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FACT SHEET

Digital deposit return systems: What you need to know (2023)

January 2023

Introduction

By the end of 2022, over 50 countries, states, and provinces worldwide had deposit return systems (DRS) for the recycling of single-use drinks containers, and by the end of 2026, we predict this number to grow to more than 70.

While deposit systems aren't new, their use as a policy tool to tackle litter and the mounting waste crisis has grown over the past decade, as governments seek to implement solutions that are tried-and-tested and that are proven to collect high quantities (90%+) of material suitable for refill or closed-loop recycling. In addition to high recycling rates, a DRS that is designed and operated in accordance with high-performance principles, like those identified in Reloop's [Reimagining the Bottle Bill](#) report,ⁱ can create jobs, bring cost savings for municipalities, avoid carbon emissions, and reduce litter.

As more jurisdictions consider introducing deposit legislation over the next few years, stakeholders are wondering whether a DRS which uses a unique digital-coding approach (referred to commonly as "digital DRS",

or DDRS) should be considered instead of, or at least in addition to, a traditional scheme which uses digital bar code identification. In the UK, for example, an industry working group (IWG) was formed in autumn 2020 to explore the potential of DDRS using unique codes.ⁱⁱ

In January 2022, Reloop released a new fact sheet titled [Digital deposit return systems: What you need to know](#). This fact sheet offered an overview of the key components of the DDRS concept and examined some of the key questions needing to be addressed before real consideration can be given to incorporating these technologies into a DRS. It also presented a high-level summary of the DDRS trials that had taken place to date.

The purpose of this new fact sheet is to provide an update on recent developments in DDRS, including an update on DDRS trials. We also look at new research that's been done to examine the feasibility of implementing DDRS at scale and summarise some of the key findings.*

*Given that research on the topic of DDRS is constantly evolving, we will seek to release an update to this fact sheet on an annual basis, or more frequently through other means such as our website.

Update on existing DDRS research

In May 2021, the IWG (together with Bryson Recycling) commissioned Resource Futures to undertake a high-level economic impact assessment of a DDRS to support discussion around DRS and the best means of implementation, and to provide an indication of the costs and benefits so that a DDRS could be compared to other DRS designs. The report was based on several hypothetical assumptions and confirmed that the feasibility of DDRS at scale is currently unproven.

As a follow-up to that work, in January 2022, Resource Futures was commissioned by the Welsh Government to research and evaluate how a DDRS might be implemented in Wales as well as in England and Northern Ireland. Phase 1 of the research explored key stakeholder perceptions around the design and feasibility of implementing a DDRSⁱⁱⁱ and provided detail regarding the different approaches for a digital scheme. As with the first report, this research confirms that there is currently no holistic deployment of the DDRS concept at scale and that its feasibility remains, to date, unproven:



An end-to-end DDRS system design has not been agreed or finalised. Discussions [with stakeholders] of feasibility therefore varied and remained open-ended, largely because the basic requirements of DDRS have not been set...”



Conversations with stakeholders revealed that the headline concept of a DDRS is valid, and with the right drivers and adequate timelines, an end-to-end solution could be designed. However, the timescales for innovation, cost and impact of the end-to-end solution, particularly compared to the RVM alternative, is unknown. In contrast, many point to the fact that the impact and cost of an RVM-based DRS solution is better understood.”

During the course of the research, stakeholders raised a number of overarching questions and concerns around feasibility that need to be considered. These are summarised below:^{iv}

- › **Timing of implementation** – would it be feasible to introduce the system in phases, to account for the current challenge of printing unique codes on aluminium cans? In general, stakeholders were not supportive of phasing in a DDRS due to operational issues, however some contemplated the introduction of a DDRS for glass bottles first, to demonstrate feasibility.
- › **The need for a uniform solution** – Stakeholders expressed a clear desire to have a uniform system that could be rolled out across the UK and that was clearly aligned with other legislation. Stakeholders had reservations around a DDRS unique to one market, seeing it as economically unfeasible to invest in serialisation and customising only a proportion of SKUs.
- › **Ensuring DDRS does not delay the introduction of a DRS, and if DDRS were to happen, it should complement the current proposal for DRS** – Stakeholders believed that consumers should continue to have the option to return containers to physical return points (i.e., RVMs), with DDRS facilitating the option to return containers at home through existing kerbside recycling programmes.
- › **Ensuring that material value and quality is maintained** – This was particularly important to producers, many of which stressed the need to move towards multi-stream collection systems to minimise contamination.
- › **Uncertainties around labelling** – such as the feasibility of printing unique codes onto cans, given incompatibilities between digital printing speeds and can production line speeds (while options exist for printing onto cans, they are still being investigated).
- › **Uncertainties around activation point** – at what point should the codes be ‘activated’ (i.e., linking/activating the serialised code with a financial DRS deposit that is redeemable by a consumer)? If a single and common point of activation is needed for all drinks containers, where should this be? The decision on whether to activate the code at the point of production or at the point of sale is one that requires clarity in order to support other aspects of the end-to-end process, such as location of the codes on the container, and whether additional measures are needed to activate multipacks.
- › **The ability of a DDRS to match the quality and quantities of material recovered compared to a RVM-based DRS, and to produce evidence of the flow of the material from the point of redemption through collection, sorting, and transport to the reprocessor** – what quality is required, what changes are needed to meet that quality, and how much would it cost? how will a DDRS replicate the function of DRS counting centres to verify the quantity of DRS material 1) collected, and 2) recycled (how to verify the flow of material and that it has actually reached a reprocessor)?
- › **Value for money** – how does DDRS compare to RVM-based DRS in terms of costs vs. benefits, and which gives the best value for money? There is limited evidence on whether an on-the-go DDRS would reduce littering, and stakeholders were hesitant about whether introducing an on-the-go DDRS would provide value for money, especially if investment is required for more sophisticated “smart” bins.
- › **Social accessibility in real-life** – While current trials show DDRS to be both accessible and acceptable by the public, it was acknowledged that the accessibility and acceptability of DDRS should be verified via a large-scale trial, with different demographic groups and recycling behaviours.

To help address stakeholders' questions and concerns, Phase 2 of the study looked at three potential end-to-end designs of a DDRS, and evaluated and compared these in order to understand the strengths and weaknesses of each approach, as well as any current gaps or uncertainty in the system. The report, published in June 2022, acknowledged that "DDRS is a highly topical area of research with continual developments, both in technology and data, as well as in policy." It also acknowledges that while there are several different approaches and technologies being developed that could form part of a DDRS solution, that practical challenges remain. The report identifies the following as three of the most pressing challenges with regards to DDRS implementation:

› **Printing of serialised codes on all packaging formats:**

This is especially challenging for cans, but is also a challenge for smaller producers of who do not own their production lines, as well as producers who export their drinks to the UK.

› **How to handle the sale of multipacks in a DDRS**

(if 'activation' of the serialised codes occurs at the point of sale)

› **Who would bear the costs of serialisation:**

serialisation will require significant investments to production lines. This investment would be over and above the anticipated investment needed for a network of RVMs.

The report concluded that:^{vi}



If done correctly, DDRS has the potential to place the UK at the forefront of digitalisation and innovation, integrating smart waste tracking with DRS. However, many still believe that the practicalities are too challenging, largely due to the fact that it requires a considerable and coordinated effort by all actors along a product's value chain, from producers through to waste management.”

The report also concluded that while DDRS is more convenient for consumers, this convenience comes at a cost in terms of lower material quality: "DDRS generally has a strong advantage related to convenience and the value of people's time. However, we have also seen that RVM-based models inherently support higher quality recycles material." The authors state that "this remains an important question that feeds back into HOW a DDRS can be implemented to ensure similar material quality.”^{vii}

Update on DDRS trials

As highlighted in the January 2022 Resource Futures report, several different organisations are in the process of developing DDRS technology, and different system designs exist. A few trials of the DDRS concept have already taken place in the UK, and technology providers have confirmed several new trials are underway or planned in the coming months to continue testing various aspects of feasibility.^{viii} An overview of the various trials is presented below.

Dublin, Ireland –

July-August 2021^x

Re-universe (previously Reward4Waste), in conjunction with the Irish Waste Management Association (IWMA) and Panda, carried out a 4-week trial to test citizen engagement and return rates for DDRS technology. The trial, which involved more than 200 households in Dublin, saw participants paying a 25-cent deposit on the purchase of milk containers, which was refunded when they returned their empties. To participate, participants had to install an app on their smart phone and stick a code label on their recycling bin. Panda sent a dedicated truck to collect the labelled bins separately on the normal day participants expected to put out their bin for collection. The material was transported to Panda's material recovery facility (MRF), where it was manually sorted to verify that users used the scheme correctly. Of the 700 containers delivered, 655 (94%) were deposited through the app.

Of these, 34 were scanned after recovering them in the MRF, meaning they were recycled by the participant but not initially scanned, representing unclaimed deposits.^x While this pilot utilised actual deposits, the sample size is very small and there is no information about how the milk containers were processed once they arrived at the MRF.

Conwy, Wales –

June-July 2021

From 7 June to 15 July 2021, the Welsh Government, in partnership with Polytag Ltd., Conwy County Borough Council, and WRAP, trialed a new digital incentive system in Colwyn Heights, Conwy.^{xi} The pilot, which set out to assess the viability of DDRS technologies being incorporated into existing council waste collection services, saw 263 households receive six uniquely tagged plastic water bottles. Once used, participants were asked to scan the bottles when placing them in their usual kerbside recycling bin, using a free app. The bottles were scanned again upon collection by the county recycling team. For each bottle that they scanned, participating households received a digital token worth 20p.

Results published in October 2021^{xii} show that 90% of these households scanned four or more bottles before returning it to their usual kerbside bin, with 73% scanning all six. As with the Dublin pilot, it's important to realise that this sample size is very small, and there is no information about how the bottles were processed after collection. It is also important to note that a deposit was never initially paid by the consumer, so this pilot is an example of a digital incentive return system versus a digital DRS.

Whitehead, Northern Ireland –

September 2020-January 2021^{xiii}

In Whitehead, Northern Ireland, CryptoCycle collaborated with Bryson Recycling and Mid and East Antrim Borough Council to run a digital incentive return trial across 2,000 households. The trial, which was paid for by PepsiCo, EnCirc and Britvik Ireland, included ‘home kerbside’ and ‘on-the-go’ recycling. Dedicated labels were placed on all drinks in plastic bottles, glass bottles, cans, and HDPE milk, with varying deposit refunds. Using a free mobile app, participants were asked to scan the unique code on their kerbside recycling bin or on-the-go recycling bin, scan the bottles, and place them inside the bin to claim their reward points (i.e., digital incentives), which were added to the app. Reward points could be redeemed for SPAR Whitehead (local supermarket that supported the trial) vouchers or donated to charity.

The trial saw more than 5,000 items collected and half of the Reward Points were donated.^{xiv} While Re-universe has deemed this trial a “successful proof of concept,” it did not charge residents a deposit so it is not the same concept as a DRS.

Championships Wimbledon 2022^{xv}

At the 2022 Wimbledon tennis tournament, Evian partnered with Reward4Waste to trial a digital incentive system. Visitors to the event were invited to participate in the project by scanning the unique QR code on the recycling bin (which opened up a web-app), and then scan the barcode on their Evian drinks container to capture the recycling. For each Evian drinks container recycled through the app, the user was entered into a draw to win a pair of tickets to the Wimbledon 2023 Women’s Finals.^{xiv} As of December 2022, results were not available.

Glasgow and West Central, Scotland –

February 2022^{xvii}

In February 2022, a digital incentive system trial integrating digital wallets and micropayments launched in Glasgow and West Central Scotland. The pilot was rolled out by HELPFUL (a payment app developer) and Mastercard, in partnership with the Scottish Grocers’ Federation. Throughout the trial, consumers obtained 20 pence for each single-use plastic bottle (up to 750ml in size) scanned and placed into a smart recycling bin or returned to one of the participating convenience stores across the city. Financial incentives were awarded digitally through the Recycle Glasgow mobile app.

According to HELPFUL’s website^{xviii}, the pilot program engaged 4,000 consumers and resulted in the return of 5,000 bottles.

Welshpool, Powys, Wales –

September 2022^{xix}

Although no specific date has been set, a three-month digital incentive system trial covering 3,000 households is expected to kick off in Welshpool, Powys sometime in Spring of 2023. It is anticipated that the trial, supported by Coca-Cola, will cover almost 800 SKUs (200,000 items), including soft drinks, water and ambient products; alcohol and multipacks will be excluded. It will be the first trial to include glass and carton recycling. As with other trials, customers will be asked to scan the containers before placing them in their regular kerbside bins, on-the-go bins, or taking them to retail collection points (Tesco has an ‘automated return point’). For every drinks container recycled, users will be offered a 10p reward, which they can claim through an app. As with the Glasgow trial, this pilot will not charge consumers a deposit and therefore is not the same as a DRS.

Greasby, North-West England –

2019^x

In 2019, Polytag, in partnership with Ecosurety, trialed a digital incentive system in Greasby, North-West England. Fifty households were engaged in the pilot, with each of them receiving two Polytagged items – a bottle of Palmolive with a unique code printed on the substrate, and an aluminium can of Lynx deodorant with the code on a sticker. Households were asked to scan these unique codes with Polytag’s mobile app once the product was finished. Over a period of six weeks, a Polytag team collected the recyclables from the participant households and recycled them at its facility. Before recycling the items, the items were scanned a second time, marking them as recycled in Polytag’s system.

According to Polytag, over 91% of the products scanned by participants were recycled at their facility. Unlike most other trials that offered a monetary reward, the incentive for households to participate in this trial was a donation to a local school; therefore, it is not the same concept as a true DRS, as no deposit was paid.

United Kingdom –

November 2022 – early 2023^{xi}

On 14 November 2022, online retailer Ocado Retail, in conjunction with recycling technology company Polytag, label manufacturer Interket, and coding and marking specialist, Xact, launched a 12-week digital incentive system pilot in the UK. As part of the trial, unique QR codes are applied to Ocado’s recyclable two-pint and four-pint milk containers, which will then be scanned by consumers before recycling it in their regular kerbside bins. After scanning the code, consumers will be able to redeem their incentive through an app. Further details, including the amount of the incentive or whether containers will be tracked beyond the point of redemption, were not available at the time of writing.

Portugal –

October 2022^{xxii}

In October 2022, Norwegian start-up Empower launched the Deposit App to support the implementation of a digital incentive system project in the West Region of Portugal, which has received nearly €1 million in funding and is being co-financed by EEA grants. When consumers place their empty single-use beverage bottles and cans in one of the RVMs deployed as part of the Oeste + Recicla Project, they receive a monetary discount on Transport Passes, through the Empower Deposit App. In total, 18 machines have been deployed across 12 municipalities.

Results of the project are not yet available, and it is worth noting that this is not the same as a DRS since consumers do not pay a deposit at the point of purchase.

Our Thoughts and Conclusions

By the end of 2026, it is projected that over 750 million people will live in jurisdictions with a DRS for the recycling of single-use drinks containers, as new systems become operational in Asia, Europe, Oceania, and South America. As more governments consider introducing deposit legislation, stakeholders are asking whether a digital DRS approach should be considered as an alternative to, or at least along side, a traditional DRS with RVMs.

DDRS has been defined by the UK's IWG as “an alternative...system largely based on kerbside collection of drinks containers on which a unique serialisation code (to individual containers) is printed. Under a DDRS the deposit on a drinks container would be redeemed by the consumer scanning the unique serialisation code via a smartphone application, which would also notify the supporting IT system that the deposit could not be redeemed again.^{xxiii}”

While Reloop recognises that we live in a digital age where our experiences increasingly take place in the virtual world, and where convenience and faster transactions have become the norm, the concept of DDRS is still new, and there are significant proof of concept questions that remain.^{xxiv}

Despite the purported benefits that might be realised, there are many practical challenges in designing and implementing a DDRS across an entire country or region, including (but not limited to) challenges related to serialisation and how to handle multipacks.

In its long-awaited response to its 2021 consultation on DRS, which was published on 20 January 2023, the UK's Department for the Environment Food and Rural Affairs (DEFRA) acknowledged that digital DRS is a possibility in the future, but that the technology is still in its infancy^{xxv}. Although responses from both consumers and businesses indicated support for some sort of digital solution, this support was tempered with a lack of knowledge and evidence on how a DDRS could be introduced in practice and be cost-effective^{xxvi}. Concerns were raised regarding set-up and ongoing operational costs, particularly impacted by the risk of increased levels of fraud and less control over material quality. It was also recognised that changes to container labels, which will be needed to facilitate the implementation of a digital scheme, are not currently possible within the industry.^{xxvii} Therefore, while DEFRA remains interested in the option of DDRS technology and will continue to discuss the application of DDRS during the next phases of implementation, it acknowledges that the development and understanding of the many elements of a digital system continues to progress and that there is no “off the shelf” implementation plan.



Another important issue that's not been adequately addressed in the analysis to date is that of data privacy. In a DDRS, valuable data is collected to facilitate the tracking and tracing of individual containers. This could include, for example: insight into the distribution of products and materials after sale and insight into individual consumption patterns (e.g. which brands does he/she buy? how many and how often?), behaviours, and locations (e.g. where does he/she purchase and return containers?). Resource Futures acknowledges that consumers might have to opt-in to geo-location services as a prerequisite for using the system; for example, in order to initiate the returns process, consumers may have to first scan a code on their kerbside bin – which is registered to their household – and use location services to confirm their location.^{xxviii} Consumers may not want to share this type of information, especially if they see the benefits as minimal. There are also likely to be issues around general data protection regulations; current concepts do not address how personal data will be used and/or how consumers will be protected.

Something else that must be considered is that unlike traditional DRS, DDRS does not support the consumer gesture and behaviour of return (e.g. in stores), which is critical to the development and success of reuse models, and in turn, the achievement of European reuse targets. As shown in **Figure 1**, traditional DRS establishes an infrastructure by which both single-use and refillable drinks containers can be returned. And as has been proven in countries like Sweden, Estonia, Lithuania, Finland, and Denmark, this makes it more likely that consumers will choose refillable packaging over single-use, because they have to return both types of packaging to the same return points anyways. The concept of DDRS, on the other hand, promotes the use of existing household waste collection infrastructure (including 'smart bins' in public spaces), which makes it less likely that consumers will engage in return behaviour.

Figure 1



To date, there are no examples of digital deposit systems operating at a national scale, and while existing trials have shed some light on aspects related to DDRS implementation, Resource Futures cautions that “existing trials have been relatively small, with only a segment of the end-to-end system being trialled (e.g. engagement with the consumer app). In other words, none of the trials have incorporated all the elements of DDRS into a holistic system, and has only experimented with specific elements, such as QR-code stickers applied by retailers or the use of a mobile application for scanning these codes. The Resource Futures report recommends that “a more all-encompassing trial, e.g., bringing in both producers and waste management companies, that can support to answer or validate some of the remaining key questions...would be beneficial.” Resource Futures also notes that “both industry and government would benefit from additional insight, addressing whole-systems thinking, rather than specific feasibility questions.”^{xxix}

In the June 2022 Resource Futures report, a “market readiness level” was assigned at each step in the value chain (e.g., production, retail, consumption, etc.) for each of the end-to-end DDRS designs developed. Of the three designs, only one ranked “high” on the market readiness criteria, while the other two approaches received a “low” and “medium” ranking.^{xxx}

All of this reiterates Reloop’s belief that DDRS is – as of yet – not an existing solution, but rather an evolving concept which is far from being qualified and ready for deployment.

Across the world, there are many examples of best in class DRS which operate currently using bar code verification that are championed as cost efficient and that achieve a high level of performance in terms of amount collected and the quality of that material for reuse or closed-loop recycling. In light of this success, we question whether using unique digital-coding for a DRS is a solution to a non-problem.



Endnotes

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