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Rethinking and optimising post-consumer packaging waste: A sentiment analysis of consumers' perceptions towards the introduction of a deposit refund scheme in Scotland.

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Abstract

Packaging waste production, especially single-use containers, is exerting detrimental effects on terrestrial and aquatic ecosystems, including human health. To internalise the externalities associated with single-use containers different instruments, including a deposit refund scheme (DRS), have been operationalised in many countries. Therefore, DRS is introduced in Scotland to reduce plastic litters by increasing recycling rates and incentivising pro-environmental behavioural change. This study addresses the complexity of single-use plastic containers by analysing consumers' perceptions regarding the introduction of DRS in Scotland. Using 940 comments from the BBC "Have Your Say" messageboard, this study adopts sentiment analysis to understand consumers' opinions about the introduction and implementation of DRS in Scotland. Findings suggest that a UK-wide scheme that is similar in terms of operations and structure is required for DRS to be successful. While consumers' knowledge and opinions about DRS are mixed, the efficacy of DRS including its relevance is questioned and raises doubts about its contribution to sustainability. The findings imply the need for UK countries to negotiate and collaborate on appropriate and attractive interventions in addressing post-consumer single-use plastic containers. The implications of the findings for policy and practice, especially in improving the operations of DRS are further discussed.

Keywords: Deposit refund scheme; Sustainability; Sentiment analysis; Plastic waste.

1.0 Introduction

Packaging waste, especially plastics, is one of the most ubiquitous litters, representing about 11% by volume of household waste with the production of about 8.3 billion metric tons of plastic as of 2017 (Brooks et al., 2018). In Europe alone, plastics consumption has increased to about 49 million tonnes/year. This translates to the production of 30 kg of plastic waste per person/year; however, only about 30% of plastic waste is currently being collected for recycling (ten Brink et al., 2018). Although data on plastic consumption and its associated waste is challenging to estimate, the available data for Europe shows high consumption pattern in Germany (24.9%), Italy (14.3%), France (9.6%), UK (7.7%) and Spain (7.4%) (Eurostat, 2020; van Seville et al., 2016). This consumption rate is primarily due to the diverse utilisation of plastics for many industrial and domestic activities (Geyer et al., 2017; Wu et al., 2013). Despite their attributes and suitability, plastics are detrimental to the environment, human health, and biodiversity (Barnes, 2019; Geyer et al., 2017; van Rensburg et al., 2020).

To reduce the negative consequences of single-use plastics by designing a more circular economy (CE) for plastics in Scotland, the Scottish government introduced a deposit refund scheme (DRS). The scheme, that is anticipated to commence in 2022 due to COVID-19, is supported by the Deposit and Return Scheme for Scotland Regulations 2020. The scheme is to improve recycling rates and reduce litter by complementing the current single-use carrier bag charge that was introduced in 2014. According to Environment and Forestry Directorate (2019), DRS would provide incentives for local businesses to tap into the locally available “closed-loop material reprocessing” infrastructure. DRS seeks to increase recycling rates of single-use packaging materials, particularly plastics, by incentivising a positive behaviour change. While the scheme was piloted in Scotland albeit, with mixed findings, there is no indication that the pilot will reflect the reality when the scheme becomes fully operational. According to the most current data on plastic recycling in the EU, countries with DRS recycled a marginally higher rate than the UK although the recovery rate was much higher. For example, the plastic recycling rate in Denmark (42%), Germany (48%), Netherlands (50%) in the year 2017 compared to the UK that recycled about 46% of its plastic waste production (Eurostat, 2020).

Considering that consumers are central for the scheme to achieve socially optimal waste diversion rate at minimum costs and efforts, this study is designed to understand users' opinions of DRS in Scotland. The rationale is to provide insights into the users' receptiveness of DRS and the impacts of the scheme including its logistics. This is necessary given that consumer behaviour is influenced by many factors, including their perceptions and awareness of DRS (Puigvert et al., 2020). The knowledge will provide opportunities for waste planners and policymakers to gauge the effectiveness of the scheme, and to address other waste streams that are not included in the scheme.

2.0 Plastic waste and management

Plastic waste production is intensified through the use of plastic materials as packaging, such as food containers

and carrier bags, most of which are difficult to recycle and mostly end up in landfills (Oke et al., 2017). For example, only about 10% of plastics ever produced are reported to have been recycled while about 60% is dumped in landfills and the remaining percentage is incinerated (European Environment Agency, 2019). It should be noted plastics can be sub-classified into low-density polyethylene (LDPE); high-density polyethylene (HDPE); polypropylene (PP); polyethylene terephthalate (PET); and polystyrene (PS). However, single-use plastics, such as carrier bags and water bottles mainly from PET are attracting more interest from stakeholders due to their proliferation and persistence in the environment (Oke et al., 2017). The renewed interest in plastic waste is instigated by Sir David Attenborough's latest BBC TV documentary series, "Blue Planet II". Also contributing to public awareness, especially in the UK, is the BBC's "War on Plastic" documentary. The documentary highlights inappropriate plastic waste management in the UK and shows that a high proportion of plastic waste that was exported from the UK for recycling was stockpiled and abandoned in some countries, including Malaysia, Turkey, and Indonesia.

The exponential increase in plastics consumption, low recycling rates, limited treatment options in Europe, and the ban on plastic waste imports by China (European Environment Agency, 2019; ten Brink et al., 2018) indicate the need for pragmatic policies that may influence behavioural change. The policies may go beyond the existing legal- or market-based instruments such as Landfill Tax (Berger and Nagase, 2018) to reduce illegal disposal of packaging waste. Any policy- or market-based instrument to increase material collection should ring-fence consumers and incentivise material reprocessing process from production, consumption, collection, and finally to reprocessing.

Although market-based instruments are proven to be effective in preventing waste generation, these measures, especially landfill tax is encouraging waste crime, such as flytipping in the UK (Oke et al., 2017). This raises a fundamental question about the contribution of these instruments, especially the Pigouvian tax, in changing waste behaviour. For these instruments to have a long-term positive effect, continuous reinforcement is required. Behaviour could return to the baseline when the reward-system is discontinued, suggesting that market-based instruments are not durable in changing behaviour (Miafodzyeva and Brandt, 2013; Oke, 2015).

2.1 Deposit Refund Scheme (DRS)

It is noteworthy that DRS has been in existence since the 19th century where refillable glass beverage containers were used for the delivery of milk to consumers across the UK. First introduced in the 1880s, the rationale was to reduce the operational costs of glass production through reuse by aligning the local production and consumption of milk. The approach became unpopular as capitalism that fuel consumerism started gaining traction, especially among the middle- and upper-class in developed economies. The rise in capitalism increased consumers' spending-power resulting in the popularity of modernism with increasing resource-use, social inequality, and environmental deterioration. To reduce the consequences of consumerism, different initiatives have been introduced in many countries. For example, polluter-pays principle and extended producer responsibility principle which encompasses advanced recycling fee, DRS and returns subsidy, are designed (Linderhof et al., 2019; Pires et al., 2015) to internalise

the negative externalities associated with overconsumption of resources.

With the global trend in plastic use, DRS may encourage consumers' responsibility in reducing plastic waste (Linderhof et al., 2019). While DRS is operationally different from countries to countries, its primary focus is to incentivise recycling of single-use containers and divert waste from landfills by ensuring that all players across the supply networks are accountable for their waste. This approach shifts the responsibility of material collection to consumers rather than retailers and producers by adding value, in terms of a deposit, to materials that would otherwise be discarded. DRS may affect the behaviour of consumers and businesses (producers and retailers) (Kulshreshtha and Sarangi, 2001) with the potential to create an informal recycling sector. Although there is a dearth of empirical research on behaviour towards DRS (i Puigvert et al., 2020), there have been efforts to highlight its economic and operational advantage over other waste collection options (Linderhof et al., 2019; Zhou et al., 2020).

Studies (Lavee, 2010; Zhou et al., 2020) have shown the potential of DRS in preventing waste generation and increase the reprocessing of single-use containers, such as plastics and cans. An understanding of plastics production, distribution and consumption may provide comprehensive knowledge about the consequences of plastics. Consumers' involvement throughout the value chain of plastics is mandatory to eliminate the consequences of plastics production and consumption. This may require a better understanding of consumers' perceptions and emotions towards plastic waste to predict the effectiveness of DRS (i Puigvert et al., 2020; Zhou et al., 2020). As a result, this study was designed to explore consumers' perceptions and sentiments concerning the introduction of DRS in Scotland. The rationale is not to analyse DSR in other countries but to understand issues that may prevent the effective implementation of DSR in Scotland based on consumers' views and receptive towards the scheme when it becomes fully operational. This study will contribute to theory and policy on the extent to which the scheme can influence consumers to change their purchasing and recycling behaviour while enhancing the overall recycling and recovery of packaging waste.

3.0 Research Method

This study adopts qualitative interpretivism through a netnographic approach, online ethnographic fieldwork, to collect and interpret people's online written account (Kozinets, 2010) regarding DRS in Scotland. The data collection approach as used in this study has been utilised in previous studies (Oke et al., 2017; Quinlan et al., 2015). The approach is governed by different epistemological, logistical, and ethical perspectives than those that apply to real-time focus groups or interviews (Oke et al., 2017; Markham and Buchanan, 2012). The advances in internet technology with different social media platforms transform readers to commentators and content generators (Do et al., 2019 Oke et al., 2017). According to Liu (2012), social media contents are now central to the decision-making process of individuals, businesses, and governments across the world.

3.1 Data Collection

The BBC "Have Your Say" platform that provides an opportunity for readers to post their comments on topical

issues, from politics to the environment was used in this study. The platform is moderated through some strict rules by a dedicated team of trained broadcast journalists and assistants at the user-generated content (UGC) Hub. The platform offers opportunities for pure observational study on true feelings of readers with no attempt to contact posters or solicit any further personal details (Quinlan et al., 2015; Oke et al., 2017). Following the Scottish government decision to introduce DRS in Scotland, BBC published many articles about the scheme. The article used in this study allowed readers to express their views about the scheme through the BBC "Have Your Say" messageboard. Although the platform allows readers to engage in debates publicly and anonymously, the comments are not representative but reflect the public's views or sentiments about social issues under discussion.

The data for this study was based on comments about a published DRS-related article on 08 May 2019 by BBC. The article was of interest in that it offered more information about the scheme, particularly about the deposit on single-use containers to address plastic waste in Scotland. According to the article, DRS in Scotland is designed with a deposit of 20p on a drink in a single-use container and payable at the till although the deposit is refunded when the empty container is returned by consumers.

In total, 1011 responses were posted on the messageboard in response to the published article. These responses were harvested, sorted, and explored to understand consumers' perceptions about DRS in Scotland. Although no socio-demographic information of the posters was available on the messageboard, we perceived commentators as those with strong environmental concern. Also, we perceived commentators as those with a specific interest in plastic waste or those who genuinely believed that the scheme might directly affect them. The BBC online audience is more likely to be within the ABC1 social category, with about 55% of this group using BBC online compared to only 34% of the C2DE group (Quinlan et al., 2015). According to Oke et al. (2017), the BBC "Have Your Say" messageboard differs from the mainstream social media platforms given that the platform is moderated and offers an opportunity for people to engage in debate about topical issues outside their private sphere.

3.2 Data Analysis

In this study, sentiment analysis and/or opinions mining (Do et al., 2019; Liu, 2012) was used. The approach was adopted given that the proliferation of social media platforms presents opportunities for consumers to express their opinions and sentiments that may influence their behaviour towards social issues under discussion. To decipher the contents of social media postings, sentiment analysis and/or opinion mining have been applied in many domains from computing to management and marketing (Do et al., 2019; Liu, 2012). The approach is gaining traction in marketing research with many blue-chip companies such as Facebook, Twitter, Amazon, and eBay are adopting it as ascribed through ratings from their end-users (Do et al., 2019; Jockers and Thalken, 2020).

To make sense of consumers' comments and to bring order into fragmented texts on the BBC "Have Your Say" messageboard, each comment was analysed at the entity and aspect level by adapted Blair-Goldensohn et al.'s (2008) sentiment analysis approach. The process includes identification of relevant sentiment-laden texts, extraction of

relevant aspects of DRS that were mentioned in the initial fragments, and a final summary of sentiments into different themes. The initial stage was data cleaning/sorting and resulted in 940 sentiment laden comments (Figure 1) that were relevant and valid for further analysis. While 25 comments were removed/deleted by the moderator for breaking the house rules, 46 comments were not relevant to this study.

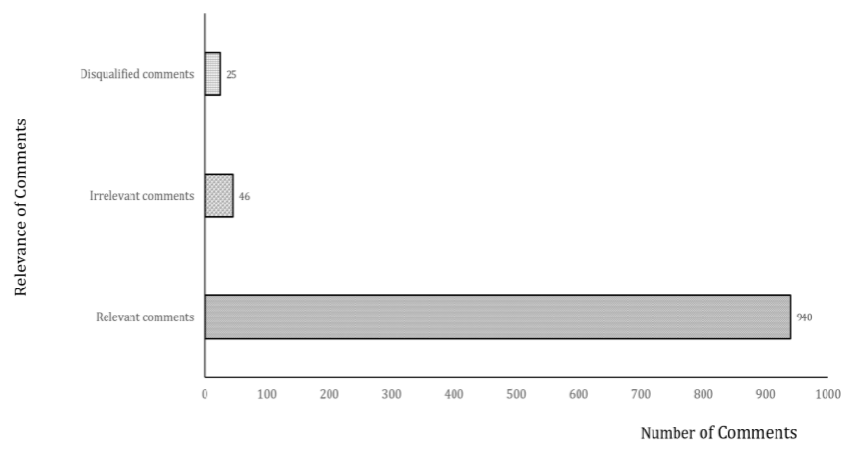


Figure 1: Data Sorting and Classification

As used in this study, sentiment analysis allowed for the identification of positive/negative sentiments and targets of opinions (Do et al., 2019) by comparing comments that may fit into different themes. Following the positive and negative comments classification, an aggregation of similar contexts was developed into different themes. The data used in this study is not representative of DRS consumers or users in Scotland. Rather it represents a broad range of accurate and honest sentiments and opinions of consumers/users that may influence their knowledge and behaviour towards DRS. Further analysis was carried out through content analysis (Willemsen et al., 2011) to classify relevant comments into different themes. The entire data analysis was facilitated through NVivo 11, a qualitative data analysis software.

4.0 Results and Discussion

The content analysis of the filtered comments (Figure 2) was followed by coding of emerging opinions that bothered around; experience or knowledge of similar schemes, cost implications; political bias; and ownership.

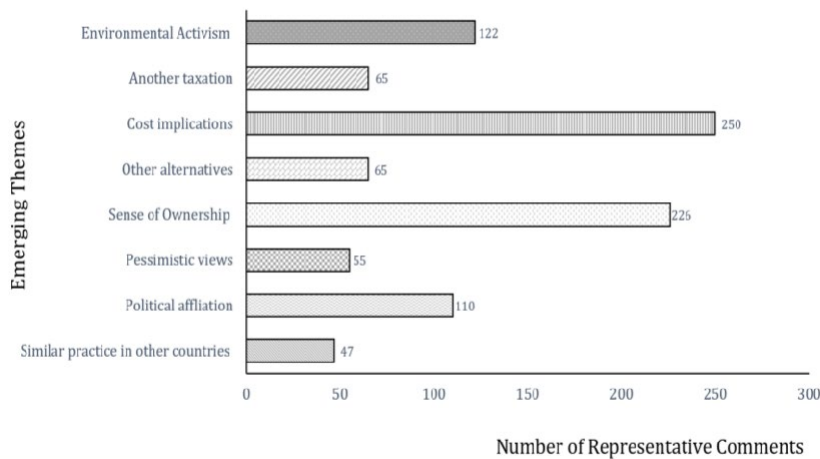


Figure 2: Proportions of Relevant Key Themes

4.1 Knowledge of similar schemes

Consumers knowledge of the scheme is mixed. The comments showed that some participants were ignorant of how the scheme will operate. For example,

“Has Scot Gov done their homework? Yes, others do it but under different conditions. No mention of how councils will be compensated for income lost from PET recycling and sale. A resultant rise in rates to cover the LA loss may be the result not to mention increased prices to cover retailers scheme management overheads, maybe the PET income they get will be channelled back to customers, no 205 chance!” [Par_1002].

This comment is not only showing a misunderstanding of the refund mechanism but also reflect a sense of anxiety about the scheme. This requires further clarification by the government to ensure that small businesses are ring-fenced against any negative consequences of the charge/tax associated with DSR. Many participants were able to draw a parallel from other countries and may inform participants’ evaluation of DRS in Scotland. While there are successful examples in North America, similar schemes were identified in Europe. For example:

“They’ve done this for years in other countries. Much of Canada has had a return policy on cans for at least 20 years... the UK is so backwards when it comes to this type of policy. [Par_100]

This scheme has been in place in Denmark all my years and it works perfectly.

Items which can be returned have a barcode so you can’t just collect any old bottles and get money back. Non-refundable items go in normal recycling. Items left lying around benefit homeless and kids. Some cities have shelves at the bins so no ‘rummaging’ required. It is really simple. [Par_990].

This knowledge is consistent with the literature (i Puigvert et al., 2020; Walls, 2011; Zhou et al., 2020) who reported successful implementation of DRS in many countries. Considering the mixed knowledge about the scheme, some important areas require more clarity for the scheme to be attractive. These areas include online

shopping and how the scheme would address disadvantaged consumers, such as disabled and elderly, that use home delivery service. For instance,

"I am disabled I get my groceries delivered weekly by Tesco including an average of 15 to 20 plastic bottles. how do I make returns will Tesco van man take them from me?" [Par_186]

"Now many people order home delivery online from Tesco, Asda, etc. These deliveries are the main point of physical contact between customers and sellers. Will their delivery trucks be compelled to take back the recycled products plastic bottles, cans, glass)?" [Par_970].

While the proposed scheme in Scotland is focusing on plastic bottles and beverage cans, many products including beverage containers, lead-acid batteries, tires, electronic waste, and other hazardous materials are included in different countries (Walls, 2011; Zhou et al., 2020). In general, the comments suggest that people who have adequate knowledge of how the scheme works are more likely to engage effectively in the scheme, be optimistic about the scheme, and support the scheme.

4.2 Political Affiliation (bias)

Political views are another important factor that may influence consumers' participation in the scheme suggesting that consumers may not be entirely objective or rational in their evaluation of the scheme. For example:

"Another great sound bite scheme by the SNP but it is the shop keepers who will need to administer it. Another buck passing scheme but if it helps the environment then at least it is a start" [Par_015]

"I'm not sure why folks are saying this is a bad thing. You get your 20p back! It's just like when we were kids! It seems the SNP get negative press no matter the good they do. Prescriptions, no council tax for care leavers, baby boxes, and now 20p back per bottle to recycle. These are good things!" [Par_067].

The comments highlight the sentiments along the political divide in Scotland which may induce a lack of trust about the intended goal of the scheme. Some comments suggest that the scheme is a complete waste of time considering the existing recycling policy in Scotland. The observed political bias against DRS in Scotland may affect the level of engagement in the scheme due to the perception that the scheme is being forced on consumers without demonstrating its impact. For instance,

"This country is regressing on the whims of environmental extremists. Nobody cares about the impact on businesses who are forced to operate this. This is what happens when politicians battle to be the most environmentally friendly to be a populist - result - a backward effect on this country" [Par_781].

These views resonate with The Scottish Wholesale Association (SWA) through its chief executive who questioned the timing of the scheme including the ratification of its underpinning legislation in the Scottish parliament. According to SWA (2020), *"This is meant to be an evidence-based policy but the evidence on which it is built – container numbers, return points, queueing spaces, online food shopping – will have fundamentally changed as business exits Covid-19. Wholesalers and others in food and drink are already under intense pressure with some businesses*

fighting for their very survival – there will be no time or money to spend trying to assist the Scottish Government or a still-to-be formed Scheme Administrator to set up the DRS”.

It is imperative that the government and planners engage actively with all stakeholders, including academics and manufacturers, for the scheme to achieve its intended objectives in Scotland.

4.3 Pessimistic views

The findings showed that consumers are less convinced about the scheme and its effectiveness in addressing single-use containers in Scotland. A pessimistic view reflects the perception that the refund charge is another form of taxation being imposed by the Scottish government. This view is consistent with consumers' views regarding the introduction of 5p charge on single-use carrier bags in Scotland (Oke et al., 2017). Besides, consumers that exhibit a pessimistic view about the scheme may perceive it to be inconvenient which may affect consumers' level of satisfaction and participation. The complexity of the process involved in collecting the refund is one of the reasons some consumers may not be satisfied with the scheme in Scotland. For example,

“This punishes the consumer. It's quite impractical to return such containers so many will go unredeemed. Without valid alternatives, this is effectively just a tax. The upside is that it could stop people buying the products thereby forcing suppliers to develop newer products” [Par_114]

“A nice idea but not practical here in the Highlands when you run a guest house! I don't have the facilities to store bottles & cans for 50 people - even now I need a trailer to get to the Bottle Bank just with the glass. We would stop selling any soft drinks or water - thus forcing guests to drive 25 miles to buy a can of coke... Their empties would go in the bin if council stop recycling” [Par_500].

Considering that inconvenience has been reported as a barrier to recycling behavior (Miafodzyeva and Brandt, 2013; Oke and Kruijsen, 2016), there is a need to simplify the refund process and make the scheme easy for consumers to understand and participate. This may be addressed by providing specific information about the scheme (Oke and Kruijsen, 2016) while installing a refund vending machine (RVM) in every major store and bring sites for ease of access. The practicality of RVM in facilitating material collection should be appropriately assessed before implementing DRS.

4.4 Sense of Ownership

The ownership as expressed by the commentators is related to the issue of responsibility and accountability, especially between manufacturers and consumers in Scotland. The comments suggest that manufacturers rather than consumers should take more responsibility by avoiding single-use plastics and also regarding the operating cost by paying more tax to fund DRS. For example,

“What this scheme should have been was buy the plastic bottle and then return it for 20p and the cost of that 20p should be shouldered by the manufacturer if not returned meaning there is then a real cost to their plastic production, which may, in turn, make them seek alternatives. Another tax!” [Par_257]

" Why is the Scottish government solution always to hit the consumer? Why not go to the big companies first and tell them it's now a law that all single-use containers must be recyclable (such as coffee cups etc). Then the government can provide recycling bins for the consumer to use. Every bin in my city centre is general waste only. No small businesses, people should do it for them" [Par_518].

While the comments suggest that manufacturers should take more responsibility in reducing plastic waste, consumers are central to the ongoing efforts to increase recycling rates by ensuring that used plastics are collected for recycling. This may require awareness and education on how consumers can engage effectively not only with the scheme but also with recycling in general. For instance,

"As the owner of a business making food packaging from recycled PET bottles, this is a great idea and should be adopted UK-wide. Some European countries recycle over 97% of their plastic bottles. This is a valuable commodity that is in big demand, with many specialist companies already operating in the UK to reprocess the bottles. The public needs more education on the process" [Par_921].

The awareness of the scheme success in other countries may provide more support for pessimistic consumers who feel that the scheme is another form of tax on consumers and small businesses. Nonetheless, comments suggest that big businesses must take ownership of DRS by bearing tax responsibility. Although this may invariably increase cost implications, private businesses (investors) should be responsible for the operation of the scheme to offset any cost implications on consumers including small businesses.

4.5 Another taxation

There is a consensus that DRS is another form of tax that may increase consumers' burdens. This view reflects a lack of holistic understanding of the deposit/refund aspect of the scheme. Considering the existence of recycling schemes in Scotland, increasing material collection rates through an extra charge on cans and bottles at the point of purchase is perceived as a tax that may punish those who are already recycling. For example,

"Just another Tax putting the responsibility of plastics on consumers and not the manufacturer!" [Par_257]

I'm all for encouraging recycling, but the gov should penalise those who don't do it rather than make it more difficult for those who do" [Par_034]

"The good and decent folk who have been rinsing out and recycling their glass and plastic waste for years will be punished by the tax while the feckless have to be bribed to recycle. Policies we describe as progressive just punish the folk doing right and following rules/laws and bail out the morons" [Par_463].

The comments demonstrate that the Scottish government should engage with consumers to ensure clarity and knowledge of the scheme. Besides, the comments questioned the efficacy of the scheme given that the existing schemes are effective in increasing recycling (Thomas and Sharp, 2013). However, the older generation may relate to similar schemes which were adopted by the government some years back. For instance,

"Deposits on bottles worked very well many years ago - you never saw a discarded bottle as children would quickly

pick them up to supplement their pocket money. Unfortunately, it needs to be the UK wide to be really effective” [Par_024].

While references were made to the scheme that was operational three decades ago, there are still bottle banks across Scotland at no extra cost. However, there is no understanding of whether these banks and other bring sites will still be functional when the scheme eventually starts by the year 2022. The Scottish government may have to convert the existing bottle banks or bring sites to deposit refund centre to facilitate collection. Also, RVM can be installed as an alternative to bottle banks. No matter the decision on the location of deposit refund centres, consumers should be sensitised about the importance and operations of DRS.

4.6 Cost implications

The common concern among the participants is the cost implications of the scheme. From the findings, it can be inferred that there are financial and non-financial cost implications on all stakeholders, especially consumers and small businesses. In terms of the financial cost implications, a participant expressed concern that:

“Whilst I support improving recycling rates, I don't think this has been thought through properly for rural dwellers. Requiring small rural shops to deal with this will increase their costs. Even storing all the empty plastic bottles will be a problem due to the fire risk (full bottles don't pose the same risk)” [Par_944].

Although the price of most items will increase once DRS is in place in Scotland, it may deter consumers from buying drinks in plastic containers which may affect sales. It may force consumers to return their used containers and enhance the recycling rates in Scotland. This observation is consistent with Numata (2009) who reported that DRS may either influence consumers' buying behaviour or material return behaviour. Contrary to financial implications, non-financial implications are associated with the efforts to return the used containers suggesting that consumers may likely make multiple trips for their refunds. For instance,

“A nice idea but not practical here in the Highlands when you run a guest house! I don't have the facilities to store bottles & cans for 50 people - even now I need a trailer to get to the Bottle Bank just with the glass. We would stop selling any soft drinks or water - thus forcing guests to drive 25 miles to buy a can of coke... Their empties would go in the bin if the council stop recycling” [Par_500]

“Terrible idea, my bottles, cans and plastic are put in different recycling bins. I live in a small village 15 mins from the local recycling place. Make it compulsory and I will have to drive and use petrol to get a few pence back. I'll stick it in my normal bin instead. Better for the environment, I'll be using less petrol” [Par_711].

The additional cost (time and effort) that is associated with DRS may force many consumers to circumvent the charge by buying items from the rest of the UK and/or through online stores or home delivery. According to a participant,

“It's a brilliant idea but it needs to be UK-Wide to work. If Scotland implements this first then they will need to mark all bottles in such a way they can identify that they were bought in Scotland in the first place as people living on the English side of the border could literally drive down the road with a boot full of these and get free money” [Par_124].

While the rest of the UK is yet to introduce the scheme, it is impractical for consumers to import drinks from outside Scotland to circumvent the scheme based on similar schemes in Germany and Canada. There is a need for more clarity and planning due to the lack of understanding of how the scheme will work as observed from the participants' comments. Nonetheless, the scheme may be counterproductive by reducing recycling rates and sales in Scotland if consumers elect to purchase drinks from online stores that are exempted from the scheme.

4.7 Environmental Activism

Environmental activism is another theme that emerged from comments and suggests a strong positive concern for the environment. This view offers support for the scheme in protecting the environment due to the increase in waste dumping or littering in Scotland. According to a participant,

"Like the plastic bag charge, I'd say it's guaranteed this charge will drive down plastic use hugely, and that has to make it a good idea. Also, it will encourage people to collect litter dropped by others. Need to be careful about potential loopholes that manufacturers could exploit" [Par_428]

"Interesting idea - has some good points, especially if it reduces litter. Some details to be worked out though. Can you return any bottle to any shop? Small newsagents and kiosks at stations will lose valuable space to machines. How will supermarket home delivery work - will they collect empties?" [Par_365].

This positive opinion of the scheme resonates with the current growing global community of environmental activism with protests in many countries (Oke et al., 2020). According to van Rensburg et al. (2020), increased environmental concerns and awareness of the consequences of plastic waste are imperative in nudging consumers towards plastic waste prevention, reuse, and recycling. DRS is perceived as a solution to the existing problems of plastics and cans while many participants advocated for the UK-wide scheme for improved effectiveness.

5.0 Discussion

From the findings as summarized in Figure 3, it is challenging to quantify the effectiveness of DRS when it becomes fully operational in Scotland, and to predict the scheme behaviour from one locality to another. There is an indication from the pilots that the scheme may likely increase the diversion rates of the target materials through prevention, reuse, and recycling. For instance, both the quality and quantity of materials collected from each pilot site were enhanced by the scheme compared to the traditional recycling scheme although the performance was observed to be short-lived after the pilot period. If this pattern mirrors the scheme's behaviour when fully operational, then the efficacy of DRS in Scotland is questionable. However, consumers' concerns and sentiments about DRS (Figure 3) should be addressed to enhance clarity and to ensure that consumers are actively involved in its operations.

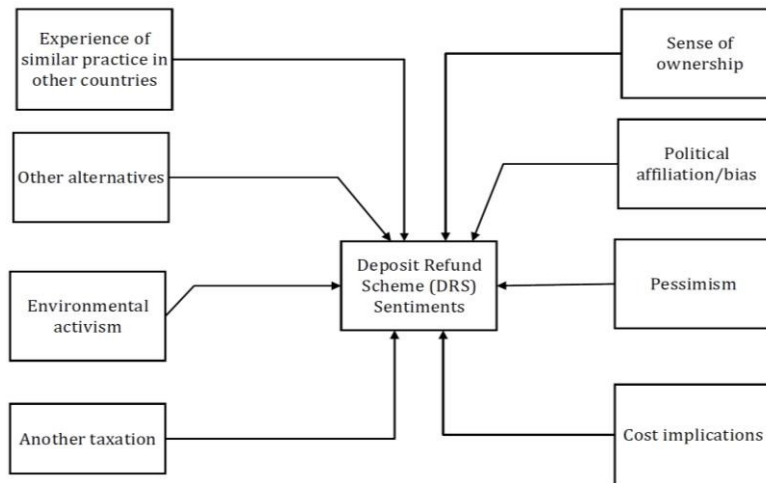


Figure 3: Sentiments of a deposit return scheme (DRS) in Scotland

Even though there are similar schemes in other countries, those schemes were introduced decades ago when recycling was practically new. With the increasing recycling rates, a sense of political bias may serve as a barrier to consumers' participation in the scheme. The scheme may lead to a defiant behaviour, especially among those who are active recyclers, due to the perception that DRS will reward non-recyclers and punish many recyclers. Other barriers are cost (time and efforts) implications of DRS coupled with the perception that the scheme is another form of tax. Environmental activism, concern, and scheme knowledge are observed as key enablers for consumers to engage actively in DRS.

Being pragmatic or pessimistic about the scheme including the dominant political views may cloud people's evaluation of the scheme including their participation. While opinions may not necessarily change government decision, it provides an understanding of possible challenges including the need for the government to engage with relevant stakeholders when DRS becomes operational in July 2022. This study is not only to understand consumers' perceptions of DRS in Scotland but also for the government and other service providers to address the overall impact of DRS before and during its implementation. Also, it provides opportunities for the Scottish government to negotiate a UK-wide scheme and make some structural adjustments based on lessons from other countries instead of reinventing the wheel.

6.0 The implication for policy and practice

While this study has illuminated consumers' sentiments about the introduction of DRS in Scotland, there are many important and useful implications for policy and practice in enhancing the scheme success. Consistent with Berger and Nagase (2018), this study shows that DRS in Scotland may not attract public support which may negatively affect its performance and intended goals. However, consumers' sentiments (Figure 3) about the

scheme should be addressed to improve the operations and logistics of DRS in achieving CE. In a comprehensive review of sentiment analysis, Bhatt and Gupta (2019) argued that public opinions matter when introducing new policies, especially when policies affect consumers' finances. This suggests the need to understand DRSend-users' sentiments and views about the policy by identifying some of the issues that might affect the scheme performance in Scotland.

Consumers are not only worried about the inconvenience due to the cost (effort and time) associated with the scheme, but they are also sceptical about the contribution of DRS to sustainability. Although the scheme may have a greater symbolic value than its actual impacts (European Parliament, 2011), the most important implication of this study is the scheme's rationale due to the existence of effective recycling schemes across Scotland. According to the current data, packaging waste in the EU increased by 6.6 million tonnes from 2007 to 2017; however, the recycling rate in the year 2017 for Germany with its DRS was about 70% compared to the UK that was about 64% (Eurostat, 2020). On the contrary, the recovery rate of packaging waste in Germany is about 30% higher than that of the UK although the difference is marginal when considering the consumption of rate of Germany (24.9%) with that of the UK (7.7%) (van Sebille et al., 2016). This knowledge provided a premise for consumers to question the Scottish government's motives and raises doubts about the contribution of the scheme to sustainability. For example,

"The deposit scheme will be counterproductive, the extra petrol costs etc from having to drive the bottles back to deposit bins when all you needed to do was place it in your recycling bin at present! 20p won't make a lot of difference to change people's minds to recycle. If you are going to do it charge £5 then you will really up the recycling rate and make people consider buying the bottle" [Par_598].

This is contrary to Kulshreshtha and Sarangi (2001) who reported a relationship between DRS and consumer recycling behaviour suggesting that DRS could positively/negatively influence recycling behaviour. The current recycling schemes across the Scottish local councils suggest that the scheme is unnecessary and may contribute little or nothing to sustainability.

The Scottish government may initiate whole life costing and lifecycle study to assess and establish the scheme's impacts and contribution compared to the existing traditional recycling schemes. For the scheme to be effective, there should be a UK-wide scheme that is similar across the UK countries in terms of operations and structure suggesting the need for negotiations and collaborations between stakeholders across the UK. Waste planners and policymakers should anticipate how to sustain DRS including its long-term effects. This may require a pragmatic and innovative approach to ensure that single-use packaging is reprocessed to enhance the UK government's CE initiatives.

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7.0 References

- Bhatt, R., Gupta, P., 2019. 'Sentiment Analysis'. Indian J. Sci. Technol. 12, 1–6. <https://10.17485/ijst/2019/v12i41/145556>.
- Barnes, S. J., 2019. Understanding plastics pollution: The role of economic development and technological research. Environ. Pollut. 249, 812-821. <https://doi.org/10.1016/j.envpol.2019.03.108>.
- Berger, W., Nagase, Y., 2018. Waste management regulation: policy solutions and policy shortcomings. Scot. J. of Polit. Econ. 65, 205-223. <https://doi.org/10.1111/sjpe.12137>.
- Blair-Goldensohn, S., Hannan, K., McDonald, R., Neylon, T., Reis, G., Reynar, J., 2008. Building a sentiment summarizer for local service reviews. <https://storage.googleapis.com/pub-tools-public-publication-data/pdf/34368.pdf> (accessed 22 October 2019).
- Brooks, A. L., Wang, S., Jambeck, J. R., 2018. The Chinese import ban and its impact on global plastic waste trade, Sci. Adv. 4, eaat0131. <https://doi.org/10.1016/j.resconrec.2018.10.044>.
- Do, H. H., Prasad, P. W. C., Maag, A., Alsadoon, A., 2019. Deep learning for aspect-based sentiment analysis: a comparative review. Expert Syst. Appl. 118, 272-299.
- Environment and Forestry Directorate (2019). A deposit return scheme for Scotland: Analysis of responses. <https://www.gov.scot/publications/deposit-return-scheme-scotland-analysis-responses/> (accessed 15 January 2020).
- European Environment Agency (2019). The plastic waste trade in the circular economy. Briefing no. 7/2019. <https://doi.org/10.2800/220248> (accessed 10 January 2020).
- Eurostat (2020). Packaging waste statistics. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Packaging_waste_statistics#Waste_generation_by_packaging%20material (accessed 28 August 2020).
- Geyer, R., Jambeck, J. R., Law, K. L., 2017. Production, use, and fate of all plastics ever made. Sci. adv. 3, e1700782. <https://doi.org/10.1126/sciadv.1700782>.
- i Puigvert, M. R., Ayuso, S., Bala, A., Fullana-i-Palmer, P., 2020. What factors determine attitudes towards the implementation of a packaging deposit and refund system? A qualitative study of the perception of Spanish consumers. J. Environ. Manage. 270, 110891. <https://doi.org/10.1016/j.jenvman.2020.110891>.
- Jockers, M. L., Thalken, R., 2020. Text Analysis with R. Springer International Publishing.
- Kozinets, R. V., 2010. Netnography: Doing ethnographic research online. Sage publications.

Kulshreshtha, P., Sarangi, S., 2001. "No return, no refund": an analysis of deposit-refund systems. *J. Econ. Behav. Organ.* 46, 379-394.

Lavee, D., 2010. A cost-benefit analysis of a deposit-refund program for beverage containers in Israel. *Waste Manag.* 30, 338-345.

Linderhof, V., Oosterhuis, F. H., Van Beukering, P. J., Bartelings, H., 2019. Effectiveness of deposit-refund systems for household waste in the Netherlands: Applying a partial equilibrium model. *J. Environ. Manage.* 232, 842-850.

Liu, B., 2012. *Sentiment analysis and opinion mining*. San Rafael, CA: Morgan and Claypool.

<https://doi.org/10.2200/S00416ED1V01Y201204HLT016>.

Markham, A., Buchanan, E., 2012. Ethical decision-making and internet research: Version 2.0. recommendations from the AoIR ethics working committee. Available online: aoir.org/reports/ethics2.pdf (accessed 20 February 2016).

Miafodzyeva, S., Brandt, N., 2013. Recycling behaviour among householders: synthesizing determinants via a meta-analysis. *Waste Biomass Valori.* 4, 221-235.

Numata, D., 2009. Economic analysis of deposit-refund systems with measures for mitigating negative impacts on suppliers. *Resour. Conserv. Recycl.* 53, 199-207.

Oke, A., Kruijsen, J., 2016. The importance of specific recycling information in designing a waste management scheme. *Recycl.* 1, 271-285.

Oke, A., Pedersen, S., McDonald, S., 2017. Public perceptions of the introduction of the single-use carrier bags charge in Scotland. *Soc. Bus.* 7, 127-154.

Oke, A., Ladas, J., Bailey, M., 2020. Ethical consumers: an exploratory investigation of the ethical food consumption behaviour of young adults in the North East of Scotland. *Brit. Food J.*

<https://doi.org/10.1108/BFJ-10-2019-0801>.

Oke, A., 2015. Workplace waste recycling behaviour: A meta-analytical review. *Sustainability.* 7, 7175-7194.

Pires, A., Martinho, G., Ribeiro, R., Mota, M., Teixeira, L., 2015. Extended producer responsibility: a differential fee model for promoting sustainable packaging. *J. Clean. Prod.* 108, 343-353.

Quinlan, S., Shephard, M., Paterson, L., 2015. Online discussion and the 2014 Scottish independence referendum: flaming keyboards or forums for deliberation?. *Elect. Stud.* 38, 192-205.

ten Brink, P., Schweitzer, J., Watkins, E., Janssens, C., De Smet, M., Leslie, H., Galgani, F., 2018. Circular economy measures to keep plastics and their value in the economy, avoid waste and reduce marine litter. Economics Discussion Papers, No 2018-3, Kiel Institute for the World Economy. <http://www.economics-ejournal.org/economics/discussionpapers/2018-3> (accessed 15 November 2019)

The Scottish Wholesale Association (SWA), 2020.

<https://www.scottishwholesale.co.uk/news/posts/2020/may/wholesalers-bitterly-disappointed-after-scottish-parliament-votes-to-pass-deposit-return-scheme-drs-regulations/> (accessed 20 May 2020).

Thomas, C., Sharp, V., 2013. Understanding the normalisation of recycling behaviour and its implications for other pro-environmental behaviours: A review of social norms and recycling. *Resour. Conserv. Recycl.* 79, 11-20.

van Rensburg, M. L., S'phumelele, L. N., Dube, T., 2020. The 'plastic waste era'; social perceptions towards single-use plastic consumption and impacts on the marine environment in Durban, South Africa. *Appl. Geogr.* 114, 102132. <https://doi.org/10.1016/j.apgeog.2019.102132>.

van Sebille, E., Spathi, C., Gilbert, A., 2016. The ocean plastic pollution challenge: towards solutions in the UK. *Grant. Brief. Pap.* 19, 1-16. https://www.imperial.ac.uk/media/imperial-college/grantham-institute/public/publications/briefing-papers/The-ocean-plastic-pollution-challenge-Grantham-BP-19_web.pdf (accessed 15 May 2019).

Walls, M. A., 2011. Deposit-refund systems in practice and theory. *Resources for the future discussion paper.* 11-47. <https://www.rff.org/publications/working-papers/deposit-refund-systems-in-practice-and-theory/> (Accessed 10 December 2019).

Willemsen, L. M., Neijens, P. C., Bronner, F., De Ridder, J. A., 2011. "Highly recommended!" The content characteristics and perceived usefulness of online consumer reviews. *J. Comput-Mediat. Comm.* 17, 19-38.

Wu, G., Li, J., Xu, Z., 2013. Triboelectrostatic separation for granular plastic waste recycling: A review. *Waste Manag.* 33, 585-597. <https://doi.org/10.1016/j.wasman.2012.10.014>.

Zhou, G., Gu, Y., Wu, Y., Gong, Y., Mu, X., Han, H., Chang, T., 2020. A systematic review of the deposit-refund system for beverage packaging: Operating mode, key parameter and development trend. *J. Clean. Prod.* 251, 119660.