today).
CAGR	Compound annual growth rate.
CBA	Cost-benefit analysis.
CCPC	Competition and Consumer Protection Commission.
Cent	€0.01.
Consultancy Team	PMCA Economic Consulting and Gill Bevington (independent consultant in recycling policy and compliance based in the UK and author of the 2008 Perchards report that considered the possibility of a beverage container deposit system for Ireland and concluded against such a move).
CSD	Carbonated soft drinks.
CSO	Central Statistics Office.
DCCAE	Department of Communications, Climate Action and Environment. Synonymous with the term ‘Department’ uses in the report. Previously known as the Department of the Environment, Community and Local Government.
Defra	Department for Environment, Food & Rural Affairs (UK).
Department	Department of Communications, Climate Action and Environment (DCCAE) or the previously-named Irish government departments responsible for recycling and the environment. Synonymous with the DCCAE.
Deposit	Deposit-refund system or deposit system (for beverage containers).
DG	Directorate General (of the European Commission) (e.g. DG Environment).
DRS	Deposit-refund system (as sometimes referred to in studies; the preferred terminology in this report is ‘deposit-refund system’ or ‘deposit system’.
DSD	German Green Dot system (Duales System Deutschland).
ECJ	European Court of Justice.
EEA	European Economic Area (includes the EU28, Iceland, Norway and Liechtenstein).

Glossary of Key Terms

EPA	Environmental Protection Agency.
ESRI	Economic and Social Research Institute.
<i>et al.</i>	Latin term, commonly used in citation of previous/existing studies or research, meaning ‘and others’ (short for <i>et alia</i>).
EU	European Union.
EU28	The twenty-eight Member States of the European Union (EU).
Eurocent	€0.01 (interchangeable with cent).
Eurostat	The official statistics agency of the European Union.
FAQs	Frequently asked questions.
FDI	Foreign direct investment.
FIT	Förpacknings- och Tidningsinsamlingen (Swedish packaging waste organisation).
g	Gram (there are 1,000 grams in a kilogram (kg) and in turn 1,000,000 grams in a (metric) tonne.
GPN	Green Dot system in Norway (Grønt Punkt Norge).
GPN	Grønt Punkt Norge.
HDPE	High density polyethylene.
IBAL	Irish Business Against Litter.
IBEC	Irish Business and Employers Confederation.
IBF	Irish Banking Federation (currently the Banking & Payments Federation Ireland or BPII).
<i>Inter alia</i>	Latin phrase meaning ‘among other things’.
kg	Kilogram (there are 1,000 grams in a kg and in turn 1,000 kg make up a tonne.
LDPE	Low density polyethylene.
LGCSB	Local Government Computer Services Board.
LGIS	Litter Geographical Information System.
LMB	Litter Monitoring Body.
LPI	Litter Pollution Index.
LQS	Litter Quantification Survey.
Major producer	Businesses involved in the production, distribution and retailing of products containing packaging who annually place more than 10 tonnes of packaging (other than packaging for reuse or export) on the Irish market and have an annual turnover of more than €1 million.
MBI	Market-based (policy) instrument, aimed at ensuring the sustainable use of resources having an environmental impact. Deposit-refund systems are an example of an MBI.
MDR	Mixed dry recyclables (household bins for recycling – green bins).
MSc	Master of Science degree.
MTC	Marginal trash charge.
NLPMS	National Litter Pollution Monitoring System.
NSC	National Spring Clean.
NWPP	National Waste Prevention Programme.
OECD	Organisation for Economic Cooperation and Development.
Packaging	Any material used to contain and protect goods or to aid in their handling, delivery or presentation. Packaging is made from such materials as cardboard, paper, glass, plastic, steel, aluminium, wood, and composite materials such as those used in milk and juice cartons. The European legislative framework covers all types of packaging, including the outer box that holds a larger batch of smaller packaged products.
Packaging Directive	Directive 94/62/EC as amended on packaging and packaging waste.
PET	Polyethylene terephthalate.
PMCA	PMCA Economic Consulting.
PMD	Plastic, metals and drinks cartons (lightweight container packaging).
PP	Polypropylene.
PPP	Polluter Pays Principle.

Glossary of Key Terms

PRI	Producer Responsibility Initiative (in waste management policy). For example, Repak is the PRI for packaging waste in Ireland, since 1997.
PRO	Producer Responsibility Organisation.
PS	Polystyrene.
PURE (Project)	Protecting Uplands and Rural Environments (under the remit of the DCCA).
PVC	Polyvinyl chloride.
Repak	Repak Limited.
RGDATA	Retail Grocery Dairy & Allied Trades Association.
RVM	Reverse vending machine.
State	Ireland or the Republic of Ireland.
Supra	Latin term used in citation of studies meaning 'as cited above or previously'.
System	Short for deposit-refund or deposit system.
TCD	Trinity College Dublin.
TFEU	Treaty of the Functioning of the EU.
UK	United Kingdom.
UNESCO	United Nations Educational, Scientific and Cultural Organization.
US	United States (of America).
Via	Latin term meaning 'through' or 'by'.
Vice-versa	Latin term meaning 'the other way around'.
Vis-à-vis	French term meaning 'relative to' or 'compared with' etc.
Viz.	Latin term, and short for <i>videlicet</i> , meaning 'namely' or 'that is to say'.
WEEE	Waste electrical and electronic equipment.
WtE	Waste-to-energy.

Acknowledgements and Disclaimer

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Disclaimer

This report is the responsibility of PMCA Economic Consulting. By virtue of preparing the report or otherwise in connection with this study, PMCA will not assume any responsibility or have any liability to any third parties.

1 Introduction

1.1 Purpose of the Report and Background

This report is prepared for Repak Limited (hereinafter Repak) by Dr. Pat McCloughan, Managing Director of PMCA Economic Consulting (PMCA), in association with Gill Bevington, an independent consultant in recycling policy and compliance based in the UK. The report provides a study on the rationale for, and consequences of, the possible introduction of a (mandatory) deposit-refund system for beverage containers in Ireland under the Waste Reduction Bill 2017. The proposed new legislation has passed through Second Stage in Dáil Éireann and is due for consideration by the Joint Oireachtas Committee on Communications, Climate Action and Environment in the autumn of 2017. The report also considers the experiences of other European countries that have introduced such a system (a small minority group) and examines the requirements that would need to be in place in Ireland to operate a deposit system. We then consider the likely consequences for drinks producers, small business and for the country's packaging waste compliance operator (Repak), and the cost.

The Waste Reduction Bill (Bill Number 80 of 2017) provides for *“a ban on single-use non-compostable cups and other tableware and for the introduction of deposit and return systems for beverage containers”*. It is latter part of the proposed new legislation (underlined by the Consultancy Team) that is the focus of this report. However, at the time of preparing this report, few, if any, details are available on the proposal and how it would work in practice, not to mention its justification; but it is understood that the proposed system would cover beverage bottles and cans, including glass bottles, polyethylene terephthalate (PET) (i.e. plastic) bottles and aluminium cans used to contain alcoholic and non-alcoholic drinks. (It is observed that the Bill provides for *“deposit and return systems [plural] for beverage containers”*, implying possibly multiple new systems for bottles and cans, which would be introduced into an environment in which there already exists an extensive infrastructure for the recycling of beverage containers and other packaging materials, with growing usage by households.)

Using a combination of relevant research review and quantitative analysis of relevant empirical data, this study considers whether there is a need for a beverage container deposit-refund system in Ireland and how, if at all, it would complement the country's existing recycling infrastructure for beverage containers and other packaging materials, which includes an extensive network of kerbside recycling, civic amenity centres and bring-banks used by households throughout the State, in addition to the country-wide infrastructure pertaining to commercial (or 'backdoor') recycling. Small businesses would likely be caught under the proposed system, whereas the current packaging waste recycling system operated by Repak, and local authorities, exempts small producers under the *de minimis* condition (turnover below €1m and placing less than 10 tonnes of packaging on the market in Ireland annually).

The Waste Reduction Bill 2017 is being sponsored by the Green Party and co-sponsored by the Labour Party, where it is observed from the Green Party's press release of 12 July 2017 (accessible [here](#)) that:

“We all recognise the need to cut down on the amount of plastic waste being produced, and the amount going to landfill. There is broad consensus that the measures we've proposed are sensible, achievable, and will have a positive impact for the environment and for consumers. We are convinced this can be done in a way which increases recycling, reduces litter, saves the householder money and wins public support for protecting our environment.”

The authors of this report, and Repak, would concur with the first sentence of this statement but the rest of it is merely speculative, in the absence of any empirical evidence to support the claims for the proposal.

In an earlier Green Party press release (6 July 2017) (announcing that the Labour Party would be co-sponsoring the proposal), it is curiously stated (without any prior consultation with Repak) that:

“The implementation of a deposit refund system and the ban of plastic cups will take a few years and will have to be cleverly integrated into the existing Repak recycling system.”

This part of the Green Party’s press release of 6 July 2017 (available [here](#)) illustrates the complexity that would be involved with a deposit system in Ireland, but without any regard to how it would work in practice or the implications for costs and small businesses.

This report asks the fundamental question as to whether there is any justification for a deposit system in the State, which basically comes down to the two principal economic benefits claimed of such systems, namely litter control and increased recycling. This leads to two key questions examined in the report:

- Does Ireland have a litter problem and in particular is there a litter problem with beverage containers – more specifically, what is the proportion of all litter accounted for by beverage containers (drinks cans and bottles (glass and plastic), covering both alcoholic and non-alcoholic beverages) and is the percentage share getting larger over time?
- What is Ireland’s record in packaging waste recycling and more particularly in glass, plastics and metallic packaging (there are EU recycling targets for all packaging materials and specific targets also exist for glass, plastics and metals)?

Related to the latter question is how Ireland’s packaging waste recycling performance compares with other European countries in which there are beverage container deposit-refund systems – does the evidence show that recycling rates are *statistically significantly* higher in countries with deposits systems?

Then comes the critically important question of cost – would a deposit-refund system in Ireland *save households money* in the manner claimed or suggested in the statement reproduced above from the Green Party’s website? If so, by how much would households benefit? Or would there be a rise in cost?

All of these important questions demand careful analysis using relevant, official empirical data, capable of being independently verified and reproduced. Owing to the costs involved, and the benefits claimed of a deposit system, one would expect the proponents of the system to conduct a full and rigorous cost-benefit analysis (CBA), taking due account of the existing infrastructure designed for the recycling of beverage containers and other forms of packaging waste, as well as the many and varied initiatives aimed at reducing litter in the country. In the absence of any robust rationale or justification for the proposal based upon its quantified and monetised costs and benefits, the proposed system should not be entertained, given the systems already in place in the State in regard to packaging waste recycling, including beverage containers, and litter control monitoring and sanctions, which are functioning effectively, as shown in this report.

The purpose of a deposit-refund system is generally to ensure that deposit-bearing items are returned to an agreed collection point. Return arrangements therefore need to be in place that are convenient for consumers. Arrangements are also needed to transport the containers for recycling (or refilling). Because of the cost involved in such arrangements, deposits usually apply to items that have some value, either durable items that can be reused, or disposable items that can be recycled.

As indicated in the Waste Reduction Bill 2017, new legal obligations would have to be introduced to mandate the deposit arrangement. These would require all the producers affected to charge the deposit on the specified beverage containers and the legislation would also have to regulate the arrangements to refund the deposit, and mandate the recycling of the returned items.

Many years ago, Ireland had a deposit-refund system for beverage containers, whereby one would return bottles to retailers/producers for re-filling and get the deposit refunded. That system operated for *refillables*, whereby the returned bottles were washed and re-used (people of a certain age and older may recall the refilling of milk bottles and mineral bottles many years ago in the distant past). However, refillable beverage containers have long since disappeared from the retail grocery trade in Ireland, as in many other countries, and no country has mandated the re-establishment of a defunct refill system. It is therefore reasonable to assume that the proposed system would apply to non-refillables (but the absence of any details on the proposal is a cause of uncertainty for many market participants, including Repak).

When Repak commenced operations in 1997, the old refillables system was no longer in use, and today there is a growing network of bring-banks and civic amenity centres for beverage container recycling around the country, as well as recycling bins for households (kerbside collections). In these networks, there are *economies of scale* – greater usage leads to lower recycling costs per tonne – and there are also *economies of scope*, in which glass, plastics and metals are also capable of being recycling as a result of the network that Repak helps to fund (economies of scope generally refer to cost savings from providing multiple products or services, while economies of scale refer to cost savings from operating at large scale).

The introduction of a new network in the form of a deposit-refund system for beverage containers would compete with, rather than complement, the existing system which has been successfully developed with significant funding down the years and has meant that Ireland has exceeded all of its recycling targets ahead of schedule. Such a new system would likely raise the cost of recycling, as found in previous studies pertaining to countries where deposit-refund systems have been introduced.

The European countries that currently have mandatory deposit-refund systems have had them for some time and most did not have an alternative infrastructure on a large scale for the recycling of beverage containers at the time of their introduction. Germany did have a packaging waste recycling infrastructure at the time it introduced a deposit system in 2002 but the experience of the system in that country has been problematic and has operated at a high cost.

On the other hand, the approach in Ireland, and most other EU Member States, has been very different, including the UK. The Repak system was introduced twenty years ago, after the old deposit systems in Ireland were ended, and the resulting packaging waste compliance system has proven successful in terms of meeting all of its externally set targets and has grown to include the household sector as well as the commercial/business (backdoor) sector since its inception in 1997.

According to Repak research (Repak funds packaging waste collection and recycling in the household sector through kerbside/green bins and bring-banks/civic amenity centres), the total volume of packaging recycling in the household sector was 256,119 tonnes in 2016, up by over 7% on the 2013 figure and driven by the strong growth in kerbside, which grew by over 12% during the period. In addition, the average cost per tonne of packaging waste recycled in the household sector has reduced from €63.57 in 2013 to €55.32 in 2016, or by 13%. The introduction of a new, additional system, which is likely to compete with, rather than complement, the existing network for recycling in the household sector risks halting and possibly reversing the valuable momentum gained in respect of falling average costs in the household sector.

The national approach in Ireland for dealing with packaging waste, which includes beverage containers, is based on the Extended Producer Responsibility Principle. This seeks to ensure that the producer of a product bears a significant portion of the cost of dealing with the disposal or recycling of the product it supplies. This has been done effectively in the State through a producer-funded compliance system, operated by Repak, which is the predominant route of choice for compliance, where the other route is for producers to self-comply through local authorities.

As the evidence illustrates, not only is the Repak system working well for producers in terms of Ireland meeting all of its packaging recycling targets, and at declining cost per tonne, but also Repak is funding packaging recycling in the household sector (through kerbside/green bins and bring-banks/civic amenity centres) at falling cost per tonne too.

The International Review of Waste Management Policy, published in 2009, which was commissioned by the then Minister for the Environment, Heritage and Local Government, former TD Mr. John Gormley (then Leader of the Green Party) reported on a possible deposit-refund system in Ireland thus:¹

“the evidence is not sufficiently strong to support a recommendation of this nature, principally because the information regarding implementation costs is not such that the costs can be said to unequivocally justify the benefits”.

1.2 Perchards Report 2008

In September 2008, Gill Bevington (then based at Perchards consultants in the UK) authored a report for Repak concerning the possibility of a deposit-refund system for beverage containers in Ireland, which at the time was under consideration by the then Department of Environment, Heritage and Local Government into the future of waste management policy in the State (which resulted in the aforementioned International Review of Waste Management Policy report of 2009, which concluded against the introduction of a deposit-refund system).

The 2008 report by Gill Bevington of Perchards at that time concluded that a deposit-refund system on non-refillable beverage containers would not be the optimal solution for Ireland, due to multiple factors:

- The systems in the other countries considered (EU and non-EU) included refillables, which have disappeared from the retail trade in Ireland.
- Kerbside collection was becoming well-established in Ireland (in 2008) and a deposit-refund system would compete with it, rather than complement it.
- Deposits tend to work best when the market has few operators – the grocery retailing market in Ireland at the time had many small independent retailers (along with the ‘multiples’).
- The environmental benefits would be marginal – a deposit-refund system is unlikely to make a significant impact on reducing litter and would not result in a significant increase in recycling rates for packaging waste.

The 2008 report by Gill Bevington considered that these outcomes must be weighed against adverse environmental implications, including duplication of collection infrastructure and less efficient use of transport. Her report concluded that there would inevitably be significant costs involved in establishing and operating a deposit-refund system. Many producers and retailers would have to pay the deposit system and also continue to pay Repak for non-deposit products. A deposit system would mean higher costs for Irish enterprises, part of which would inevitably be passed on to consumers in the form of higher retail prices; and as alluded to earlier, small businesses currently exempt from the State’s packaging waste compliance system, by virtue of the aforementioned *de minimis* conditions, would not have such an exemption for a deposit system. Thus currently obligated producers would face an additional compliance cost and presently exempted small producers would face a new cost.

¹ As quoted by the current Minister for Communications, Climate Action and Environment, Mr. Denis Naughten TD, in a Dáil speech on the Waste Reduction Bill 2017 on 11 July 2017) (available [here](#)).

The 2008 report by Gill Bevington advised that the government would need to satisfy itself that the additional costs due to a deposit-refund system would be justified by the environmental benefits, which the report concluded were likely to be marginal.

What has changed since the 2008 Perchards report? Of significance is that household recycling has grown further and become even better established, with the average cost of recycling packaging waste per tonne coming down (as noted above) and, as shown in more detail in Section 3, litter in Ireland has become less of a problem and there is no evidence that beverage container litter has grown over the past fifteen years – the results of econometric analysis presented in that part of the report show that the share of all litter due to beverage containers has reduced over time.

In addition, Lithuania is the only country that has introduced a mandatory deposit system since 2008, although several EU Member States have considered doing so (but none has implemented a system) (including Austria, Belgium, France, Spain and the UK, all of which have packaging compliance systems – although Scotland has recently announced its intention to introduce a system). In the 31-country EEA, only nine (9) countries have a mandatory deposit-refund system in effect on non-refillable drinks containers currently: Croatia, Denmark, Estonia, Finland, Germany, Iceland, Lithuania, Norway and Sweden.² (In The Netherlands, the only deposit-bearing non-refillables are large PET bottles (over 0.5 litres), despite repeated political discussion about expanding the scope to small PET bottles, cans and glass. Current packaging legislation in that country contains provisions for a deposit on these container types and on refillables, but they are not in effect – the provisions are dormant.)

The present report includes an update of the 2008 Perchards report by Gill Bevington, where she considers the current situation regarding deposit-refund systems for beverage containers in other EEA countries and reaches the same conclusion as in her previous report, namely that there is insufficient evidence to justify the introduction of a deposit-refund system in Ireland. Also considered in this report are the relatively simple deposit systems in place in certain US states – as in Europe, only a minority of US states have introduced a system (Connecticut, Iowa, Maine, Massachusetts, Michigan, New York, Oregon and Vermont – 8 in the US, the same as in the EEA). None of the eight US states with a deposit has a packaging waste compliance infrastructure, as exists in Ireland and most EEA countries.

² The European Economic Area includes the EU28, Iceland, Liechtenstein and Norway. As signatories to the Treaty of the EEA, the latter three countries are required to implement the Packaging Directive (94/62/EC as amended).

Box 1.1: Deposit-Refund Systems for Refillable and Non-Refillable Beverage Containers – A Summary

Refill Systems

Deposit refill systems are traditional systems, typically operated in the past by the majority of drinks producers in a given country, although participation tended to be voluntary. All participating drinks producers used refillable glass bottles, often of standard size(s) and design(s) in a pool arrangement, for drinks distributed both to pubs and restaurants and to consumers through grocery retailers. Consumers returned the bottles to the grocery store, from where they were transported back to the producers for washing and reuse. The level of the deposit in traditional refill systems was/is not usually set by law, and was/is typically the replacement value of the empty container.

Such traditional systems were common in western countries until the 1970s and 1980s. They suited traditional patterns of production and distribution, with small to medium-sized regional producers selling beer, carbonated soft drinks and mineral water through independent grocery stores or specialist drinks retailers.

Then, new non-refillable packaging formats – beverage cans and plastic drinks bottles – became available. The new pack types quickly gained popularity for retail distribution among producers, retailers and consumers because they were better-suited to new methods of marketing and distributing drinks and modern consumption patterns. They were cheaper for producers, who no longer needed washing equipment and who saved on the cost of transporting used containers back from retailers. The availability of the new type of containers coincided with the development of supermarket chains that sold all types of grocery products. The new containers were cheaper for these and other retailers, as they did not need arrangements to refund the deposit and sort the bottles, nor make space available in-store for returned bottles. The popularity of the new containers among consumers reflected a shift in lifestyle away from families eating meals together and to increased “on-the-go” consumption.

In many western countries, such as the UK, France and Ireland, and in North America, refillables disappeared from the take-home trade, as the new non-refillable formats replaced them. Refillables continued to be used in the catering trade for on-premise consumption in these countries however, as they do in Ireland. However in some countries, measures were introduced to protect refill systems in the retail trade, such as bans or taxes on non-refillables.

Some Irish drinks producers continue to use refillable bottles in the on-trade sector for beer, carbonated soft drinks and waters, and have return arrangements in place. The 2008 Perchards report, authored by Gill Bevington, co-author of the present report with Dr. Pat McCloughan of PMCA, outlines that the market share of refillables was in decline in the on-trade sector at that time. Reasons for the decline included a drop in the retail price of beer in grocery stores since the repeal of the Groceries Order, so pubs could sometimes buy beer more cheaply from supermarkets than from wholesalers. We are informed by industry that the decline in refillables in the on-trade sector has continued since then, due in part to more imported drinks becoming available in Ireland and the falling cost of recycling glass bottles is also a factor.

Non-Refillable Systems

Deposit systems for non-refillables aim to ensure the return and collection of one-way drinks containers for recycling. Such systems exist only where legislation directly or indirectly requires them to operate. Such legislation was introduced in some countries as a response to the market introduction of non-refillable containers. Non-refillable deposit systems currently operate in a small minority of European countries (9 out of the 31 EEA members) and the same is observed in the US, where just 8 states have ‘simple’ bottle systems. Further details are given in Section 4.

- Direct legal requirements take the form of an obligation on drinks producers to charge a deposit on specified containers of specified drinks and on retailers to refund it. Among the Member States of the EU, such requirements exist in Denmark, Estonia, Germany, Lithuania and Sweden.
- Indirect legal requirements include those that incentivise high return rates through taxes as in Norway where they are linked to requirements that encourage the continued use of refillables or in Finland where containers in an approved deposit system are exempt from a tax on them. Norway also has a tax on non-refillable drinks containers that is not charged on refillables. Such taxes aim to protect refill systems by making non-refillables more expensive.

Source: Consultancy Team research.

1.3 About Repak

1.3.1 Ireland's National Package Waste Compliance System

A not-for-profit organisation, Repak is a government-approved environmental compliance system operator whose aims include the prevention and minimisation of packaging waste in Ireland as well as the funding of packaging recycling, among households as well as businesses/producers. Under European and Irish legislation, certain businesses – known as ‘major producers’ – are obliged to comply with the law, and the conditions for compliance apply to businesses in manufacturing, distribution and retailing with turnover greater than €1m and who place more than 10 tonnes of packaging/packaged goods in the country annually. Such obligated businesses have a choice of two compliance routes – they can self-comply and register with a local authority or they can become a member of Repak. The membership fees associated with joining Repak are used to fund packaging recycling, among households as well as the commercial/backdoor sector. Repak is the predominant choice of compliance route for obligated businesses and the organisation has played a leading role in ensuring that Ireland has successfully achieved all of its recovery and recycling targets since the legislation came into effect in 1997.

As well as assisting member producers to meet their packaging waste obligations, and playing a leading role in ensuring that Ireland has met all of its recycling targets ahead of schedule, Repak also contributes to the funding of recycling in the household sector, including repositories for the recycling of glass bottles, plastic bottles and aluminium cans at civic amenity centres and bring-banks around the country as well as green bins for households to place their packaging waste, including PET and HDPE plastic bottles plus steel and aluminium cans, as well as paper and board.

Since Repak began in 1997, the following beverage containers have been recycled (see Box 1.2, p. 11):

- 8 billion plastic bottles
- 7 billion glass bottles
- 6 billion beverage cans.

1.3.2 Summary of Ireland's Packaging Waste Recycling Performance

The latest available, official comparative data on EEA countries' recycling performance from Eurostat pertain to 2015 but not all countries have submitted their data for this year at the time of preparing this report. Ireland's data for 2015 (submitted to Eurostat *via* the Environmental Protection Agency (EPA) and with inputs from Repak, whose activities and those of its members determine to a very large extent Ireland's recycling performance) show that 983,384 tonnes of packaging waste were generated in that year, of which 664,199 tonnes were recycled, implying an overall packaging waste recycling rate of 67.5% in 2015. Expressed alternatively, Ireland achieved packaging waste recycled per capita of 143 kilograms (kg) in that year, the second highest recycling performance measured in this way, after Germany, which recycled 154 kg per head of population in 2015. Of the aforementioned 664,199 tonnes of packaging waste recycled in respect of Ireland in 2015, 579,756 tonnes or 87.3% were funded by Repak and a further 182,708 tonnes of packaging waste were funded by Repak for energy recovery.

In 2014 – the latest year for which Eurostat data are available for all EEA countries (with the exception of Iceland, where the data are not available) – Ireland achieved packaging waste recycled per capita of 143 kg (the same as in 2015), compared with 107 kg for the EU28. Like 2015, Ireland had the second highest rate of packaging waste recycled per capita in 2014, after Germany.

While Germany has had a beverage container deposit-refund system since 2003, the presence of such systems does not necessarily mean that such European countries have higher recycling rates: for example, Denmark, which is similar in size and population to Ireland, has had a system since 2002 but its packaging waste recycled per capita was 110kg in 2014, well below that of Ireland (and Denmark does not have an EPR like Repak). Further consideration of the relationship, if any, between the presence of beverage container deposit-refund systems and recycling rates is presented in Section 3, where the analysis reveals that the presence of a deposit does not mean *statistically significantly* higher recycling rates (for all materials and specific packaging materials relating to beverages – glass, plastic and metallic).

In regard to specific materials, Ireland achieved the following recycling rates in 2015 (2014 figures in parenthesis) [proportion of 2015 tonnes recycled funded by Repak in square brackets]:

- Glass 87.6% (86.8%) [99.6%];
- Paper and board 79.7% (79.4%) [89.1%];
- Metallic packaging (aluminium and steel) 74.6% (80.5%) [51.6%];
- Plastics 34% (35.4%) [76%]; and
- Wood 85.4% (84.8%) [97.5%].

Further analysis of the recycling rates for specific material types is given in Section 3.

1.3.3 Other Repak Initiatives and Recent Studies

1.3.3.1 Impacts of Repak's Packaging and Packaging Waste Prevention Activities

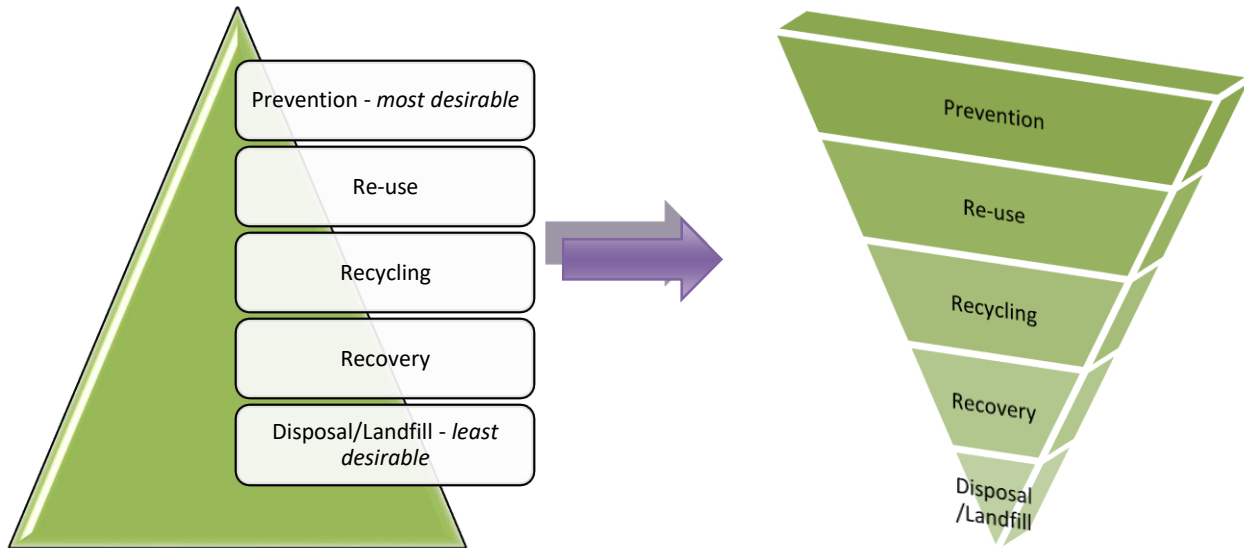
As the approved compliance system operator for packaging waste in Ireland, Repak assists its member producers in meeting their legislative obligations in respect of packaging recovery and recycling. In addition to coordinating the funding of packaging recycling, it works with its members to optimise the volume of packaging placed on the market in Ireland (including 'light-weighting'), where its member services include dedicated packaging technology expertise and website resources (*Prevent and Save* and the dissemination of best practices).

Repak's activities in this regard are mindful of the waste management hierarchy, which emphasises *prevention* as the preferred option for dealing with all types of waste and currently occupies a central place in European and Irish waste policy. The goal of waste policy is to invert the pyramid, ensuring that desirable waste management activities exceed the least desirable (landfill), which is in sharp decline in Ireland through recent policy initiatives, and from the efforts of Repak and its members.

When Repak was formed in 1997, there were 126 landfill sites around the country. Today the number has come down dramatically to just 4. Of the four landfills left in the country, it is understood that half of them will run out of capacity at the end of this year, leaving just two landfill sites in the country as we head into 2018.³

³ The marked fall in landfilling in the State and these figures were outlined in the recent event hosted by Repak at the Science Gallery, Trinity College Dublin on 13 September 2017, at which Dr. Pat McCloughan of PMCA Economic Consulting attended. The purpose of the event was to mark the twentieth anniversary of Repak and to consider packaging waste compliance in the foreseeable future, in Ireland and internationally.

Figure 1.1: Waste Management Hierarchy – ‘Today’ and ‘Tomorrow’



Source: National waste management policy.

Prevention of waste is not only beneficial for the environment but is also good for the economy because it means lower costs for businesses, thereby improving their operating performance (other things being equal) and in turn helping to sustain and create employment.

A recent report (2017) for Repak by PMCA suggests that its members are responsible for significant monetary savings arising from their packaging waste prevention activities, supported by resources from Repak, including the organisation’s *Prevent and Save* website and packaging technology expertise designed to assist members to optimise the volume of packaging placed on the market in Ireland.

Making use of data from Repak, the Central Statistics Office (CSO), the EPA and other sources, the main findings of the PMCA study are as follows:

- *Tonnes prevented* – 857,000 tonnes of packaging waste prevented by Repak members cumulatively during 2006-2016, with 121,700 tonnes prevented in 2016 alone;
- *Procurement savings* – more than €365m in procurement savings during the period, in which €52m in such savings were achieved in 2016;
- *Supply chain savings* – €188m cumulatively 2006-2016 and €26m in 2016 alone; and
- *Total savings* – €553m cumulatively over the period and €78m in 2016.

The estimated €78m in total savings in 2016 represents almost €37,000 per Repak member and 18% average annual growth compared with the corresponding figure a decade earlier, which is significant by any comparison.

1.3.4 Packaging Implications of Consumers in Ireland making Online Purchases of Goods from Abroad

Further research by PMCA for Repak in 2017 concerns the packaging implications when households make online purchases of consumer goods from abroad – the packaging accompanying the goods coming into Ireland is additional to that placed on the market in Ireland, yet it is unaccounted for in the compliance system, even though compliant producers (the vast majority of which are members of Repak) are effectively funding the collection, recovery and recycling of the extra tonnes. PMCA estimates that the costs of dealing with the additional tonnes of packaging waste from this form of e-commerce were in the region of €200 per Repak member in 2016 but the cost is expected to grow strongly in the coming years as online purchases from abroad by consumers in Ireland continue to escalate (while consumers are attracted to this form of purchasing by convenience and cost, and generally without being sensitive to the origin of the goods or being particularly mindful that the goods require packaging, typically more compared with the situation in which the same goods are purchased in physical outlets, in order to protect the goods in transit, there are nevertheless environmental implications, which are set to become more significant in the years ahead).

These PMCA studies and other research conducted or commissioned by Repak are shared with the EPA and the Department of Communications, Climate Action and the Environment (DCCAE).

1.4 Structure of the Report

The rest of the report is structured as follows:

- Section 2 considers existing studies of relevance to the present assignment, namely studies that have examined the economic rationale and/or impacts of deposit-refund systems internationally and in Ireland previous to this study.
- Section 3 then presents the results of relevant empirical analysis relating to the economic rationale or need for the proposed deposit-refund system for beverage containers in Ireland, under the Waste Reduction Bill 2017, where we consider whether the proposal is merited on the grounds of litter and recycling.
- Then in Section 4 we look in more detail at the experiences of European countries that have deposit-refund systems or that have considered such systems but have not implemented them.
- In Section 5 we consider specific issues that would have to be carefully considered by the authorities in Ireland in the event of instituting a deposit system in the State.
- Finally, Section 6 concludes the report, with recommendations for consideration of the proposal: given the complexities involved, and the experiences of other European countries, the government/authorities would have to commission studies to examine all of the implications, including the costs and benefits, of introducing a deposit system.

Box 1.2: Achievements in Packaging Waste Compliance in Ireland (1997-2017) and Challenges/Opportunities for the Next Twenty Years

Repak 1997 to 2017

Packaging Waste
Recovered 15% to 91%

Packaging- 10m tonnes
8,666,387 tonnes recycled
1,375,333 tonnes waste-to-energy

Industry
5,025 waste sector jobs supported

Co2 Emissions
Circa 250,000 tonnes saved annually

1.2 million bins

€400m invested in recycling

All EU targets met

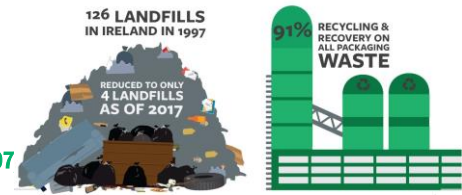
1,848 Bottle Bank Sites

118 Bring Centre Sites

Landfills reduced 126 to 4 (1997-2007)



Since 1997 you have recycled over...



1. EU
2. China

Source: Repak (20th anniversary event at the Science Gallery, TCD, 13 September 2017 (supra footnote 3).

2 Review of Relevant Research Studies on Beverage Container Deposit-Refund Systems

2.1 Introduction

In the preceding section, we took note of the conclusion of the 2009 International Review of Waste Management Policy on the possible introduction of a (mandatory) deposit-refund system for beverage containers in Ireland. Commissioned by the then Minister for the Environment, Heritage and Local Government, former TD Mr. John Gormley (former Leader of the Green Party), the International Review concluded that the evidence at the time was insufficient to support a recommendation of such a system, mainly on the grounds of the cost of implementing such a system relative to its claimed benefits.

This section reviews other relevant research studies and policy reports regarding the economics of deposit-refund systems for beverage containers in Ireland and other countries. It includes consideration of the findings of the major review of waste compliance systems in Ireland of 2014, which concluded that a *wide-ranging* deposit-refund system would not be required or necessary given the success of the packaging waste compliance system and the likely costs that would be involved, and it added that a *specific* deposit-refund system in packaging would need careful examination, including the conduct of a CBA. The 2014 review in Ireland was particularly mindful of the existing infrastructure and networks for the collection, recovery and recycling of packaging waste, including beverage containers, which had at that time developed rapidly in the household sector, and which have grown further since that time, with the average cost of recycling in the household sector having fallen strongly since that time, meaning that the overall average cost per tonne recycled among both the household and commercial/backdoor sectors has come down appreciably.

For every €1 spent by Repak in 2016, €0.57 went to household recycling, €0.15 to commercial recycling, €0.03 to recovery (waste-to-energy, WtE), €0.20 to overhead in administering and coordinating the system, and €0.05 in rebate to Repak members.

2.2 Economic Principles of Deposit-Refund Systems

Generally speaking, a deposit-refund system is an economic policy instrument designed to ensure socially optimal outcomes, including protection of the environment. Like all public policy interventions in the economy, the rationale for deposit systems stems from the concept of ‘market failure’, namely that in the absence of the policy intervention the market would give rise to ‘negative externalities’ or in other words social costs over-and-above the private costs to buyers and sellers transacting in the market: deposit systems seek to *internalise* the social costs from market failure so as to ensure socially optimal outcomes, in which wider society is not adversely affected from the actions of buyers and sellers in individual markets making up the economy. Thus, in the case of beverage containers, it is argued, left to its own devices the market would give rise to social costs, in the form of litter (e.g. plastic bottles and/or aluminium cans left in streets, footpaths and on public parks, beaches etc.), which can damage the natural environment as well as being unattractive for both the natural and built environments. Externalities generally arise when the actions of one market participant (a consumer or a firm, for example) affect others but they escape the pricing mechanism of markets (note also that externalities can be beneficial as well as harmful). CBA or cost-benefit analysis seeks to identify, quantify and monetise both positive and negative externalities.

In seeking to minimise the *potentially* harmful social and environmental effects from the normal, everyday operation of drinks markets (alcoholic and non-alcoholic), a deposit-refund system for beverage containers typically operates by consumers paying a deposit when purchasing a drinks product captured by the system and then receiving a refund (the deposit back) when the packaging that contained the product is returned to an approved centre or depot, which may be a reverse vending machine (RVM) located in or close to retail outlets. The returned packaging then proceeds through a supply chain leading to refill, recycling or disposal – under the waste management hierarchy (Figure 1.1, p. 9), re-use is preferred to recycling, which is preferred to disposal, the least desirable option for dealing with waste (prevention is the most desirable option but in the case of drinks is not feasible in reality).

Deposit systems for refillable beverage containers are now largely a thing of the past in advanced economies, reflecting the growth in plastic (PET) bottles for mineral waters and soft drinks, and aluminium cans for alcoholic drinks. While refillable deposits have not completely disappeared from Ireland – they are still used in the ‘on-trade’ sector (pubs and restaurants) – they are in decline.

Accordingly, were there to be a return of a deposit-refund system for drinks containers in Ireland, it would most likely operate for non-refillables – a ‘one-way’ deposit system, whereby the container is returned primarily for recycling and the consumer/user returning the packaging container receives a refund.

There are few, if any, details on the nature of the proposed deposit-refund system under the Waste Reduction Bill 2017, including whether it would include refillables or be a one-way system leading to recycling, and the level of the deposit would have to be established and the types of container involved etc. Given the growth in bring-banks and civic amenity centres, which include bottle banks and facilities for the depositing of used drinks cans and plastic bottles, the scope for a deposit-refund system to duplicate or compete with the existing infrastructure for the collection and recycling of beverage containers in Ireland would be high, and it is likely that separate systems would need to be designed for the different types of beverage container involved, with possible distinction between alcoholic and non-alcoholic drinks, not to mention container sizes. In this way, the potential for such a system in Ireland to become complex, as well as duplicative of existing networks, is easily appreciated.

The deposit that consumers pay at the point of sale is basically the same as a consumption tax (even if it is not imposed by the State), justified on the belief that there is market failure from the consumption of non-alcoholic and alcoholic drinks in the manner outlined. While the concept of market failure may be attractive or make sense *in principle*, it should not be entertained as a mere act of faith to justify intervention in the marketplace; effective regulation of markets generally needs to be based on solid foundations, meaning that the *extent* of market failure itself needs to be established using relevant empirical evidence. In the case of beverage containers, this means addressing the key questions:

- Is there a litter problem with beverage containers? Or in other words, what share of all litter items is accounted for by beverage containers and has the share been increasing over time?
- What is the extent of beverage container recycling? Are the country’s glass, plastic and metallic recycling rates relatively high or low, and/or is the presence of a deposit system associated with statistically significantly higher recycling rates?
- Weighing up the empirical evidence on the key issues of litter and recycling, is there a clear and unambiguous case for *additional* intervention in the market, given existing initiatives in respect of litter control and recycling infrastructure, which must be taken into account in considering whether a deposit-refund system is warranted?

Empirical analysis of these key questions is provided in the next section of the report.

People who return their drinks containers and reclaim the deposit basically redeem the consumption tax, while those that do not deposit are punished. In this regard, deposit-refund systems make sense *in principle* – good behaviour is rewarded with redemption while bad behaviour is punished monetarily or taxed. However, the justification or rationale for such a system in the first place needs to be rigorously established, as with all policy interventions in economic markets – otherwise market interventions risk becoming regulatory burdens and wasteful of scarce resources. Better regulation of markets generally requires careful rationale and tailored design of the policy instrument in turn so as to avoid being a blunt, inefficient and potentially costly instrument.

Even if well-established and appropriately-designed, another issue that a deposit system may have to contend with is the *perception* of being a hidden charge or a stealth tax, which may cause the system to be seen in negative terms and become unpopular, not least where there already exists alternative solutions (e.g. kerbside collection, bring-banks etc.). This reinforces the need to factor-in existing networks for beverage container collection and recycling when considering the rationale for a deposit-refund system. The evidence for Ireland is summarised in this section and expanded upon in the next section of the report.

Simple as it might first appear, it is already apparent from the present outline that any proposal to introduce or re-introduce a beverage container deposit-refund system is complex *in practice* and necessitates very careful justification, based on relevant empirical evidence on the extent of market failure (principal among which are litter and recycling), which cannot merely be assumed *a priori*.

The costs of introducing and operating a deposit-refund system also need to be carefully considered, leading to the view that nothing short of a full cost-benefit analysis (CBA) is required to justify such a system being introduced. Such a study would be required to include identification, quantification and monetisation of the underlying rationale for the system (based on relevant empirical data) and the CBA itself should include comparison of the proposed system with alternative options, in order to appraise the *proportionality* of the proposal *vis-à-vis* the alternatives and whether the same outcomes/benefits could be achieved in a less restrictive manner or by existing practice/infrastructure or modification ('tweaking') of same. Accepting the inherent difficulties associated with conducting CBAs in practice, including the identification, quantification and monetisation of each of the positive and negative externalities relevant to the particular market or sector, it may be advisable to also perform a multi-criteria analysis (MCA) of the policy proposal, and relevant alternative options, to reinforce the CBA, with both the MCA and the CBA paying particular attention to sensitivity analysis and the robustness of the results to changes in the modelling parameters.⁴

⁴ The Department of Public Expenditure and Reform has developed guidance notes on CBA and MCA, and other forms of evaluating public policy proposals, as part of the Public Spending Code. While these notes are helpful as a general introduction to the methods involved, they are not a substitute for the details of the techniques required or their economic and statistical foundations, which need to be properly understood and established with recourse to relevant empirical data analysis.

2.3 International Studies

2.3.1 Rademaekers *et al.* (2011)

The study by Rademaekers *et al.* completed for the European Commission in 2011 had the objective of examining the efficacy of various market-based instruments (MBIs) in EU Member States in respect of sustainable use of resources, including deposit-refund systems for beverage containers.⁵ Echoing the remarks made in the outline of the economic principles of deposit-refund systems above, the authors reached the following high-level conclusions *inter alia* (pp. 7-8) (Consultancy Team emphasis underlined):

- *“To introduce an effective instrument, you need support for it.”*
- *“Administrative burdens vary considerably, but for container deposit systems are high.”*
- *“Market based instruments are part of a wider system of instruments that they need to work with to be successful.”*
- *“Monitoring and data relating to market based instruments is typically weak.”*
- *“Fully understanding impacts would require more detailed econometric analysis.”*
- *“Economic impacts of the studied MBIs were estimated to be slightly negative, which could in many cases be offset by the revenues raised.”*
 - *A double-dividend from environmental taxation was achieved, but only in the UK.*
 - *Distributional impacts were typically slightly regressive.”*

These high-level conclusions of the Rademaekers *et al.* study reinforce the importance of ensuring an empirical evidence base to inform the rationale for MBIs and their particular design in countries (on a case-by-case basis), and they also illustrate the complexity involved in any proposal to introduce a system, especially where there is another system already in place (as, for example, in Ireland where Repak is responsible for the funding of packaging waste recycling in both the household and commercial/backdoor sectors, where there are already extensive networks, including for beverage containers). Rademaekers *et al.* (2011) proceed to make a number of high-level recommendations for the European Commission, and EU Member States, including *inter alia* (p. 8):

- *“Carefully consider the cost-effectiveness of container deposit systems.”*

The consultants’ consideration of drink container deposit systems in the EU was based on examination of Denmark and Germany, which introduced mandatory deposit systems in 2002 and 2003 respectively.⁶

The report concludes that the systems in these countries have been associated with high rates of return and recycling in the specific materials concerned, *although there were voluntary systems in place in both countries before the mandatory systems were launched, so that there were bases to build on.*

However, the report by Rademaekers *et al.* (2011) is chiefly concerned by the high costs of the systems in Denmark and Germany.

⁵ Rademaekers, K., van der Lann, J., Smith, M., van Breugel, C. and Pollitt, H. (2011) ‘The role of market-based instruments in achieving a resource efficient economy’, commissioned by DG Environment of the EC.

⁶ Further details of the systems in Denmark and Germany are outlined in the review of other countries’ experiences contained in Section 4 of this report.

According to Rademaekers *et al.* (p. 25) (our emphasis underlined – emboldened text reproduced here):

“Administrative burdens vary considerably, but for container deposit were very high

Across the case studies data on administrative burden was limited (possibly because the burdens were often not large enough to merit attention). The available estimates of administrative cost ranged from lows of around 0.3% of revenues for the aggregates levy in the UK to estimates of 3% of total costs for effluent charges in Germany. The one case that stood out as being expensive in this respect was the container deposit system, while effective in ensuring very high levels of return and resource recycling, the administrative costs estimated in both Denmark and Germany ran into tens of millions of euros, constituting a significant additional burden to retailers, but one that may be argued to be consistent with some level of provider/producer responsibility regarding waste.”

On Germany, Rademaekers *et al.* (2011) concluded as follows (p. 153):

“In conclusion, the effects of the German deposit system are twofold. On the one hand it appears that the promotion of environmentally friendly beverage containers was not successful, at least not by 2005. Some critics have focused on this failure of the container deposit system and argue that other mechanisms would be more successful in promoting the desired goal. On the other hand however, the collection rates are estimated to be very high and the rates of recycling have been increasing steadily over recent years. This leads to the overall conclusion that the container deposit system in Germany has been successful in improving systems to deal with waste following purchase of a good but has been less successful in encouraging more sustainable and resource efficient consumption choices among consumers.”

This passage indicates that the container deposit system in Germany has not been unambiguously positive or successful. On the positive aspect of the high return rates, the report considers that associating them with the introduction of the container deposit system in 2003 may give the false or misleading impression that the system has been successful, when the reality is that there was already a *voluntary* container deposit system in Germany prior to the introduction of the *mandatory* system in 2003. According to Rademaekers *et al.* (2011, p. 153):

“When looking in the container deposit collection history, data shows that Germany already experienced high return rates in 1998 when no mandatory system was in place.”

“It can thus be assumed that the compulsory participation in the refund-deposit system introduced in 2003 enjoyed a good base of consumer acceptance and established behaviour to build from.”

(In addition, as shown in Section 4 of this report, Germany was already achieving good recycling rates for beverage containers through DSD, the Green Dot system in that country.)

But the main concern that Rademaekers *et al.* (2011) have with the German deposit system is its costs, where it is concluded (p. 153):

“As a final and important point the system appears, based on the available data, to also be highly expensive to implement and administer, with net costs of approximately €285 million each year.”

Turning to Denmark, Rademaekers *et al.* conclude as follows (p. 160-161):

“In summary, the Danish deposit-refund system works fairly successfully from a resource efficiency perspective with high and improving return rates and recycling rates. Its efficiency and effectiveness is less clear, the system is costly to administer at ~€30 million a year and the environmental objectives have had to be relaxed due to slow progress towards meeting targets.”

“Looking just at the container deposit instruments in can be concluded that the systems yield positive effects for the environment and resource efficiency. However, when taking the wider context in consideration, it is more accurate to say that a container deposit system reduces material loss and potential environmental damage, however it does not prevent it entirely and its effectiveness in directing consumers towards more sustainable behaviour is impossible to quantify. Thus, the presented results should always be regarded critically with regard to other uncontrolled factors influencing the analysis.”

The key finding from Rademaekers *et al.* (2011) on the experiences of the container deposit systems in Denmark and Germany concerns the *cost of implementation*, where the report observes (p. 162):

“In both countries administration of the system was expensive, imposing annual costs to the administrative bodies, these more than €285 million in Germany. Proportionally, costs were lower in Germany than in Denmark, representing a more simplified system applying equally to all container sizes, but possible also economies of scale. Quantified resource efficiency benefit values are harder to find, the one estimate from Germany in relation to secondary materials suggests a value of only €82 million in income of materials, much less than the full administrative cost of the system. This suggests that deposit systems can be relatively very expensive ways of improving resource retention and re-use.”

Rademaekers *et al.* (2011) also consider the cross-border implications of introducing a deposit-refund system in the EU, where it is stated: (p. 164):

“An important critique by EUROOPEN concerning the container deposit policy instrument in the context of Europe claims that deposits are incompatible with cross-border movement. The freedom of EU citizens to work, travel and shop in neighbouring countries is widely perceived as a benefit of EU membership, but deposit systems for non-refillable containers are not compatible with cross-border shopping. Containers purchased abroad will become waste in the home country of the purchaser. Even if a deposit system operates there, it will not apply to containers sold in another country. Thus these containers will either end up in the waste stream or in an integrated recycling system. (EUROOPEN, 2003).”⁷

On the wider context concerning the effects of container deposit systems on EU Member States’ wider packaging compliance systems, Rademaekers *et al.* (2011) observe the introduction of container deposit systems in Estonia (2005) and Croatia (2006). However, the study concludes that the costs of introducing and operating container deposit systems in these countries could be very high and could threaten their wider packaging compliance systems as well (pp. 164-165) (Consultancy Team emphasis underlined):

“However, consistent with the findings on administrative burden and costs-benefits in this study, other assessments have also shown that the cost of launching mandatory deposits for single-use beverage containers in the new MS would be very high, threatening the successful replication of EU recovery system models in these countries. It is not clear on this basis whether it would be cost-effective to advise further adoption of container deposit models along the lines of the German or Danish systems, the evidence suggests not, but the subject bears further investigation to develop a clearer picture of costs and benefits.”

On balance, the study by Rademaekers *et al.* (2011), at the very least, raises considerable doubts about the efficacy of beverage container deposit-refund systems in the EU, principally due to their high costs.

⁷ The EUROOPEN (2003) study referred to is ‘Mandatory deposits for non-refillable beverage containers’.

2.3.2 European Parliament Committee on Foreign Affairs Briefing Note on the Possibility of an EEA-Wide Mandatory One-Way Deposit-Refund System for Beverage Containers (2011)

Concerned by the risk and actual behaviour of cross-country ‘dumping’ (an economic term) alluded to in the aforementioned reports by Rademaekers *et al.* (2011) and EUROOPEN (2003)⁸ – in which consumers buy beverages in one European country and ‘dump’ them in another such country (on purpose or inadvertently), thereby diminishing the intended benefits of container deposit systems – this briefing note (a desk research study) from the European Parliament Committee on Foreign Affairs summarised different instruments for promoting the reuse and recycling of beverage packaging and discussed the advantages/disadvantages of mandatory one-way deposit-refund systems for beverage containers and its EEA-wide implementation.⁹

The overall conclusion of the study is that while mandatory container deposit systems may be seen as effective for preventing littering and achieving high recycling rates, *a global (kerbside) separate collection system for different packaging materials may also achieve high recycling rates in countries.* The report proceeds to state (p. 5) (Consultancy Team emphasis underlined):

“Countries which already achieve high recycling rates without a mandatory deposit refund system may therefore not be too keen to introduce such a system and would rather aim at a more direct promotion of reusable beverage packaging. An analysis of current trends suggests that the market shares of reusable packaging and the recycling rates will keep falling in several countries without additional measures. However, the available information is not sufficient to determine if an EEA-wide mandatory deposit refund system would be the optimal solution, especially when environmental benefits as well as economic and social impacts are also taken into account.”

In Ireland’s case, as outlined in the research review below, and as demonstrated by reference to relevant empirical evidence, the existing packaging waste compliance system is working effectively (as concluded by an independent study in 2014, reviewed below), with all recycling rates (all packaging materials and specific packaging materials) surpassing the externally set targets ahead of schedule, and there is now a network of kerbside recycling for households along with bring-banks and recycling/civic amenity centres where consumers can deposit drinks containers and other recyclables (at the end of 2016 there were 118 civic amenity centres around the country and 1,848 bottle banks). The relevant empirical evidence also shows that litter is contracting in Ireland and that the proportion of all litter items due specifically to beverage container packaging has declined since 2002, and since the Perchards report of 2008.

Were Ireland to introduce a deposit-refund system for beverage containers, the cross-border implications would have to be carefully considered, among other things, and specifically the question of depositing and returning containers purchased in NI (or other parts of the EU). The complexity of this issue could increase further in view of Brexit.

⁸ *Supra* footnotes 5 and 7.

⁹ *Supra* footnote 2 on what countries form the EEA.

Box 2.1: Prominence of Alcohol Sales in Cross-Border Shopping on the Island of Ireland

Cross-border shopping between the two parts of the island of Ireland has for many years been an important way of life, with most of the flows being from Ireland (South) to NI (North). The issue has exercised policymakers and local communities during periods when sterling has been relatively low against the euro or previously the punt, including currently as part of the fallout from Brexit (which is also apparent from car park data assembled by InterTradeIreland).

A special module on cross-border shopping was conducted by the CSO in 2010 and is relevant in the context of the present report for highlighting the importance of alcohol sales and the extent of cross-border shopping by people living south of the Border Region of Ireland.

Alcohol emerged as the second most common category of good bought by Irish shoppers making the trip over the border in the 2010 study, with 44% of households purchasing alcohol (the most common category was groceries, 77%, which include non-alcoholic drinks).

Of interest is the fact that alcohol sales are particularly common among households living south of the Border Region in the State (the Border Region comprises Counties Donegal, Sligo, Leitrim, Cavan, Monaghan and Louth). Compared with the total figure of 44% purchasing alcohol on cross-border shopping in NI, the corresponding figure for the Border Region was 29% but higher in the other parts of the State, namely the Midlands (50%), West (60%), Dublin (52%), the Mid-East (51%) and the rest of the State (48%).

In terms of average spend, the figure for all households was €274, which belies significant variation across regions: €155 in the Border Region; €322 in the Midlands; €293 in the West; €284 in Dublin; €391 in the Mid-East; and €523 on average per household in the other regions of the State (Mid-West, South-East and South-West regions). Alcohol spending was correspondingly higher among households south of the Border Region in the State: €11 on average in the Border Region but rising to €50 for Dublin households and €54 among households in the most southern parts of Ireland.

Source: CSO Quarterly National Household Survey: Cross Border Shopping (Quarter 2 2010).

2.3.3 OECD Study on Waste Management Policies (2004)

In its 2004 study of waste management policies in its member countries (including Ireland), the Organisation for Economic Cooperation and Development (OECD) succinctly sums up the position and evidence on deposit-refund systems (pp. 137-138) (Consultancy Team emphasis underlined):¹⁰

“Two bottom lines to mandatory deposits. One, if a product is toxic and should be recovered and recycled carefully, then mandatory deposits are an excellent way of enlisting consumer assistance in keeping the product uncluttered and out of landfills (or incinerators). And two, mandatory deposits are a very expensive anti-litter program even when there is no recycling, and mandatory deposits become more expensive when and where there is curbside recycling. Moreover, if the loss of recycling revenue delays or undermines the operation of socially profitable recycling programs, the final cost of litter reduction will be even higher. This is not just speculation.”

The OECD takes the view that mandatory deposits on beverage containers are, at best, only a second-best solution for encouraging recycling, when other recycling infrastructure is already in place (as is the case in Ireland).

¹⁰ ‘Addressing the Economics of Waste’, OECD (2004).

According to the OECD report (p. 136):

“Introducing mandatory deposits on beverage containers is a very indirect and second-best way of encouraging recycling. Why second-best? Because it only encourages beverage-container recycling – not recycling in general – and it initiates a new, separate, and high-cost collection system – instead of utilising the already-installed, cheaper curbside-collection system. The same sort of story applies to the other supported benefits of mandatory deposits ... They are all second-best, at best.”

In view of its conclusion that mandatory beverage container deposits systems are only a second-best form of encouraging recycling, at best, the OECD study then recommends that the only rationale for introducing a mandatory beverage container deposit-refund system, *where there is already recycling infrastructure and where recycling has become widespread, is to tackle litter due to beverage containers*. According to the OECD study (p. 137):

“Mandatory deposits are an anti-litter policy, which recycling is not ... and taxing litter directly is impossible ... if beverage container litter is considered to be a serious problem, then mandatory deposits are a much more effective policy than either the availability of recycling or an MTC [marginal trash charge], and the co-existence of all three may make sense”.

This takes us to the heart of the matter, namely that deposit-refund systems and recycling systems are separate policies aimed at separate goals – the former are a means to address litter due to beverage containers and this then leads to the question as to the extent of the market failure: is litter a problem in Ireland? Is it getting worse? Is there a particular problem with beverage containers in the composition of litter and is it getting worse over time?

These key questions are addressed with the relevant empirical evidence in Section 3.

2.3.4 University of Ghent Master of Science in Economics Thesis Study (2015/2016)

Another relevant study (but of lower profile compared with the other studies reviewed here) is the thesis prepared by Mr. Niek Deprez for the Master of Science in Economics degree at the University of Ghent in Belgium in the academic year 2015/2016. The study is particularly relevant in the context of deposit-return systems being considered as a possible economic instrument to combat litter problems in which beverage containers are prominent in the mix of litter materials, as highlighted in the preceding OECD study (2004). Belgium is a case in point and is the subject of the MSc thesis considered presently. Like Ireland, Belgium is a country with packaging recycling rates above the EU28. Belgium is also of interest because it does not have a deposit-refund system for beverage containers – a mandatory system was scheduled for introduction at the beginning of 1993, but has not been introduced.

The MSc thesis begins by observing that litter has been an issue for Belgium residents for some time. A study conducted by OVAM (the Flemish waste authority) in 2013 found that litter cost approximately €61.5m per year in Flanders, in which about 40% of the volume of the litter consisted of beverage packaging. Policymakers decided that a deposit-refund system for (one-way, non-refillable) beverage containers might be deployed as a means of tackling the litter problem and accordingly commissioned a CBA of a deposit-refund system for one-way beverage packaging for Flanders. The policy objectives were twofold, namely to reduce litter (and in particular the apparently sizeable proportion of litter due to beverage containers) and secondly to increase recovery rates for one-way beverage packaging. The thesis considered whether a deposit-refund system on one-way beverage packaging is theoretically and empirically viable for Belgium, based on the cost-benefit analysis carried out by OVAM (2015).

As well as looking at the OVAM study for Flanders, the thesis also examined CBAs carried out on deposit-refund systems in Germany and The Netherlands, and in Israel as an example of a non-EU country.

The main findings of the MSc thesis are that the CBAs reviewed all find that the implementation of such a system for beverage containers is “*very costly*”, with the CBAs in Germany and The Netherlands leading to the conclusion that the systems in those countries are “*cost-inefficient*”. The thesis also found significant uncertainties in estimating the costs and benefits for beverage container deposit-refund systems in the countries considered.

Based on the 2013 study by OVAM (referenced in the thesis), the study reports litter per capita in Flanders of 2.7 kilograms (not including street litter in litter bins). If the litter in these bins is included this amounts to 25,300 tonnes or an average of 3.9 kg per capita per year. The total cost of the 25,300 tonnes of litter was €61.5m or €9.60 per capita, or around €2,420 per tonne of litter.¹¹

In identifying the benefits and costs of a deposit-refund system for beverage containers, the thesis sets out the following:

- Benefits;
 - Litter reduction
 - Increase in recycling rate
 - Value of the returned container
 - Money earned because people do not return the containers (no deposits paid)
- Costs;
 - Investment costs – depots, RVMs, marketing etc. (capital costs)
 - Administration costs
 - Costs for consumers
 - Costs of returning the packaging container to the depot/centre/RVM
 - Inconvenience costs – for example, if an RVM machine does not work, is full up or if the packaging container’s barcode cannot be read etc. (as might be the case with beverage containers bought in other jurisdictions, for example)
 - Increased costs of the beverage (through the *perceived* deposit) (although this is a redeemable cost through the operation of the system, as outlined earlier in this report, it might nevertheless be perceived by people as an additional cost or ‘stealth’ charge imposed on the retail price of beverages)
 - Costs for suppliers
 - Collecting costs – more space may be needed for the returned containers
 - Lower demand for beverages as a result of the deposit and the increased product prices (which might nevertheless be justified on other public policy grounds, such as reducing alcohol consumption or the consumption of sugary soft drinks to combat obesity but then this raises further complexity regarding the underlying objectives of deposit-refund systems, which may make them unpopular and a source of debate among political parties (‘nanny state’ etc.) and in any event deposits are an environmental tool, not a health one)
 - Profits of beverage packaging firms may be adversely affected
 - Job losses and rising social welfare spending for government
 - Costs in suppliers lobbying against the system.

¹¹ The thesis refers to ‘tons’, understood here to be metric tonnes or ‘tonnes’ as used to here.

The MSc thesis outlines that the costs and benefits (which are not necessarily exhaustive of all possibilities) are difficult or uncertain to estimate, in particular to monetise. This includes the main intended benefit – reduction of litter, where the author of the thesis proceeds to outline alternative methods of monetising the value that people may place on litter reduction (more specifically, reduction of container packaging among litter).¹²

The MSc thesis then reviews previous CBAs (carried out by others) in three countries, beginning with The Netherlands, where the author concludes that the Dutch system cost approximately €40m per year and the energy saved due to the system amounted to a benefit of about €34m, which suggests that the system in that country is not cost-efficient. However, the thesis observes that the CBA carried out for The Netherlands (independently of the thesis) did not take into account the range of possible costs and benefits, including supplier costs, consumer costs and litter benefits outlined above.

In the case of Germany, the thesis author looked at a previous CBA study of the deposit-refund system for beverage containers in that country and noted the finding of no statistically significant differences in litter in three Germany cities between 1997 (before the system came into effect) and 2005 (two years after the beverage container system was introduced) (the cities being Cologne, Dusseldorf and Frankfurt). The thesis noted that: (1) the reduction of emissions and energy consumption due to the system has not been significant; (2) almost all of the costs for suppliers and retailers have been passed on to consumers; (3) the policy has negatively affected the profits of beverage packaging producers, leading to job losses; and (4) the system has been highly cost-inefficient from the perspective of reducing carbon dioxide (CO₂) emissions. As the author of the MSc thesis puts it after reviewing the German experience (p. 27):

“The total costs of the system amount to 640 million euros while the reduction of CO₂ emissions amounts to only a reduction 0,5 million tonnes. This would make the DRS [deposit-refund system] one of the most expensive measures against CO₂ emissions with a cost of 1300 euros per ton reduction of CO₂. We can conclude that also in Germany the DRS is highly cost-inefficient.”

A different outcome was found from the study pertaining to Israel considered in the thesis, which suggests that the system in that country has been cost-efficient. However, the author tempers this finding by observing that the study for Israel “*did not account for the loss of consumer surplus, inconvenience costs and the loss of profit for the supplier because of lower demand*”, giving rise to the view that the “*conclusions of the study could be [the] opposite if these were taken into account*” (p. 29).

The MSc thesis then considers Belgium, based on a detailed review of the aforementioned OVAM (2015) study, which contains a CBA on a container deposit system for that country. The author concludes (pp. 48-49) (Consultancy Team emphasis underlined):

“We found that there are a lot of uncertainties regarding the estimations of the costs and benefits of a DRS for one-way beverage packaging in Flanders (and Belgium in extension). Some costs and benefits were probably underestimated, others were probably overestimated. Some important cost and benefits were simply left out because of their non-monetary character. We found that a DRS for one-way beverage packaging can serve as a means to increase the recovery rate of PET-bottles. The result for reducing the amount of litter was more ambiguous. The reason for this is that one-way beverage packaging only accounts for 40% of the total volume of litter and 4% of the total pieces of litter.”

¹² Another possible cost (or benefit) concerns medical injuries to people as a result of broken glass on the street or in public spaces (e.g. a child playing football in a park who sustains a cut needing stitches after a fall on a piece of broken glass that contained an alcoholic beverage).

This partially accomplishing of the political objectives is accompanied with a very costly system. In addition the system also has some negative effects on suppliers, retailers and ultimately consumers, who bare the [brunt] of the costs as suppliers can charge their extra costs in their product prices. Combined with already high taxes in Belgium this could be an undesirable system. As a conclusion we propose that more extensive research is conducted about the cost-effectivity of the PMD-system and that a more extensive cost-benefit analysis, keeping in mind the results of the research about the PMD-system, is made.”¹³

The thesis by Mr. Niek Deprez for the Master of Science in Economics degree at the University of Ghent, Belgium in the academic year 2015/2016 (supervised by Professor Johan Albrecht of that institution) lends support to the previous study by Rademaekers *et al.* for the European Commission (2011) (reviewed earlier), namely that deposit-return systems for beverage containers are very costly or cost-ineffective.¹⁴

2.3.5 Spanish Study (2017)

A recent study by the United Nations Educational, Scientific and Cultural Organization (UNESCO) considered the “*Sustainability study on the introduction of a mandatory DRS for packaging in Spain: comparative environmental, social and financial analysis versus current situation*”, the Ariadna Project.

Like Belgium, Spain is particularly relevant to Ireland as a country without a mandatory beverage container deposit-refund system, and the UNESCO examined the implications of introducing such a system on top of an existing packaging waste PRI. In 2014, Spain’s recycling rate for all packaging materials was 69%; Ireland’s was 68% and Belgium had the highest rate at 81% (based on latest available Eurostat data).

The UNESCO study, published in June 2017, found that:

- The increased recycling rate of the proposal relies on processes entailing more pollution;
- The total net collection cost would see a 4.6-fold increase in the total cost of collecting packaging.

On the importance of properly justifying such a system, the UNESCO study concluded that (p. 29):

“In order to comply with the law on waste and with the European Commission’s recommendations, before deciding whether to require the implementation of a DRS, its technical viability and sustainability must be studied throughout its life cycle in three areas: social, environmental and economic. A study that does not consider these aspects is not adequate for making decisions involving waste policy.”

On the proposal’s effects compared with the existing PRI in Spain, the UNESCO study found that (p. 29):

“A full and rigorous analysis indicates that the suggested change to the management of packaging waste caused by the addition of a DRS under the conditions of this study would be less sustainable than continuing with the current system, since: its social impact would not be beneficial to Spanish citizens or to the parameters evaluated for the general economy; its cost would be much higher for society; and the environmental impact would be higher in most of the impact categories.”

¹³ Also of interest in this passage of the MSc thesis is the way litter can be measured: measurement based on *pieces of litter*, as opposed to volume or weight, is how litter in Ireland is officially assessed (see Section 3). PMD is short for plastic, metals and drinks cartons. In the Belgian Green Dot system, FOST Plus ensures the kerbside collection of lightweight packaging (PMD items), which are collected together.

¹⁴ The MSc thesis of Mr. Deprez is publicly available from the University of Ghent Library (it can be found [here](#)).

Regarding what should be done as a result of the study, UNESCO came to the following conclusion (p. 29):

“The vast majority of the financial and human resources the change would require would be better devoted to improving the existing system and the processing of other types of waste that are more abundant and environmentally problematic. Packaging waste is a small and relatively problem-free fraction of all municipal waste, and the packaging proposed for the DRS is the kind that is handled well by the current system.”¹⁵

2.4 Irish Studies

2.4.1 Introduction – Waste Management Policy in Ireland

Public policy on waste management in Ireland has been based on the Polluter Pays Principle (PPP), meaning that the generator of waste is obliged to ensure that the waste is properly managed. In pursuit of the PPP, the State has introduced Producer Responsibility Initiatives (PRIs) in several waste streams, including packaging (others include farm plastics, waste electrical and electronic equipment and end-of-life vehicles). PRIs are considered below, with the focus on the packaging PRI run by Repak since 1997.

While waste management policy and implementation of the PPP has tended to focus on producers (and importers) of waste streams (i.e. businesses), recent years have seen growing acceptance of the need to involve households as well as businesses. This has manifested itself in the rollout of household recycling initiatives – in the form of green bins for packaging waste and brown bins for recyclable food waste. Today, householders are becoming more aware of the waste and environmental consequences of their day-to-day actions, and there is an opportunity for public policy to continue to support effective waste management in the household sector as part of the process to ensure a more sustainable environment for the current and future generations.

For instance, and as a brief aside, a recent study commissioned by Repak from PMCA in 2017 considers the packaging waste implications of households in Ireland engaging in online purchases of consumer goods from overseas locations – a form of e-commerce valued at over €1.5 billion currently and growing rapidly, given convenience, and cost, considerations. However, when goods purchased in this way arrive in Ireland from foreign destinations, so too does extra packaging that is not accounted for by the packaging waste compliance system (PRI) in the country (on the other hand, businesses which import goods with packaging into Ireland through online or traditional means are obliged to count the imported packaging as part of their overall packaging placed on the market in Ireland, and when a consumer buys groceries online from an outlet in Ireland or orders a prepared meal or pizza from an Irish outlet through the internet the accompanying packaging is counted as part of all packaging waste generated in the country, by the respective suppliers). Thus, the packaging arising in Ireland from online purchases of consumer goods from abroad by households/people (non-businesses) in Ireland is currently escaping the packaging waste compliance system and is creating an additional cost to compliant producers in Ireland, which PMCA estimates at approximately €200 per Repak member per annum and growing rapidly because of the very strong growth in this form of e-commerce.

¹⁵ PMCA notes that the study was sponsored by representatives of industry (including recyclers) in Spain but is nonetheless a study by the UNESCO Chair on Life Cycle and Climate Change.

Of significance to the research review relating to the situation in Ireland is the wide-ranging review by the then Department of the Environment, Community and Local Government of PRIs in the State in 2014, including packaging, within which consideration was given to the possible introduction of a deposit-refund system for beverage containers (by Professor Paul Gorecki, then of the Economic and Social Research Institute). The ESRI/Gorecki study is considered below, after first considering the main relevant findings from the PRI Review.

2.4.2 PRI Review 2014

Under Extended Producer Responsibility (EPR), manufacturers and importers of products are required to bear a significant degree of responsibility for the environmental impacts of their products throughout the product life-cycle, including upstream impacts inherent in the selection of materials for the products, impacts from manufacturers' production processes, and downstream impacts from the use and disposal of the products. Producers accept their responsibility when designing their products to minimise life-cycle environmental impacts, and when accepting legal, physical or socio-economic responsibility for environmental impacts that cannot be eliminated by design.

PRIs allow producers of products (such as beverage/drinks producers) to devise or become members of State-approved systems having the capacity to fulfil the objectives of waste management legislation without the need for a 'command and control' approach from the State. Packaging is among the principal PRIs in Ireland and producers obligated by the packaging waste legislation have a choice of two compliance routes: they can become a member of Repak or they can self-comply by working in tandem with their relevant local authorities. The vast majority of producers of packaging waste in Ireland comply through Repak (also referred to as a Producer Responsibility Organisation, PRO), which operates under approval granted by the Minister for Communications, Climate Action and Environment, who is responsible for EPR and PRIs.

The PRI Review of 2014 found that most PRI systems have operated very successfully and have enabled Ireland to reach its domestic and EU recycling targets, and have also successfully contributed to Ireland meeting its overall environmental goals and have diverted substantial amounts of waste from landfill.

Accepting the strong performance of most of the PRIs, particularly in packaging, the purpose of the PRI Review was nevertheless to examine Ireland's position in meeting its EU and national targets in a cost-effective manner and to ensure measures in place in this regard in the years following the PRI Review. In particular, the terms of reference were to examine the following (the ToR were informed by a consultation period prior to their publication):

- The operation of the existing PRIs.
- The scope for additional measures to improve the effectiveness of the existing PRIs.
- The potential for further measures to enhance the prevention and minimisation of PRI waste and to encourage the preparation for reuse of recovered PRI waste resources.
- The potential to introduce further PRIs for the management of additional waste streams
- The suitability and effectiveness of the current statutory and regulatory arrangements particularly when compared against best practice in other Member States.
- The effectiveness of the current competitive dynamic in the waste streams where PRI operates and how it can be maximised (i.e. existing systems enhanced and/or additional systems made subject to PRI) to increase competition, lower costs for producers and lower the potential for free-riders, and also bearing in mind the potential increase in costs which might arise due to the increases in the number of compliance systems.

- The cost of recycling for Irish producers, including both the actual cost of recycling and the administrative cost of the compliance system.
- The effectiveness of the current use of information and awareness within the PRI and recommendations for its enhancement.
- The suitability, availability and quality of waste recycling infrastructure and services, which are present in Ireland and relevant to PRIs, including the practical potential for the use of emerging technologies.

The PRI Review of 2014 recognised the possibility that PRIs can be used in conjunction with other policy instruments, including deposit-refund systems, to achieve their intended environmental outcomes. On this possibility in packaging waste, the PRI Review concluded that a *wide-ranging* deposit-refund system would not be required or necessary given the success of the PRI in packaging and the likely costs that would be involved, and a specific deposit-refund system in packaging would need careful examination, including the conduct of a CBA. According to the PRI Review (p. 443) (our emphasis underlined):

“To add a wide-ranging packaging deposit and return system to the current system is inappropriate in view of the operation of the existing EPR packaging system and proposed policies concerning household waste collection, combined with the high administrative costs of a deposit and return system and the limited experience with deposit and return systems beyond drinks containers. There may be specific types of packaging waste or specific externalities, such as some forms of littering, where introduction of a deposit and return system might be appropriate. However, this would require careful examination through a cost-benefit analysis.”

To this the Consultancy Team would draw upon the lessons of the key international studies reviewed earlier, which indicate that the costs involved with even specific deposit-refund systems are likely to be substantial and that the findings from the relevant research suggest that careful consideration be given to the need, rationale or justification for a specific deposit system in the first place, in addition to carrying out a CBA, which would need to be very carefully specified, including paying particular attention to identifying, quantifying and monetising all of the costs and benefits, even though the literature suggests the costs and benefits are imbued with uncertainty owing the subjectivity involved in many of the costs and benefits.

The 2014 PRI Review did not recommend any deposit-refund system for Ireland (wide-ranging or specific, including for beverage containers) and its main conclusions for the packaging PRI were:

- Ireland has achieved great success in recovering and recycling packaging waste and one of the key reasons for the success has been the shared responsibility approach to the packaging PRI.
- Repak and its members are largely responsible for the achievement of the national targets – in contrast, self-compliers (through the local authority route) have had a very limited contribution.
- The cost to producers who are members of a PRO was €35.6 per tonne in 2012, which have fallen by approximately €10/tonne since 2010.
- When compared with other European countries, these costs are in the lower end of the spectrum – although a direct comparison of compliance cost may give an incomplete picture as costs may vary due to differences in a number of factors.
- In the period 2009-2011 Repak spent more than its income from producer fees, with the deficit covered by the contingency fund, whereas in 2012 expenditure was less than income.

The PRI Review recommended that, in order to preclude a reoccurrence of expenditure exceeding income, Repak should examine how to reduce direct recycling costs in order to balance income with expenditure. In particular in setting subsidy levels, the effect of the landfill levy should be considered. In combination with the recommended improvement of the self-compliance system, the Department responsible for PRIs should investigate the allocation of a share of national targets to self-compliers. Increased enforcement of producers' obligations could also assist Repak's financial sustainability.

Following the PRI Review in 2014, Repak drew up a five-year plan, which was agreed by the Department. Generation of fee income from a wider membership base, plus cost management, are the key priorities for the Repak Board in its mission to deliver of recycling targets on a value for money basis. The average cost per tonne (including household and commercial) fell from €27.64 in 2013 to €23.25 in 2016. Surpluses (income over spending) have been recorded in 2015 and 2016, since the PRI Review in 2014.

2.4.3 ESRI/Gorecki Study on a Possible Deposit-Refund System for Beverage Containers in Ireland (2013)

Part of the PRI Review 2014, the primary purpose of this study by Professor Paul Gorecki (then at the ESRI) was to consider the feasibility, desirability and merits of a packaging levy as a method to reduce, reuse and recycle packaging and packaging waste. At the time of the study, there was no packaging levy in Ireland – which continues to be the case today (there is, however, a levy on one form of packaging – plastic bags, which should not be confused with a wider packaging levy). The Gorecki study came down emphatically against the introduction of a packaging levy in Ireland because it is likely to generate a large number of costs – to the legislative process, to public administration and to business – with few, if any, tangible benefits. Professor Gorecki considered that a packaging levy would be an example of double regulation, given the existence of the packaging EPR administered by Repak and the pricing of many externalities. This would not only be likely to create additional administrative burdens on producers – which would be reflected in higher prices to consumers as well as putting Irish-based business at a competitive disadvantage leading to job losses – but would also result in sub-optimal use of packaging, which performs many useful functions.

The study by Professor Gorecki as part of the PRI Review also considered the possibility of a deposit-refund system in packaging waste and concluded that such a system would be inappropriate in Ireland, owing to the success of the Repak system, which contributes towards the funding of household dry recycling, civic amenity centres and bring-banks.

The Gorecki study also quotes from the aforementioned study by Rademaekers *et al.* (2011), namely that such systems can be “highly expensive to implement and administer.”¹⁶

According to Professor Gorecki (p. 21):¹⁷

“In sum, to add a wide-ranging packaging deposit and return system to the current system is inappropriate in view of the operation of the existing EPR packaging system and proposed policies concerning household waste collection, combined with the high administrative costs of a deposit and return system and the limited experience with deposit and return systems beyond drinks containers.”

¹⁶ *Supra* footnote 5 (of this report by PMCA and Gill Bevington).

¹⁷ Gorecki, P. K. (2013) ‘A Packaging Levy for Ireland’, Review of the Producer Responsibility Initiative Model in Ireland – Annex to the Main Report, ESRI and Department of Economics, Trinity College Dublin.

2.4.4 OECD Environmental Performance Reviews – Ireland (2010)

The OECD Environmental Performance Reviews provide independent assessment of countries' progress in achieving domestic and international environmental policy commitments and goals, together with policy-relevant recommendations. They include the management of waste and a broad range of economic and environmental data and statistics.

The last such review on Ireland was published in April 2010 and examined progress since the previous review in 2000. The study observed that Ireland met a number of waste policy targets ahead of schedule, *"including the 2010-11 targets for recovery of paper, cardboard, wood and packaging waste"* (p. 21). The OECD's report did not recommend any changes to the packaging PRI in Ireland, or any deposit-refund systems, including for beverage containers in the country.

2.5 Summary of the Relevant Research Review

The review of relevant research on the performance of beverage container deposit-refund systems in countries where they have been introduced on a mandatory basis can be summarised as follows.

Despite their attractive features *in principle*, the experience *in practice* is that deposit systems are not unambiguously successful in respect of achieving their principal benefits, namely litter reduction and increased recycling rates, and a major cause of concern is their costs of implementation and operation, which is found to be very high in the research literature, relative to the benefits claimed for them.

Perhaps the best summing up of the efficacy of beverage container deposit-refund systems is from the OECD study of international waste policies in 2004, whose conclusion is worth showing again (p. 136):

"Introducing mandatory deposits on beverage containers is a very indirect and second-best way of encouraging recycling. Why second-best? Because it only encourages beverage-container recycling – not recycling in general – and it initiates a new, separate, and high-cost collection system – instead of utilising the already-installed, cheaper curbside-collection system. The same sort of story applies to the other supported benefits of mandatory deposits ... They are all second-best, at best."

In view of its conclusion that mandatory beverage container deposits systems are only a second-best form of encouraging recycling, at best, the OECD study then recommends that the only rationale for introducing a mandatory beverage container deposit-refund system, *where there is already recycling infrastructure and where recycling has become widespread, is to tackle litter due to beverage containers.*

Because Ireland now has a recycling infrastructure, for households as well as the producers of packaging waste, and because recycling is now well-established in the State, the latter part of the OECD study of 2004 takes us to the heart of the matter concerning the need for such a system in Ireland, namely as a means to address litter due to beverage containers, which in turn demands examination of the relevant empirical evidence: *is there a litter problem in Ireland? Is it getting worse over time? Is there a particular problem with beverage containers in the composition of litter and is it getting worse over time?*

These questions of fundamental importance to the rationale for a beverage container deposit system in Ireland are considered by reference to the relevant empirical evidence in the next section of the report.

3 Quantitative Analysis of the Need for a Beverage Container Deposit in Ireland

3.1 Introduction

Following the review of relevant research on beverage container deposit-refund systems internationally and in Ireland in the preceding section, we now further consider the rationale for such a system in the State, as proposed under the Waste Reduction Bill 2017, by reference to relevant empirical analysis.

The OECD study of international waste policies (2004), reviewed in Section 2, is particularly enlightening and relevant to the case of Ireland because it considers the need for beverage container deposit systems in countries where there is an *already-established recycling infrastructure and recycling has become widespread (by households as well as producers of packaging waste)*. In view of its conclusion that mandatory beverage container deposits systems are only a “second-best” form of encouraging recycling, “at best”, the OECD study recommends that the only rationale for introducing a mandatory beverage container deposit-refund system, *where there is already recycling infrastructure and where recycling has become widespread, is to tackle litter due to beverage containers*.

Thus, the key question that needs to be addressed with relevant empirical evidence is: ***does Ireland have a litter problem due to beverage containers, and is it getting worse over time?*** In assembling the relevant data and conducting empirical analysis of this key question, we also consider whether there is a more widespread problem with litter in Ireland and how it has changed over time.

While the OECD study was published more than a decade ago, its conclusion regarding the justification for a deposit-refund system being a method of litter control, in countries with established recycling infrastructures and recycling practices, is grounded in *economic research and principles*, which continue to be relevant today, and ***they are directly relevant to the situation in Ireland***.

As well as examining the evidence on litter – both general litter and specifically in regard to beverage container litter, and their respective trends over time – we also analyse the evidence on recycling rates, namely for all packaging materials and for specific beverage container packaging materials. The examination includes analysis of whether there is a statistically significant relationship between officially compiled European countries’ recycling rates, on the other hand, and the presence of beverage container deposit systems, on the other hand. There are currently nine (9) countries in Europe with mandatory beverage container deposit-refund systems – Croatia, Denmark, Estonia, Finland, Germany, Iceland, Lithuania, Norway and Sweden – with seven of the countries being Member States of the EU and both Iceland and Norway part of the EEA, and therefore required to implement the Packaging Directive. Eurostat data on recycling rates is available for all EEA countries and the latest year for which the data are available on all EEA countries at the time of conducting the analysis in the autumn of 2017 is 2014 (with the exception of Iceland, for which there are missing data in the Eurostat database). Because Lithuania commenced its deposit system in 2016, it is allocated to the group of countries without a DRS in the sample (as is The Netherlands, which has only a partial system for large PET bottles).

Thus the sample analysed in this section of the report comprises 30 countries, within which 7 have deposit systems and 23 are without systems (including Ireland). The available official data from Eurostat allows us to statistically test the claim that such systems lead to increased recycling rates. In other words, we have a ‘natural experiment’ setting with the official data, which permits examination of the rationale (in part) of the proposal to institute such a system in Ireland.

3.2 Litter Reduction – Is there a Litter Problem due to Beverage Containers?

3.2.1 Introduction – Ireland’s Strong Incentive to Minimise Litter *A Priori*

Green is the colour associated with Ireland – physically, culturally and in numerous other ways, including in sport. The same colour also helps to define the economy of Ireland. For example, two of the most important sectors are agri-food and tourism, which have particularly strong economic impacts, reflecting the extent to which they are embedded in the national economy. Green is a fundamental part of the country’s international comparative advantages in these sectors. In all segments of the agri-food value chain, Irish producers, and consumers (both here and abroad) put value and take pride in the wholesomeness of Irish produce, including its provenance and traceability, and the close connection with the land and wider environment. In tourism, Ireland promotes itself as a friendly country with a clean and unspoiled environment. Inflows and outflows of tourists in either direction feature regularly in the news, not least in the context of Brexit, and there is clearly a strong incentive to minimise litter of all types.

A priori (i.e. before one considers the relevant empirical evidence), one would therefore reasonably expect Ireland to be a country with low litter or litter under control, and/or litter improving over time.

We consider the evidence in regard to both *all items of litter* and *beverage container litter* shortly; but first we look at the extensive network of litter control initiatives around the country, which reflect the importance of keeping litter under control from an economic perspective.

3.2.2 Ireland’s Extensive Litter Control Infrastructure and Initiatives

3.2.2.1 Litter Prevention and Control in the State

The legal definition of ‘litter’ extends from small bits of paper or cigarette ends to anything that is, or is likely to become, unsightly. The Litter Pollution Act 1997 provides for penalties for people who litter.

Local authorities are responsible for keeping public places under their control, including public roads, clear of litter as far as is practicably possible. This includes arranging cleansing programmes, as well as providing and emptying litter bins. They can take enforcement action against people who break or ignore the law. The Gardaí also have the power to issue on-the-spot fines for litter offences.

Each local authority is required to prepare a litter management plan for its area, setting out its objectives to prevent and control litter, along with measures to encourage public awareness of litter. The plan must also set out measures and arrangements by which the local authority intends to achieve these objectives. In preparing its litter management plan, the local authority must consult with local community and voluntary interests.

The National Litter Pollution Monitoring System (NLPMS) collates litter pollution surveys carried out by local authorities and measures the changes over time. Litter control is an important element of the Tidy Towns competition. Local authority grants are available for anti-litter and anti-graffiti awareness projects. We consider data from the NLPMS over the past decade below.

3.2.2.2 Local Authority Grant System for Litter Control

The DCCAE has co-funded local authority anti-litter awareness and education initiatives amounting to well over €12m since 1997. Local authorities are responsible for selecting suitable anti-litter awareness projects for funding and deciding on the grant allocations in individual cases. Projects/activities are required to promote greater public awareness and education in relation to litter and graffiti control, and should, as far as possible, have a particular focus on voluntary initiatives by community and environmental groups, and on involving schools and young people in anti-litter and anti-graffiti actions.

The criteria for selecting anti-litter and anti-graffiti awareness projects include:

- Promoting greater public awareness and education in relation to litter and graffiti, with a particular focus on involving schools and young people in anti-litter and anti-graffiti action and on voluntary initiatives by community and environmental groups.
- Leveraging local business co-funding of education and awareness measures so that there is private sector involvement as well.

3.2.2.3 National Litter Pollution Monitoring System (NLPMS)

The NLPMS aims to provide an accurate picture of litter pollution countrywide and to accurately measure changes in litter over time.

It was developed by the Department/DCCAE and Tobin Consulting Engineers in consultation with local authorities. Under the System, local authorities carry out surveys – a minimum of between 30 and 600 surveys per annum depending on population size – to determine the extent, composition and causes of litter pollution in their areas. The data obtained enables the local authorities to provide more effective litter management planning for their areas, to assess the effectiveness of their litter management strategies and to ensure the optimum allocation of its resources to tackle litter. The NLPMS provides important information to the Department on the national picture regarding litter pollution, reflecting the importance placed on litter control for the national economy and well-being of the society in Ireland.

The System provides answers to three key questions:

- How littered is the country at local and national levels?
- What are the main constituent elements of litter pollution?
- What are the main causes of litter pollution?

Two types of survey are undertaken. The first is to determine the extent and severity of litter pollution overall (all litter items). The Local Government Computer Services Board (LGCSB) has developed a Litter Geographical Information System (LGIS) software package to assist local authorities to map potential sources of litter and identify locations for their surveys. Local authorities determine the survey locations using maps produced by the LGIS Software, as follows:

- 40% 'high risk' locations.
- 40% random potential litter generating areas chosen by the LGIS Software.
- 20% based on local authorities' knowledge of litter pollution in their respective areas.

The litter pollution survey results (all items) are expressed as a Litter Pollution Index (LPI) for the areas surveyed, ranging in value from 1 to 5, as follows:

- LPI 1 – *Unpolluted or Litter Free.*
- LPI 2 – *Slightly Polluted.*
- LPI 3 – *Moderately Polluted.*
- LPI 4 – *Significantly Polluted.*
- LPI 5 – *Grossly Polluted* (e.g. the level of litter expected after a major entertainment event).

In the NLPMS annual reports, compiled by Tobin Consulting Engineers, which acts as the Litter Monitoring Body (LMB) for the DCCA in respect of the NLPMS, the results are expressed in the form of a bar chart, showing the percentage breakdowns of LPI 1-LPI 5 (all litter items counted or ‘pieces’ of litter, all forms) and their changes over time. From the results, it is possible to derive a weighted average LPI, based on the values/scores and their respective percentage frequencies and to show an overall performance over time – the (Consultancy Team-derived) weighted average LPI is shown below as well as the LPIs from the surveys, on which the weighted average summary statistic is based.

The second type of survey is the Litter Quantification Survey (LQS), which identifies the composition (i.e. the type and origin) of litter pollution prevailing in a particular area. The results of the LQS are also considered below.

Ireland’s litter has reduced over time – the details are shown below. The main sources are cigarette-related and chewing gum; while the main causes or places of litter pollution are passing pedestrians, motorists, retail outlets, places of leisure/entertainment and gathering points.

3.2.2.4 National Spring Clean

The National Spring Clean (NSC) is run by An Taisce and co-financed by the DCCA. Traditionally run each year in April, during which volunteers get out-and-about to remove litter from the country, it is a multi-sectoral initiative that promotes public awareness and participation in local litter clean-ups and awareness actions to improve the local environment. The campaign includes a central role for local authorities to co-ordinate and assist events at local level. The year 2016 marked the 18th anniversary of the campaign, which saw 5,476 events organised across the country, with an estimated 2,768 tonnes of litter collected and with approximately 35% of the total amount of waste collected recycled.¹⁸ Every year of the campaign, volunteers are equipped with free materials donated by NSC sponsors and the collected litter is recycled or disposed of in partnership with local authorities.

3.2.2.5 Irish Business Against Litter (IBAL)

Echoing the remarks made earlier regarding the strong economic incentive for Ireland to maintain a clean and litter-free environment, IBAL’s members believe that continued economic success – including tourism, food, and in foreign direct investment (FDI) – depends on a clean, litter-free environment. The IBAL League is a national anti-litter initiative involving local authorities, local communities and businesses. The main objective of the League is to encourage improvement in local authority performance in tackling litter through publication of a league table for participating towns/cities.

¹⁸ These figures are reproduced from the Department’s website ([here](#)).

Under the 'League', participating towns are monitored by An Taisce, on behalf of IBAL, and the results are published in a league format in the national media. The main objective of the League is to encourage improvement in local authority performance in tackling litter through publication of the monitoring results. Awards are made to litter-free towns at a ceremony in Dublin in December each year, with a plaque for the overall winner.

According to the Department, the League results over time show significant improvement in litter levels throughout the country since the League was established in 2002. For 2016, the results indicate that:¹⁹

"In 2016, over 65% of towns and cities participating in the survey were adjudicated to be clean or cleaner than the European average. Of the 40 participating towns and cities, 13 were classified as 'Cleaner than European norms', and a further 14 were classified as 'Clean to European norms'."

3.2.2.6 Negotiated Agreements for Chewing Gum and ATM Litter

On foot of the 2003 Litter Monitoring Body Report, a consultancy study was commissioned to carry out a comprehensive and objective analysis on the application of economic instruments (including environmental levies) on chewing gum and automated teller machine (ATM) receipts as a means of minimising the litter problems caused by such items.

Over the course of the study, the consultants considered three principal options as a means of tackling the specified litter categories: voluntary agreements; negotiated agreements; and mandatory levies.

Negotiated agreements for chewing gum and ATM litter were instituted with representatives from the chewing gum industry and the then Irish Banking Federation (IBF) in respect of ATM receipts, which can be a source of localised litter in urban areas.²⁰

3.2.2.7 Plastic Bags

The plastic bag levy's primary purpose is to reduce the consumption of disposable plastic bags by influencing consumer behaviour. The levy is remitted into the Environmental Fund, provided for in the Waste Management (Amendment) Act 2001 and managed and controlled by the Minister for Communications, Climate Action and Environment.

The levy had an immediate effect when introduced in 2002, with a decrease in plastic bag usage from an estimated 328 bags per capita to an estimated 14 bags per capita in 2014 with the current levy at 22 cent per bag. The levy has a strong anti-litter emphasis, and does not distinguish between biodegradable plastic bags and other plastic bags.

3.2.2.8 Election Posters

The State also recognises that election posters can be unsightly and a source of litter, and the Department provides for rules and guidelines in respect of the erection and taking down etc. of this form of political advertising.²¹

¹⁹ See the DCCA's website [here](#).

²⁰ The IBF is today known as the Banking & Payments Federation Ireland (BPI).

²¹ See the Department's website for frequently asked questions (FAQs) on election posters ([here](#)).

3.2.2.9 Protecting Uplands and Rural Environments (PURE)

The PURE Project is an environmental partnership initiative which aims to unite statutory and non-statutory interests in the Wicklow/Dublin Uplands (local authorities, Coillte (which is headquartered in Co. Wicklow), the National Parks & Wildlife Service and a number of non-statutory organisations represented by the Wicklow Uplands Council) in a single endeavour to tackle the damage to the environment from littering and fly-tipping.

The project was originally set up and funded by the Department on a pilot basis for a three-year period, 2006-2008. The project involved the employment of a full-time coordinator and the use of a dedicated vehicle with appropriate equipment to remove all types of litter/fly-tipping. The project was renewed for a number of subsequent terms. The most recent agreement for funding will see the project run until 2019 with the provision of €345,000 in support of the project.

3.2.2.10 Local Authority Litter Fines and Expenditure Statistics

The current €150 on-the-spot fine for littering offences, which became effective on 30 September 2007, is one of a range of measures aimed at tackling litter in Ireland. Authorised local authority officers and Gardaí may issue a notice or an on-the-spot fine to an individual believed of committing an offence under the legislation. In addition, under the Protection of the Environment Act 2003, penalties attaching to litter offences are substantial. This Act amended Sections 19, 21 and 24 of the Litter Pollution Act 1997 and introduced conviction on indictment for litter offences, with a maximum fine of €130,000 and set the maximum fine for summary conviction at €4,000. The fines for continuing offences are €600 per day for summary offences and €10,000 per day for indictable offences. A person convicted of a litter offence may also be required by the court to pay the local authority's costs and expenses in investigating the offence and bringing the prosecution.

In 2016, local authorities spent approximately €94 million nationally on litter control and prevention. Data on expenditure by each local authority on street/road cleaning, litter warden services, and litter public awareness initiatives, for 2010-2016 are available from the Department's website.²²

3.2.2.11 Clean Coasts and Fishing for Litter

Clean Coasts is an initiative that aims to involve local communities in protecting Ireland's beaches, seas and marine life. The programme is operated by the Environmental Education Unit of An Taisce and funded by the DCCA and Fáilte Ireland. Clean Coasts is made up of two main elements – Clean Coasts Volunteering and the Green Coast Award. According to its website, there are 550 Clean Coasts groups currently operating in Ireland ([here](#)). The same website also contains infographic material on the sources of marine litter and its impacts (to marine life and people/society/economy) – globally.

Bord Iascaigh Mhara (BIM) currently supports three fishing ports to establish 'Fishing for Litter' initiatives at three ports, namely Clogherhead, Castletownbere and Union Hall. The aim is to reduce litter (including plastics) in the seas around the country using fishing nets and where possible the litter is recycled.

Repak has called for a plastics strategy, motivated in part because a lot of plastics recycling internationally occurs in China; however, as that country develops further, it may wish to move away from such activity, leading to an urgent re-think on plastics recycling internationally (see Box 1.2, p. 11).

²² Accessible [here](#).

3.2.3 Ireland's Record in Litter Control

3.2.3.1 Introduction

Having outlined Ireland's extensive infrastructure and initiatives in respect of litter prevention and control (the outline above does not purport to be exhaustive), we now turn to the relevant empirical evidence. Based on the publicly available results from the NLPMS, coordinated by Tobin Consulting Engineers, working in partnership with the country's local authorities, we first consider all litter, before examining the evidence on the share of all litter accounted for by beverage containers (the unit of measurement in the NLPMS is litter items counted or 'pieces').

3.2.3.2 Trend in All Litter Pieces in Ireland over Time

The figures shown in Table 3.1 are reproduced from the NLPMS and show, for each year during 2002-2016, the LPI (Litter Pollution Index) values in the country as a whole (on a scale of 1 to 5, with 1 being "unpolluted or litter free" and 5 being "grossly polluted"). Two facts are observed from the table: firstly that the modal or most frequent LPI value for the State is LPI 2 or "slightly polluted" and secondly that the frequency of LPI values above the modal value has come down over time. While the frequency of LPI 2 ("slightly polluted") has grown over the period, it is evident from the figures that litter pollution in Ireland (all sources) has decreased over time.

The evidence accords with our *a priori* expectations, given the importance of litter prevention and control in the State from an economic perspective as well as socially and from the vantage of local communities.

Table 3.1: Trend in Ireland's Litter Pollution Index (2002-2016)

Year	Litter Pollution Index - Tobin Consulting Engineers				
	LPI 1 - <i>Unpolluted or Litter Free</i>	LPI 2 - <i>Slightly Polluted</i>	LPI 3 - <i>Moderately Polluted</i>	LPI 4 - <i>Significantly Polluted</i>	LPI 5 - <i>Grossly Polluted</i>
2002	5.5%	42.6%	39.7%	10.4%	1.9%
2003	4.4%	49.5%	35.2%	9.1%	1.9%
2004	5.1%	45.3%	37.3%	10.5%	1.8%
2005	6.1%	49.5%	34.4%	8.5%	1.5%
2006	6.8%	53.6%	31.7%	7.4%	0.6%
2007	5.1%	58.5%	31.1%	4.6%	0.7%
2008	6.6%	62.6%	26.6%	3.8%	0.5%
2009	6.8%	63.5%	25.7%	3.7%	0.3%
2010	9.7%	62.8%	24.2%	3.1%	0.3%
2011	9.9%	67.0%	20.3%	2.4%	0.4%
2012	10.4%	63.2%	22.9%	3.2%	0.3%
2013	12.2%	62.8%	21.0%	3.3%	0.6%
2014	12.3%	64.4%	19.9%	3.0%	0.3%
2015	16.4%	62.8%	16.7%	3.6%	0.4%
2016	13.2%	65.1%	18.0%	3.3%	0.3%

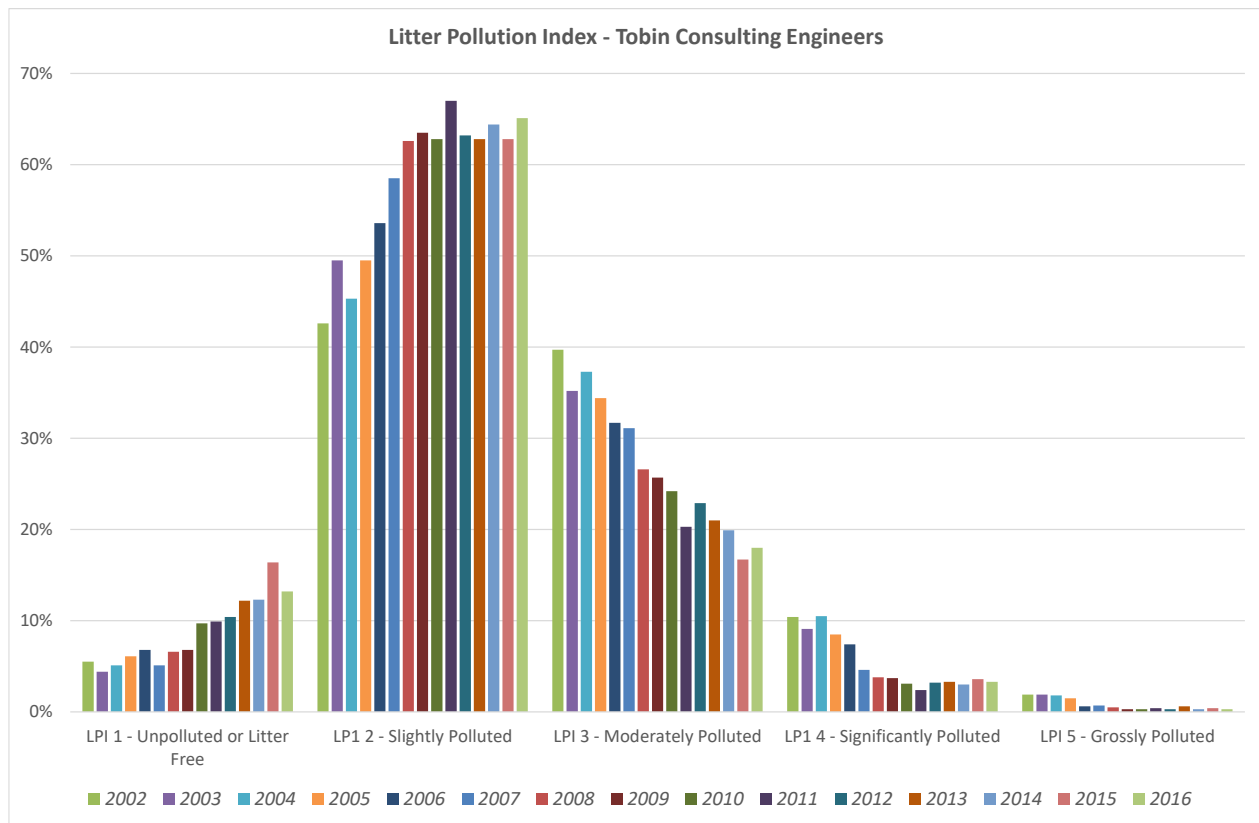
Source: NLPMS (detailed data available [here](#)).

Illustration of Ireland’s record on litter prevention and control is provided in the graph in Figure 3.1, which is based on the NLPMS data as presented in the table on the previous page.

A clear trend of improvement is evident, in which Ireland’s litter (all items) has become less significant (distributed in LPI 3-5) and more distributed in the categories of LPI 1 and 2 over time (*“unpolluted or litter free”* and *“slightly polluted”*).

However, while there is clear evidence that the country’s litter problem has come down over time, this does not necessarily mean that the war on litter has been won or that the efforts to prevent or control litter should ease; the battle is a perpetual one and the opportunity is to continually reduce litter from all sources in the coming years, as is being done in other countries.

Figure 3.1: Graphical Illustration of the Trend in Ireland’s Litter Pollution Index (2002-2016)



Source: NLPMS (detailed data available [here](#)).

Another way of presenting the NLPMS data shown in Table 3.1 and Figure 3.1 above is through the use of a weighted average LPI. This has the advantage of condensing the LPI into a single summary measure per year: for example, the weighted average LPI for 2016 is calculated using that year's data in Table 3.1 above as $1 \times 13.2\% + 2 \times 65.1\% + 3 \times 18\% + 4 \times 3.3\% + 5 \times 0.3\%$, which results in a weighted average value of 2.12, putting Ireland in the LPI 2 category or "slightly polluted".

Repeating this process over the other years, Ireland has made the transition from being a country with a weighted average LPI of 3 (rounded) during 2002-2005 to a weighted average LPI of 2 since 2006, reflecting the extensive infrastructure and initiatives in litter prevention and control during the period.²³

Table 3.2: Trend in Ireland's Litter Pollution Index together with the Consultancy Team-Estimated Weighted Average Litter Pollution Index for Ireland (2002-2016)

Litter Pollution Index - Tobin Consulting Engineers						
Year	LPI 1 - <i>Unpolluted or Litter Free</i>	LP1 2 - <i>Slightly Polluted</i>	LPI 3 - <i>Moderately Polluted</i>	LP1 4 - <i>Significantly Polluted</i>	LPI 5 - <i>Grossly Polluted</i>	Weighted Average LPI (PMCA)
2002	5.5%	42.6%	39.7%	10.4%	1.9%	2.61
2003	4.4%	49.5%	35.2%	9.1%	1.9%	2.55
2004	5.1%	45.3%	37.3%	10.5%	1.8%	2.59
2005	6.1%	49.5%	34.4%	8.5%	1.5%	2.50
2006	6.8%	53.6%	31.7%	7.4%	0.6%	2.42
2007	5.1%	58.5%	31.1%	4.6%	0.7%	2.37
2008	6.6%	62.6%	26.6%	3.8%	0.5%	2.29
2009	6.8%	63.5%	25.7%	3.7%	0.3%	2.27
2010	9.7%	62.8%	24.2%	3.1%	0.3%	2.22
2011	9.9%	67.0%	20.3%	2.4%	0.4%	2.16
2012	10.4%	63.2%	22.9%	3.2%	0.3%	2.20
2013	12.2%	62.8%	21.0%	3.3%	0.6%	2.17
2014	12.3%	64.4%	19.9%	3.0%	0.3%	2.14
2015	16.4%	62.8%	16.7%	3.6%	0.4%	2.09
2016	13.2%	65.1%	18.0%	3.3%	0.3%	2.12

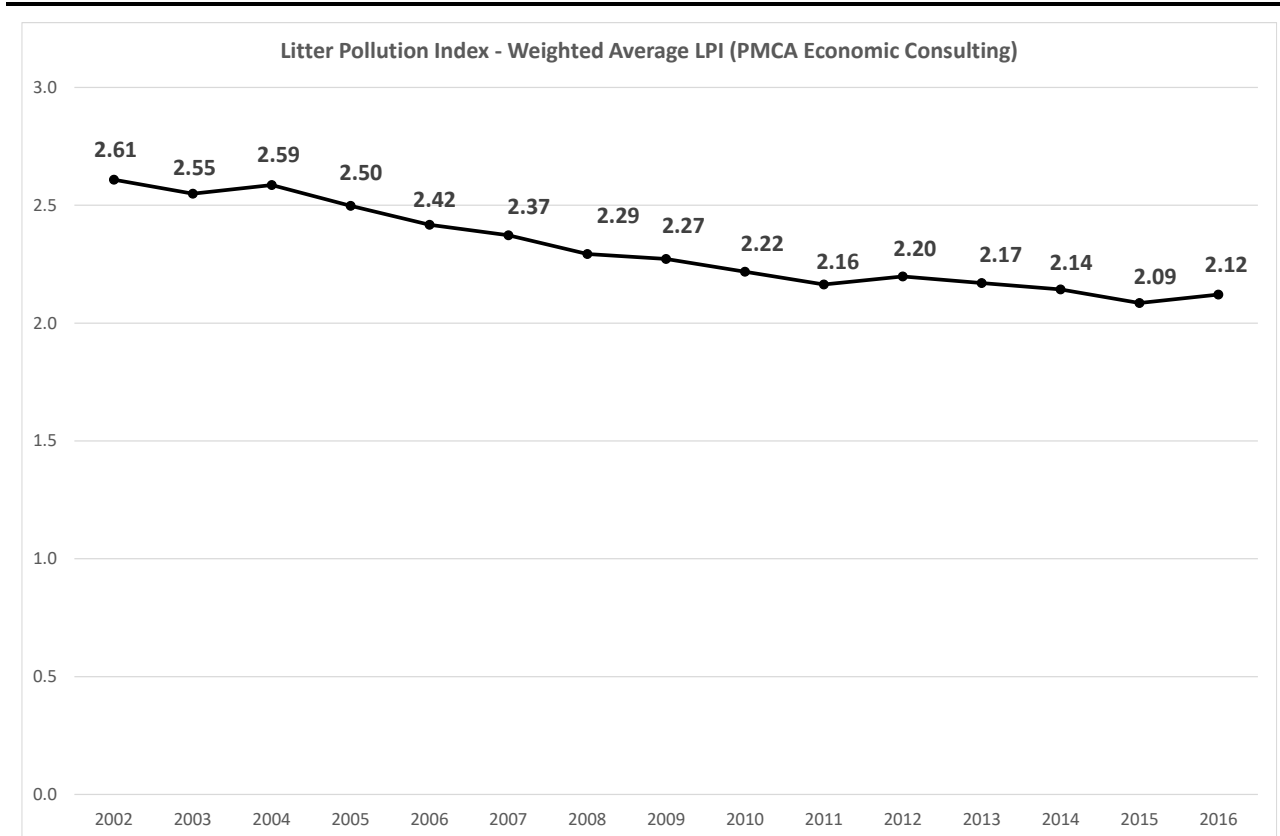
Source: NLPMS (detailed data available [here](#)); Consultancy Team analysis.

²³ Note that in calculating the weighted average LPI here, it is (implicitly) assumed that the LPI values in the NLPMS are linear, increasing in steps of 1 through the five categories. If, for example, we changed the scoring of the LPI values to 1, 2, 4, 8 and 16 (putting even more value on eradicating significant litter), Ireland would have transitioned from being a country with a weighted average of 4 ("significantly polluted") during 2002-2004 to one with a weighted average of 3 ("moderately polluted") during 2005-2014 to a weighted average of 2 ("slightly polluted") 2015-2016. However scored, it is an undeniable fact from the independent NLPMS data that Ireland's litter has reduced over the past fifteen years.

Illustration of the Consultancy Team-calculated weighted average LPI from the independent NLPMS data 2002-2016 is given in Figure 3.2, which shows a clear downward trend in Ireland’s litter problem over time, commensurate with the roll out of litter prevention and control policies and initiatives, whose value to the economic performance of the country is significant.

Summing up the evidence so far, it is clearly the case from the independent NLPMS data, compiled by Tobin Consulting Engineers, that Ireland’s litter problem (all litter items) has lessened over time, but the efforts and campaigning will continue to be deployed in the years ahead, reflecting the value of maintaining a tidy and litter free environment for the country’s economic performance and wellbeing.

Figure 3.2: Graphical Illustration of the Trend in the Consultancy Team-Estimated Weighted Average Litter Pollution Index for Ireland (2002-2016)



Source: NLPMS (detailed data available [here](#)); Consultancy Team analysis.

3.2.3.3 Trends in Beverage Container Litter in Ireland over Time

We next examine the independent evidence from the NLPMS on litter due specifically to beverage container items in Ireland over time, which is particularly important for appraising the rationale or need for the proposed beverage container deposit-refund system, under the Waste Reduction Bill 2017. According to the OECD, where a country already has an infrastructure for recycling and recycling behaviour has become established, the only rationale or justification for such a system is to control litter, in particular litter due to beverage containers. This leads to the question of the extent of beverage container litter in Ireland and how it has changed, if at all, over time. These questions can be answered by reference to independent data from the NLPMS on the share of all litter in Ireland due to beverage containers – all types of beverage container together and specific types of beverage container.

According to the data reproduced from the NLPMS in Table 3.3, all beverage container items (comprising beverage cans and beverage bottles, both alcoholic and non-alcoholic, and drinks cartons) accounted for 3.5% of all litter pieces in the State in 2016. Excluding drinks cartons (which are not normally included as part of DRSs but are shown here nonetheless for completeness), the share of all beverage containers was 3% of all litter items in that year. Over the whole period (2002-2016), the share of all litter items attributable to beverage containers averaged 3.5% (including drinks cartons) and 2.9% (excluding drinks cartons). None of the specific types of beverage container had a share above 1% in recent years.

Table 3.3: Trend in Beverage Container Litter in Ireland by Specific Type of Beverage Container (2002-2016)

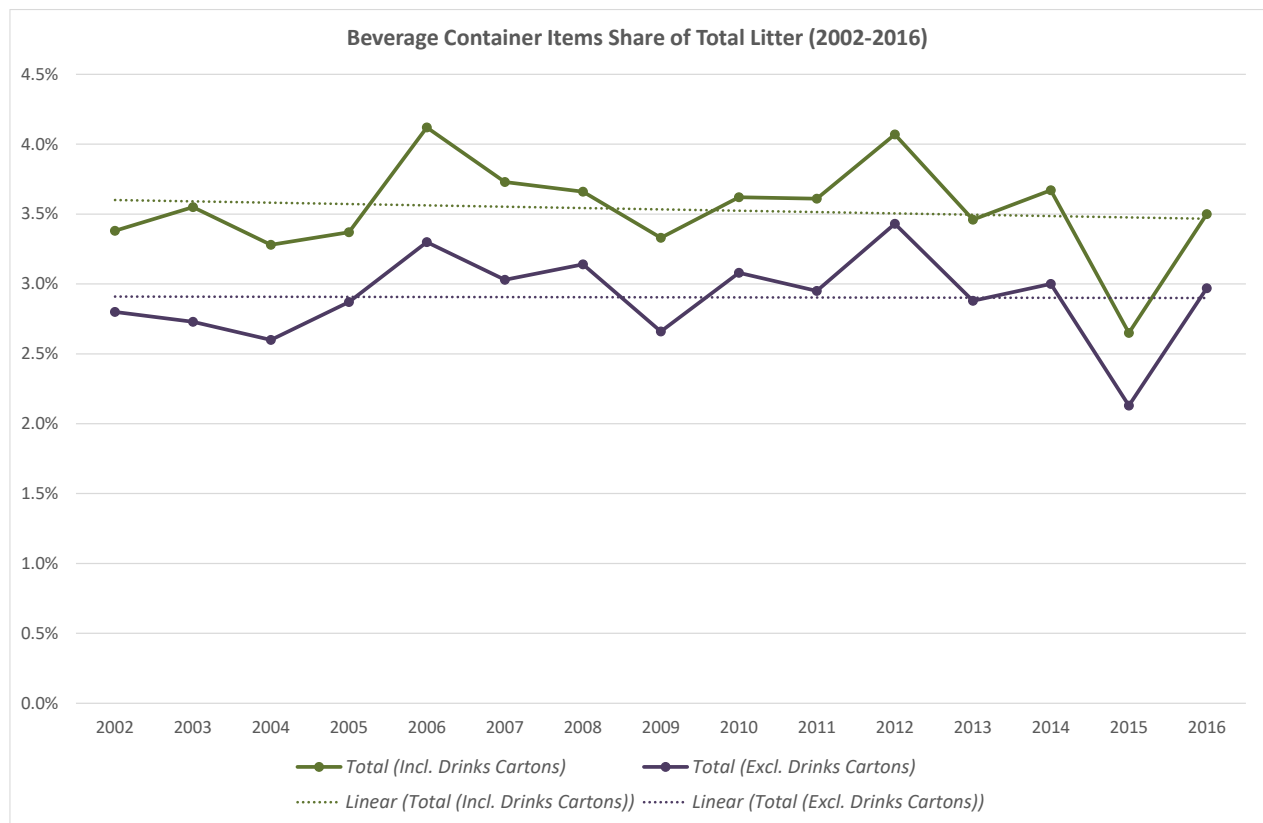
Year	Beverage Container Items					Total (Incl. Drinks Cartons)	Total (Excl. Drinks Cartons)
	Beverage Cans - Non-Alcoholic	Beverage Cans - Alcoholic	Beverage Bottles - Alcoholic	Beverage Bottles - Non-Alcoholic	Drinks Cartons		
	2002	1.07%	0.65%	0.32%	0.76%		
2003	1.08%	0.55%	0.43%	0.67%	0.82%	3.55%	2.73%
2004	0.77%	0.82%	0.45%	0.56%	0.68%	3.28%	2.60%
2005	0.90%	0.74%	0.62%	0.61%	0.50%	3.37%	2.87%
2006	1.16%	0.80%	0.65%	0.69%	0.82%	4.12%	3.30%
2007	1.00%	0.78%	0.56%	0.69%	0.70%	3.73%	3.03%
2008	0.84%	1.04%	0.66%	0.60%	0.52%	3.66%	3.14%
2009	0.75%	0.68%	0.61%	0.62%	0.67%	3.33%	2.66%
2010	0.78%	0.75%	0.79%	0.76%	0.54%	3.62%	3.08%
2011	1.14%	0.72%	0.53%	0.56%	0.66%	3.61%	2.95%
2012	0.87%	0.78%	1.04%	0.74%	0.64%	4.07%	3.43%
2013	0.90%	0.93%	0.52%	0.53%	0.58%	3.46%	2.88%
2014	0.93%	0.76%	0.60%	0.71%	0.67%	3.67%	3.00%
2015	0.46%	0.56%	0.47%	0.64%	0.52%	2.65%	2.13%
2016	0.90%	0.81%	0.66%	0.60%	0.53%	3.50%	2.97%
Average	0.90%	0.76%	0.59%	0.65%	0.63%	3.53%	2.90%

Source: NLPMS (detailed data available [here](#)); Consultancy Team analysis.

To put the shares in perspective, namely that beverage container items account for between 3% and 3.5% of all litter items in the State (depending on the inclusion or not of drinks cartons), cigarette-related litter has accounted for around 55-60% of all litter items and food-related litter (which includes chewing gum as its principal item) for about 15% of all litter items, meaning that beverage container items *together* form a very small proportion of all litter items in the State. The share of all beverage container items is also small when compared with the share of all litter due to packaging items, namely 10-15%, which in turn means that beverage containers combined constitute a minority share of packaging items as well as a very small minority share of all litter items.

Figure 3.3 shows the share of all litter due to beverage containers during 2002-2016, including and excluding drinks cartons. The fitted trend lines for each case (i.e. with and without drinks cartons) suggest a mild downward trend over the period, implying in turn that beverage containers' share of all litter pieces in the State has fallen since 2002 or in other words that litter due to beverage containers has become even less problematic over the past fifteen years (because the share was small at the start of the period).

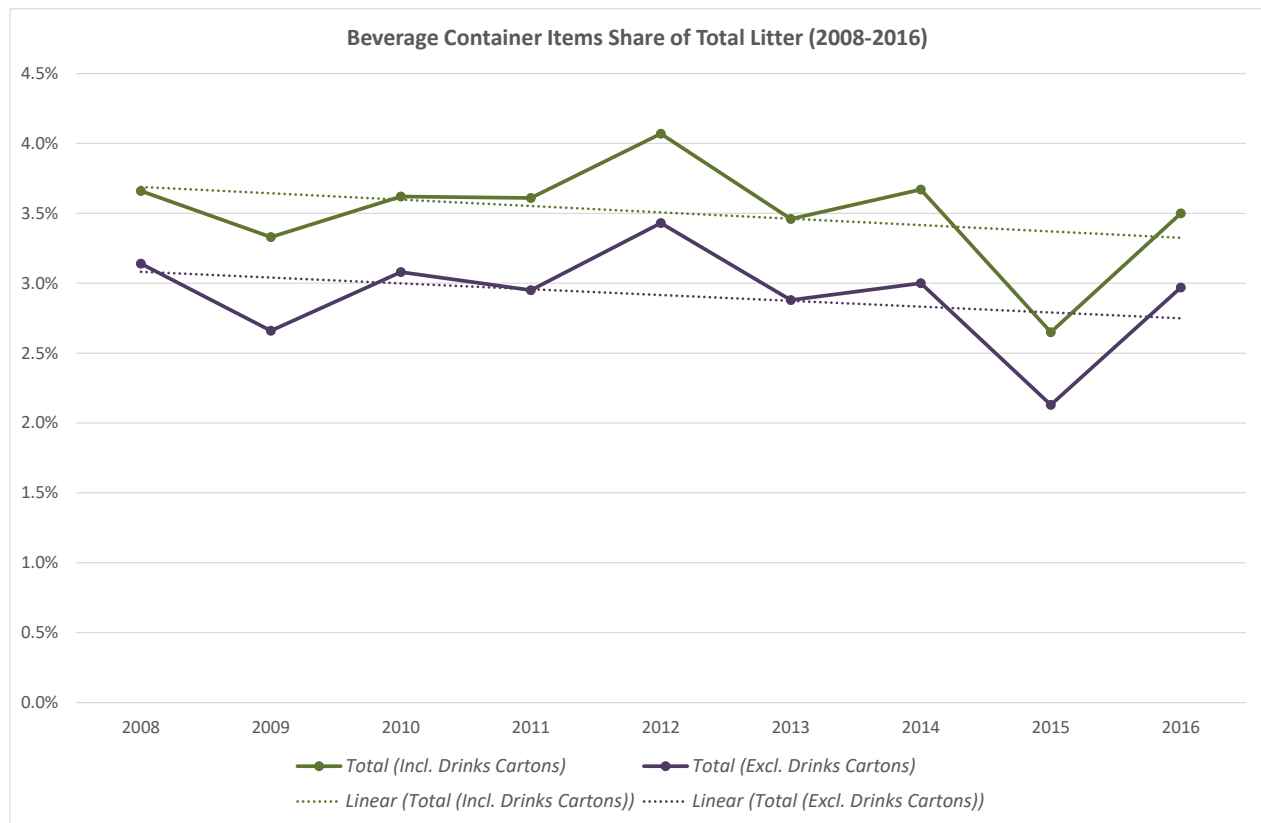
Figure 3.3: Graphical Illustration of the Share of All Litter due to Beverage Container Pieces in Ireland (2002-2016)



Source: NLPMS (detailed data available [here](#)); consulting team analysis.

Figure 3.4 shows the same data but now for the more recent period since 2008 (the year of the Perchards report authored by Gill Bevington, which concluded that a deposit-refund system was not warranted in Ireland at that time). Although there is some volatility from year-to-year (like the previous graph), a downward trend in the share of all litter due to beverage containers is evident in each case (i.e. with and without drink cartons), supporting the view from the preceding graph (Figure 3.3) that litter due to beverage containers has fallen since 2008 and thus that beverage container litter in the State has become less problematic since that time, as well as since 2002.

Figure 3.4: Graphical Illustration of the Share of All Litter due to Beverage Container Pieces in Ireland (2008-2016)



Source: NLPMS (detailed data available [here](#)); Consultancy Team analysis.

What can be inferred from both Figure 3.3 and Figure 3.4 is that the share of all litter pieces in Ireland attributable to beverage containers (with or without drinks cartons) has fallen since 2002 and 2008, meaning that litter due to beverage containers has lessened over the past fifteen years and more recently since 2008.

In short, beverage containers form a very small and decreasing percentage share of all litter items in Ireland, in a country with a low and declining litter problem. The facts do not support the need for a beverage container deposit-refund system in Ireland, as envisaged under the Waste Reduction Bill 2017.

Econometric Analysis of the Trends in the Shares of All Litter due to Beverage Containers with and without Drinks Cartons

The downward trend in the share of all litter pieces in Ireland due to beverage containers (whether including or excluding drinks cartons) is more apparent in the recent period (2008-2016) (Figure 3.4 above) than the longer period (2002-2016) (Figure 3.3). To sharpen the assessment of the apparent downward trends in the shares of all litter due to beverage containers, we may apply econometric time series analysis to the data. The particular analysis involves assessment of the 'stationarity' or not of the time series in question, which basically equates to examining whether there is a trend in the data and whether it is due to a random or 'stochastic' trend (i.e. what is called a 'unit root') and/or whether there is a deterministic or predictable trend in the data.

The results of the econometric analysis, using the augmented Dicky-Fuller test for the presence or not of a unit root and deterministic trend, are presented in tabular form in the Annex of Supplementary Information. The findings are as follows:

- For the share of all litter pieces in Ireland due to beverage containers *inclusive* of drinks cartons;
 - During 2002-2016, there is a unit root or stochastic trend in the series (Table A1, p. 114)
 - The same conclusion is reached for the more recent period 2008-2016 (Table A2, p. 114)
- For the share of all litter pieces in Ireland due to beverage containers *exclusive* of drinks cartons;
 - During 2002-2016, a unit root or stochastic trend is present in the series (Table A3, p. 115)
 - The same conclusion is reached for the more recent period 2008-2016 (Table A4, p. 115).

The econometric results support the earlier graphical analysis that the share of all litter pieces in Ireland due to beverage containers has fallen over time. This finding is robust to whether or not we include drinks cartons and is true of the more recent period (2008-2016) as well as the longer period (2002-2016).²⁴

3.2.4 Summary and Assessment of the Evidence So Far

Ireland does not have an overall litter problem. In respect of all litter pieces, the country has transitioned from being 'moderately polluted' in the early part of the last decade (2002-2005) to being 'slightly polluted' (with a weighted average score of 2) since 2006 through to 2016 (the latest year to which the independent NLPMS data pertain), with the extent of improvement increasing over that period of time.

The improvement in Ireland's overall performance in litter prevention and control reflects the various policy initiatives over the years, which in turn reflect the importance of litter prevention and control to the national economy.

Secondly, beverage containers (including beverage cans for both alcoholic and non-alcoholic drinks plus beverage bottles for these drinks but excluding drinks cartons, which tend not to be included in DRs) had a share of just 3% of all litter pieces in Ireland in 2016. When drinks cartons are included (for completeness), the share of beverage containers of all litter items is slightly higher (3.5% in 2016) but in both instances (i.e. including and excluding drinks cartons), the share of all litter pieces due to beverage containers in Ireland has decreased over time, meaning that litter due specifically to beverage container items has lessened through the years.

²⁴ The main qualification of the analysis concerns the length of the (annual) time series, over which we have no control because they come from an independent source, namely the NLPMS, the official litter data for Ireland.

In sum, the official NLPMS data are clear in showing that litter due to beverage containers occupies only a very small proportion of all litter and that the share has fallen over time.

In view of the OECD's conclusion that the only rationale for introducing a mandatory beverage container deposit-refund system, where there is already recycling infrastructure and where recycling has become widespread, is to tackle litter due to beverage containers, the results of the analysis presented here lead to the conclusion that the proposed beverage container deposit-refund system under the Waste Reduction Bill 2017 is without rationale. While there is room for further improvement in Ireland's litter performance (overall and in respect of beverage containers, and other sources of litter), the empirical evidence presented here, at the very least, casts significant doubt on whether a mandatory beverage container deposit-refund system is warranted in the State, not least given the litter prevention and control measures currently in place, which the empirical evidence shows are functioning effectively.

Normally in studies of this type, the weight of evidence against the need for the proposed system would imply the end of the matter at this juncture. But we will nevertheless consider other evidence below, including the question of whether European countries with such a system show higher recycling performance compared with those without a system, like Ireland.

3.3 Ireland's Packaging Waste Recycling Performance and Growing Recycling Infrastructure

3.3.1 Introduction

The main conclusions of the PRI Review completed in 2014 for the packaging PRI (Repak) were that:

- Ireland has achieved great success in recovering and recycling packaging waste and one of the key reasons for the success has been the shared responsibility approach of the packaging PRI;
- Repak and its members are largely responsible for the achievement of the national recycling targets – in contrast, self-compliers (through local authorities) have had a limited contribution;
- The cost to producers who are members of a PRO was €35.6 per tonne in 2012, which have fallen by approximately €10/tonne since 2010;
- When compared with other European countries, these costs are in the lower end of the spectrum – although a direct comparison of compliance cost may give an incomplete picture as costs may vary due to differences in a number of factors;
- In the period 2009-2011 Repak spent more than its income from producer fees, with the deficit covered by the contingency fund, whereas in 2012 expenditure was less than income.

The PRI Review recommended that Repak examine how to reduce direct recycling costs in order to balance income with expenditure. It also recommended that the government department responsible for PRIs investigate the allocation of a share of national targets to self-compliers and that increased enforcement of producers' obligations could also assist Repak's financial sustainability.

Following the PRI Review of 2014, Repak drew up a five-year plan, which was agreed by the Department. Generation of fee income from a wider membership base, plus cost management, are the key priorities for Repak in delivering recycling targets on a value for money basis. The average cost per tonne (including household and commercial) fell from €27.64 in 2013 to €23.25 in 2016. Surpluses (income over spending) have been recorded in 2015 and 2016, since the PRI Review in 2014.

3.3.2 Summary of Ireland's Packaging Waste Recycling Performance

As well established in the PRI Review of 2014 and in other studies, Ireland's packaging waste recycling performance has been strong and it has been driven by Repak and its members, bearing in mind that Repak was established in 1997, before which there was no packaging waste recycling infrastructure or tradition in the country. Examination of the official Eurostat data on recycling rates shows the following:

- All packaging materials;
 - Under the Packaging Directive (Article 6(1)), Ireland had a target recycling rate of 55% by weight for all packaging materials to be achieved by the end of 2011
 - That target was achieved as early as 2006, when Ireland's recycling rate was 54.5%, rising to 60.6% in the following year and was 67.5% in 2015, the latest year to which the Eurostat data for Ireland pertain (Ireland's packaging waste data are submitted to Eurostat through the EPA, with the cooperation of Repak, whose members determine to a very large extent the national recycling rate)
- Paper and board packaging;
 - Under the same Directive, Ireland had a target recycling rate of 60% by weight for paper and board packaging by the end of 2011
 - In 2006, the recycling rate was 73.7% and was 79.7% in 2015
- Plastics packaging;
 - 22.5% target by the end of 2011, which was achieved in 2008 (28.9%) and the rate in 2015 was 34%
- Wooden packaging;
 - 15% target by the end of 2011, achieved well ahead of schedule, with the recycling rate of 77.1% in 2006, rising to 85.4% in 2015
- Metallic packaging;
 - Target rate of 50% to be achieved by the end of 2011, which was met in 2007 with a recycling rate of 67.6%, which grew to 74.6% in 2015
- Glass packaging;
 - 60% target by the end of 2011, which was surpassed in 2006 with a recycling rate of 62.1%, rising to 87.6% in 2015.

In the latest year for which the Eurostat data cover all EEA countries (with the exception of Iceland), Ireland's recycling performance per capita was the second highest of all countries at 143.4kg in 2014 (after Germany, 156.7kg), compared with 106.9kg for the EU28. The corresponding recycling performances, measured in this way (kg/head), in respect of specific packaging materials for Ireland in that year were:

- *Paper and board packaging* – 67.7 Ireland, the third highest after Germany (87.8) and France (68.2);
- *Plastics packaging* – 21.2 Ireland, the highest in the EEA;
- *Wooden packaging* – 15.7 Ireland, the second highest after Italy (25.6);
- *Metallic packaging* – 10.74 Ireland, the third highest after Estonia (15.6) and The Netherlands (11.1)
- *Glass packaging* – 28 Ireland, the fourth highest after Luxembourg (51.3), Belgium (36.2) and France (30.9).

The above facts clearly illustrate Ireland's strong recycling performance, which includes beverage containers.

3.3.1 Tonnes Funded by Repak for Recycling of Beverage Containers

Shown in Table 3.4 below are the tonnes of glass bottles, plastic bottles (mainly PET but also including HDPE bottles) and aluminium cans funded by Repak for recycling in 2011 and 2016 (beverage containers pertaining to both alcoholic and non-alcoholic drinks).

Well over 142,000 tonnes of beverage containers were funded by Repak for recycling in 2016, comprising almost 112,000 tonnes of glass bottles, over 27,000 tonnes of plastic bottles and almost 3,600 tonnes of aluminium cans. Between 2011 and 2016, the volume of all beverage containers funded by Repak for recycling grew by 11%, within which glass bottles recycled grew by 8%, plastic bottles by 17% and aluminium cans by 36%. The Repak tonnes make up a significant majority of all beverage container tonnes funded for recycling in Ireland.

Table 3.4: Beverage Container Tonnes Funded by Repak for Recycling (2011 and 2016)

Year	Tonnes Funded by Repak for Recycling			Total
	Glass Bottles	Plastic Bottles	Aluminium Cans	
2011	103,301	23,097	2,648	129,046
2016	111,950	27,093	3,592	142,635
% Change	8%	17%	36%	11%

Source: Repak data; Consultancy Team analysis.

3.3.2 Ireland's Growing Packaging Waste Recycling Infrastructure for Households

As manifest from the figures presented above, and the review of relevant research in Section 2, including the PRI Review of 2014, Repak has proven to be very successful as a PRI in Ireland. The organisation's focus in its early years (after coming into being in 1997) was building out a national infrastructure for the coordination of funding towards the collection, recovery and recycling of packaging waste generated in Ireland and achieving Ireland's recycling (and recovery) targets for packaging waste, which were externally set by the EU. In those early years, Repak concentrated on growing its membership of compliant members (producers) in meeting the targets, all of which were achieved ahead of schedule and today Ireland's performance in packaging recycling is among the strongest in the EEA (analysis of which is presented below). The Repak PRI model has been developed and enhanced in a cost-effective way, with the average cost per tonne funded for recycling being €10.87 in 2016, down from €12.98 in 2013, a fall of over 16%.

In order to advance Ireland's recycling performance – the opportunity now and in the coming years is to increase the recycling rates for all packaging materials and specific packaging materials even further – which will necessitate expanding recycling activity in the household sector as well as continuing to grow recycling in the commercial sector by encouraging more obligated producers to comply by joining Repak (the predominant compliance route for packaging materials in the State).

The growth in Repak-funded packaging tonnes for recycling in the household sector, in addition to Repak's funding of commercial/backdoor tonnes among compliant producers, is being achieved in two ways, namely through kerbside and civic amenity centres/bring-banks, to which Repak also contributes in funding.

In regard to civic amenity centres and bring-banks (non-commercial), there were 118 civic amenity centres around the country in 2016 and 1,848 bottle banks (at civic amenity/recycling centres and at other locations, such as close to retail outlets). In free-standing bottle banks, people can deposit their used bottles free-of-charge and at civic amenity/recycling centres users pay a small, nominal fee for access, where they tend to go on a weekly or other basis to deposit larger quantities of recyclables (packaging and other waste). According to Repak data, a total of 95,700 tonnes funded through Repak for recycling of packaging waste were achieved at these facilities in 2016.

Illustration of the growth in recycling among the household sector is presented in Table 3.5. Tonnes recycled in the household sector have grown by 7.4% during the period, from 238,409 in 2013 to 256,119 in 2016. The growth has been driven mainly by kerbside, whose tonnes recycled have grown by over 12% during the period, while civic amenity/bring-bank tonnes recycled have been steady.

Of particular note in Table 3.5 is the decrease in the average recycling cost per tonne (to Repak), which has fallen by 13% in the household sector, made up of decreases of 14.4% and 13.7% in the civic amenity/bring-bank and kerbside sub-sectors respectively during the period. The figures illustrate that the recycling of packaging waste in the household sector has become more cost-efficient over time, given the growth in usage by households, which has driven the increasing tonnes recycled.

Table 3.5: Household Recycling Infrastructure in Ireland (2013-2016)

Household Recycling Infrastructure	2013	2014	2015	2016	% Change (2013-2016)
Civic Amenity/Bring-Banks					
Tonnes	95,568	94,954	92,356	95,700	0.1%
Repak Funding	€4,646,661	€4,598,149	€4,049,433	€3,980,756	-14.3%
Average cost per Tonne	€48.62	€48.43	€43.85	€41.60	-14.4%
Kerbside					
Tonnes	142,841	152,584	145,907	160,419	12.3%
Repak Funding	€10,509,878	€11,290,156	€9,542,991	€10,187,767	-3.1%
Average cost per Tonne	€73.58	€73.99	€65.40	€63.51	-13.7%
Household Total					
Tonnes	238,409	247,538	238,263	256,119	7.4%
Repak Funding	€15,156,539	€15,888,305	€13,592,424	€14,168,523	-6.5%
Average cost per Tonne	€63.57	€64.19	€57.05	€55.32	-13.0%
<i>Kerbside Share</i>	60%	62%	61%	63%	
<i>Civic Amenity/Bring-Banks Share</i>	40%	38%	39%	37%	

Source: Repak data; Consultancy Team analysis.

In 2016, kerbside's share of all tonnes of packaging waste recycled was 63%, up from 60% in 2013, compared with civic amenity/bring-banks, whose share fell from 40% in 2013 to 37% in 2016. For households, kerbside and civic amenity centres (and bring-banks) are complementary to higher recycling.

With education and awareness-raising about household recycling continuing, the volume of packaging waste recycled is set to continue rising in the coming years, with the average cost per tonne coming down accordingly, and with the share of kerbside expected to increase *vis-à-vis* civic amenity/bring-banks.

Repak estimates that there were 799,220 households in the country on MDR (mixed dry recyclables) bins and 12,005 on recycling bags in 2016, meaning that about half of all households in the State have access to such recycling opportunities at home, compared with the situation a decade ago, when kerbside recycling was only commencing in Ireland. As the momentum gained in the household sector is maintained and enhanced in the coming years, household tonnes sent for recycling will increase and the average cost per tonne will fall accordingly.

In regard to the Waste Framework Directive (2008/98/EC), the EPA expects that the Article 11(2)(a) target in respect of packaging waste recycling among households to be achieved by the due date of 12 December 2020. That particular target specifies “*Preparing for reuse and recycling of 50% by weight of household derived paper, metal, plastic & glass*”; and the EPA quotes the proportion of 45% achieved to date in its ‘Progress towards EU Targets’ (August 2017).

Consumers/households today can use Repak’s [online search tool](#) to find their nearest civic amenity centre or bring-bank for recycling of packaging waste, and other waste streams. The online search tool works by user keying in their town or street name. The search tool will then list the recycling facilities and in addition will inform on the distance to the facilities, as well as addresses, opening hours and the materials that can be deposited/accepted at the facilities. A map showing the recycling facilities is also produced and the user can vary the distance covered from their current location using the facility. Alternatively one can download the RecycleMore Search app (available [here](#)) to find the nearest recycling centre/bring-bank or civic amenity site through one’s GPS locator on a smartphone.

3.3.3 Significance of Ireland’s Growing Household Recycling Infrastructure to the Proposed Beverage Container Deposit System

The proposed beverage container deposit-refund system risks competing with, rather than complementing, the growing infrastructure for household recycling in the State. On the other hand, the components of the current infrastructure for households – consisting of kerbside and civic amenity centres and bring-banks, where consumers can deposit various other waste streams as well as packaging waste – complement each other and the opportunity for ensuring further growth in the existing infrastructure is to reinforce and build upon what is already available through education and awareness-raising using traditional and social media formats. The existing components benefit from both scale economies and economies of scope (i.e. falling average costs as more is deposited and recycled, and the components can handle a range of different packaging materials and other waste streams). The introduction of an extra layer of infrastructure – to accommodate a beverage container deposit-refund system, which works in a different way to the existing facilities for household recycling – risks detracting from the need to achieve scale in the existing infrastructure, not to mention the extra cost in installing the new facilities (be they RVMs and/or depots/outlets, and where?) and administering them.

In any event, the earlier empirical evidence on litter in Ireland (including beverage container litter), which has fallen over time, does not support the introduction of a deposit-refund system for beverage containers, which is the key issue to be considered, given the fact that Ireland already has infrastructures for household and producer collection, depositing and recycling of packaging waste, including drinks containers.

Box 3.1: Household Recycling (including for Beverage Containers) at a Recycling Centre in Ireland



Source: Repak.

3.4 Are Higher Recycling Rates Associated with Mandatory Deposit-Refund Systems?

3.4.1 Introduction

We now turn to examine whether there is a relationship between European countries' recycling rates, on the other hand, and the presence of (mandatory) beverage container deposit-refund systems, on the other hand. As outlined at the beginning of this section of the report, the Eurostat data sample examined here consist of 30 EEA countries, within which 7 have deposit systems and 23 are without systems (including Ireland). The countries with systems are Croatia, Denmark, Estonia, Finland, Germany, Norway and Sweden.

In analysing the data, we make use of the Eurostat data on recycling rates for all packaging materials and for specific packaging types relevant to beverage containers (i.e. metallic, glass and plastic). The latest year to which the official Eurostat data pertain is 2015; however there are missing data for a number of countries in that year (Ireland has already submitted its data to Eurostat for that year, through the EPA, with Repak inputs given its role in packaging recycling in Ireland), which means that the latest year for which data on all EEA countries are available is 2014 (Iceland is excluded due to unavailable data).

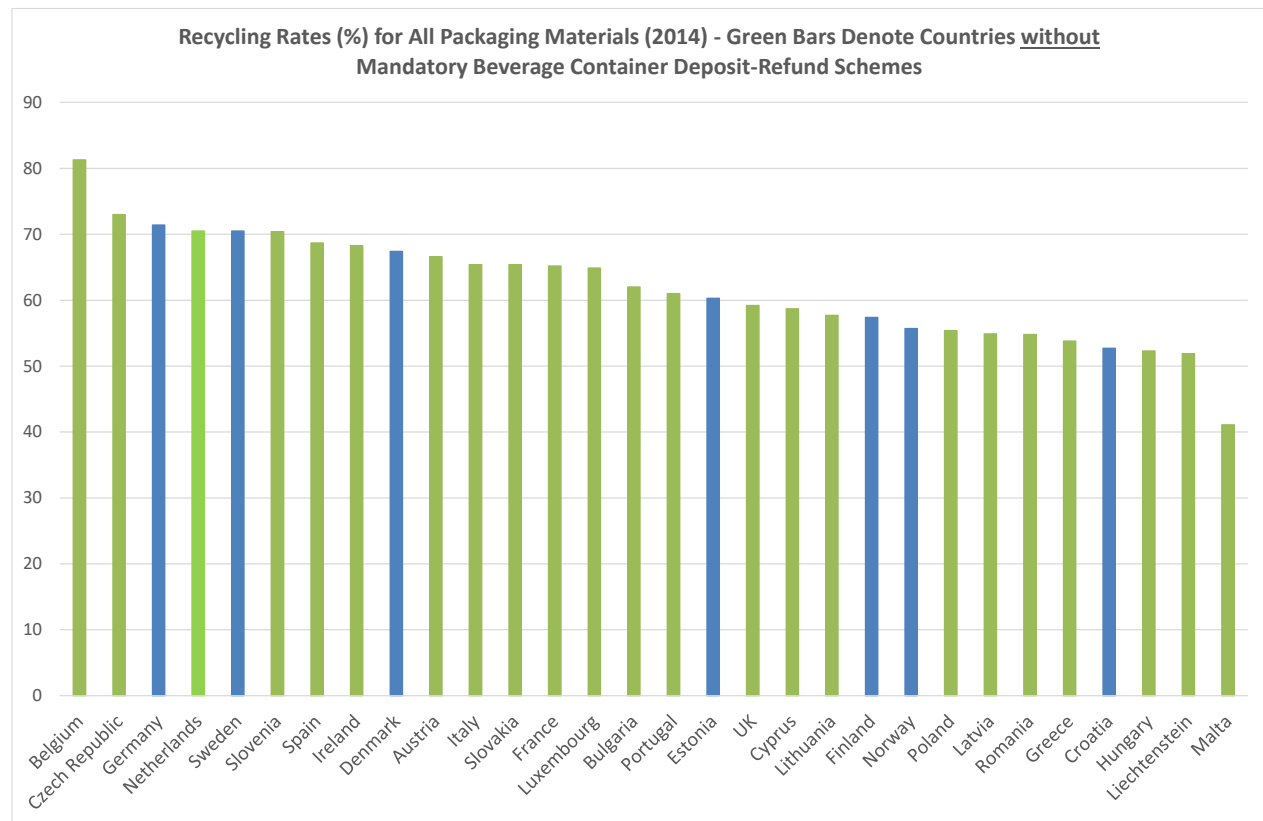
3.4.2 Are Mandatory Deposit-Refund Systems Associated with Higher Recycling?

3.4.2.1 *Recycling Rate (%) of All Packaging Materials*

The graph in Figure 3.5 overleaf shows the percentage recycling rates for all EEA countries in 2014 (the latest year for which the figures from Eurostat are available for all countries, with the exception of Iceland, due to unavailable data). The bars coloured in blue denote the countries with mandatory beverage container deposit-refund systems and those in green, including Ireland, are the countries without such systems. From inspection of the graph, there does not appear to be a relationship between the presence of beverage container deposit-refund systems and higher recycling rates for all packaging materials.

The country with the highest recycling rate – Belgium – does not have a system: a mandatory system had been scheduled for the start of 1993, but has not been implemented. That country is also noteworthy for having an extensive kerbside network for household recycling. In the research review of Section 2, we considered among other studies the thesis by Mr. Niek Deprez for the Master of Science in Economics degree at the University of Ghent, Belgium in the academic year 2015/2016 (supervised by Professor Johan Albrecht of that institution), which supports other studies (also reviewed in that part of the report) that deposit-return systems for beverage containers are costly or cost-ineffective.

Germany is the country with a deposit-refund system with the highest recycling rate for all packaging materials in 2014 and is noteworthy for being the only case among the European countries that introduced a DRS after putting in place a packaging waste recycling infrastructure, which suggests a system might be merited in Ireland. However, Germany is a much larger country than Ireland, with a population density 3.5 times that of Ireland, among other differences, and a single country case does not necessarily determine the rationale for a system in another country. The case of Germany also illustrates the risk of high costs from systems – as shown in the review in Sub-Section 2.3.1 and in the next section of the report, where we provide more detail on the issues encountered in that country.

Figure 3.5: Recycling Rates (%) for All Packaging Materials in the EEA (2014)

Source: Eurostat (detailed data available [here](#)); Consultancy Team analysis.

Note: The only EEA country for which there are no recycling data in the Eurostat database in 2014 is Iceland (which has a system). While Lithuania currently has a system, it was not effective until 2016 and thus is excluded from the group of countries with a system, as is The Netherlands, which has only a partial system covering large PET bottles.

The mean or average recycling rate for all packaging materials for the 7 EEA countries *with* a DRS in 2014 is 62.2%, which is greater than the corresponding rate for the countries *without* a system, namely 61.8%. For comparison, Ireland's recycling rate for all packaging materials in 2014 was 68.3%, which is higher than the average of either group.

The higher mean recycling rate for the EEA countries with a system in 2014 suggests that the presence of a beverage container deposit system is associated with higher recycling rates on average. However, we need to ascertain whether the difference in the means is *statistically significant*.

Two-group mean comparison tests with respective assumptions of equal and unequal variances in the groups can be applied to answer this question.

The results of the tests for the mean recycling rates for all packaging materials (2014) between EEA countries with and without systems are presented overleaf in Table 3.6.

Table 3.6: Results of Two-Group Mean Comparison Tests of Recycling Rates (%) between EEA and EU15 Countries with and without Beverage Container Deposit-Refund Systems – All Packaging Materials (2014)

Two-Group Mean Comparison Test between Countries with and without DRS: <i>Total Recycling Rate (%) (2014)</i>									
Test No.	Country Group			Details of the Test under Different Conditions					Conclusion: Significant Difference?
	EEA	EU15	DRS	No.	Mean Recycling Rate (%)	Equal Variances Assumption	t-statistic	p-value (2-sided)	
1	Yes	No	No	23	61.8	Yes	-0.0964	0.9239	No
			Yes	7	62.2				
2	Yes	No	No	23	61.6	No	-0.1044	0.9185	No
			Yes	7	62.6				
3	No	Yes	No	11	65.9	Yes	-0.1933	0.8497	No
			Yes	4	66.7				
4	No	Yes	No	11	65.9	No	-0.2018	0.8454	No
			Yes	4	66.7				
Ireland's recycling rate (%) (2014)					68.3				

Source: Eurostat (detailed data available [here](#)); consultancy team analysis (conducted using the specialist econometric software Stata SE).

Note: The only EEA country for which there are no recycling data in the Eurostat database in 2014 is Iceland (which has a system). While Lithuania currently has a system, it was not effective until 2016 and thus is excluded from the group of countries with a system, as is The Netherlands, which has only a partial system covering large PET bottles.

Four separate mean comparison tests have been carried out, as outlined presently.

The first test result reported in Table 3.6 deals with whether there is a statistically significant difference in the means of the recycling rates for all packaging materials between the countries with and without systems under the assumption of equal variances in the two groups. The key t-statistic and p-value from the first test lead to the conclusion that there is no statistically significant difference in the mean recycling rate for all packaging materials between the two groups of countries.

In the second test, we relax the assumption of equal variances of recycling rates in the two groups. The same conclusion as that for the first test is reached, namely that there is no statistically significant difference in the mean recycling rate for all packaging materials between the two groups of countries.

In the third test, we reduce the sample from the EEA30 in the first two tests (Iceland is not present due to unavailable data in the Eurostat database) to the EU15 countries, in which 4 countries (Denmark, Finland, Germany and Sweden) have systems and the other 11 do not have a DRS. The conclusion of this test, which assumes equal variances of recycling rates in the two groups of EU15 countries, is the same as before, namely no statistically significant difference in the mean recycling rate for all packaging materials between the two groups of countries.

The fourth test relaxes the equal variance assumption in the third test and concludes that there is no statistically significant difference in the mean recycling rate for all packaging materials between the two groups of EU15 countries.

In summary, there is no statistically significant difference in the mean recycling rate for all packaging materials between EEA countries with and without beverage container deposit-refund systems, and this finding is also true of EU15 countries (the p-value exceeds 0.05 in each and every test).

In what next follows, we consider the test results in respect of the specific packaging materials relevant to beverage containers, where the corresponding tables have the same structure as Table 3.6 above.

3.4.2.2 Recycling Rate (%) of Specific Packaging Materials Relevant to Beverage Containers

Metallic Materials (Steel and Aluminium)

The corresponding results for the tests in respect of the metallic recycling rate (%) in 2014 are shown in Table 3.7. There is no statistically significant difference in the mean recycling rate for metallic packaging between EEA countries with and without DRSs and this finding is also true of EU15 countries.

Table 3.7: Results of Two-Group Mean Comparison Tests of Recycling Rates (%) between EEA and EU15 Countries with and without Beverage Container Deposit-Refund Systems – Metallic Materials (2014)

Two-Group Mean Comparison Test between Countries with and without DRS: <i>Metallic Recycling Rate (%) (2014)</i>									
Test No.	Country Group			Details of the Test under Different Conditions					Conclusion: Significant Difference?
	EEA	EU15	DRS	No.	Mean Recycling Rate (%)	Equal Variances Assumption	t-statistic	p-value (2-sided)	
1	Yes	No	No	23	72.2	Yes	0.2076	0.8371	No
			Yes	7	70.5				
2	Yes	No	No	23	72.2	No	0.1645	0.8734	No
			Yes	7	70.5				
3	No	Yes	No	11	77.5	Yes	-0.5106	0.6182	No
			Yes	4	81.5				
4	No	Yes	No	11	77.5	No	-0.6711	0.5137	No
			Yes	4	81.5				

Ireland's recycling rate (%) (2014)

80.5

Source: Eurostat (detailed data available [here](#)); Consultancy Team analysis (conducted using the specialist econometric software Stata SE).

Note: The only EEA country for which there are no recycling data in the Eurostat database in 2014 is Iceland (which has a system). While Lithuania currently has a system, it was not effective until 2016 and thus is excluded from the group of countries with a system, as is The Netherlands, which has only a partial system covering large PET bottles.

Glass

Table 3.8 reports the corresponding results in regard to the glass recycling rate (%) in 2014, where no statistically significant differences emerge between EEA countries with and without a DRS and the same is true of the EU15 countries.

What is also noteworthy from the same table is that Ireland's glass recycling rate (86.8%) is higher than the corresponding rates pertaining to the EEA and EU15 countries with a DRS in 2014, even though Ireland does not have such a system.

Table 3.8: Results of Two-Group Mean Comparison Tests of Recycling Rates (%) between EEA and EU15 Countries with and without Beverage Container Deposit-Refund Systems – Glass (2014)

Two-Group Mean Comparison Test between Countries with and without DRS: Glass Recycling Rate (%) (2014)									
Test No.	Country Group			Details of the Test under Different Conditions					Conclusion: Significant Difference?
	EEA	EU15	DRS	No.	Mean Recycling Rate (%)	Equal Variances Assumption	t-statistic	p-value (2-sided)	
1	Yes	No	No	25	67.7	Yes	-1.0653	0.2958	No
			Yes	5	78.3				
2	Yes	No	No	25	67.7	No	-1.6886	0.1105	No
			Yes	5	78.3				
3	No	Yes	No	12	75.3	Yes	-0.7688	0.4558	No
			Yes	3	85.1				
4	No	Yes	No	12	75.3	No	-1.4949	0.1577	No
			Yes	3	85.1				
Ireland's recycling rate (%) (2014)					86.8				

Source: Eurostat (detailed data available [here](#)); Consultancy Team analysis (conducted using the specialist econometric software Stata SE).

Note: The only EEA country for which there are no recycling data in the Eurostat database in 2014 is Iceland (which has a system). While Lithuania currently has a system, it was not effective until 2016 and thus is excluded from the group of countries with a system, as is The Netherlands, which has only a partial system covering large PET bottles.

Plastic

The results for plastic recycling are shown in Table 3.9. In none of the tests conducted does there emerge a statistically significant difference in the mean glass recycling rate, for either EEA countries or the EU15.

In this case, it is seen that the recycling rates for both sets of countries are comparably low, and in Ireland too. At its recent event to mark its 25th anniversary, Repak highlighted *inter alia* the challenge of plastics recycling (which is a global one) and has called for a plastics recycling strategy.²⁵

Table 3.9: Results of Two-Group Mean Comparison Tests of Recycling Rates (%) between EEA and EU15 Countries with and without Beverage Container Deposit-Refund Systems – Plastic (2014)

Two-Group Mean Comparison Test between Countries with and without DRS: <i>Plastic Recycling Rate (%) (2014)</i>									
Test No.	Country Group			Details of the Test under Different Conditions					Conclusion: Significant Difference?
	EEA	EU15	DRS	No.	Mean Recycling Rate (%)	Equal Variances Assumption	t-statistic	p-value (2-sided)	
1	Yes	No	No	23	41.1	Yes	0.8383	0.4089	No
			Yes	7	36.5				
2	Yes	No	No	23	41.1	No	1.0088	0.3277	No
			Yes	7	36.5				
3	No	Yes	No	11	37.7	Yes	-0.0983	0.9232	No
			Yes	4	38.2				
4	No	Yes	No	11	37.7	No	-0.0721	0.9460	No
			Yes	4	38.2				
Ireland's recycling rate (%) (2014)					35.4				

Source: Eurostat (detailed data available [here](#)); Consultancy Team analysis (conducted using the specialist econometric software Stata SE).

Note: The only EEA country for which there are no recycling data in the Eurostat database in 2014 is Iceland (which has a system). While Lithuania currently has a system, it was not effective until 2016 and thus is excluded from the group of countries with a system, as is The Netherlands, which has only a partial system covering large PET bottles.

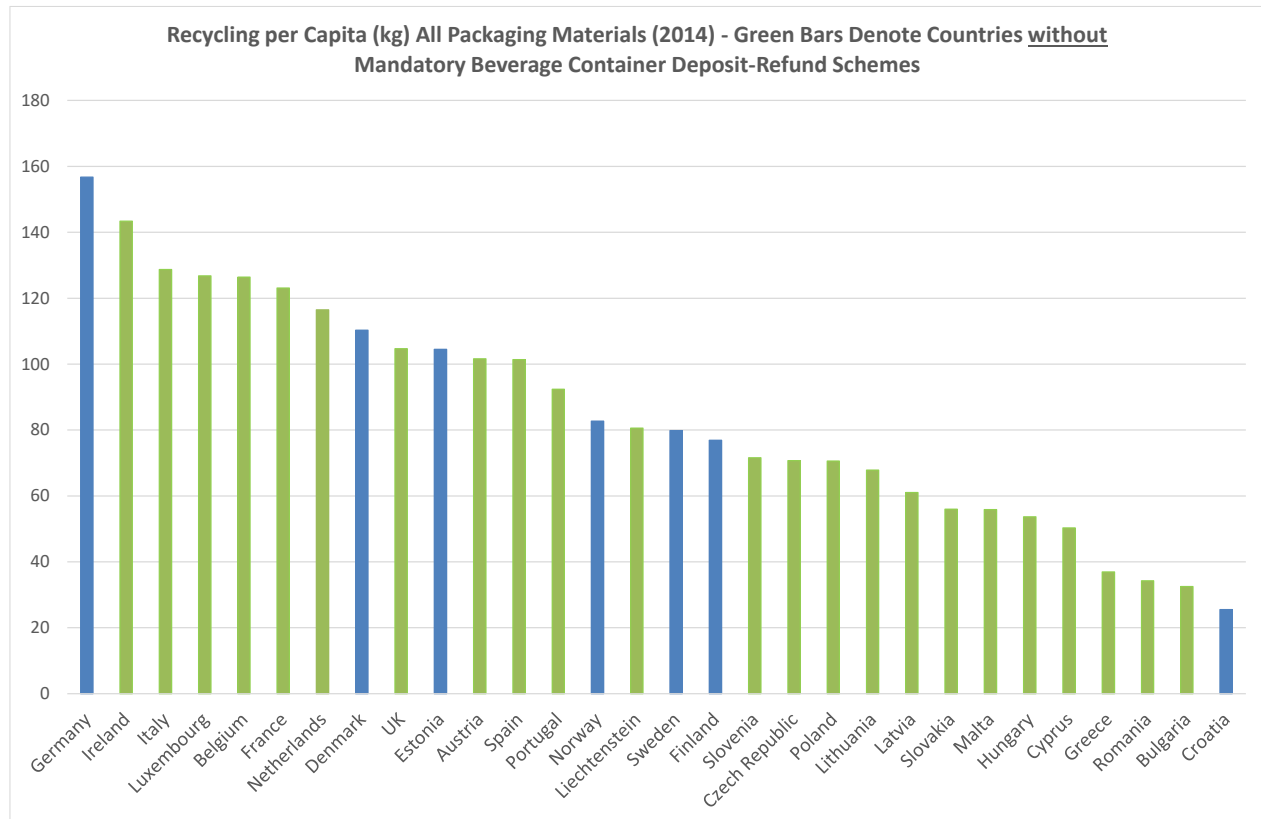
3.4.2.3 Recycling per Capita (kg) of All Packaging Materials

Finally, we consider the Eurostat data on recycling performance per capita (kg) in the EEA in 2014. As illustrated in Figure 3.6 below, Ireland had the second highest recycling performance in the EEA on this basis in that year, with over 143 kg of packaging materials recycled per head (after Germany, with 157kg).

The relative performances of the EEA countries with and without a beverage container deposit-refund system in the graph suggest that no statistically significant difference in recycling measured in this manner.

The results of two-group mean comparison tests are reported after the graph.

²⁵ *Supra* footnote 3 and Box 1.2 (p. 6).

Figure 3.6: Recycling per Capita (kg) for All Packaging Materials in the EEA (2014)

Source: Eurostat (detailed data available [here](#)); Consultancy Team analysis.

Note: The only EEA country for which there are no recycling data in the Eurostat database in 2014 is Iceland (which has a system). While Lithuania currently has a system, it was not effective until 2016 and thus is excluded from the group of countries with a system, as is The Netherlands, which has only a partial system covering large PET bottles.

According to the results shown in Table 3.10 overleaf, there was no statistically significant difference in the mean recycling of packaging materials per capita (kg) between countries with and without DRSs in the EEA and the EU15 in 2014.

It is seen in the table below that Ireland's recycling performance measured in this way is much higher than the averages of either groups of countries with and without DRSs in the EEA and the EU15.

Table 3.10: Results of Two-Group Mean Comparison Tests of Recycling per Capita (kg) between EEA and EU15 Countries with and without Beverage Container Deposit-Refund Systems – All Packaging Materials (2014)

Two-Group Mean Comparison Test between Countries with and without DRS: Total Recycling per Capita (kg) (2014)									
Test No.	Country Group			Details of the Test under Different Conditions					Conclusion: Significant Difference?
	EEA	EU15	DRS	No.	Mean Recycling per Head (kg)	Equal Variances Assumption	t-statistic	p-value (2-sided)	
1	Yes	No	No	23	82.9	Yes	-0.5277	0.6019	No
			Yes	7	90.9				
2	Yes	No	No	23	82.9	No	-0.4814	0.6410	No
			Yes	7	90.9				
3	No	Yes	No	11	109.3	Yes	0.1860	0.8553	No
			Yes	4	105.3				
4	No	Yes	No	11	109.3	No	0.1627	0.8768	No
			Yes	4	105.3				
Ireland's recycling rate (kg) (2014)					143.41				

Source: Eurostat (detailed data available [here](#)); consulting analysis (conducted using the specialist econometric software Stata SE).

Note: The only EEA country for which there are no recycling data in the Eurostat database in 2014 is Iceland (which has a system). While Lithuania currently has a system, it was not effective until 2016 and thus is excluded from the group of countries with a system, as is The Netherlands, which has only a partial system covering large PET bottles.

3.4.2.4 Conclusion on whether Mandatory Deposit-Refund Systems are Associated with Higher Recycling?

Concluding on the statistical analysis presented above, there is no evidence that the presence of a mandatory beverage container deposit-refund system is associated with higher recycling performance in Europe. This is true for all packaging materials and those specific to beverage containers, which account for a very small proportion of all litter items in Ireland (3-3.5% and declining over time).

The main caveat of the analysis conducted here is that it is based on relatively aggregated recycling data, as opposed to data on recycling rates for disaggregated packaging materials, namely plastic bottles, glass bottles and aluminium cans – for alcoholic and non-alcoholic drinks. However, such data is not officially available from Eurostat. The official Eurostat data on recycling performance employed in this report is geared towards assessment of the EU targets, which relate to recycling rates of all packaging materials and specific materials, viz. glass, plastic, metallic/metals, wood and paper and board.

3.5 Summary: Rationale for a Beverage Container Deposit System in Ireland?

We have approached the empirical evidence on litter control and recycling performance regarding packaging materials relating to drinks/beverages in Ireland through the insights of the relevant research outlined in Section 2. The principal lesson from the existing research, in the context of this report, and in view of the proposed introduction of a beverage container deposit-refund system in Ireland, is that such a system is only a “second” best solution, “at best”, in a country that already has an established recycling infrastructure and where recycling has become widespread, among households as well as producers of packaging waste. Ireland is an example of such a country, where recycling has generally become part-and-parcel of everyday activity over the past twenty years, and this fact is manifest in the growth of the recycling infrastructure and the fact that all of the country’s recycling targets have been met ahead of schedule. While there are always some exceptions to normal behaviour in respect of recycling, the evidence on Ireland’s packaging waste recycling performance is unambiguously positive, and starting from basically zero twenty years ago the country has made enormous strides in this regard since that time, thanks to public policy initiatives, Repak and its members, and the efforts of households.

The research reviewed in Section 2 is also clear that in countries, like Ireland, with established recycling infrastructures and where recycling behaviour has become widespread (among households and producers), the only rationale for a beverage container deposit-refund system is to reduce litter. Accordingly, the first part of the analysis of this section of the report has considered the evidence on litter in Ireland. The conclusions from the analysis of the official NLPMS data (DCCAE) are clear:

- Overall litter from all sources has declined in the State over the past fifteen years (which spans an economic cycle from boom to bust to recovery) – Ireland has transitioned from being a ‘moderately polluted’ country to being a ‘slightly polluted’ country, or quantitatively it has come down on the 5-point litter scale from 3 in the early part of the last decade to 2 since that time, where scores of 4 or 5 would generally be grounds for serious concern;
- Turning more specifically to litter from beverage containers – glass bottles, plastic/PET bottles and aluminium cans for alcoholic and non-alcoholic drinks – the share of these items together in all litter in the country is just 3% (excluding drinks cartons) or 3.5% (including drinks cartons, which are not normally considered as part of beverage containers but are considered in this report nevertheless) and none of the particular items (glass bottles, plastic bottles etc.) accounts for a share greater than 1% of all litter – thus there is no significant problem with litter due to beverage containers in Ireland (although generally speaking no matter how small the share of all litter may seem, there is always room for improvement);
- The trend in the share of all litter due to beverage containers over time has come down, as shown by the graphical and econometric analysis presented in this section of the report, which means that litter due to beverage containers is declining.

The second tranche of analysis in this section of the report concludes that there is no statistically significant relationship between the presence of a deposit-refund system and higher recycling performance in European countries, again using official data, in this case from Eurostat. In other words, the presence of such a system is not associated with better recycling of packaging materials, including those relating to beverages.

On the basis of the relevant empirical evidence presented, a beverage container deposit-refund system in Ireland is not warranted. There is no rationale in practice.

4 A Deposit-Refund System for Ireland? Experiences from Other European Countries

4.1 Introduction

From the review and evidence presented so far in the report, a beverage container deposit-refund system in Ireland is without empirical foundation. There is no evidence of market failure – in the form of a litter problem due to beverage containers or recycling underperformance – that would otherwise warrant consideration of such a new system in the State. In studies such as this, that would normally be the end of the matter at this juncture because such a regulatory intervention in the market would necessitate an identified problem to be addressed, when the reality is otherwise. Nonetheless, let us for assume the purposes of this section of the report that there is a basis for a system and then trace the likely model that could be applied – based on the experiences of other countries.

4.2 Non-Refillables versus Refillables

The sponsors of the Waste Reduction Bill 2017 have not indicated what type of containers would be included in the proposed system, among other details that would have to be worked out. It may be reasonably assumed that the system would apply to non-refillables, not to refillables.

There is no precedent anywhere for legislation that mandates a return to using refillables in the take-home trade once they have disappeared from the market; although policy-makers in some countries have legislated to protect existing refill systems. Refill protection measures have not proved successful, and the market share of refillables has declined despite them. The market preference for non-refillables is too strong. This has happened, for example, in three European countries as follows:

- *Germany* – where the mandatory deposit on non-refillables was set higher than that for refillables (€0.25 compared with €0.08 for refillable beer bottles and €0.15 for other refillables) to encourage consumers to buy refillables. The legislation set an 80% market share for “environmentally favourable” containers (refillables, cartons and pouches) but since the deposit-refund system took effect in 2003, the market share of refillables has fallen to 45% (2015).
- *Denmark* – where legal requirements kept non-refillables off the market until 2002. A deposit-refund system then started to operate for refillables and the few non-refillables then on the market. Since then, the market share of non-refillables has steadily increased, and 84% the containers registered with the deposit system operator, Dansk Retursystem, were non-refillable in 2016.
- *Norway* – where a tax is charged on non-refillable containers but not on refillables. The tax is NOK 1.17 (€0.12) per unit in 2017. Despite this, some major fillers of beer and soft drinks have recently switched to non-refillables. The number of PET bottles participating in the deposit system (Infinitum) increased from 134.5 million in 2011 to 612.6 million in 2015.

Further to the above, any proposals aiming to promote refillables in Ireland would have to be notified to the European Commission, as required by the Packaging Directive. When Member States have notified such proposals, they have been challenged by drinks importers and neighbouring Member States arguing that the proposals are a barrier to trade for imported drinks, because it makes neither environmental nor economic sense to transport empty containers over long distances for refilling.

4.3 Deposit-Refund System for Non-Refillable Beverage Containers

4.3.1 Overall Legislative Requirements

New regulations would require introduction specifying the container types and drinks categories affected and would require all producers, and importers, to charge a deposit that would be invoiced/passed on through all stages of the distribution chain to consumers. The regulations would also require producers and importers to take back deposit containers, refund the deposit and ensure that the containers are recycled.

4.3.2 Compatibility with EU Law of a Mandatory Deposit on Non-Refillables

The Packaging Directive (Article 7) requires Member States to ensure that return, collection and recovery systems are set up to ensure either the reuse of packaging or recycling of packaging waste. The Directive does not specify what form such systems should take, but it says that they must be open to the participation of the economic operators concerned and that they must apply to imported products under non-discriminatory conditions. Their tariffs must avoid barriers to trade or distortions of competition.

A deposit is a form of economic instrument so it would also be subject to Article 15 of the Directive, which permits Member States to introduce such instruments provided that they are in line with EU environment policy and with obligations arising out of the Treaty of the Functioning of the EU (TFEU).

Although there is no inherent incompatibility with a mandatory deposit for non-refillables and EU law, the Irish requirements and the market conditions arising from them would have to be carefully assessed. They would for example have to offer imports continued free access to the Irish market without distortions of competition.

Since the chaotic introduction of a mandatory deposit on selected non-refillables in Germany in 2003 (described in the international review below), the European Commission would also want to satisfy itself that the conditions set out in the two rulings from the European Court of Justice in 2004 about the German deposit would be met in Ireland.

In the case brought by the European Commission against Germany, the ECJ ruled that there needed to be a sufficient transition period after the announcement that deposits would be imposed to allow industry to adapt production and management of the relevant containers to the new system.²⁶

The second case, referred by the Administrative Court of Baden-Württemberg, was brought by two Austrian drinks producers.²⁷ The producers *inter alia* challenged the requirement to participate in a deposit return system, arguing that they were already meeting their recycling obligations by participating in the German Green Dot system (DSD). The ECJ found that, if a Member State switches from a close-to-home collection system to a deposit return system, the Member State is responsible for ensuring that there is an adequate number of return points and there must be a smooth transition to the new system so that producers can participate at all times and without discrimination.

²⁶ Case C-463/01, Commission vs. Federal Republic of Germany.

²⁷ Case C-309/02, Radlberger and Spitz vs. Land Baden-Württemberg.

4.4 Deposits for Non-Refillables – Possible International Models for Ireland

In the EEA, only nine countries have a mandatory deposit-refund system in effect on non-refillable drinks containers: Croatia, Denmark, Estonia, Finland, Germany, Lithuania, Iceland, Norway and Sweden. In what follows, we focus on the systems in Denmark, Germany, Norway and Sweden, as the systems in Estonia, Finland and Lithuania are similar to them. Lithuania is the only country that has introduced a mandatory deposit since the Perchards report of 2008, although several Member States have considered doing so (but none has implemented systems).

In Iceland, a mandatory deposit applies to glass, metal and plastic drinks containers. Domestic producers and importers pay the deposit together with excise duties to the tax/customs authority which passes the money to the deposit operator, Endurvinnslan, which is jointly owned by several private companies and public bodies. Deposit containers are not returned in-store, but to recycling centres that also handle non-deposit containers (there are very few RVMs). For non-deposit packaging producers/importers pay a recycling fee managed by a state Recycling Fund. Croatia was not a Member State of the EU in 2008 although its system was already in place. Its system is managed by the state Environmental Protection and Energy Efficiency Fund, not by industry.²⁸ The Croatian system's arrangements are not discussed below because they are unlike those of other European countries, which are managed by industry, so we do not think that they are likely to be adopted in Ireland. In The Netherlands, the only deposit-bearing non-refillables are large PET bottles, despite repeated political discussion about expanding the scope to small PET bottles, cans and glass. Current packaging legislation has provisions for a deposit on these container types and on refillables, but they are not in effect.²⁹ Producers are incentivised to charge the deposit on large PET bottles through discounts for deposit bearing PET on packaging recycling fees.

Although the main focus of the international review here is Europe, deposits in the US are discussed briefly because they provide an alternative model for Ireland. Only 11 US states have introduced a mandatory deposit on selected drinks containers and one has been repealed. Eight of these 'bottle bills' have similar, simple deposit arrangements. The other two US deposit states, California and Hawaii, introduced their legislation later, and they both opted for more complex arrangements. In the US, waste management and recycling are the responsibility of individual states, and there is no federal legislation in this area. Unlike Europe, there is no concept of an internal market for products, and individual states do not have to consider the impact of their rules on other states.

Deposits for non-refillables are managed in different ways in the above countries so there is more than one model that Ireland could follow. However, all such systems have certain features in common:

- The filler or drinks importer who first places the relevant drinks on the market charges a deposit when it invoices its customer, namely the wholesaler or retailer. The deposit is charged through all stages of distribution to the final consumer.
- The filler/importer also pays handling fees, part of all or which goes to the retailer (or other return handler) as compensation for the cost of charging and refunding the deposit and of sorting and managing the returned containers. Germany is the only exception to this.

²⁸ The same Fund is also responsible for the management of non-beverage packaging. No organisation equivalent to Repak operates in Croatia.

²⁹ Packaging Decree 409 of 2014 on the Management of Packaging and Packaging Waste. The Decree contains the same (dormant) deposit provisions as the 2005 Decree it replaced.

The variations arise in how deposit monies and handling fees are managed, how consumers get their deposits refunded, how the returned containers are managed, and how the arrangements are funded.

The European deposit arrangements include a system operator whose main role is to act as a clearing house for imbalances between deposits paid and deposits refunded. Without a clearing arrangement, market operators who refund more deposits than they generate would be out of pocket (or conversely would have a windfall). If a high return rate is sought, a clearing arrangement is essential to enable consumers to get their deposit refunded anywhere, not only the store chain where they bought the drink. The clearing arrangement is managed by a company established by producers and distributors. Everywhere except Germany the operator also handles logistics and recycling.

However eight of the US states with a mandatory deposit have no centrally-managed clearing arrangement. We believe that this simple arrangement is acceptable only because the deposit in these states is low – only \$0.05 (currently €0.04), so losses and gains from deposit imbalances are correspondingly low. This, and the fact that none of the ‘simple’ bottle bills sets a return target, make it less necessary to count returned containers accurately.

The key features of each deposit system are set out below, with an analysis of the advantages and disadvantages.

4.4.1 Swedish and Norwegian Model

4.4.1.1 Context

Sweden

Legal requirements were introduced for aluminium drinks cans in 1982 and for PET bottles in 1991. These requirements were different for each material type but both had the effect of requiring fillers and importers to charge a deposit. Producers set up a deposit return system for each material.

The requirements were revised in 2005³⁰ and all commercial fillers and importers of all ready-to-drink beverages in plastic bottles and metal cans are now required to participate in an approved deposit system. The obligations do not apply to drinks that are over 50% composed of dairy products or vegetable, fruit or berry juice. The Ordinance required deposit systems to be approved and it established operating conditions (that demonstrate that operators will manage the deposit system properly) and they must report to the authorities each year. Participating containers must be marked with the level of the deposit. The Ordinance kept the statutory return targets unchanged, at 90% for each material.

The main deposit system, Returpack,³¹ was approved under the new requirements. It is owned half by the Brewers’ Association (which also covers soft drinks and waters) and 25% each by two associations representing grocery distributors.

Containers are mainly returned in-store, although Sweden is the only European country where the legislation does not require all retailers that sell deposit drinks to refund the deposit. In practice the supermarket chains do so, but other retailers do not. Around 3,000 stores have RVMs that compact return containers, which handle 94% of returned containers.

³⁰ Ordinance 2005:220.

³¹ Some other deposit systems have been approved under the new rules but they are small, closed systems, not open to all producers.

Sweden adopted EPR legislation for non-beverage packaging in 1994 (later than the deposit legislation), to transpose the Packaging Directive. Producers set up a series of material-specific recovery organisations to meet the recycling targets, although most of these have since merged their operations into an organisation, known as FTI.³² Owned by the material organisations, FTI handles both household and consumer packaging, with fees paid by packers/fillers and importers of packaged products.

Household packaging is mainly collected through a national network of 5,800 bring sites, which are operated by FTI through contractors. FTI has recently indicated that only one-third of households in Sweden have access to 'close-to-home' collection, mainly in apartment buildings. Through a plan launched in 2012, it is working to increase this proportion to 50% in order to meet higher recycling targets which were set by revised packaging legislation in 2014 and must be met by 2020.

According to a report by Avfall Sverige,³³ taxes charged by municipalities to householders for waste management are usually split between a flat rate amount and a variable element. In 2015, 80% of municipalities charged a flat rate tax. The variable element is usually based on volume – the size of container and emptying frequency. However 30 municipalities (out of 290 in total) charge a weight-based fee, combined with various forms of fee per bin and flat-rate tax. The report notes that the levels of tax vary significantly in part because of differences between municipalities in what is included in basic council tax, but geographic and demographic differences also affect rates.

Norway

Norway is not a member of the EU but is required to implement the Packaging Directive because it is a signatory to the Treaty on European Economic Area (EEA). Participation in a return system for drinks containers is not mandatory but a packaging material tax, which is discounted according to the return rate achieved, gives an incentive to do so. Containers participating in systems achieving a return rate of 95% or higher are exempt from the tax. The tax applies to both refillable and non-refillable containers of glass, metals, plastics and board (beverage cartons) and covers most drinks including juices and milk.

Return systems for drinks containers are governed by a Regulation adopted in 1993, which covers both deposit and non-deposit systems.³⁴ Systems must be approved and, if they charge a deposit, they must charge the rates set by the Regulation. Deposit-bearing containers must be marked to show the level of the deposit and retailers selling deposit-bearing drinks must accept a reasonable number of containers.

Systems approved under the Regulation include the Infinitum deposit system for non-refillable cans and plastic bottles.³⁵ Also approved are non-deposit systems for beverage containers operated by GPN (Green Dot organisation) for glass, for plastic bottles, for cans, for beverage cartons, a separate system for school milk cartons. Traditional refill systems operated by brewers, and some smaller deposit systems operated by individual suppliers are also approved.

³² Förpacknings- och Tidningsinsamlingen, which also handles newspapers and other printed papers, which are subject to extended producer responsibility.

³³ Hushållsavfall in siffror – Kommun- och länsstatistik 2013, Report No. 2016:33. Avfall Sverige is an association representing municipalities' waste collection and management activities.

³⁴ As revised, Regulation on the recovery and treatment of waste (Waste Regulation) of June 2004.

³⁵ Known as Resirk until 2014.

The authorities in Norway publish the individual return rates achieved by each system (and thus the discount on the tax) each year. Infinitum has been achieving 95% each year since 2013 for both cans and plastic (PET and some HDPE), so all containers in this system are exempt from the tax. In 2016 GPN achieved a return rate of 87% for plastic (= 87% tax discount), 72% for cans, 90% for glass, 95% for school milk cartons and 94% for other cartons. Producers can choose which system they participate in, but we understand that the majority of cans and PET are deposit bearing.

Infinitum (then called Resirk) started to operate for cans in 1999 and for plastic bottles in 2000. It is owned by several associations representing producers and distributors. Non-refillable containers have been taxed since 1974 after the government abandoned a failed attempt to ban them. The tax, now known as the 'basic tax', is index-linked and in 2017 is NOK 1.17 (12 cents) per non-refillable container. Despite this tax, some major fillers, including Coca-Cola, have been switching to non-refillables since 2012. The number of PET bottles participating in Infinitum increased from 135.5 million in 2011 to 612.6 million in 2015. The number of cans increased to a lesser extent, from 409.3 million to 508.6 million. Infinitum reports that it has had to adjust its operations to handle the increase including opening an additional handling plant where returned containers are checked and baled.

Containers are mainly returned in-store and Infinitum pays handling allowances to return points per container handled. 3,700 return points have RVMs.

For non-beverage packaging, there are no statutory recycling requirements, but the Norwegian government agreed a series of material specific agreements with industry in 1995, which were revised in 2003. To implement these, producers established a series of material-specific organisations to ensure that packaging was collected and recycled. As in Sweden, most of these organisations have now merged their operations into a system called Grønt Punkt Norge (GPN). Norway has just adopted legislation for non-beverage packaging following the establishment of a small competitor to GPN. This will require recovery organisations to be approved and from January 2018 it will for the first time make it mandatory for producers to participate in an approved system.

Non-deposit packaging is collected from households through a combination of kerbside and bring arrangements, which are co-ordinated by the local authorities.

4.4.1.2 Key Features of the Swedish/Norwegian Systems

First, both are *centrally managed systems*, with a private sector company managing money flows (deposits and handling fees/allowances) between fillers/importers, and acting as a clearing house for imbalances between deposits paid and refunded by different market operators. The systems also organise the transport of containers from return points and their recycling. In both countries the system operator is owned by associations representing the drinks producers and distributors.

Second, the deposit systems in both countries handle cans and PET sold through retail outlets and in the catering trade. The main drinks affected are beer, waters and carbonated and still soft drinks. Deposit rates are set in legislation in Norway but the Swedish system sets its deposit rates in consultation with the authorities.

Third, producers pay fees to participate in the system and per pack (see table). Retailers and other return points who register with the system receive handling allowances per container handled (see table). Retailers fund their own return facilities such as RVMs but receive higher allowances per pack for automated handling than for manual handling.

Fourth, containers are mainly returned to the grocery store but other sites can register as return points and receive handling allowances. The use of RVMs is widespread, and all deposit containers must be marked with a logo and bar code unique to each country.

Fifth, the deposit system operators in both countries have complemented in-store deposit-refund arrangements with collection banks in locations designed to capture on-the-go containers. These include camp sites, ski resorts and festivals. Consumers using these facilities do not get their deposit refunded, but the money is donated to a good cause (mountain rescue, lifeboats etc.). The Swedish system is trialling large scale RVMs at 10 civic amenity sites. These enable consumers to return deposit containers together with other packaging and waste.

Sixth, the deposit on non-refillables was introduced when these first became available. The traditional deposit refill systems continue to operate in both countries although the market has shifted significantly towards non-refillables.

Seventh, a producer-funded packaging recovery system for non-deposit packaging including glass operates in each country. Beverage producers participate in the deposit systems and to the general systems for their grouping and transport packaging.

Finally, Swedish return rates in 2016 were 86% for cans and 83% for PET, with more large bottles returned than small ones.³⁶ The Swedish system has rarely met its statutory return rates, which are 90% for cans and for PET. In Norway 95% of cans were returned and 95% of PET in 2016.

4.4.1.3 Assessment of the Swedish and Norwegian Systems

The Swedish and Norwegian deposit systems are often cited as the model to follow. This is because they achieve good return rates with low fees. The main reasons for this are as follows.

The deposit for non-refillables was established alongside the existing deposit-and-return system for refillables. As a result, fillers and retailers were used to operating deposits and retailers already had a return infrastructure in place, which had to be adapted to handle non-refillables. The number of non-refillables was small at first and gradually increased as the market shifted away from refillables. Thus the systems started small, and in initially they could take advantage of use existing logistic arrangements (such as back-loading returned containers on delivery vehicles). They were able to plan their expansion as the number of containers increased, as demonstrated by the recent increase in containers handled in Norway. Further, consumers were still accustomed to returning drinks containers in-store, and segregated collection of recyclables had not yet become commonplace.

Other factors, unique to Sweden, keep costs down there. Cross-border purchases by Norwegians in Sweden are extensive (particularly of canned beer), due to higher taxes and retail prices in Norway. Norwegian RVMs are programmed to accept Swedish containers but they do not refund the Swedish deposit. The Swedish deposit system keeps these deposits, and uses this money towards its operating costs. This arrangement is possible only because both countries have deposit systems.

³⁶ For 2015, Returpack reported return rates 84% for PET and for cans. However official data from the Swedish EPA for that year reported 92% for cans but only 83% for PET. Its report covers deposit and non-deposit packaging and notes that deposit PET was the only target not met.

4.4.1.4 Other Systems Similar to Sweden/Norway

Finland, Estonia and Lithuania have deposit systems that operate in a similar way to those in Norway and Sweden although they also handle refillable and non-refillable glass. They are centrally managed systems which handle clearing and logistics, and they are owned by producers and retailers. They operate alongside recovery organisations for non-deposit packaging. They are all affected (positively or adversely) by cross-border shopping, particularly of canned beer.

In *Finland*, until 2008 taxes on non-refillable drinks containers meant that refillable containers dominated the market although there were some cans, handled through a deposit system called Palpa. From 2008 amended legal requirements exempted containers from the tax provided an approved deposit return system operated and met return targets. Non-refillable PET entered the market and Palpa expanded its scope to handle it. Palpa now handles some non-refillable and non-refillable glass since it merged operations with other systems (Alko, state alcohol monopoly, and A-Pullo) in 2012. A separate system for refillables continues to operate and some producers and retailers operate their own deposit systems.

Turning to *Estonia*, until 2004 the main instrument driving recycling policy for packaging was an excise tax on beverage containers with an exemption if a certain return rate was achieved. The focus remained on beverage containers even after a take-back requirement was imposed on sales packaging in 2004, together with a tax on sales packaging that failed to meet the recycling targets (expanded to all packaging from 2008). A mandatory deposit was introduced on refillable and non-refillable containers of glass, metal and plastic in 2005, operated by Eesti Pandipakend. There is significant cross-border shopping from Estonia, particularly canned beer into Finland. The return target for cans is only 50%, less than the 85% target applicable to other deposit containers, to compensate for the cans that are not returned in Estonia.

Many companies use the same bar codes for all three Baltic countries, making it profitable to take drinks containers purchased in Latvia or Lithuania to Estonia to claim the deposit. Pandipakend requires detailed documentation for import consignments of more than 4 kg of packaging that is deposit-bearing in Estonia. Producers using a universal bar code rather than a bar code unique to Estonia have to pay higher unit fees per unit.

For non-deposit packaging three competing compliance organisations are approved. The operation of compliance organisations has not always been smooth and the environment ministry sent them an open letter in 2013 reminding them that all producers should be offered the same terms. There had been reports that shareholders were paying significantly lower fees than other producers.

In *Lithuania*, a mandatory deposit took effect in February 2016. Latvia indicated in 2008 that it would follow Estonia and introduce a deposit, prompting discussions between all three Baltics on a pan-Baltic deposit system. In 2013 Lithuania announced that, as Latvia planned to have a deposit, it would also impose one to avoid aluminium and PET being diverted to claim a deposit. Although Latvia then decided not to introduce a deposit, Lithuania went ahead and introduced legislation in 2014. The deposit applies to non-refillable glass, PET and metal, and the system operator USAD handles deposit clearing and logistics. As in Estonia, USAD charges a higher unit fee for containers not marked with a unique bar code. The deposit is not mandatory for refillables, but fillers can join USAD on a voluntary basis.

4.4.2 Danish Model

4.4.2.1 Context

The current Danish deposit system started to operate in 2002 when Denmark lifted a ban on drinks cans and other rules that had made it difficult and expensive to use other non-refillables. The Order on Deposits and Collection of Certain Drinks Packaging made it mandatory for anyone selling the drinks affected in refillable and non-refillable containers to charge a deposit. The legislation governing the deposit system sets out in great detail how the system operates and all its funding arrangements, deposit rates, etc.

Producers established a company called Dansk Retursystem to operate the system. It handles deposit clearing for both refillables and non-refillables but handles logistics only for non-refillables. It is the only approved deposit return system in Denmark as it took over the traditional deposit system for refillables.

Cross-border shopping is an ongoing problem. Danes import significant numbers of drinks (estimated at 600-700 million cans in 2015), particularly in special shops on the German border. VAT and excise duties are lower in Germany and the border shops are permitted by the authorities in Schleswig Holstein not to charge the German deposit to non-Germans provided they prove their nationality and residence. The drinks must be for personal consumption but not for resale in Denmark. However the Danish tax authorities have raided retailers (small snack bars and convenience stores) and found some that were re-selling German containers.

Danish retailers, who lose business from the border shops, have been lobbying for a solution for years. To reduce the price differential with Germany, the Danish authorities lowered excise duty on beer and soft drinks in 2013 and repealed a weight-based tax on packaging. In 2015 a political agreement was announced whereby the border shops would have to charge either the German or the Danish deposit. Danish consumers paying the German deposit would be able to get their deposit refunded only in Germany. Those paying the Danish deposit could get their deposit refunded in Denmark but not the German VAT (about 2 eurocents), which is charged on deposits in Germany. The arrangement is not scheduled to enter into effect until 2018 to allow Dansk Retursystem time to adapt its infrastructure. In 2016 Dansk Erhverv (Confederation of Danish Enterprise) filed a complaint with the European Commission against the current arrangement.

A volume-based tax, originally imposed to reduce consumption of non-refillable containers, is charged on beverage containers. It applies to containers of the drinks subject to the mandatory deposit, including refillable and non-refillable deposit-bearing containers as well as non-deposit containers such as cartons if they contain drinks covered by deposit requirements.

Denmark is the only EU Member State that has not imposed EPR for packaging. There is no systematic funding by industry of segregated collection of packaging waste from households which remains the responsibility of local authorities. A report published by the Danish EPA in 2015 indicates that 80 local authorities had a collection system for paper, 73 for board, 57 for metal, 46 for glass and only 41 for plastic packaging. Most of these relied on bring systems, with less than half the number for each material reporting that they had introduced kerbside collection.

For non-household packaging waste, there is a voluntary agreement for transport packaging, originally signed in 1994, which sets recycling targets but does not set out precise take-back commitments. Waste management legislation sets out the conditions under which business end-users can access bring sites operated by local authorities.

The Danish deposit system has much in common with those in neighbouring Sweden and Norway, but it also has some significant differences.

4.4.2.2 Key Features of the Danish System

The following key features are apparent:

- A centrally managed one, with a private sector company that manages money flows between fillers/importers and retailers, and acts as a clearing house for deposit imbalances for both non-refillables and refillables. Fees paid by producers and deposit rates are shown in Section 5.
- Dansk Retursystem organises the transport and recycling of returned non-refillable containers but not for refillables, which are handled directly by the fillers and retailers.
- The current deposit system started operating when non-refillables first became available on the market. The proportion of non-refillables participating in the system has increased steadily since then, reaching 59% in 2010 and 84% in 2016.
- The system handles cans, and refillable and non-refillable glass and PET bottles in the retail trade and in catering outlets. Initially only carbonated drinks were subject to the mandatory deposit but from 2008 the deposit has also applied to ready-to-drink still drinks including water and fruit drinks (but not juices, smoothies and nectars). The system has always paid handling fees to retailers for refillables but did not start to pay them for handling non-refillables until 2008.
- Containers are mainly returned to the grocery store, but all retail and catering outlets that sell deposit drinks are legally required to take them back. Dansk Retursystem collects returned deposit containers free of charge from all such sites and refunds the deposit. However it pays handling fees only to larger retailers handling over 23,000 containers per year, who must pay to register with the system. The use of RVMs is widespread, and all deposit containers must be marked with a special logo and unique bar code. As in Sweden and Norway, Denmark is complementing in-store return with return options that are more convenient for consumers and are designed to capture containers consumed on-the-go.
- The return rate for non-refillables has gradually increased and in 2016 it was 90%. The original 2002 deposit legislation set an ambitious target of 95%, which has never been met. The latest amendment to the legislation, adopted in 2015, no longer mentions a return target.
- The system operator keeps unredeemed deposits, but the legislation specifies for what purposes it can use the money.

4.4.2.3 Assessment of the Danish Model

The level of detail in the Danish legislation provides information about how the system works and what it costs. It also makes clear that the Danish authorities spent considerable time discussing the system with stakeholders before the legislation was drafted.

Because the legislation contains so much detail, all changes to the system, even minor administrative provisions, require a legal amendment that has to be notified to the European Commission. The equivalent regulations in the other Nordic countries contain less detail, and administrative changes are negotiated between the system and the relevant national authority. Although the Danish approach makes the system transparent, it seems a cumbersome way to fine-tune the system in line with market changes, and we would not recommend it for Ireland.

The Danish system is also affected by personal imports of container purchased in Germany without a deposit. Danish retailers are not legally required to accept them, although we understand that RVMs are programmed to do so.

4.4.3 German Approach

Experience in Germany highlights the problems that can arise when a deposit system is not designed properly and when the legislation does not set out clear legal obligations. It also shows how a deposit may be unacceptable under EU rules.

4.4.3.1 Context

The mandatory deposit took effect in 2003 under provisions of the Packaging Ordinance adopted in 1991. The Ordinance imposed EPR on producers for all packaging and required them to meet high recycling targets for sales packaging waste with a short deadline. It also required the market share of drinks supplied in refillables to remain at the levels prevailing when the Ordinance was adopted, both overall (72%) and in each drinks category (beer, waters, etc.) A mandatory deposit would be imposed on non-refillable drinks containers either if the recycling targets for sales packaging were not met or if the market share of refillables fell below the quota.

The Ordinance permitted producers to meet their recycling targets collectively through a 'dual system', and producers set up a company, Duales System Deutschland (DSD), to operate the system.

Germany was the first country to introduce such an arrangement. Although DSD had a shaky start, it met its recycling targets each year. However the market share of refillables continued its gradual decline throughout the 1990s and the overall market share fell below the 72% quota.

The mandatory deposit took effect in 2003 on non-refillables of beer, waters and carbonated soft drinks (which had breached the refill quota). The deposit provisions in the Ordinance did not provide for a clearing arrangement. It set the level of the mandatory deposit deliberately higher than the existing deposits on refillables (set by industry), to encourage consumers to choose refillables. Producers were reluctant to set up a clearing arrangement because, if the deposit had the desired effect and the refill market share quota was met, the mandatory deposit might be cancelled again.

Retailers protected themselves from the financial loss of refunding more in deposits that they received. They switched back to refillables and/or they refunded the deposit only on the containers they had sold. This arrangement, known as an 'island solution', was permitted only for containers of a unique design. PET can be moulded to a unique shape but cans cannot, so retailers were reluctant to sell them and they largely disappeared from the market. Some foreign drinks suppliers found their products excluded. They complained to the European Commission, which took a case against Germany to the European Court of Justice. Two Austrian drinks producers brought a separate case.

After Germany lost the cases, the deposit provisions were reformed. They set clearer obligations for producers and retailers to charge and refund the deposit and it clarified the categories of container and drink subject to the deposit. The link between imposition of a deposit and refill quotas was removed. Producers and retailers established a deposit clearing house, DPG.

At the same time, DSD was coming under increasing pressure. As a condition of approval, DSD had to ensure that the system operated nationwide and that all householders had access to segregated collection. Producers had started undercutting DSD by meeting some of their targets using sales packaging waste on catering outlets, a practice known as “self-compliance”. DSD’s attempts to protect itself from this competition, including its insistence that all packs marked with the Green Dot should pay it a recycling fee, even if they were in a “self-compliance arrangement, fell foul of the competition authorities.

The competition concerns relating to DSD probably explain why the German authorities prevented DPG from handling logistics and recycling. Unlike the Nordic systems, it handles only deposit clearing. It is the responsibility of individual retailers to ensure that returned containers are recycled.

4.4.3.2 Key Features of the German System (2003-2005)

A mandatory deposit on non-refillable containers (glass, plastic, metals) of beer, waters and carbonated soft drinks took effect in 2003. As the producer-funded recycling system for household packaging waste was meeting its recycling targets, its objective was to protect refillables.

The deposit is 25 eurocent on each non-refillable container regardless of size.³⁷ This is higher than the 8 cent deposit charged on refillable glass beer bottles and 15 cents for other refillables (PET), in order to encourage consumers to buy the refillable.

The legislation did not set out detailed obligations for charging and refunding the deposit nor did it provide for a system operator or deposit clearing house.

Retailers selling containers of a unique design were exempt from the obligation to accept other containers. This exemption gave rise to ‘island solutions’ in which consumers could get their deposit refunded only in the store (or chain) where they had bought the drink, not at any store. Cans virtually disappeared from the market because they cannot be made to a unique design.

The Commission successfully challenged German arrangements in the European Court of Justice, as a result of which Germany revised its legislation.

4.4.3.3 Key Features of the German System (2006 Onwards)

Clear legal obligations for producers and subsequent distributors to charge a deposit and to refund it on all containers of the material they supply, i.e. suppliers of drinks in PET must refund the deposit on all PET containers, regardless of brand. However small retailers (sales area of less than 200 m²) can refuse containers of brands that they do not sell.

The mandatory deposit (still 25 eurocent) applies to all containers except “*environmentally favourable*”, namely refillables, beverage cartons and pouches. Thus the deposit applies to non-refillable glass, plastic and metal containers. It applies to beers, waters and carbonated drinks and to still soft drinks and alcopops, but not to milk-based drinks, fruit juices or wines.

80% of beverages must be in “*environmentally favourable*” containers. The legislation does not set a return target, and no return rates are published.

³⁷ The deposit applies only to containers of between 0.1 and 3 litres.

The role of the clearing house, DPG, is narrower than elsewhere in Europe – it provides the central database for deposit clearing and it has devised an on-pack security logo, but it has no role in transporting containers, nor in the mechanics of deposit clearing. Market operators appoint service providers to fulfil these tasks on their behalf. DPG is owned by retailers and producers.

Participation in the system is more expensive than in the Nordic equivalents, although a full comparison is not possible because German producers have to pay separately for services provided by the other system operators. In 2013 annual registration fees paid by fillers or importers ranged from EUR 1,200 to 18,000, depending on the quantity of drinks sold although producers selling fewer than 50,000 containers per year no longer pay this. All participants in the system, including service providers and retailers claiming deposits must pay to register with the system.

Retailers do not receive handling allowances, although they are responsible for the transport and recycling of returned containers. Although retailers must refund the deposit, they do not have to register with the system. In practice we understand that smaller ones do not, and either take any returned containers to the nearest RVM or use a service provider.

Unredeemed deposits are kept by individual operators, not by DPG.

4.4.3.4 Assessment of the German Approach

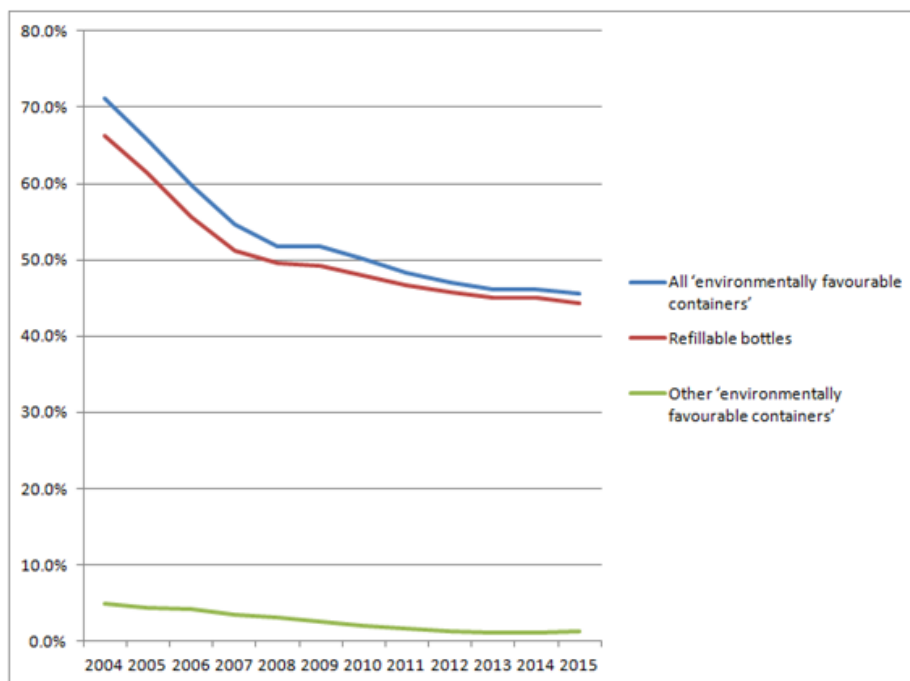
The badly planned introduction of the German deposit contains some useful lessons:

The lack of detail in the original legislation resulted in significant disruptions to the market after the deposit took effect. The obligations were very similar to those in the “simple” US bottle bills, which have not had the same adverse effect on the market there, perhaps because the German deposit was much higher (25 eurocent compared with 5 US cent = 4 eurocent). The structure of the market is also different – discount chains in Germany have a significant market share for drinks, and they focus on private label versions.

This highlights the need to understand market conditions and to design the deposit system around them. Only once there is a blueprint for a system should the legislation be drafted, with appropriate obligations based around that system and market structure.

The German legislation did not impose a recycling obligation for deposit containers, perhaps because the focus was on protecting refillables. A recycling obligation was added in 2006, although still no return target.

Setting a higher deposit on non-refillables than on refillables has not succeeded in protecting refillables. Their market share has fallen in all categories (except beer) since 2004, and in 2015 it was c. 45%, as shown in Figure 4.1 below. Over 80% of beer continues to be in refillables, although this is declining slowly.

Figure 4.1: Market Share of “Environmentally Favourable” Drinks Containers in Germany (2004-2015)

Source: German Federal Environment Agency.

Another lesson from Germany is the need to define terms carefully. The exemption for ‘dietetic/diabetic drinks’ from the deposit caused confusion, with some but not all producers claiming that sugar-free drinks were exempt. The definition of small retailers is also unclear – does the 200 m² threshold apply to total sales area or only the sales area devoted to food and drink (such as a café within a department store)?

A high deposit may be needed to ensure a high return rate, but the German experience demonstrates that a high deposit can create other problems:

- It requires robust anti-fraud measures, because a high deposit creates a strong incentive for fraud. Such measures are expensive to implement. DPG adopted a sophisticated on-pack deposit label using security inks so that it could not be easily counterfeited. As there is no deposit in countries adjacent to Germany, including some beyond its eastern border where retail prices are typically lower, German producers wanted to prevent fraudsters printing counterfeit deposit labels on foreign containers.
- This does not seem to have been entirely successful according to some recent press reports. Frauds included copied deposit labels on foreign bottles or non-beverage packaging, makeshift devices that enable containers to pass through the RVM several times, and a burglar who on five separate occasions poured drink away from around 300 cans at a club before stealing the empty cans. A more organised fraud involved returned containers being collected from small convenience stores and snack bars, correctly refunding the 25 cent deposit to them but then returning the containers to a wholesaler. Because of the way that VAT is charged on the deposit, wholesalers charge 28 cents to retailers so the wholesaler refunded 28 cents although the drinks were probably bought at a discount supermarket, according to the press report.

The German system is halfway between the Nordic managed systems and the simple US arrangement (see below). The German arrangement seems to us to offer the worst of both worlds. It is expensive – its fees are higher than in Scandinavia but it provides fewer services, which are paid for separately.

The narrow role was due to competition concerns – understandable given the large size of the German market and given the competition concerns facing DSD at the same time.

4.4.4 ‘Simple’ US Deposit Model

4.4.4.1 Overview

The simple bottle bills operate in only eight US states and were all introduced in the 1970s or early 1980s (none later than 1983), when non-refillables first became available and refillables were still in common use.³⁸ The simple deposit in Delaware was repealed in 2010.

There is no centralised management of the deposit. There is no clearing arrangement nor organised transport of returned containers. Each producer/wholesaler makes its own arrangements with each retailer to refund deposits and to collect containers.

The deposit is 5 ¢ (4 eurocent), except in Michigan, where it is 10 ¢ (8.5 eurocent). The deposit in Oregon increased from 5 ¢ to 10 ¢ in 2017.

Most states set the rate of the handling allowance paid by the producer/wholesaler to the retailer or return depot. Most states set the fee between 1¢ and 3.5 ¢ (0.85 to 3 eurocent). In most cases this has remained unchanged since the law was adopted.

The deposit applies only to carbonated drinks (beers, waters and soft drinks) except in Maine, where still drinks are included. In most of the states, it applies to refillable and non-refillable glass, metal and plastic containers. Some states include cartons in the deposit provisions, but as these are not used for carbonated drinks, the deposit does not apply in practice to cartons.

Retailers are permitted to refuse containers of the type and brand that they do not sell. Most bills offer the option of establishing third party return depots, although many containers are returned in-store.

None of the states sets a return target.

Deposit containers must be marked. In practice each container is marked with both 5 ¢ and 10 ¢, and with the abbreviations of all the deposit states.

None of the deposit states has introduced producer responsibility (“stewardship”) requirements for packaging in general.³⁹ Segregated collection of recyclable waste operates in many states, but this remains publicly funded. However several states have introduced litter taxes on commonly littered items, including drinks containers.

³⁸ The ‘simple’ bottle bills are in place in Connecticut, Iowa, Maine, Massachusetts, Michigan, New York, Oregon and Vermont.

³⁹ Hawaii has an advance disposal fee for non-deposit glass. Delaware replaced its mandatory deposit with a fee on beverage containers, which is one source of funding for segregated collection and recycling.

4.4.4.2 Assessment of the 'Simple' US Model

The 'simple' US arrangement is a cheap way to operate a deposit system. The absence of a system operator and its associated overheads reduces the cost of the deposit to market operators. However the arrangement makes individual market operators responsible for operating deposits, and some of them are no doubt more assiduous and better resourced to do so than others. There are differences in how they apply the rules, with some for example handling deposit refund themselves while others rely on return depots.

The lack of a clearing arrangement for deposit imbalances is acceptable only because the deposit is low. If the deposit were as high as in Germany, individual producers would have to reconcile imbalances with each other to avoid unacceptably high losses for those refunding more deposits than they pay out. The practice of weighing large batches of containers rather than counting them is also possible only because the deposit is low. It is likely that large batches include some non-deposit containers on which the deposit is then paid out, particularly in states neighbouring non-deposit states.

Although the 'simple' bottle bills do not specify any clearing arrangement, they do specify the rate of the deposit and of handling allowances. As in Denmark, putting this level of detail in the legislation makes it hard to make changes as circumstances evolve. In practice, it has proved very difficult in the US to get any proposed amendments to deposit laws approved by state legislatures.

The mandated handling allowances fees paid to retailers by producers are now below real handling costs. Retailers no doubt seek the necessary additional financial support from their suppliers as part of commercial negotiations on product prices. The real cost of handling and of financial support are therefore not transparent.

No state has adopted the 'simple' deposit since 1983. Many states (including some bottle bill states) have now introduced general recycling arrangements, with segregated collection of recyclables, and some have set recycling targets and/or have introduced general anti-litter measures. This broader approach has helped to reduce political support for deposits. Despite this, bottle bills have continued to be proposed but none has been adopted. The drinks industry strongly opposes deposits and lobbies against new bottle bills and amendments to existing requirements.

The absence of statutory return targets helps to explain why US producers did not set up an operating system, which would have increased the cost of operating the deposit. There is a greater need to manage the system and to count returned containers accurately when a specified return rate must be verifiably achieved.

The multi-state marking of containers, combined with manual handling of returned containers and the practice of estimating the number of containers by weighing them, makes it impossible to determine return rates accurately. Drinks purchased in one deposit state may be returned in a neighbouring state.

The marking arrangement also creates problems in deposit states that adjoin non-deposit states, particularly as large batches of containers may be weighed. To combat fraudulent redemption, containers sold in New York often have "NY" marked on the crown in addition to the standard deposit marking, to prevent a deposit being paid on containers sold in neighbouring New Jersey, which does not have a deposit.

4.4.5 Alternatives to a Deposit-Refund System for Beverage Containers

4.4.5.1 Introduction

Several European countries have considered introducing a deposit in recent years, but have decided not to do so. Such proposals are put forward either by the country's environment minister, or by an individual parliamentarian or, as now in Ireland, by one or more opposition parties. The reasons for proposal of a deposit are usually similar to those mentioned by the sponsors of the proposal under discussion in Ireland – to increase recycling rates and to tackle litter (but having the necessary evidence to support the rationale for a deposit system is of critical importance).

However, although such proposals are discussed by policy-makers and stakeholders, and a study is often commissioned to consider whether and how to introduce a deposit, in most cases, the country has not gone ahead to introduce a deposit.

4.4.5.2 Austria

Austrian policy-makers considered introducing a deposit in 2003. They were seeking new policies to replace combined refill/recycling targets for individual drinks categories (which gave companies the choice between using refillables and achieving high recycling targets). At that time refillables were still common in the retail trade, although the market share of refillables was in decline.

In the event, Austria did not adopt a mandatory deposit. New measures were set out in a voluntary agreement in 2004. In that agreement, Austrian industry undertook to meet a 50% recycling target for PET drinks bottles and to develop bottle-to-bottle recycling of PET. It also undertook to maintain refillables and to meet a combined reuse/recycling target for beverage containers of 80%. These targets have all been met and this voluntary approach has been maintained.

A new agreement with revised objectives has recently been signed. The commitment to maintain refillables has been abandoned and instead a new commitment to reduce greenhouse gas emissions from drinks containers has been agreed. However, there remains political support for refillables and the commitment to maintain has been reinstated. This is being achieved through voluntary measures taken by producers and retailers (pricing policies, communications, etc.).

4.4.5.3 Belgium

Waste management policy is the responsibility of each of the three regions, and initiatives to introduce a deposit have been made at different times over the years by the two larger regions, Wallonia and Flanders. None of these was taken forward because the regional governments concluded that it would be impracticable to introduce a deposit in only one region.

Wallonia commissioned a study in 2011 to consider a deposit on cans, which concluded that the environmental benefits of a deposit would depend on the return rate achieved.⁴⁰ The environmental benefits would be outweighed by the economic cost, which would be much higher for a deposit than for improving the existing collection system.

⁴⁰ Preparatory study for the implementation of a deposit for beverage cans in Belgium, Intertek RDC, December 2011. See also the MSc. thesis study on Belgium reviewed in Sub-Section 2.3.4.

In 2015/2016 both Flanders and Wallonia considered a deposit, as a way to combat litter. As they were both considering deposits at the same time, it was more likely that the proposals could be adopted. Belgium raised the possibility of an EU-wide deposit-return system at the EU Environment Council in December 2015. However the issue was discussed only briefly – the European Commission said at the meeting that it did not intend to introduce such a system.

A study published in Flanders in 2016 concluded that, although a deposit would reduce beverage container litter, the additional cost would be considerable.⁴¹

Despite these discussions, neither region has adopted a deposit. Flanders reached agreement on an anti-litter plan instead and so did Wallonia. In both regions, activities are being co-ordinated by the Green Dot organisation FOST Plus, although the commitments and funding are different in each region.

4.4.5.4 France

A study commissioned by French environment agency ADEME in 2009 by Ernst and Young considered a deposit on drinks containers and the expansion of household plastics recycling beyond bottles.⁴² On deposits, the study noted the high cost of the German deposit and that Austria was achieving comparable recycling rates with no deposit. It commented on the market disruption caused by the deposit in Germany and said that drinks producers would prefer to expand the scope of existing selective collection from households, rather than investing in new infrastructure and organisations.

The national Waste Prevention Plan 2014-2020 says that deposit/reuse systems should be developed “where appropriate”, and the Plan goes on to note that reuse of glass bottles is a better environmental option than non-refillables in the catering sector.

France introduced EPR for packaging waste in 1994 and a Green Dot organisation, Eco-Emballages, was established for household packaging waste. Almost 100% of the population has access to segregated collection, either kerbside or bring systems. Eco-Emballages achieved an overall recycling rate of 75% in 2012.

At the time the Ernst & Young report was written, the collection and recycling of household plastic packaging was limited to bottles. Since then, Eco-Emballages has been gradually expanding segregated collection to include a wider range of plastics. New approval conditions for compliance organisation Eco-Emballages and its new competitor Léko (approved from 2018) require that mixed plastics are collected separately from all households by 2020.

4.4.5.5 Latvia

In May 2013 the Ministry of Environmental Protection and Regional Development announced that a deposit for refillable and non-refillable PET and glass bottles would be introduced from 2015. Deposit-bearing containers would be exempt from the Natural Resources Tax provided that the deposit system met its return targets.

⁴¹ Impactanalyse invoering statiegeld op eenmalige drankverpakkingen, May 2016.

⁴² Evaluation des résultats de la réutilisation et du recyclage des emballages en France, March 2009.

However a working group set up by the Ministry which included representatives of the municipalities and industry then recommended against setting up a deposit return system to operate alongside existing EPR systems. The working group said that deposits would require a significant increase in expenditure: a set-up cost of EUR 20-26 million (EUR 10-13 per capita) and an annual cost of EUR 12.8 million (EUR 6.4 per capita) but would not reduce the quantity of waste landfilled. Nor would it reduce litter very much as most inappropriately discarded waste was bags, paper, disposable plates and other non-beverage items.

This followed studies into deposits, two by PwC in 2008 and 2010 and one by the Green Freedom Society 2012, all of which discussed cross-border issues. The 2008 report by PwC stressed the importance of having similar deposit rates in neighbouring countries and of marking deposit containers. The Green Freedom Society recommended a single deposit system for all three Baltic countries.

Latvia has not introduced a deposit. However now that both Estonia and Lithuania have deposits, Latvia may be forced to review its position. The Lithuanian system is still new, so it remains to be seen whether Latvian beverage containers are being taken to either Estonia or Lithuania to claim a deposit there, which could deprive Latvia of material needed to meet its targets.

4.4.5.6 Slovakia

Until 2015 Slovakia had legislation that provides for a deposit on certain non-refillables but this has never been in effect. The Ordinance set standard deposit rates for refillables and provided for a deposit on non-refillable PET bottles large than 500 ml and on aluminium cans, at zero.⁴³

The Ordinance was repealed in 2015 as part of a wider reform of legislation on waste and EPR. For the first time, the new legislation sets out harmonised operating requirements for compliance organisations for packaging and other waste streams. Competing compliance organisations that were operating for packaging have had to seek approval under the new requirements.

4.4.5.7 Spain

Spanish legislation on packaging and packaging waste gives producers a choice between charging a deposit on one-way packaging (of any product, not only drinks) or joining an approved compliance organisation.⁴⁴ No deposit systems have been set up under these requirements. Traditional deposit systems for refillables, which were already operating when the legislation took effect, continue to operate, but are not governed by the requirements.

In practice producers comply with the requirements by participating in approved recovery organisations: Ecoembes (which handles all materials except glass) and Ecovidrio (which handles only glass). Both organisations operate nationwide including in the Balearic and Canary Islands.

Legislation adopted in 2011 to transpose the Waste Framework Directive said that measures may be taken to facilitate the establishment of deposit and return systems for industrial packaging, transport packaging, glass, plastic and metal packaging and other reusable products, to promote prevention, reuse and high quality recycling.⁴⁵

⁴³ 81/2011, which replaced an earlier Ordinance.

⁴⁴ Law 11/1997 on Packaging and Packaging Waste and Implementing Decree 782/1998, as amended.

⁴⁵ Law 22/2011 on Waste.

The text of the legislation referred to the need to ensure the correct functioning of the internal market and said that, before such a system was established, the government must prepare a report on its technical, environmental and economic viability.

However this article of the law was repealed in 2012.⁴⁶ A separate section of the 2011 Law that set out provisions on EPR said that implementing decrees specifically about packaging or deposit systems must take account of the extent to which EU recycling and reuse targets were being met, and of the particular circumstances of small and medium companies. As amended in 2012, the Law says that deposits are voluntary except for waste that is hard to dispose of, for waste whose hazardous characteristics make it necessary to have to deposit to ensure the correct management of the waste, or if objectives established in current legislation are not met.

As the inclusion of the reference to deposits in the 2011 legislation demonstrates, there is some political support for a deposit. Support is strong in certain regions, particularly Catalunya and the Balearic Islands, and more recently in Valencia. A new bill promoting deposits is currently under discussion in the parliament in Valencia.

4.4.5.8 Switzerland

Switzerland is not a member of the EU and did not sign the Treaty on the European Economic Area so it does not have to transpose the Directive on Packaging and Packaging Waste. Switzerland has legislation that sets recycling targets only for beverage containers, not for all packaging.

The Beverage Containers Ordinance as amended in 2000 says that 75% of PET, of aluminium and of glass beverage containers must be recycled. If any of these materials fails to meet its target, the authorities can impose a mandatory deposit and/or a take-back and recycling obligation on suppliers.

Producers set a compliance organisation for PET (PET Recycling Schweiz) and one for aluminium cans (IGORA).⁴⁷ Although material-specific, they operate in a similar way to compliance organisations in neighbouring countries – producers pay fees which are used to support the segregated collection and recycling of the packaging. Practical arrangements are similar for glass, although the system is funded by an Advance Recycling Fee set out in the legislation. Collection and recycling is co-ordinated by a private company appointed by the authorities.

The targets for glass and aluminium were met, but not for PET. Although PET Recycling Schweiz (PRS) met its target, the recycling rates achieved by individual producers were lower so the national target was not met. The authorities considered imposing a mandatory deposit on small PET bottles.⁴⁸ A study undertaken by BUWAL, PRS and IGORA in 2004/2005 concluded that, although a deposit would yield an increased recycling rate, a deposit on only small bottles would be complex for businesses, and consumers, costly in terms of logistics and would not solve the litter problem since these bottles represented only a small proportion of litter. BUWAL thought that an advance recycling fee (ARF) would be a more appropriate response than a deposit.

⁴⁶ Decree Law 17/2012 adopted in May 2012 and confirmed by Law 11/2012 of December 2012.

⁴⁷ There was originally also an organisation for steel cans, but this has now merged its operations with the aluminium organisation.

⁴⁸ The Federal Environment Agency, then known under the acronym BUWAL. Since then its name has changed and it now known under the acronym BAFU.

PRS was opposed to an ARF and encouraged more producers to participate in its system and increased the number of collection containers. As a result, the recycling rate increased so that the target was met, and BUWAL announced that it no longer planned to impose a mandatory deposit.

More recently there has been some discussion of a mandatory deposit in the parliament. The government indicated on each occasion that it opposed a deposit. In 2013 it said that a mandatory deposit would have start-up costs of CHF 29 million (EUR 25.4 million) and in 2014 it estimated that the annual cost of operating such a system would be CHF 250-300 million (EUR 219-263 million).

In the PRS and IGORA systems, PET and cans are collected through collection points at retailers and other sites. There are also collection points at public transport stations, ski lift stations, cinemas, schools, etc. Some collection points are provided by municipalities, mainly in manned recycling sites or in small villages without many shops. Glass is mainly collected through a national network of bring sites, most of which are colour separated, and are often at the same sites as bring containers for cans.

The 75% recycling target for PET has been met each year since 2005 and was 82% in 2014. Over 90% of aluminium has been recycled each year and reached 92% in 2015. Recycling rates for glass are consistently above 95%.

4.4.5.9 UK

Each of the four jurisdictions comprising the UK now make their own waste policies, with for example different municipal waste recycling targets in England, Wales, Scotland and Northern Ireland.

At UK level, the Department for Environment, Food & Rural Affairs (Defra) has consistently rejected container deposits as disproportionately expensive compared with the benefits it might bring. That remains its view, despite pressure from the Scottish Government, which supports a deposit. In May 2016, the Defra Minister then responsible told the parliament that recent work undertaken by the Scottish government highlighted significant uncertainties regarding the impacts and benefits of a deposit system, notably regarding cost, environmental quality and littering, and existing waste collection systems.

There have been serious discussions about the introduction of a beverage container deposits in Scotland, some interest in Wales and NI, but the lack of support from the UK government means that there will not be a nationwide deposit system.

In September 2017, the Scottish government announced in its Programme for 2017-18 its plan to develop *“a deposit return system for drinks containers for roll-out across Scotland”*. However details of the scope and operating arrangements have yet to be determined. The government has commissioned Zero Waste Scotland to draw up a design for the system. It has also indicated that a steering group will be established involving stakeholders.

A deposit was discussed in the Welsh parliament in December 2015. Several parliamentarians spoke in favour of a pilot system to test deposits, but the idea was not supported by the government. We are not aware of any further discussion. Any progress in Wales on a deposit may now depend on whether Scotland goes ahead with a deposit.

Coca Cola GB announced in July 2017 that it wanted to work to increase the recycling of its containers. It referred to awareness-raising through advertising and research into how consumers respond to rewards by testing an *“incentive-based system”*.

4.5 Assessment from the Country Review

Our analysis of the above systems revealed the following success factors for a deposit on non-refillables:

- ***Most deposits were introduced when refillables were still common in the retail trade.*** This meant that retailers had return facilities and both retail staff and consumers were still accustomed to return drinks containers in-store. Further it meant that only few non-refillables were on the market when the deposit took effect so deposit systems for non-refillables started small. Logistic and recycling arrangements could develop gradually as the number of non-refillables increased.
- ***Most deposits were introduced before the kerbside collection of recyclables was commonplace and before the introduction of producer responsibility for all packaging.*** There is some evidence that the deposit has slowed the introduction of kerbside collection because the absence of drinks containers reduced the economic viability of kerbside collection. Furthermore, once consumers have become used to the convenience of a kerbside bin, they may consider it a retrograde step if they then have to take their containers back to a grocery store or depot.
- ***Deposit systems need the support of industry to be successful, because individual businesses need to make significant investment in infrastructure (return facilities etc.) and adjusting production.*** Scandinavia and Germany again provide good examples for comparison. German business, which had invested in kerbside collection through the Dual System, opposed the deposit and used a legal loophole to avoid having to set up a clearing arrangement.
- ***Cross-border shopping can have a significant effect on deposit arrangements.*** Differences in retail prices and excise duties between neighbouring countries make drinks a popular cross-border purchase. This means that deposit containers are not always disposed of in the country of purchase. The deposit system on the exporting side benefit from not having to refund deposits, while the system in importing country receives more containers, although no deposit is paid.
- ***Changing consumption patterns are affecting deposit systems.*** The increase in on-the-go consumption has led deposit systems to introduce additional collection arrangements to complement their network of in-store RVMs. These include collection bins at locations associated with on-the-go consumption, special holders for deposit containers attached to the outside of litter bins, and large scale RVMs on civic amenity sites.
- ***Relatively few countries in Europe have actually introduced a deposit system, although many countries and jurisdictions have considered doing so.*** The main reason why they considered a deposit was to increase recycling rates and to tackle litter. In many cases, it was decided not to introduce a deposit because, although a deposit may increase recycling rates and reduce litter to some extent, it was disproportionately expensive to set up and operate. Many countries have opted instead to improve their existing packaging waste compliance systems.

5 A Deposit-Refund System for Non-Refillables in Retail – Key Issues

5.1 Introduction – Options for Consideration

The research review and empirical analysis presented in Sections 2 and 3 respectively lead to the conclusion that a beverage container deposit-refund system is without any factual foundation in Ireland.

Nonetheless for completeness, and in view of the arrangements in the small number of other European countries in which systems currently exist, as presented in Section 4, we consider in this section of the report the possible options for a mandatory deposit system in Ireland, focusing on non-refillable beverage containers sold through the retail trade (to consumers) (refillables are not an option, as shown earlier).

The experience of Germany, which established its packaging waste PRI prior to introducing a deposit system in 2003, shows that careful consideration would need to be given to how a system would operate in practice, and to the design of the legal requirements in turn. While Germany might be relevant to Ireland in being a country having a packaging PRI *before* introducing a deposit system, in many other respects it is very different to Ireland – in terms of size, population density etc. – and the lessons from Germany and other countries can only take one so far in view of the fact that Ireland, and every other country, is unique, with its own circumstances, conditions and legacies, including the fact that it had a system many years ago, which ceased to operate before the current packaging PRI commenced in 1997.

In short, it would be inadvisable to superficially apply, or to ‘lift-and-shift’, any of the deposit arrangements of the countries outlined in the last section, or any other country with systems, to Ireland for the sake of having an Irish beverage container deposit-refund system.

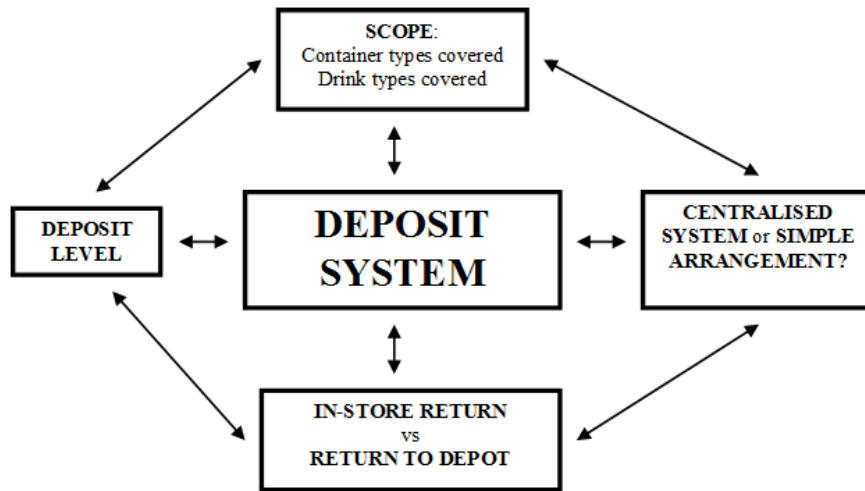
In the event that the government were to consider a deposit system for non-refillable beverage containers sold through the retail trade, the main options that would need to be examined would be (after first establishing a rationale or justifiable case for a system through empirical analysis, which we consider is not possible because the relevant empirical evidence shows otherwise):

- The scope of the deposit – what types of drink and what container types, and whether containers sold through the catering trade would be included as well as those sold through grocery stores.
- Whether there would be a centrally managed system with a deposit clearing arrangement, or a ‘simple’, individual arrangement.
- Whether consumers would be required to return their containers and get their deposits refunded at retail stores, or through return depots, or a combination of both.
- What level the deposit would be – which in turn raises subtle yet complex questions because, for example, a high deposit may incentivise a high return rate but it may also cause distortions in the marketplace and may encourage fraud.

In what follows, we start by considering each of the above factors separately. However, we also consider them together because they are inter-dependent – the categories of drinks and containers subject to the deposit may affect the return arrangements and *vice-versa*, as will the level of the deposit and whether there is a clearing arrangement or not.

The main options for consideration are illustrated graphically in Figure 5.1 overleaf.

Figure 5.1: Main Options for Consideration for a Beverage Container Deposit System in Ireland



Source: Consultancy Team research.

5.2 Irish Market Context

The structure of the production and distribution of drinks in Ireland is significant because the deposit-refund system would be charged by each producer or importer to its customers, who would then charge it on through all stages of distribution to the final consumer. Thus, the greater the number of market operators involved, the more complex it is to operate a deposit, and the harder it is for national authorities to enforce it. The size of the operators is also relevant as small drinks producers/importers and retailers are less likely to understand or to have the resources to comply properly with the deposit requirements than large companies.

5.2.1 Irish Retailing Environment

The 2008 report by Perchards (authored by Gill Bevington) found that grocery retailing in Ireland is diffuse. Data from the then Competition Authority for 2006 indicated that vertically integrated retailers accounted for 46% of retail turnover in groceries.⁴⁹ Retailers affiliated to the four largest wholesaler-franchisors accounted for 40%, while independent retailers and retailers affiliated to smaller wholesaler-franchisors accounted for 14%.⁵⁰

⁴⁹ 'A Description of the Structure and Operation of Grocery Retailing and Wholesaling in Ireland: 2001 to 2006', Irish Competition Authority, April 2008. Since then, in 2014, the former Competition Authority was merged with the National Consumer Agency to form the Competition and Consumer Protection Commission (CCPC).

⁵⁰ Six wholesaler-franchisors (ADM Londis, Barry, BWG, Gala Retail Services, Mangan and Musgrave) license 18 retail brands.

Recent data suggest that vertically integrated stores have increased their market share since the 2008 report. Data from Kantar Worldpanel for 2017 indicates that the vertically integrated stores have a 67% market share.⁵¹ Supervalu has around 22% and other outlets 11%.

The two sets of data come from different sources so are not fully comparable but, given the significance of the increase, it is safe to conclude that the market share of the vertically integrated stores has increased since 2006. The Irish grocery sector has become more concentrated since the Perchards report of 2008; however the competitive constraint from smaller retailers continues to be strong and the country is still characterised by many small, independent stores, shops, forecourts etc., who retail drinks, foods and other consumer items.

Of significance here is that the cap on the size of food/grocery stores, as set out in the Guidelines for Planning Authorities on Retail Planning, remains in place, and it is fair to say that the average size of retail stores in Ireland is likely to be smaller than in other European countries – economic principles dictate that average size is likely to be smaller in Ireland given the smaller size of the retail grocery sector.

A large grocery/retail chain would implement a deposit in a consistent way in all its stores so consumers would understand the arrangements more easily than the piecemeal approach of independent stores. Large chains would have the management and financial resources enabling them to invest in the equipment (RVMs) and data systems to manage a deposit system. Moreover, consumers are more likely to return deposit containers when they drive to do their shopping, so supermarkets with a car park are more likely to receive deposit containers. These factors could mean that chains with larger stores could gain competitive advantage from a mandatory deposit. Thus, a beverage container deposit system could have significant implications for competition in the Irish retail grocery market.

Ensuring that the deposit is applied correctly by small stores would likely require a significant enforcement effort from the government; and the existence of cross-border shopping between Ireland and NI is also relevant (neither part of the island currently has a deposit system).⁵²

5.2.2 Irish Supply Environment

An analysis of the supply environment – covering both domestic production and imports – is also necessary to guide the design of a deposit that might be suited to the Irish market. This includes the size of the market, broken down by drinks type and pack types, which is essential to determine the optimum scope of the deposit. It may not be sensible to include some drinks or pack types if they have only a small market share, particularly if their inclusion would blur the scope of the deposit.

Other important factors are the size and number of operators – to assess the likely number of operators involved and the economic impact. The size of the import market is also important because this affects the significance of potential barriers to trade and the need to ensure that the deposit complies with EU rules.

Several producers treat both NI and Ireland as a single market and use the same bar codes for products sold on both sides of the border.

Accordingly, the Irish authorities would need to undertake a detailed market analysis to establish the economic impacts of a system (including on competition) and to guide the design of the system.

⁵¹ Total of data for Tesco, Dunnes, Aldi and Lidl.

⁵² See, for example, the earlier Box 2.1 (p. 19).

5.3 Scope of a Deposit System

5.3.1 Grocery Retailers and Catering Trade

It is clear that an obligation to charge a mandatory deposit would have to apply throughout the grocery retail trade. A discussion of whether it would be advisable to exempt small retailers from the obligation to refund the deposit can be found in Sub-Section 5.8.3 below.

Should pubs and restaurants also have to charge the deposit?

In pubs and restaurants, where drinks are commonly consumed on the premises, the pub or restaurant is effectively the end-user. The wholesaler would charge the deposit to the pub, but there would be no need for the pub to charge the deposit on to customers to get the containers back.

However, the situation is less clear-cut in the case of a small café, where consumers may either consume deposit drinks on or off the premises, or of a busy pub or club where customers may take their drinks outside and then leave the empties on the street. In these situations the deposit should be charged. If the deposit were charged on all drinks, would consumers consuming the drinks on the premises have to return their empties to the counter to get their deposit refunded? We imagine that few of them would bother, and the pub or café would get to keep the deposit.

Whatever the arrangement, including the catering trade in the deposit on beer (and on other drinks), a deposit system would undoubtedly increase handling costs for these outlets. Their inclusion would also greatly increase the number of outlets involved in the deposit arrangement.

However, despite the practical problems and the cost implications, we believe that beer and other relevant drinks categories sold in non-refillable containers through the catering trade would have to be included in a mandatory deposit. Deposit requirements in other European countries invariably include drinks sold in catering outlets as well as in the retail trade. Excluding this category of trade would create a major loophole. If pubs and cafes did not have to charge the deposit, they could supply deposit drinks for home consumption without the deposit, which might enable them to undercut supermarkets. Excluding drinks intended for sale in catering outlets would also mean that these drinks would have to be specially marked, without a deposit logo.

If drinks sold in catering outlets were deposit-bearing, the pubs and restaurants would also have to handle returned containers. Most of the Nordic systems reviewed earlier encourage them to register with the system and pay handling allowances to them, and arrange to collect returned containers from them.

However in Denmark, catering outlets register with the system and the system operator ensures that returned containers are collected. However the system pays handling fees only to outlets that handle a minimum number of containers per year and most catering outlets are probably below this threshold.

In Germany, catering outlets are legally required to take back and refund deposits on containers that they sell. However, unless they receive a large number of containers, they may not register with the system operator and make their own arrangements to handle any returned containers – either through their wholesaler or, if they are small or do not handle many containers, by simply taking containers to the nearest RVM.

5.3.2 Drinks Categories

In most European countries, the deposit on non-refillables initially applied to drinks that were traditionally sold in refillables. That made it easy to decide what product categories should be made subject to the mandatory deposit in those countries. Further, these drinks were usually the highest volume sectors of the drinks market when the deposit was introduced, and these drinks, when sold in non-refillables, were usually in homogenous container types. The scope of deposit requirements in European countries then expanded to other drinks that were sold in similar containers, and to reflect changes in the market. As no drinks are sold in refillables for home consumption in Ireland, legislators would have to determine the categories according to Irish market conditions.

The drinks categories most commonly subject to deposits in Europe are: beer, waters (carbonated and still) and soft drinks (carbonated and still). However, containers of milk and other dairy-based drinks and juices, and wines and spirits,⁵³ are usually excluded from the deposit and are handled by the relevant Green Dot systems, even if the glass is deposit-bearing.

For Ireland, it could be argued that the deposit should apply to the largest possible range of containers of different products as this would help both to spread the cost of establishing the deposit system among a large number of containers and to divert the largest possible number of containers from litter and to collect them for recycling.

However, as the discussion below highlights, care is needed to determine the categories of drinks and container types to be covered for the following reasons.

First, the scope of the deposit should be clear-cut, so that consumers and retail staff understand easily which containers of which drinks are deposit-bearing, and which are not. If consumers are confused, some of the containers that they try to return will get rejected. After a few failed attempts, some consumers would lose faith in the system and stop returning deposit containers. The lack of a clear logic to the scope of the deposit in Germany certainly caused confusion there. For this reason, deposit regulations usually require that deposit-bearing containers are visibly marked with a deposit logo and/or with the value of the deposit in addition to a special barcode.

Second, competitive distortions between drinks categories and pack types that are deposit-bearing and those that are not should be avoided. As it is usually more expensive to participate in a deposit system than in a recycling system handling all pack types, some producers may avoid the deposit by switching some production to other pack types or reformulating some drinks. Some pack types (such as beverage cartons and laminated pouches) are usually excluded from deposit requirements although they are used for drinks that are often deposit-bearing. These packs are unsuited to standard RVMs, which operate by spinning containers to read the bar code. That is not possible with rectangular cartons, while the flexibility of an empty pouch makes the bar code illegible in an RVM.

Changing to a different pack type would involve significant costs for producers, but it is impossible to anticipate the extent to which such production changes might be made. Producers would make a commercial decision once the cost of participating in a deposit arrangement is known. However, Irish legislators need to be aware of the risk that some producers may make such changes.

The deposit also makes the relevant drinks look expensive to consumers on the retail shelf, even though the deposit is refundable. This may encourage some consumers to switch to a non-deposit alternative.

⁵³ Wines and spirits are in theory included in the systems in Sweden and Norway. However, as these drinks categories are rarely sold in PET or cans, if ever, in practice they are not deposit-bearing.

An increase in demand for non-deposit drinks would reduce the effects of the deposit in achieving policy objectives.

Below we discuss the drinks categories that are likely to be considered for inclusion in a mandatory deposit in Ireland. As the discussion shows, care would be needed to define each category to avoid unintentionally excluding similar drinks. There are issues that need to be considered for each product category, to determine how best to apply the deposit consistently and clearly.

5.3.2.1 Beer

All jurisdictions with a mandatory deposit include beer sold through the retail trade, and beer is highly likely to be included in any Irish deposit requirements. The non-refillables used for beer in the retail trade are mainly cans and glass, although beer is sometimes also available in PET.

The issue of whether the deposit should include pubs and similar catering outlets, discussed above, is particularly important for beer, given that a significant proportion of beer is not sold through the retail trade for home consumption, but is drunk in pubs and bars.

Traditionally, much of the beer sold through the licensed trade in Ireland is draught (i.e. supplied in refillable metal kegs), and draught beer has traditionally had a larger share of the national beer market in Ireland than anywhere else in Europe. Although the pub trade in Ireland continues to sell a significant proportion of beer in refillable kegs and glass bottles, this is declining. Also, the proportion of beer sold in refillable bottles is now far lower than the quantity of cans and non-refillable bottles.

A mandatory deposit on non-refillables would also affect the use of refillable glass bottles, but it is impossible to anticipate how. On the one hand, requiring pubs to operate the mandatory deposit for non-refillables would help to reduce the cost differential with refillables, so perhaps it would help to maintain refillables in this sector. But on the other hand, producers and pubs may then abandon the refill system, to avoid having to operate two parallel deposit arrangements, particularly since non-refillables are easier for pubs to manage, and refillable glass only has a small market share anyway. So a mandatory deposit could accelerate the decline of refillable glass in the catering sector. Individual operators (producers, wholesalers and pubs) would make commercial decisions based on the cost and convenience of each option.

The Perchards report of 2008 found that that pubs were returning fewer refillable bottles than in the past, although they then forfeited the deposit. This suggests that, for the deposit on non-refillables to achieve a good return rate, it would have to be as high as, or higher, than the current deposit on refillable bottles.

The Danish, German, Norwegian and Swedish deposit requirements all include catering outlets. However, market conditions do not match those in Ireland. In Norway and Sweden, the sale of beer above a given alcohol content is closely controlled. Such 'strong' beer (and wines and spirits) can be purchased by consumers and bar operators only through state-owned monopoly suppliers. Supermarkets are permitted to sell only lower-alcohol drinks.

In Germany, a large proportion of beer continues to be sold in refillable bottles – beer being the only drink sector where the market share of refillables has declined the least following the imposition of the deposit. This is mainly because of the unique nature of the German beer market, characterised by a large number of small local brewers. The market share of refillables has also declined in Denmark.

The beer categories that would be subject to a deposit in Ireland would have to be carefully defined. They would likely include stout, bitter and lager, plus shandies and other pre-mixed beer drinks.

5.3.2.2 Waters

All jurisdictions with a mandatory deposit include waters. Water is usually supplied in glass and in PET, and occasionally it is also available in cans and beverage cartons. Most European countries (and US bottle bills) initially imposed the deposit only on carbonates, because non-carbonated waters were not as common when the deposit took effect as they are now. Since those bills were adopted, there has been a surge in the popularity of bottled waters throughout the western world, including in countries such as Ireland where there had previously been little tradition of drinking bottled water. Still waters now have a significant share of the market for packaged waters, even in countries where carbonated waters were the norm in the past.

Irish legislators would need to define the categories of water to ensure that all relevant categories, such as mineral water, spring water, table water etc. are included. Flavoured waters have become available in recent years, and it would make sense to include this category of water also.

One issue to be considered for still water is the possibility that producers would switch some production to cartons to avoid having to participate in the deposit arrangement. This happened to some extent in Germany in the chaotic market conditions that followed the introduction of the deposit there. Denmark originally imposed its mandatory deposit only on carbonated waters, and when the Danish authorities first considered bringing still waters within the scope, they decided against this because having a deposit on water in glass and plastic, but not on water in cartons, would create a competitive distortion between these pack types. They feared that the proposal would be challenged on competition grounds.⁵⁴ Since then, Denmark has brought still waters within the scope of its deposit rules because excluding them gave them a competitive advantage *vis-à-vis* carbonated waters.

Another issue to be considered is the status of large containers used with water coolers. We believe that there would be little point in making these containers subject to a mandatory deposit, because they are usually supplied together with the cooling equipment and many already participate in a voluntary return arrangement, and they rarely get littered. Moreover they are usually made of polycarbonate, which cannot be recycled, together with PET.

5.3.2.3 Carbonated Soft Drinks

Carbonated soft drinks (CSDs) are also included in all the mandatory deposit arrangements reviewed in the country profile earlier in the report. CSDs are predominantly sold in glass, cans and PET. We would expect this drinks category to be included in a deposit requirement in Ireland.

Of note is that the convenience sector has a significant market share of this drinks category in Ireland. Many convenience stores are by their very nature small, and many are independently owned and not part of large chains. This may make it difficult to ensure an adequate coverage of return facilities in this sector, not to mention ensuring that these stores charge the deposit to customers correctly in the first place. The authorities in both Sweden and Denmark have reported difficulties in enforcing the operation of the deposit in the convenience sector.

⁵⁴ 'Study on the progress of implementation and impact of Directive 94/62/EC on the functioning of the Internal Market', Perchards *et al.* for DG Enterprise, May 2005.

In 2005 the Danish authorities announced that they were tightening up enforcement activities against restaurants and convenience stores (known as 'kiosks'). These stores had been importing drinks without the deposit from the German border shops, and the Danish customs authorities were given new powers to seize drinks not correctly marked with the deposit label.⁵⁵

The CSDs category also includes some sports drinks and energy drinks. The original German deposit legislation exempted drinks for special diets, as defined in the German regulations that transposed the EC Directive on Foods for Particular Nutritional Uses,⁵⁶ although sports drinks and energy drinks were specifically included in the scope of the deposit. This exemption encouraged some producers of sugar-free drinks to claim that they were suitable for diabetics, and hence exempt from the deposit. However not all producers claimed this spurious exemption, so one brand of a sugar-free drink was deposit bearing while an almost identical one of another brand was not. This exemption has now been rephrased to exempt only drinks intended for consumption 'under medical supervision'.

Germany has just adopted an amendment to its legislation that will bring carbonated nectars within the scope of deposit requirements from 2019.

At the boundaries of the CSD category are alcopops, which are discussed under the heading of wines and spirits below.

5.3.2.4 Still Soft Drinks

This sector covers ready-to-drink squashes, iced teas, and still fruit drinks that are not classed as juices. These drinks were not traditionally sold in refillables and so were not originally included in mandatory deposit requirements. However they are now included in the scope of European deposit requirements. Still soft drinks may compete with carbonated soft drinks, implying that they may be included to avoid competitive distortions between the two categories. Moreover, consumers may be confused if carbonates are deposit-bearing but still drinks are not, particularly as it is not always easy to know whether a drink is carbonated or not until it is opened.

However defining the drinks in this category is not straightforward. If juices are excluded (see below), consumers and retail staff are likely to be confused between deposit-bearing containers of fruit based drinks and non-deposit containers of juice. There may also be some confusion between ready-to-drink squashes and the concentrated versions intended to be diluted at home.

Another problem with this category of drinks is that they are supplied in a wider range of container types than carbonates, including beverage cartons and laminated pouches, that would be probably be excluded from a deposit arrangement, unless of course they were returned manually in Ireland. Germany excludes cartons and pouches from its mandatory deposit because these are considered to be 'environmentally favourable' on the basis of an LCA study. This LCA related to the situation in Germany in the late 1990s and may not be relevant to Ireland. If Ireland excluded these pack types, then it is possible that some producers would change their packaging to pouches and cartons to avoid the deposit.

Irish policy-makers would need to give careful consideration to whether to include still soft drinks or not. One point to bear in mind is that they constitute a relatively small part of the market.

⁵⁵ Danish Environment Ministry newsletter, summer 2005.

⁵⁶ Directive 89/398/EC, as amended.

5.3.2.5 Milk, Milk Drinks and Juices and Nectars

Milk is exempt from deposit requirements in Europe. Fruit and vegetable juices and nectars are exempt from most European deposit requirements.

These drinks categories have been excluded from deposit requirements for a variety of reasons. These include:

- Milk and juice are mostly consumed at home, so they are not considered to contribute to litter.
- Storing the empty containers in-store may have hygiene implications. Fears about bacteria, mould spores and odour in supermarket stock rooms were among the reasons why the Swedish authorities recently decided not to bring these drinks categories within the scope of the deposit.⁵⁷ (Drinks composed of over 50% milk or fruit juice are exempt from deposit requirements.) This would not be a problem if deposit containers were returned to depots, as usually are in Canada.
- Milk and juice are often supplied in container types not usually handled through deposit systems, such as beverage cartons and HDPE plastic containers. Denmark ruled out including drinks in beverage cartons in its deposit requirements because they are unsuited to standard RVMs, and adapting RVMs to accept cartons would be disproportionately expensive.⁵⁸ The Swedish authorities also took the view that larger producers would switch some production to exempt container types to avoid the deposit. This, they argued, would put small producers in particular at a competitive disadvantage because they would find it harder to make such a switch.⁵⁹

Even if plain pasteurised milk and juice are excluded from a deposit system, what about ready-to-drink drinks, such as chocolate milk and similar shakes, coffee drinks, drinking yogurt, and fruit smoothies? The sale of such drinks in small containers through convenience stores is a recent development. These are more likely to be consumed on-the-go than pasteurised milk or juice, and may now be regarded as contributing to the litter problem.

Germany exempts drinks that contain at least 50% dairy product from its deposit requirements. One side effect of this is that fruit drinks are now available there containing whey. Although these drinks look and taste just like other fruit drinks, their dairy content exempts them from the deposit. This is an example of producers reformulating their drinks to avoid having to operate the deposit.

5.3.2.6 Wines, Spirits and Alcopops

Wines and spirits are rarely included in deposit systems in Europe. In Norway and Sweden these drinks are included in deposit requirements but they are not deposit-bearing in practice as they are usually in glass and the deposit systems handle only plastic and metals. In Denmark, Estonia, Germany and Lithuania, where non-refillable glass is deposit-bearing, the deposit requirements exclude wines and spirits but include mixed drinks containing them. Thus Finland is the only European country where wines and spirits are deposit-bearing.

⁵⁷ Returförpackningsutredningen, Jordbruksverket, Rapport 2006:7.

⁵⁸ Accompanying draft Act on a duty on mineral waters etc. as well as the Packaging Duty Act, notified to the EU Commission in December 2006.

⁵⁹ *Supra* footnote 57.

Wines and spirits are usually excluded because their high retail price means that the deposit provides little incentive to return the empty container, and because of the lengthy time delay that may occur between placing on the market, purchase by the consumer and consumption.

However pre-mixed drinks containing wines (spritzers) and spirits (such as pre-mixed spirit drinks and alcopops) are deposit-bearing. The argument for including mixed drinks is stronger than for wines and spirits. Alcopops can be described as a carbonated soft drink with added alcohol and they may be more likely to be littered than unmixed wines and spirits. If Ireland wanted to include these mixed drinks in a deposit, it would have to define them, such as by specifying the alcohol content of mixed drinks.

5.3.2.7 Other Drinks Categories

Other drinks such as cider and perry, which are popular in Ireland, are also now included in deposit requirements in other European countries. They were not brought within the scope of the Danish deposit law until 2007. Before any legislation is prepared, we would recommend that an analysis of the Irish drinks market is undertaken to identify other significant drinks categories that are suitable for inclusion in the deposit requirement. This is essential to avoid creating loopholes and to ensure consistency in the scope of the requirements.

5.3.3 Container Types

The decision as to what drinks categories would be subject to the deposit must also take account of which container types would be deposit-bearing.

PET and cans are by far the most likely contenders, and the mandatory deposit requirements in all countries that have one include these pack types. PET is commonly used for water and CSDs, while cans are commonly used for beer and CSDs.

Most drinks cans are made of aluminium, but tinsplate cans are also used for drinks. Ireland should make all metal cans subject to any deposit. The Swedish deposit legislation originally applied only to aluminium cans and to PET bottles, but in 2005 Sweden expanded the scope of its obligations to cover all metal and plastic drinks containers. This was because some importers were buying drinks in tinsplate cans, which fell outside the scope of the deposit. Including all metals makes operational sense because, once the empty cans have been returned, it is easy to separate out any tinsplate cans using magnetic extraction so that both types can be recycled.

As for plastics, the vast majority of plastic drinks bottles are made of PET, but other plastics, such as polycarbonate, HDPE and laminated PET pouches, may also be used for drinks. Care is thus needed in defining the plastic container types to be included in the deposit. The benefits of including all plastic bottles in a deposit requirement are less clear-cut than for metals. Non-PET containers would have to be separated as they would hamper PET bottle recycling.

That leaves the question of non-refillable glass, which is not subject to the mandatory deposit in Sweden or Norway, but is in Denmark, Estonia, Finland, Germany and Lithuania. Glass is widely used for beer, some waters and soft drinks.

It can be argued that glass should be included in the deposit to avoid competitive distortions with the other pack types, because glass is often used for the same drink types. If glass were excluded, then some producers might switch to glass to avoid having to operate the deposit. Moreover, glass may be littered, and broken glass on pavements, footpaths etc. is potentially dangerous.

On the other hand, including glass might create confusion among retail staff and consumers because glass is also used for drinks that are likely to fall outside the scope of the deposit (such as wines and spirits). Further, returned glass is harder for retailers to manage than PET and cans, because it is heavy and requires careful handling and storage. Retailers would lose their deposit on broken bottles, as would consumers. Glass could be more easily included in a deposit arrangement if consumers get their deposit refunded at return depots, not in-store.

We believe that glass is the material least likely to achieve good return rates in a deposit system. This is because bottle banks are the most common return arrangement in Ireland for glass and they have been in place for a relatively long time, so consumers have become used to using them. Ireland reported a recycling rate of 87% for glass in 2014, which is among the highest in the EEA, and the rate was even higher again in 2015 (88%). As consumers will still have to take bottles of non-deposit drinks, and bottles and jars of other products to the bottle bank, they may not bother to sort their deposit bottles and get their deposit refunded on them.

5.3.3.1 Container Size

As regards the size of the containers subject to the deposit, in Germany the deposit applies only to containers of between 0.1 and 3 litres. This has the effect of excluding 5 litre party kegs of beer sold in Germany, and water containers used with water coolers.

The Scandinavian countries do not impose a minimum or maximum container size, although they do have higher deposit rates for larger sizes.

Irish legislators would need to establish whether a similar minimum or maximum size restriction is necessary for Ireland. It may be simpler not to impose any size limit, but to specify that the deposit should apply to all containers of the specified material intended for retail sale and through catering outlets, if they are to be included.

There is an argument that the deposit should apply only to smaller sizes of container because these are more likely to be littered. The deposit could apply only to containers of, say, less than 0.75 or 1 litre. Larger containers would continue to be collected through existing bring/kerbside arrangements.

The disadvantage is that the deposit would be proportionately more expensive as the system and facilities would be set up for a smaller quantity of containers.

Furthermore, PET and glass bottles are produced in a range of different sizes, but cans are not. Thus, all cans would be included in the deposit, but only smaller sizes of the other materials. Would this constitute a distortion of competition against cans?

A deposit only on small containers was considered in Switzerland but the authorities rejected it following publication of a study that concluded it would be too confusing for consumers, and too expensive.⁶⁰

⁶⁰ Press release from Swiss environment agency BUWAL (now known as BAFU) 7 July 2005. Study by Ellipson AG, commissioned by BUWAL, PRS and Igora.

3.3.4 Future-Proofing the Scope of Deposit Requirements

The discussion of the various drinks categories above illustrates that determining categories of drinks categories needs careful consideration. New drinks have been developed in recent years, such as alcopops, flavoured waters, and fruit smoothies. And the popularity of some drinks has also changed – who could have anticipated the growth in demand for bottled still water?

The market for drinks is likely to continue to change in future – other new drinks will be developed and the popularity of some drinks will change, and correspondingly, their significance in the market.

The same is also true of pack types. New pack types suitable for drinks are likely to be developed, and they may fall outside the scope of deposit requirements.

Care would therefore be needed when drafting legal obligations in defining the drinks and specifying the pack types to be subject to the deposit. The regulations would need to be sufficiently flexible so that they can be adjusted in line with future market developments.

5.4 Level of a Deposit

It is fairly self-evident that a low deposit, say €0.05, may not yield a good return rate. A 5 cent deposit represents a low percentage of the selling price of the product and may be less than the difference in price charged by different retailers for the same drink, for example between a large grocery store and a convenience store. As Irish consumers are not in the habit of returning their drinks containers to the store, and as an increasing number of them now have access to bring-banks and/or kerbside collection, the deposit would have to be sufficiently high to motivate them to take their ‘empties’ when they do the grocery shop or make a special trip to the return depot. Kerbside collection is undoubtedly more convenient for consumers, and return to store or depot would in effect ‘compete’ with kerbside.

An omnibus survey undertaken on behalf of Repak in summer 2008 indicated that only 7% of respondents said that a deposit or refund system in-store was their first choice of collection arrangement, compared with 51% whose preferred kerbside collection.⁶¹ The results reveal that kerbside (or household wheelie bins or bags), bring-banks/bottle banks and civic amenity centres or recycling centres are preferred or would be most supported by Irish consumers.

However, a high deposit rate of, say, 15, 20 or 25 cent, although likely to generate a better return rate, does bring other problems with it. Thus, careful consideration would be needed in setting the deposit rate. The issues that would need to be considered are:

- The higher the deposit, the greater the incentive to fraud. If the deposit is greater than the cost of printing a forged label and bar code on a non-deposit container, then we would expect that there would be attempts to obtain a deposit on containers on which it was never paid. As the container retains the value of the deposit until it has been crushed, then a high deposit would also require retailers to take measures to prevent fraud by staff. Containers would need to be stored securely to prevent staff re-scanning some returned containers. Return using RVMs with compactors that RVMs crush containers is preferred for this reason.

⁶¹ Omnibus survey by Millward Brown IMS for Repak with fieldwork undertaken 13 August-2 September 2008 (976 respondents).

- A high deposit would generate more income in unredeemed deposits. If Ireland opts for a centrally managed system, then this money provides a useful source of funding that helps to keep participation fees for producers down. This of course means that consumers who do not reclaim their deposit provide a key source of revenue for the system. This is acceptable provided that there is a good network of return facilities. But if return rates are low because there are insufficient return facilities, then the deposit would have an adverse social impact because it would increase the real cost of drinks for consumers.
- Although the deposit is refundable, the extra charge does make drinks on the retail shelf look more expensive, particularly for consumers not motivated to return the empties. This could encourage more consumers to cross the border to Northern Ireland to buy drinks.
- A high deposit would also encourage some operators, particularly smaller ones, to purchase drinks across the border to avoid having to operate the deposit, and to enable them to sell the drinks to customers more cheaply. Both the Swedish and the Danish authorities have reported problems along these lines. Consumers assume that they have paid the deposit on these 'grey imports' and they may lose confidence in the return system if they fail to get their deposit refunded.

Norway, Sweden, Finland and Denmark have different deposit rates for different container types, particularly higher deposits for large containers. However a single rate applies to all deposit containers in Estonia, Germany and in Lithuania.

For Ireland, we see no reason to have deposit rates for different sizes, which would only add complexity to the arrangement. To keep matters as simple as possible, we suggest that the rate of the deposit should be the same for all container sizes and types.

5.5 Managing a Deposit System

Above we discussed the centrally managed Northern European systems, the US 'simple' model with no centralised clearing, the model adopted by two US states and Croatia, with deposit clearing arrangements operated by a state authority, and the German semi-managed system.

5.5.1 A Simple Deposit for Ireland?

Although the 'simple' US model is cheap to operate, we believe that the lack of centralised clearing is acceptable only if the rate of the deposit is low. Without a clearing arrangement, a high deposit could give rise to windfall profits for some operators and losses for others as consumers frequently return containers to a different store from that where they purchased the item.

To avoid this problem, the legislation could permit retailers to refuse containers of brands that they do not stock, as in US 'simple' bottle bills. That would make it hard for consumers to get their deposit back in some circumstances, so it is unlikely to achieve high return rates. The arrangement could also have an adverse social impact, as it may be particularly hard for socially disadvantaged consumers (the elderly, low-earning families, etc.) and consumers without a car to get their deposit back.

The problems that arose in Germany when a 25 cent deposit was introduced without a clearing arrangement indicate that this model would be unsuitable for Ireland. It no longer operates in Europe.

If Ireland has a higher deposit, in the 15-25 eurocent range, which we think would be necessary to achieve a reasonable return rate, then we believe that a central clearing arrangement would be required.

5.5.2 A Centrally Managed System

In a centrally managed system, when fillers/importers sell deposit drinks, they pay the deposit to the system operator and claim back the deposit from their customers (wholesalers or retailers) by adding it to product invoices. The deposit is then charged on through each stage of distribution to the final consumer. When the final consumer returns the empty container and claims back the deposit, the retailer or wholesaler reports on the number of returned containers to, and claims back the deposit from, the system operator. The flow of deposit monies is nowadays tracked online, with retailers reporting regularly to the system operator on deposit monies received and refunded.

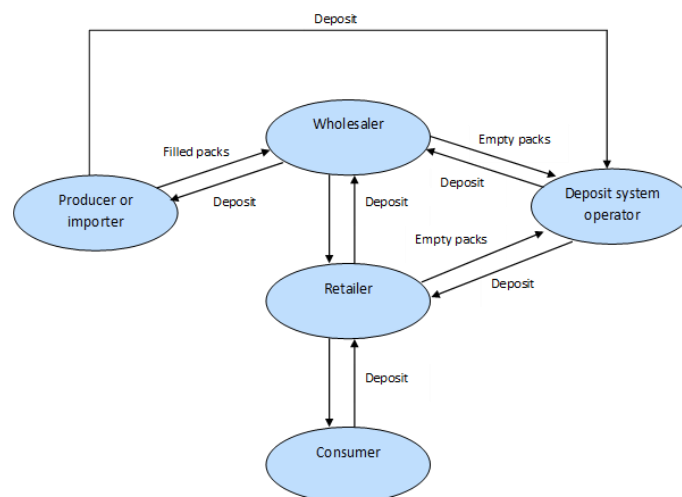
At the same time, producers also pay a handling fee per unit to the system which covers the cost of operating the system and the handling allowance paid to the retailer per returned container.

In European managed systems, a new market entrant must register with the deposit system which usually involves the payment of an upfront registration fee. They report all the drinks and containers that will participate in the system and they must also submit samples for testing to ensure that RVMs can read them. Thus, there is a delay while all the container details are programmed into the database and tested. However once the process is complete, a new producer is included in the deposit system nationwide, and that its containers can be read by all RVMs in any retail outlet. Further, some of the Nordic deposit systems share this data with each other, such as Sweden and Norway. That practice enables containers purchased in other deposit countries to be accepted by RVMs, although no deposit is paid.

In Germany, the law requires all retailers to refund the deposit and register with the system. However not all retailers report directly to the system. The wholesaler often interacts with the system operator on behalf of its retailer customers. Retailers pass on deposits received and are refunded by the wholesaler. This arrangement reduces the number of market operators that the system operator has to deal with. Given the significance of wholesalers in the Irish market, an adapted version of this German arrangement might suit Ireland.

Figure 5.2 shows the flow of deposit monies in a centrally managed system, with options for the retailer to interact directly with the system operator or indirectly through the wholesaler.

Figure 5.2: Flows of Deposit Monies in a Centrally Managed Deposit System



Source: Consultancy Team research.

5.5.2.1 Who or what Organisation would Operate a Centrally Managed System in Ireland? Would it make sense for Repak to be Involved?

In Europe, deposit clearing is usually handled by a private sector company established jointly by the associations representing drinks producers and grocery retailers. In Ireland, the relevant industry groups may all or some of the following: Irish Beverage Council, Alcohol Beverage Federation of Ireland, and Food and Drink Industry Ireland and Retail Ireland. Some other Irish industry groups might also want to be involved, such as the associations representing the smaller retailers and convenience stores, RGDATA (Retail Grocery Dairy & Allied Trades Association).

Associated with the above organisations' involvement in any deposit system in Ireland are potential competition concerns: for example, in regard to imported products that compete with the organisations' own products, new entrants to the beverage industry in Ireland and also craft brewers, for example, which have become a more visible part of the beer market in Ireland in recent years. The involvement of drinks companies in the operation of a centrally managed system in Ireland may necessitate regulation to ensure that the involvement is not used to gain a competitive advantage or to limit or regulate in any way potential competition to the Irish market.

The sponsors of the Waste Reduction Bill 2017 have suggested that Repak could operate the deposit alongside its existing activities. At first glance this option looks sensible because it could save the cost of establishing and operating a new separate company to operate the deposit, and there could be advantages in co-ordinating the complementary activities of the two organisations.

However there is no precedent anywhere for a compliance organisation (Green Dot or similar) handling all types of packaging to run a deposit system. This is partly because deposit systems were generally established before the other systems but the deposit system operator is also separate from the other packaging recovery systems in the countries where the deposit system was established later, namely in Estonia, Finland and Lithuania. And no deposit system opted to expand its range of activities to handle all packaging.

The two systems are kept separate also because the deposit requirements affect a smaller range of companies than general packaging requirements, so they have different shareholders. The costs of operating each system are different and their fee structures are different – fees for deposit containers are generally per unit, not based on weight.

The types of system also differ operationally. The key role of deposit systems is financial – to act as a clearing house for deposits. European deposit systems (except Germany) are also responsible for ensuring the collection of returned containers so there is some overlap with recovery organisations, except that collection arrangements are very different. Deposit containers are generally in sealed containers in retail stores, while other packaging waste has to be collected from bring sites or at the kerbside and then sorted. Returned deposit containers must be kept separate from other collected packaging because they are subject to separate statutory targets so must be counted separately, even if the same contractors collect the materials.⁶²

⁶² It would of course be possible for deposit containers to be collected from a retailer at the same time as other packaging waste. However, deposit containers that have not been crushed in an RVM need to be kept secure and must not be squashed until they have been counted. They would usually be in a security tagged box or sack of some kind.

The Scandinavian deposit systems have now established their own plants where returned containers are counted (if handled manually), sorted, checked, and baled. These sites were established only after the systems had been in operation for several years.

Whether the operation of a deposit system is a suitable expansion of Repak's role is an issue that the Irish businesses affected by a deposit would need to consider further. *Our view is that, given the different funding arrangements and different activities, the deposit system should probably be managed by a company separate from Repak, with a separate board and management team. However it would clearly make sense for both organisations to liaise on matters relating to collection and recycling.*

5.5.2.2 Scope of Activities

The range of activities to be undertaken by the system operator would also need to be determined.

In Norway, Sweden, Denmark, Estonia, Finland and Lithuania, the system operator manages the entire system – deposit flows, flows of handling fees from producer to retailer, transporting the returned containers for recycling, and communications.

However in Germany, the central organisation operates the basic database necessary for clearing but each market operator uses service providers for data management (reporting on containers supplied and claiming deposit refunds) and to collect returned containers. This arrangement seems to us to offer the worst of both worlds between the simple deposit and the centrally managed arrangement. It involves the overhead cost of a central system, but each market operator still needs to manage a significant part of the arrangements themselves or contract a third party to do so. For example, each retailer needs to make their own arrangements to get returned containers recycled.

The German system is structured in this way for competition policy reasons. The German competition authority felt that a Scandinavian style deposit operator would have become an enormous monopoly company with a massive budget, controlling a large tonnage of returned containers. While such concerns may be reasonable in a large market like Germany, in principle there should be no such competition concerns in a smaller market, like the Scandinavian countries or Ireland. In Germany the deposit operator has a monopoly for the limited role that it fulfils – all market operators selling deposit drinks must register and report to it. Sweden has one large deposit operator that represents nearly all the market.

The Swedish deposit legislation does, however, permit other deposit systems to operate, provided that they register with the authorities (the food and agriculture agency). Three such small systems have been licensed. They operate at a local level and supply a specialist market, such as mineral water for offices branded with the customer's logo. Similarly, Norway and Finland each have one large deposit system but smaller systems operated by individual producers for their own containers operate alongside. Further, producers in Norway can choose to participate either in the deposit system or the Green Dot system. However we understand that most plastic bottle and cans participate in the deposit system.

The Danish competition authority investigated the Danish deposit system operator (DR). The authority had received complaints from small importers and producers who felt that the system was bureaucratic and inflexible. These small operators also said that the fact that system is owned and operated by their large competitors – Carlsberg and the Brewery Group (Bryggerigruppen) – *“made them insecure”*. The competition authority argued that the reporting arrangements for small producers should be simplified and that the ownership of DR should be put out to tender when it came up for renewal in 2008.⁶³

⁶³ Statement from the Danish Competition Council to the Danish Environment Minister, 17 December 2003.

Although DR has made some adjustments to its reporting requirements, the Danish government has decided to renew its licence until 2012, and has renewed it again since then. It is now approved until 2022. The complaints by the small operators should be seen in the context of the Danish market situation, where there are a few dominant players in the drinks market and where non-refillable drinks containers were not available until 2002.

5.5.3 Managing the System – Conclusions

Given that Ireland is likely to need a high deposit to ensure a good return rate, we believe a centrally-managed system would be necessary.

The Irish authorities would need to explore with industry stakeholders about who would operate a centralised system, and the scope of services it would provide. Our view is that there would be benefits in the operator providing a wide range of services like the Nordic systems.

- ***The deposit arrangements are fully managed*** – ensuring that deposit imbalances are reconciled and organising the collection and recycling of the containers. The system operator can establish ground rules for the operation of the system, and can also help to ensure that all market operators apply the deposit correctly and consistently. As many Irish market operators are unfamiliar with operating deposits, this type of system operator would have an important role in co-ordinating activities and liaising with and advising market operators.
- ***Revenue from the unreturned containers accrues to the system operator, not to individual producers.*** The income from unredeemed deposits provides the system with a source of revenue, which can be used to defray some of its operating costs and/or be used for beneficial activities such as litter abatement and public communications. If revenue accrues to individual producers and retailers, they have a disincentive to make it easy for consumers to return their containers. Of course the more successful the system is in delivering high return rates, the lower the income from unredeemed deposits, so the system cannot rely on this revenue source. An alternative income stream in the form of fees charged to market operators will also be necessary.
- ***The German approach would require Irish retailers to get returned containers recycled, which would be challenging for them.*** However it might be less challenging for some of the international retailers with stores in Ireland, particularly for any that also operate stores in Germany which already have recycling arrangements in place for deposit containers. They could probably absorb Irish material in those arrangements.

Given the concerns over competition that arose in Germany and Denmark, care would be needed in how the operating company is established and in the way that it operates. The system would need to be monitored by the Irish authorities, and the system operator should ensure that the interests of small operators are fully taken into account. This may necessitate extra regulation.

The authorities may want to consider whether it should be permitted for individual producers and retailers to operate their own deposit refund systems that handle only their own containers. We would not expect many producers for choose to do so, but it may be appropriate to offer them the option. Any such arrangements would need to be subject to a robust approval procedure.

5.6 Return In-Store or through Return Depots, or Both?

In all the European deposit systems, all containers sold through retail outlets are returned in-store. This was an obvious arrangement as systems for non-refillables evolved alongside return systems for refillables. However, in deposit systems outside Europe (US, Canada and Australia), it is common for containers to be returned to third party return depots, not in-store.

And some of the European deposit systems are now increasingly complementing their in-store return arrangements with additional return options. These aim to capture on-the-go consumption and offer more convenient return for consumers in response to changing lifestyles and consumption patterns, such as on-line shopping.

The key criterion for deciding which arrangements are best-suited for Ireland is which would yield the highest return rate at minimum cost.

5.6.1 Return In-Store

Return in-store has the advantage of being more convenient for consumers – they can return containers when they are going to the store anyway to shop. Returning the containers to a separate return depot might require consumers to make a special trip, depending on where they would be located.

However grocery retailers are often reluctant to provide return facilities because it requires them to allocate space for container return, which they would prefer to put to more profitable use (understandably enough). Where containers are handled manually, staff need be trained to identify the deposit bearing containers, and they must be available to refund the deposit, which diverts them away from their core or other tasks. Sometimes deposit refund is handled at store checkouts, which is time-consuming and means that large storage bins must be available nearby.

This explains why larger stores usually install RVMs, which automate the return/refund process, although these are expensive. RVMs are usually located either in the entrance to the store, or near to where drinks are sold. Some RVMs are free-standing, with returned containers stored inside them, but some are installed on the wall between store and the stock room, so returned containers pass through to storage boxes or sacks in the stock room behind. The more sophisticated RVMs crush the containers, which reduces the storage space required, and prevents fraud because the deposit cannot be refunded once the container has been crushed. Store staff need to check RVMs regularly to change the storage boxes/bags and reset the machine.

The retail cap on the size of food stores in Ireland remains in place, as discussed above, and although store average store size has increased since the 2008 Perchards report, Ireland probably still has fewer large stores than other European countries. That may make supermarkets particularly reluctant to operate deposit-refund.

The deposit requirements in Europe usually require all operators (retailers and catering outlets) regardless of size who sell deposit drinks containers to accept back the containers and refund the deposit. The only exception to this is Sweden, where the major brand supermarkets handle deposit refund (including their small stores) but other retailers (convenience stores, the state alcohol monopoly, etc.) do not.

The current German deposit requirements permits retailers, regardless of size, to refuse containers of materials that they do not stock. This means that if they sell non-refillable PET but not cans, they must refund the deposit on any deposit-bearing PET bottle but may refuse cans. That exemption makes sense because individual retailers are responsible for getting returned containers recycled. It would be unreasonable to expect them to arrange for cans to be recycled if they do not sell them.

In Germany small retailers with a sales area of 200 m² or less can also refuse containers of brands that they do not stock. That exemption remains in place even though there is a clearing house in Germany. This is perhaps justified because German retailers do not receive handling fees, but it reduces the convenience of the system for consumers.

Because the Nordic centralised deposit systems organise not only clearing but also the transport and recycling of containers and they pay handling allowances to retailers, all retailers can easily accept all packs of all brands. The system manages the database of participating containers so RVMs accept all materials and products registered with the system. That is a strong argument in favour of this type of centralised arrangement.

If Ireland adopted the Nordic-style deposit, fillers would initiate the deposit on drinks produced in Ireland and intended for sale in Ireland and would charge it to their customers, namely the retailers or wholesalers. The retailers (vertically-integrated grocery chains and the large wholesalers) would initiate the deposit on any products that they place on the Irish market (private label, imports). The wholesalers would invoice it on to their customers, either affiliated or independent stores. All retailers would charge the deposit to customers.

If Ireland opted for in-store return, retail outlets would have a legal obligation to refund the deposit and accept the returned containers. The vertically integrated stores would have to ensure that all their outlets had the necessary facilities and operated deposit refund correctly.

However wholesale groups would have to decide whether each individual affiliated retailer would have to make its own arrangements to operate deposit refund, or whether this would be managed on their behalf by the wholesaler. These wholesalers already provide support services to their affiliates, and it could make sense if the wholesalers organised the purchase of the necessary equipment (RVMs, hand scanners etc.) centrally to obtain a better price for a large order. However manual return would probably make more sense for smaller affiliates or stores where only few containers are usually returned. Even if the franchising contracts between wholesalers and affiliated retailers require retailers to comply with relevant legislation, an effort will be needed to ensure that small individually owned stores operate deposit return correctly.

Independent retailers not affiliated to a wholesaler would have to make their own arrangements to handle deposit return. They represent a small proportion of turnover, but many are likely to be small convenience stores who sell drinks likely to be subject to the mandatory deposit. It would undoubtedly be challenging to ensure that these small retailers both charge the deposit correctly and provide adequate return facilities.

The implications for small retailers are discussed further below.

5.6.2 Return Depots and Other Options

Return depots are the standard return arrangement in parts of Canada and in South Australia, where depots are operated by third party commercial operators, not by retailers.

One option for Ireland is to use this type of return facility instead of, or in addition to, retail stores.

If return is handled solely through depots, the scope of the deposit could include juices and milk, because there would be fewer hygiene concerns. Depots are likely to have a larger storage area for containers, which may also make it easier to include glass in a deposit arrangement.

Potential sites for return depots in Ireland include:

- *Civic amenity centres* which accept a range of packaging and non-packaging items. Many of the civic amenity sites are operated by local authorities although an increasing number are operated by the private sector. Many could potentially also handle deposit refund as they are already accessible to the public, the public are used to the idea of taking recyclables there, and they are locked when closed to provide safe storage.
- *Bring-banks* where consumers can take glass and cans, and in some cases plastic and are mainly in urban areas. Not all the sites would be suitable however. Security could be a key issue. Unmanned or non-secure sites on the street would not be suitable as they would not provide secure storage for deposit containers. Further investigation would be needed to ascertain the number of suitable sites.
- *New depots* – established as a commercial venture in retail premises. Such sites would also provide convenient return facilities for consumers but the question of financial viability in Ireland would have to be considered (such depots might also handle WEEE and batteries).

We assume that the most likely scenario would be take-back in-store, as this is the common arrangement in European DRSs. However, before proceeding with a DRS, the Irish authorities would need to discuss options with potential return sites – both the grocery retailers and the third party sites listed above.

If in-store return was the preferred option for Ireland, it may be helpful to complement such a network with RVMs in other sites, such as on civic amenity sites and bring-banks, as is now being trialled in Denmark and Sweden. This would be enable consumers to return their deposit containers together with other packaging, particularly for people who usually buy groceries on-line.

RVMs in grocery stores do not usually give refunds in cash but in the form of a voucher that is refunded at the till (usually as a credit on the shopping bill). Cash refunds could be problematic at civic amenity centres or bring sites. Consumers could either receive refund vouchers (redeemable at any grocery store) or, as is now being trialled in Denmark and Sweden, they could register their bank details with the DRS, and have the refund paid directly into their account, or be refunded *via* Paypal.

5.7 Cost of Establishing a Deposit System in Ireland

The cost of establishing a deposit system in Ireland would depend on the scope of the deposit obligations, the system design, whether return was undertaken in-store or at return depots and the extent to which returns were handled by RVMs or manually.

Below we review costs and the cost factors to be taken into account using data from Germany and Denmark respectively, and the fees charged by European deposit systems. We then consider what type of costs would be incurred by producers, retailers and consumers. However we recommend that the Irish government commission a thorough cost benefit analysis of a deposit system. A deposit system would mean higher costs for Irish industry, part of which would inevitably be passed on to consumers as higher retail prices. The government would need to be satisfied that the additional costs are justified by the environmental benefit likely to be achieved.

5.7.1 Germany

The German deposit system was introduced into a market where refillables survived, so stores already had return facilities. However, new investment was made in RVMs to cope with the greater variety and number of deposit-bearing containers now being handled, and there are other costs such as registration so that returns can be recorded, printing special labels bearing a security logo intended to minimise fraud and so on.

Before the deposit law came into force in 2003, there were widely differing estimates of what the system would cost. These were largely dependent on assumptions about how many RVMs would be needed. More recently Roland Berger estimated that the initial investment by industry was €726m, of which €702m was paid by retailers (mainly for RVMs) and €24m by 'industry' (i.e. drinks producers and importers, packaging manufacturers, including label printers and can makers).⁶⁴ DPG, the system operator in Germany, commented in May 2008 that the cost per container is three times as much as household-based collection.

Roland Berger estimates the annual costs for retailers at €699m and for industry €94m. This is based on a market size of 14 billion deposit containers.

These figures cannot simply be scaled down to produce an estimate of likely costs in Ireland, since the number of RVMs is a function of the number of large stores in operation rather than being population-dependent, and because the cost of household-based collection is very different between Germany and Ireland.

5.7.2 Denmark

The best guide to possible costs comes from Denmark, where a lot of research was undertaken into costs when the deposit arrangements were adjusted to include non-refillables from 2002. However the starting-point is not comparable as Danish retailers had return facilities for refillables.

When the system first took effect in 2002, DR had an investment programme whereby retailers could receive financial support from DR towards the cost of return infrastructure.

Costs were assessed again before the scope of the deposit was expanded to include still drinks from 2008, when DRS started to pay handling fees to retailers for non-refillables, which had previously been paid only for refillables.

The Danish experience provides an insight into the types of cost that retailers incur in handling deposit and refund. The handling allowances paid in Denmark from 2008 were based on time and motion studies carried out by DR in 84 'standard stores'.

Table 5.1 below shows the calculation variables (some of which relate to refillables).

⁶⁴ Roland Berger are the consultants advising DPG. The estimates were given in a presentation to PRO-Europe in February 2008.

Table 5.1: Variables used to Calculate Deposit-Refund Handling Fees in Denmark

Across Stores	Unit
Number of loose packaging items on bottle table	<i>Packaging items per m²</i>
Number of crates on rollway	<i>Crates per m</i>
Number of fixed non-assignable costs relating to bottle handlers' (BHs') time	%
Number of non-assignable costs relating to store assistants' (SS') time	%
BHs' hourly salary	<i>DKK per hour incl holiday pay</i>
SS' hourly salary	<i>DKK per hour incl holiday pay</i>
Price and wage index considerations	<i>Increase in %</i>
SS' service time: minimum per reverse vending machine per hour	<i>Minimum per hour</i>
At Individual Stores	
BH/SS distribution	%
Loose bottles/bottles in crates distribution	%
Walking time for bottle handlers and store staff – only in non-self service stores	<i>Seconds per bottle</i>

Source: Consultancy Team research.

Costs were calculated separately for refillables and non-refillables. Handling times were divided into a number of subsidiary operations, and handling costs were split between fixed non-assignable costs and variable costs assignable to particular types of container.

The handling times for the fixed non-assignable costs were split between the following operations:

- Lifting bottles onto belt (stores with RVMs only)
- Pushing bottles forward (stores with RVMs only)
- Moving crates/sacks/pallets
- Customer service/changing of receipt roll
- Planning (stores with RVMs only)
- Clearing up
- Searching for crates/sacks/pallets
- Waiting time.

Time spent on handling operations that cannot reasonably be attributed to a specific returns group were distributed among the individual returns groups on the basis of their share of the total operations time in the store and on the basis of their share of the packaging returned to stores in the previous 12 months.

The following variable assignable costs would be obtained through time and motion studies:

- Moving crate or pallet container to belt or table
- Accepting packaging from customer and sorting in crate or sack
- Accepting crates from customer
- Writing out bottle receipt for customer
- Move pallet containers to emptying station
- Sorting in crates/sacks or pallet containers
- Moving crates from rollway onto pallet or floor
- Moving crates to stacking location
- Placing of crates onto clean pallets/mix pallets
- Transport to rear storage room/yard/shed/cellar
- Subsequent sorting and transferring from mixed pallet to clean pallets
- Baling
- Transport of pallets, crates, sacks or pallet containers from rear storage room to pick-up place
- Put containers into the compactor
- Moving filled crates from the compactor
- Mark and lock filled crate with compacted containers and filled sacks or palletized containers.

The final results were a weighted average of the findings from:

- Stores taking back 700,000 containers or more per annum
- Supermarkets and discount stores taking back less than 700,000 containers per annum
- Convenience stores, kiosks, filling stations etc.

5.7.3 Cost for Producers

5.7.3.1 Fees for Participating in the Deposit System

The fees charged by deposit systems in Europe to each drinks producer vary in scale and structure, as shown in Table 5.2 below.

Most systems charge either an annual registration fee or a one-off registration fee paid by each producer. Producers (except in Sweden) also have to pay to register each bar code, which covers the cost of updating the database used by RVMs and of testing containers to ensure that RVMs can read them. This fee must be paid every time a producer changes a bar code, such as for a new product or a new pack type or size.

In addition producers pay a unit fee for each non-refillable container. These fees vary according to the material and the size of container and cover the operating cost of the system, the cost of the handling allowance paid to retailers and the costs of transporting and baling the collected containers, and getting them recycled. In Sweden and in Estonia, there is no fee for aluminium cans because of large-scale cross-border exports, particularly to Norway and Finland respectively.

Several of the systems also charge other fees such as:

- A surcharge on the unit fee for non-standard materials (such as coloured PET and sleeves) because this material is harder to recycle.

- A surcharge for using an international barcode rather than a country-specific one. Some systems require producers using general barcodes to cover the general barcode with special stickers (showing a barcode, deposit logo as necessary) that must be purchased from the system operator. This is to ensure that the deposit is refunded only on containers on which it was charged, not paid on containers purchased in a neighbouring countries using the same barcodes.
- Financial guarantee – the system in Finland requires producers to pay a financial guarantee to cover the cost of any unpaid fees.

The fee structure in Germany is different in that fillers do not pay unit fees to DPG. Producers pay an annual fee and a fee per barcode, which vary depending on the number of containers. Although DPG has in recent years exempted smaller producers (fewer than 50,000 containers), for the larger producers the fees are high. Producers have to pay service providers separately for collection and recycling and other services.

5.7.3.2 Other Costs for Producers

If a deposit was introduced to Ireland, producers would, in addition to the type of fees outlined so far, would have to make adjustments to their production arrangements.

This would at the very least involve marking containers with a unique bar code and special deposit logo. Drinks producers that have integrated distribution arrangements covering both Ireland and NI with the same packs and marks on both sides of the border would have to make significant changes to their production arrangements. They would have to mark containers separately for each side of the border, store them separately, and adjust delivery arrangements to ensure that customers on each side of the border received appropriately marked containers.

For situations where it is not feasible to mark containers in this way, the Irish deposit system would sell adhesive labels displaying a special bar code and/or the deposit logo, as the other systems do. The producers would then have to arrange for the labels to be stuck on relevant container by hand, so this option is only suitable for a small number of containers, such as for small quantities of imported drinks or for test marketing new products.

The existing European deposit systems all have precise design guidelines to ensure that RVMs can identify containers and refund the deposit accurately, or that hinder recycling. These cover the shape and size of containers, size of the bar code and deposit logo and where they are located on the container. Producers whose containers do not meet those guidelines would need to adjust the design of their containers or adjust the labels before the containers can participate in the systems. The deposit systems require producers to submit samples of their containers for testing. This together with the time needed to update the barcode database used by RVMs means that there is a delay of between one and four weeks before containers can participate in the system.

Fillers would no longer pay fees to Repak for the containers now handled through a deposit system. But they would still have to pay Repak for non-deposit packs, such as glass bottles (assuming they are not deposit-bearing), beverage cartons, board outers or plastic rings for six-packs, board trays or other grouping packaging, and transport packaging. They would have to adjust their administrative arrangements to complete two sets of forms and pay fees and deposits to two separate systems.

5.7.4 Costs for Retailers

5.7.4.1 Handling Deposit Refund

If Ireland opted for in-store return, retailers would face the costs of adjusting their stores and their data systems to operate deposit refund. In most European deposit systems, the retailers bear the upfront cost of purchasing RVMs.

Retailers with large stores or who handle large numbers of returned containers would automate the process by purchasing one or more RVMs, costing at least €30,000 to purchase. Added to this would be installation costs (including moving shelves, possibly knocking a hole in the wall between the store and the stockroom), of associated data management systems, and service and maintenance costs.

In addition, there would be the cost of staff time spent handling returned containers, including checking RVMs and switching over boxes for returned containers when full, etc.

Larger retail chains would in many cases also be registered with the system as producers in respect of own-brand or directly imported drinks.

If Ireland adopted a centrally managed system similar to those in the Nordic countries, retailers would not have to pay for returned containers to be collected, which is handled through the system, although retailers pay for storage boxes, sacks etc.

However in most US states and in Germany individual retailers have to organise this themselves and they pay for it.

Table 5.2: Fees and Costs for Non-Refillable Beverage Containers in European Countries (2017)

Country/ System Name	Admin Fee	Pack Type	Unit Fee		Deposit		Marking Requirements	Comments
Denmark/ Dansk Retursystem	DKK 2,000 / €268 per year. No fee payable if no new packs registered in any year.	Alu 0.33l	11 øre	1.5 c	DKK1. 00	13c	Deposit logo & special bar code – adhesive labels can be purchased from DR @ 10 øre each. Containers marked with stickers pay fees at different rates from those shown.	Fees shown are for non- refillable containers directly marked with deposit. Fees for common pack sizes are shown as fees vary by size (0.36 litre, etc.). Producers also pay packaging tax on drinks containers.
		Alu 0.50l	10øre	1.3c	DKK1. 00	13c		
		Steel 0.33l	21	2.8c	1.00	13c		
		Steel 0.5 l	22	2.9c	1.00	13c		
		Plastic 0.33l	20	2.7c	1.50	20c		
		Plastic 0.50 l	21	2.8c	1.50	20c		
		Plastic 1.5 l	26	3.5c	3.00	40c		
		Plastic 2.00 l	31	4.1c	3.00	40c		
		Glass 0.33 l	38	5.1c	1.00	13c		
Glass 0.5 l	45	6.0	1.00	13c				
Estonia/ Eesti Pandipakend	€100 joining fee. €52 fee per barcode.	Plastic<0.75l	€0.002		€0.10		Deposit logo and unique barcode. Stickers can be purchased from system (prices vary depending on size and quantity).	Fees shown are for containers with unique national bar code. Higher fees are charged for international barcodes. Partial refund of unit fee if return target is exceeded.
		Plastic>0.75l	€0.007					
		Glass – all	€0.007					
		Metal	€0.000					
Finland/ Palpa	Joining fee €6178 (or 5 annual instalments). Barcode fee €284.55 cans/plastics or €325.20 glass (retail). Financial guarantee to cover unpaid fees, varies by material/ number of containers.	Alu can PET:	€0.00935 <1l €0.0172 >1l €0.0344		€0.15 <0.35l €0.10 0.35-1l: 0.20 >1l: € 40 €0.10 (any size)		Deposit logo and special barcode.	Fees shown are for clear plastic and retail glass with unique bar code. Higher fees are charged for coloured plastic and for glass with international barcode and catering.
		Glass	<0.5 l €0.0792 >0.5 l €0.1368					

Country/ System Name	Admin Fee	Pack Type	Unit Fee		Deposit		Marking Requirements	Comments
Germany/DPG	Annual fee up to €20,000. No fee if <50k containers) Plus barcode registration fee €80 - 33,000.	All cans, plastic and glass between 0.1 and 3 litre.	Not to DPG. Price negotiated between individual market operators and service providers.		€ 0.25		Amount of the deposit plus DPG logo using security ink. Must use special bar code.	Annual and bar code fees depend on number of containers sold. Deposit account-holders, deposit claimants, RVM manufacturers and service providers also pay annual fees.
Norway/ Infinitum (previously called Resirk)	Joining fee of NOK 10,000 (€1,065) plus NOK 2,000 (€213) per bar code registered.	Alu cans	2 øre	21c	NOK1.00	11c	Deposit logo and special bar code. Surcharge if standard bar code used. Surcharge for coloured PET bottles and sleeved bottles, or for cans with label or sleeve.	Producers also pay tax of NOK 1.17 (12c) per unit, on non-ref containers. Material tax is discounted according to return rate achieved each year. Containers in Infinitum qualify for 100% discount.
		Steel cans	21 øre	21c	NOK 1.00	11 c		
		PET < 0.5 l	16 øre	17c	NOK 1.00	11 c		
		PET >0.5 l	16 øre	17c	NOK 2.50	27 c		
Sweden/ Returpack	No joining fee or bar code fee. Annual fee of SEK 10,000 (€1,042), passed to the authorities	Alu cans	0.0öre	0.0 c	SEK 1.00	10c	Returpack logo and amount of deposit, unique barcode. Surcharge for coloured PET.	Producers pay deposit net of VAT, with different rates for drinks with low and high alcoholic content.
		Steel cans	22öre	2.3c	SEK 1.00	10c		
		PET ≤ 1 l	22öre	2.3c	SEK 2.00	20c		
		PET > 1 l	52öre	5.4c	SEK 2.00	20c		

Source: Consultancy Team research.

5.7.4.2 Handling Allowances

In the Nordic systems and the US, retailers receive handling allowances to cover the cost of operating deposit-refund systems. This arrangement means that retailers initially have to cover the capital cost of installing return facilities, including RVMs, and they are compensated over time by the handling allowances that they receive.

Retailers have to register with the system operator in order to get deposits refunded and to receive handling allowances. The allowances per container handled are lower for manual handling than for automated, although the systems in Norway, Sweden and Denmark now differentiate between manual and RVM with compaction. The Swedish system has recently introduced a flat rate annual allowance for RVMs with compaction and it now pays less if it collects the containers directly from the retailer than if the containers are collected by the wholesaler (from smaller stores in remote locations) and collected from there by Returpack.

Retailers do not pay to register with the system except in Denmark. The Danish system, which still offers grants to retailers towards the cost of installing handling facilities in certain circumstances, charge retailers to register if they want to receive handling allowances (DKK 1,500 (c. €200 per year). However only retailers handling a large quantity of containers (c. 24,000 per year) can register.

German retailers do not receive handling allowances. They are responsible for ensuring that returned containers get recycled. Retailers may in practice negotiate with their suppliers for a deduction from product prices to compensate.

Table 5.3: Handling Fees Paid to Retailers in the Nordic Countries

	NORWAY	
	NOK	EUR
	Manual handling or RVM without compaction	
PET	0.10	0.011
Cans	0.05	0.005
	Automated handling with compaction	
PET	0.25	0.026
Cans	0.20	0.021

(Net of VAT)	SWEDEN	
	SEK	EUR
	Manual handling or RVM without compaction	
PET <1 litre	0.20	0.021
PET >1 litre	0.20	0.021
Cans	0.00	0.00
	Automated handling with compaction – direct collection	
PET < 1 litre	0.269	0.028
PET > 1 litre	0.338	0.035
Cans	0.184	0.019
Flat rate allowance	20,000 per year	2,082
	Automated handling with compaction – collection through wholesaler	
PET < 1 litre	0.332	0.035
PET > 1 litre	0.500	0.052
Cans	0.198	0.021
Flat rate allowance	20,000 per year	2,082

Paid only to registered retailers	DENMARK	
	DKK	EUR
	Manual handling	
PET <1 litre	0.018	0.002
PET >1 litre	0.104	0.015
Cans	0.062	0.008
Glass	0.148	0.019
	Automated handling with compaction	
PET < 1 litre	0.015	0.002
PET > 1 litre	0.024	0.003
Cans	0.012	0.002
Glass	0.071	0.009
	Automated handling with secure storage	
PET < 1 litre	0.011	0.001
PET > 1 litre	0.021	0.003
Cans	0.012	0.002
Glass	0.048	0.006
	Automated handling with compaction and secure storage	
PET < 1 litre	0.015	0.002
PET > 1 litre	0.024	0.003
Cans	0.012	0.002
Glass	0.048	0.006
	Automated handling and sacks	
PET < 1 litre	0.018	0.002
PET > 1 litre	0.041	0.006
Cans	0.014	0.002
Glass	0.120	0.016

Source: Consultancy Team research.

5.7.5 Costs for consumers

Consumers bear the cost of the deposit until they return the containers, at which time they may purchase new containers and pay more deposits. Thus, they effectively provide an ongoing source of funding for the deposit system. If they do not reclaim the deposit, then the unredeemed deposit provides a permanent source of funding for the deposit system. Some systems offer them the choice of donating the deposit to charity by pressing a button on the RVM. The Nordic deposit systems complement in-store take-back with other collection points that offer greater convenience to consumers but they do not get their deposit refunded. These include camp sites, music festivals, sailing harbours, workplaces, sports clubs, special attachments on litter bins etc.

The cost of setting up a deposit system to producers and retailers is passed on to consumers as higher product prices. The extent to which these costs are passed on will depend on market forces, which may mean that the additional costs may not necessarily be applied only to deposit-bearing drinks, but to other products in some cases.

5.8 Implications for Small Business

5.8.1 Small Producers and Importers

It would not be possible to exempt small producers and importers from the obligation to charge the deposit because the deposit must apply consistently to all the specified drinks and containers. Thus, even small producers and importers would have to participate in the system and pay the relevant fees.

Small operators may not fully understand or have the resources to operate the deposit successfully, and this could result in gaps in coverage. Such importers would include specialist companies importing a range of food and drink products from, say, Italy or Poland for supply to delicatessens and specialist restaurants. It is always problematic to enforce this type of legal requirement on small operators.

The Danish authorities estimated that only 78% of imported drinks were complying with the deposit requirements in 2005 and that 55% of 2 litre bottles were sold without the deposit. In response customs and excise officers were given new powers to confiscate drinks sold without deposit.

Joining fees and bar code registration fees charged by deposit systems are usually charged at a flat rate. These fees fall harder on small operators who sell a smaller number of deposit containers so the fees work out higher per container sold. Germany is the exception where registration fees depend on the number of containers. Its fees in recent years have been adjusted so that small producers no longer have to pay this fee.

5.8.2 Small Retailers

Small retailers would be charged the deposit by their suppliers. The challenge for them would be to charge it correctly to their customers, particularly if there are different deposit rates for different container types or sizes.

Refunding the deposit correctly and storing the containers could be challenging for small shops. Small retailers usually handle returns manually.

It might be possible to exempt retailers with a sales area below a specified size from the obligation to refund the deposit. Any exemption would need to be balanced against the need to ensure that consumers throughout Ireland had access to convenient deposit return options, even in rural areas.

Germany allows small stores (< 200 m²) to refuse containers of brands that they do not stock, and stores of all sizes can refuse containers of materials that they do not stock. The exemption by brand should not be necessary if Ireland had a centrally managed system. The exemption by material would not make sense for Ireland because, unlike Germany, all retailers would all supply drinks in both PET and cans.

The size threshold in Germany proved difficult to implement in practice. It was not clear whether the sales area should apply only to the sale of food and drink, thus whether a large store (such as a department store) that had a café or sold a small selection of drinks should be classed as a small retailer or not. Small grocery and convenience stores often display fruit and vegetables on the pavement outside – should this be included in the sales area in question?

Some jurisdictions allow small retailers to accept only a reasonable number of containers per day. This might be difficult to enforce in practice, but it could protect them from having to accept large batches.

Small retailers may prefer to accept deposit containers for fear of losing business to large stores. Retailers could participate in the clearing arrangement through their wholesaler rather than claiming deposits refunded directly from the system. Stores that handle few returned containers could opt not to register with the system but, they could simply take any containers they receive to their nearest larger store. We understand that this informal arrangement is used by some small stores and cafes in Germany.

The experience in Germany suggests consumers mainly return containers to larger stores – it has been found that small stores usually had the necessary facilities in place and accepted containers, but staff seemed genuinely unused to handling deposit returns.⁶⁵

5.8.3 *De Minimis* Exemption from Producer Responsibility Obligations

Ireland currently exempts small companies from the obligations to meet recycling targets in respect of all packaging waste under the producer responsibility regulations, although these small producers are subject to the obligations to take their backdoor packaging waste available for recycling. These *de minimis* exemptions benefit companies with an annual turnover less than €1m and who place less than 10 tonnes of packaging on the market each year.

As argued above, it would not be possible to exempt small producers from the obligation to charge the deposit but would these obligations fit in with the existing *de minimis* exemptions for non-deposit packaging? Would companies exclude deposit-bearing containers from their packaging tonnage for the purposes of determining whether they exceed the thresholds?

Consider for example a small importer of various types of drink currently just above the *de minimis* threshold. If some of its packaging tonnage is deposit-bearing, how would that affect the business? Should it count the deposit tonnage which would mean that it has to both operate the deposit and still participate in Repak for any non-deposit packaging such as grouping packaging and transport packaging? Or should it be counted separately, which would bring the business below the *de minimis* thresholds?

⁶⁵ In-store research undertaken by Perchards for DG Enterprise in January 2006 and again (after the rules were amended in May 2006) in October/November 2006. Findings of second investigation published as: ‘Study on factual implementation of a nationwide take-back system in Germany after 1 May 2006’.

The *de minimis* arrangement for packaging clearly benefits small operators and reduces the overall administrative burden on Irish industry. However, it also gives rise to a competitive distortion around the threshold between companies that are exempt and those with a slightly higher tonnage or turnover which just above the thresholds. There is a risk that the deposit obligations might magnify this distortion to unacceptable levels.

A mandatory deposit could therefore call into question the current *de minimis* exemption from the producer responsibility obligations for small businesses.

5.9 Impact on Repak and the Existing Recycling Arrangements

The sponsors of the Waste Reduction Bill 2017 have suggested that Repak could/should manage the proposed deposit-refund system for beverage containers. As discussed above, there is no precedent for such an arrangement.

If a deposit were introduced in Ireland, deposit-bearing containers would no longer participate in Repak and producers would no longer pay fees for them. In theory, such containers would no longer be collected through the existing kerbside and bring collection arrangements that Repak subsidises through its RPS payments made to local authority and private waste collectors.

Producers would of course continue to participate in Repak in respect of non-deposit sales packaging, plus their grouping and transport packaging, including the transport packaging of deposit containers.

The potential implications of a deposit for Repak include: income; operations and costs; shared fee structure; and Repak fee. These are considered in turn.

5.9.1 Repak Income

Repak would lose the income from deposit containers. It is impossible to estimate the impact on Repak's fee income until the scope of the deposit is known. It is also difficult to make estimates for different scenarios because material tonnage reported by producers to Repak is not broken down by product type, and many small retailers pay according to turnover. Thus, the exact tonnage of drinks containers cannot be discerned from existing data for plastic, glass and metal packaging. The impact would also depend on how the *de minimis* thresholds took account of the deposit as discussed above.

5.9.2 Repak's Operations and Costs

Some deposit containers would end up in collections subsidised by Repak, particularly since many Irish consumers have got used to using kerbside collection (similar to the case with packaging from online consumer goods purchases by households in Ireland, as recently examined by PMCA). The Danish environment ministry has also complained about consumers putting their deposit containers in recycling collections. We have seen that some Swedish metal 'bring' containers have large numbers of drinks cans. Some of these were no doubt purchased abroad, but some had Swedish deposit markings.

Repak pays collectors for each tonne of material collected, at a higher rate for kerbside collection than for bring-banks (averaging €63.51 versus €41.60 per tonne for civic amenity/bring-banks, as shown earlier in Table 3.5, p. 46). Waste contractors would, justifiably, continue to claim their Repak subsidy on this material. If most drinks cans and bottles were returned in-store, the tonnage they collect in each round would decrease; and as PET and aluminium are among the easiest pack types to recycle and have higher secondary market values, the economic viability of kerbside/bring collections would decrease.

Alternatively, the contractor could claim a collection fee from the deposit system once the materials are sorted. We are not aware of any precedent for this where a deposit operates alongside a general packaging recovery system. It would be complicated and it might lead to some double-counting.

Repak would face reduced economies of scale. Even though it handled a lower tonnage of packaging, its tasks would remain the same. The cost of the core management team and offices would be spread across a reduced tonnage of material and of fee income.

5.9.3 Impact on Repak's Shared Fee Structure

At the moment the company that places packaging on the market in Ireland pays a material-specific fee but the other stages of the packaging chain also contribute some funding. The fees paid by other stages of the chain are based on the weight of packaging but are not material-specific. Small retailers and catering outlets contribute based on turnover, according to a fee scale based on typical quantities of packaging in each sector. Brand-holders would know which packs were now deposit-bearing so they would be able to adjust their data, but companies at other stages in the packaging chain would find it hard to re-calculate what tonnage should no longer be reported to Repak.

If some drinks containers were no longer handled through Repak, this fee structure would be hard to maintain. The fee structure has always been part of the Irish packaging waste arrangements, which have performed successfully as illustrated by Ireland's recycling record, which is driven by Repak and its members. It was devised by the industry stakeholders that originally developed Ireland's producer responsibility arrangements for packaging waste – it was not imposed by Repak. Irish industry continues to support the concept of the shared fee structure.

5.9.4 Potential Impact on Repak Fees

A deposit looks likely to confront Repak with a combination of lower income and reduced economies of scale, and it may pay collection subsidies on some deposit containers. This may result in Repak having to increase its fees to its members. The deposit is therefore likely to have a knock-on effect on all of Repak's members, including those who do not sell drinks in deposit containers.

5.10 Summary

Our discussion of how a deposit system might operate in Ireland makes clear that establishing ***a deposit system in Ireland would be complex and would require very careful planning.***

The elements that will need to be decided include what drinks and containers should be deposit-bearing, how the system would be managed and by whom, and ensuring that there are sufficient return arrangements.

The complexity and sophistication of a deposit system means that it is more expensive than a general recovery system for all packaging. This is likely to be the case as Ireland would be establishing its system from scratch for a large number of containers. More research into the costs and benefits of a deposit is needed. However it looks certain that ***Irish producers and retailers would face higher costs, which would be passed on to consumers.***

Repak would likely be faced with reduced economies of scale and its members with the prospect of higher fees to maintain the generally packaging PRI.

6 Conclusions and Recommendations

6.1 Conclusions

The detailed review and analysis conducted in the course of this report suggests that a deposit on non-refillable containers in Ireland is not the optimum solution for Ireland, as well as being without any rationale in fact (regarding beverage container litter and recycling).

- The **factors associated with success** identified in the review of international deposit systems **do not apply in Ireland**. These include:
 - refillables have disappeared in the retail trade in Ireland so consumers are no longer familiar with them and retailers do not have facilities to handle returned containers;
 - kerbside collection is now well-established in Ireland and would compete with in-store return;
 - A deposit system is complex and would need careful planning and implementation.
- There would be **high costs for producers and retailers** associated with establishing and operating a deposit, some of which would be passed to consumers in product prices.

6.2 Recommendations

If policymakers still wish to proceed with a deposit, then we recommend the following preparatory steps:

- **Robust market research** – to establish the size of the market for drinks likely to be deposit-bearing and the number of operators likely to be affected. This is essential to assess the market implications and costs of the various deposit options.
- **Consumer research** – to determine consumer preference for returning deposit containers in-store or to return depots. This exercise should also investigate whether those with access to kerbside collection would be willing to take containers elsewhere for deposit, and at what deposit rates.
- An **environmental impact assessment** of various deposit options compared with existing collection arrangements.
- **Discussions with the relevant sectors of Irish industry** on the deposit arrangements. Draft regulations should be devised around the arrangements agreed with industry.
- **Draft regulations** should then be put out to wide **consultation** in Ireland. Individual stakeholders may be able to highlight potential loopholes or other problems.

A full cost-benefit analysis (CBA) would also be needed before coming to a decision, because the experiences of other countries with systems for non-refillable beverage containers indicate that the costs are very considerable in relation to the benefits.

Legal Position

Irish legislators would have to ensure that deposit legislation and the deposit system are in line with EU rules, particularly the Directive on Packaging and Packaging Waste (94/62/EC), and relevant case-law of the ECJ. The Packaging Directive says that national systems for collecting and recycling packaging waste, including those involving a deposit, must be accessible to importers without discrimination and they must not give rise to trade barriers or distort competition. The same goes for economic instruments (such as a deposit) adopted by member states to meet the objectives of the Directive.

Annex of Supplementary Information

Table A1: Econometric Analysis of the Presence of Trends (Stochastic and Deterministic) in the Share of All Litter due to Beverage Container Pieces in Ireland (2002-2016) – Inclusive of Drinks Cartons

Augmented Dickey-Fuller test for unit root		Number of obs = 13			
Test Statistic	Interpolated Dickey-Fuller				
	1% Critical Value	5% Critical Value	10% Critical Value		
Z(t)	-1.569	-4.380	-3.600	-3.240	
MacKinnon approximate p-value for Z(t) = 0.8044					
D.bevcons1	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
bevcons1					
L1.	-.9422794	.6006081	-1.57	0.151	-2.300949 .4163906
LD.	-.1527661	.4750632	-0.32	0.755	-1.227434 .9219015
_trend	-.0002351	.0003176	-0.74	0.478	-.0009535 .0004833
_cons	.0352813	.0214264	1.65	0.134	-.0131887 .0837512

Source: NLPMS (detailed data available [here](#)); Consultancy Team analysis (conducted using the specialist econometric software Stata SE).

Table A2: Econometric Analysis of the Presence of Trends (Stochastic and Deterministic) in the Share of All Litter due to Beverage Container Pieces in Ireland (2008-2016) – Inclusive of Drinks Cartons

Augmented Dickey-Fuller test for unit root		Number of obs = 9			
Test Statistic	Interpolated Dickey-Fuller				
	1% Critical Value	5% Critical Value	10% Critical Value		
Z(t)	-1.148	-4.380	-3.600	-3.240	
MacKinnon approximate p-value for Z(t) = 0.9206					
D.bevcons1	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
bevcons1					
L1.	-.9282798	.8086228	-1.15	0.303	-3.006911 1.150351
LD.	-.2833966	.6074698	-0.47	0.660	-1.844947 1.278154
_trend	-.0004741	.0006182	-0.77	0.478	-.0020633 .0011151
_cons	.0341356	.0305618	1.12	0.315	-.044426 .1126972

Source: NLPMS (detailed data available [here](#)); Consultancy Team analysis (conducted using the specialist econometric software Stata SE).

Table A3: Econometric Analysis of the Presence of Trends (Stochastic and Deterministic) in the Share of All Litter due to Beverage Container Pieces in Ireland (2002-2016) – Exclusive of Drinks Cartons

Augmented Dickey-Fuller test for unit root		Number of obs =		13	
	Test Statistic	Interpolated Dickey-Fuller			
		1% Critical Value	5% Critical Value	10% Critical Value	
Z(t)	-1.223	-4.380	-3.600	-3.240	
MacKinnon approximate p-value for Z(t) = 0.9057					
D.bevcons2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
bevcons2					
L1.	-.7011215	.5734032	-1.22	0.252	-1.99825 .5960066
LD.	-.3735087	.5091319	-0.73	0.482	-1.525245 .7782278
_trend	-.0002288	.0003052	-0.75	0.473	-.0009192 .0004615
_cons	.0222467	.0162399	1.37	0.204	-.0144905 .0589839

Source: NLPMS (detailed data available [here](#)); Consultancy Team analysis (conducted using the specialist econometric software Stata SE).

Table A4: Econometric Analysis of the Presence of Trends (Stochastic and Deterministic) in the Share of All Litter due to Beverage Container Pieces in Ireland (2008-2016) – Exclusive of Drinks Cartons

Augmented Dickey-Fuller test for unit root		Number of obs =		9	
	Test Statistic	Interpolated Dickey-Fuller			
		1% Critical Value	5% Critical Value	10% Critical Value	
Z(t)	-0.939	-4.380	-3.600	-3.240	
MacKinnon approximate p-value for Z(t) = 0.9518					
D.bevcons2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
bevcons2					
L1.	-.8135118	.8668011	-0.94	0.391	-3.041695 1.414671
LD.	-.468757	.6843987	-0.68	0.524	-2.22806 1.290546
_trend	-.0005203	.0005626	-0.92	0.397	-.0019665 .0009259
_cons	.025229	.0270469	0.93	0.394	-.0442972 .0947551

Source: NLPMS (detailed data available [here](#)); Consultancy Team analysis (conducted using the specialist econometric software Stata SE).