FACT SHEET

Digital deposit return systems: What you need to know (2024)

May 2024

reloop resources remain resources

Introduction

As of May 2024, 56 deposit return systems (DRS) are operational globally, serving more than 346 million people. During the next few years, several other jurisdictions are expected to implement systems, including Austria (2025), Poland (2025), the Australian state of Tasmania, Turkey, the Indian state of Goa[I], Uruguay[II] and Singapore[III], indicating a growing global momentum for this policy tool. The European Union's new Packaging and Packaging Waste Regulation (PPWR), provisionally agreed to by the European Parliament and Council in the spring of 2024, is anticipated to further bolster the global reach of DRS in the coming decade. Article 44 of the regulation mandates Member States to ensure the separate collection of at least 90% of single-use plastic bottles annually and metal beverage containers up to 3L by 2029 (with the exception of wine, spirit drinks, milk and milk products).[IV] To achieve that target, they are required to set up a DRS for those packaging formats.[V] This means that countries such as Italy, Spain, and France, all of which currently lack DRS, must introduce them by 2029 to attain the 90% target. While adoption of a DRS is optional if countries reach an 80% collection rate by 2026 (Article 44[3]), achieving such high levels without a DRS is unfeasible for most countries, many of which have collection rates below 50%.

Amidst the growing momentum for deposit return legislation, some stakeholders have drawn attention to a distinct variant known as "digital DRS (DDRS)" (also called "serialised DRS" or "smart DRS") which employs a unique digital-coding approach and is very different to classic DRS.

Unlike classic DRS, where consumers pay a deposit upfront and return the empty containers to designated return locations for refunds, digital or serialised DRS involves the use of additional or alternative return pathways. In DDRS, consumers utilise smartphone apps to scan empty containers, which are then placed into existing kerbside recycling bins. Aside from the key difference in return pathways, the concept of DDRS relies on the use of serialised barcodes or QR codes to uniquely identify each container within the system. It's noteworthy that the PPWR does not address digital or serialised DRS in any form.

In January 2022, Reloop released the first instalment in a series of fact sheets on DDRS, titled "Digital Deposit Return Systems: What You Need to Know" providing an overview of DDRS and addressing key considerations for incorporating components of this approach into a classic DRS. A second fact sheet was published a year later, in January 2023, aimed at presenting an update on recent DDRS developments, trials, and new research on implementing DDRS at scale. Since then, a notable surge in reward/incentive-based "DDRS pilots" has been observed, with some groups claiming that serialised deposit systems could achieve similar circular economy outcomes at a much lower cost. The purpose of this new fact sheet is to provide an update on these trials, including a comparative analysis. 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 as of April 2024.

LET'S GO

Classic DRS and Digital DRS: What's the difference?

One significant limitation observed in the many DDRS trials thus far is the notable absence of a monetary deposit, thereby omitting a fundamental component of a DRS. Instead of requiring consumers to pay a sum of money (aka the deposit) upfront at the point of purchase, which is later refunded upon container return, most trials that have been carried out involve the use of rewards or incentives, offered by system operators or producers, to consumers.

This deviation from classic DRS risks skewing the trials' results and undermines their relevance in informing nationwide deposit return legislation. A case in point is WRAP Cymru's April 2024 report on a trial conducted in Brecon, Wales in 2023 (see page 11), which acknowledged that the use of rewards rather than deposits turned out to be a major limitation, and that participation would probably have been higher if deposits had been used.

To better understand the differences between a classic DRS and a DDRS, it helps to compare the two systems in terms of a few key parameters. *Table 1* highlights the contrasts between classic DRSs and digital DRSs (DDRSs) in terms of financing, container collection methods, material quality, impact on litter, and whether they support the transition to refillables.

A **deposit return system** manages substantial sums of money within the system, in the form of deposits, which will need to be repaid to consumers as and when they return containers. The value of the deposits is set high enough to ensure effectiveness, but this also necessitates a fairly sophisticated interface to ensure accountability.

Conversely, a **rewards/incentive system** does not involve consumers paying these sums of money. Instead, it offers a much smaller incentive to a specific group of people, such as those purchasing a particular product or brand. However, if the incentive is substantial, similar to the value of the deposit in a DRS, it tends to apply to only a small fraction of containers.

Table 1
Comparison between Classic DRS vs. DDRS and Rewards-based Alternative Systems

	Classic Deposit Return System (DRS)	DDRS and Rewards-based Alternatives
How is the system financed?	In best practice DRSs, the system is financed through a combination of unredeemed deposits, material revenues, and eco-modulated producer fees.	DDRS and rewards-based alternative systems are often financed through a combination of sponsorship from industry stakeholders, or government subsidies.
How are containers collected?	In best practice DRSs, retailers who sell beverages are legally obligated to provide take-back services and refund the deposit. Return-to-retail (R2R) models offer the most convenience for consumers, allowing them to return containers during shopping (or, if they are consuming their beverage outside of the home, to the nearest convenient location, which may be a shop or other local hub).	DDRS assumes that the existing municipal waste management infrastructure will absorb and manage in-scope material in a dedicated stream, as part of the household waste. This would likely require infrastructure repurposing and upgrades that have not yet been explained or costed in detail.
Quality of material collected?	High-performing DRSs based on best-practice principles are known for their ability to collect high quantities of beverage containers and maintain the materials' high quality in a way that enables closed-loop applications like "bottle-to-bottle recycling". This is because beverage containers are collected separately from other packaging materials (e.g., dirty food containers), which minimises contamination.	RFID-enabled bins and other "smart" containers offer no control on contamination. Although a smart bin might be less contaminated than a regular waste or recycling bin, there is no guarantee of improved material quality, as consumers could discard any type of litter into the bin. It is also unlikely that PET collected through commingled containers would be of food-grade quality.
Impact on litter reduction?	Attaching a monetary value to beverage containers, in the form of a refundable deposit, decreases the likelihood that containers will be littered or remain as litter in the environment.	Unlike a classic DRS, which requires containers to be physically returned to designated points to obtain the deposit refund, a DDRS allows individuals to simply remove or photograph the code to redeem the reward/incentive value. As a result, littered containers are less likely to be picked up and properly recycled, as the focus shifts from returning the container to merely scanning the code.
Does the system facilitate the transition to refillables?	Yes, DRSs serve as a mechanism to promote the adoption of refillable beverage containers by encouraging consumers to return containers and the establishment of necessary infrastructure. With modern DRSs, the consumer does not have to distinguish between returning a container for recycling or reuse; that distinction is made instead by the back-end handling systems.	No, contamination in municipal bins, lack of a system for acquiring and washing reusable containers, and unclear ownership and responsibility for selling collected material, all hinder beverage container reuse.

Update on existing DDRS research

In September 2022, PricewaterhouseCoopers (PwC), in partnership with Fost Plus, Fevia and Comeos,[IX] published a report commissioned by the Belgian packaging industry, aimed at informing the Belgian government's plans for the implementation of a DRS in the Flanders region. The report, *"Every Packaging Counts - DDRS Blueprint Consolidated report"* proposes a blueprint for a Digital DRS targeting PET bottles and aluminium and steel beverage cans. Key findings include an evaluation of DDRS from legal, financial, infrastructure, stakeholder, technical, and technological perspectives, suggesting it offers enhanced consumer convenience at reduced costs compared to classic models, with similar collection rates. It suggests potential cost savings, particularly by incorporating existing collection systems, albeit requiring additional IT infrastructure and collection points. Producers would need to adjust packaging for unique code printing, and pilot projects have emphasised reward-based incentives over true deposit return systems.

However, a thorough analysis conducted by the Fair Resource Foundation (formerly Recycling Netwerk Benelux) suggests that the digital system's feasibility remains uncertain. Moreover, the PwC study neglects to demonstrate whether the digital system would effectively meet its objectives of reducing litter and improving recycling quality. Additionally, the system may not be accessible to all consumers and imposes an unnecessary financial and organisational strain on municipalities.

Critics of this study have pointed out significant gaps in its evaluation of potential DDRS compared to classic DRS models operating globally, which have proven to be highly effective at collecting large quantities of beverage containers for high-quality recycling. Given the lack of data available on DDRS at such a scale, the study's reliance on flawed assumptions, derived from trials that diverge significantly from the operational principles of a classic deposit return system, has raised concerns. As a result, the study's advocacy for a standalone nationwide DDRS is unconvincing, lacking sufficient evidence to support its recommendations.

The PwC study did not examine the effectiveness of the system in the areas identified as gaps, but instead assumed that the impact mirrors that of a classic DRS, despite the entirely different set-up. The study also failed to address additional issues concerning data privacy, fraud, compliance with the European single market regulations, potential for reuse, and improvement of recycling quality, as well as technical feasibility such as code activation, and so on.

The Fair Resource Foundation also noted that several studies have demonstrated the economic viability of classic, return-to-retail (R2R) based deposit systems for businesses, with no additional costs for municipal authorities under 100% producer responsibility. For instance, they referred to a 2015 study conducted by the Public Waste Agency of Flanders[XIII] (OVAM – *Openbare Afvalstoffenmaatschappij voor het Vlaams Gewest*) which estimated the annual costs of can and bottle deposits at EUR 77 million, compared to revenue streams of EUR 82 million, indicating surplus of revenue over costs.[XIV] Similarly, a CE Delft study, commissioned by the Dutch government, is referenced, which revealed even more substantial revenue surplus with a R2R deposit system.[XV]

Therefore, upon examining long-established systems, it becomes clear that classic DRSs function effectively and are widely embraced by diverse stakeholders.

A 2023 study by Eunomia on serialisation makes a point regarding the quality of materials collected from kerbside and on-the-go locations, stating that while Belgium does indeed report good kerbside collection by international standards, material from kerbside collections will be of lower quality and consistency than would be achieved with a classic DRS. Material from on-the-go locations, like public bins is likely to remain relatively low in quality.[XVI] Additionally, collecting from public bins bearing only a scan code could lead to the commingling of deposit and non-deposit packaging types, unlike with RTR-DRS where they are collected separately and isolated from other non-food packaging. The commingling and contamination would result in loss of time, money, and other resources in the recycling infrastructure.

In the Walloon region of Belgium, a study similar to PwC's was requested by the government and conducted by RDC Environment[LVII] titled, *"Établissement des conditions de faisabilité de la mise en oeuvre d'un système de consigne pour les canettes et les bouteilles en plastiques usagées en Belgique"*. It presents different scenarios including that of a classic DRS against a DDRS, and a combination of the two was considered and assessed based on certain flawed assumptions.[LVIII]

The Fair Resource Foundation was able to assess this study from January 2024 and found that the RDC study does not provide a credible pathway for how serialised DRS could be introduced. They raised concerns regarding the uncertainties of fraud prevention and how the cost-benefit analysis was conducted for the study.[LIX]

The *Union des Villes et Communes de Wallonie* (Union of Cities and Municipalities of Wallonia or UVCW) also firmly advises against the possible obligation for municipalities to increase the number of public bins to be able to organise separate collection[LX] mentioned in the study, which is a responsibility that must fall on the packaging producers. Additionally, the UVCW emphasised the need for considering overlooked but important criteria in selecting a scenario — the ability to be implemented across the three Belgian regions and potentially align with existing or future deposit systems in neighbouring countries.

In April 2024, Polytag, a company creating software for DDRSs, joined with the DDRS Alliance, and are continuing to develop a DDRS, using GS1 Digital Link QR codes to enhance recycling schemes. Proponents also argued that a DDRS could reduce costs and carbon emissions by leveraging existing infrastructure. The lack of industry capability for the container labelling changes required was notable.[LVI]

According to Eunomia's study on serialisation, while it does present itself as an alternative marking technology that could provide extra anti-fraud advantages, unless it proves its effectiveness in other functions and operations of a DRS, which already has highly efficient systems in existence, adopting costly and disruptive change is unlikely to be welcomed by most authorities.[XVII]

Technology such as unique-every-time QR codes at scale, invisible UV tag reading technology,[XVIII] RFID with flexible integrated circuits,[XIX] near-field communication (NFC), and invisible security markings exist in the market and are continually being upgraded. And while they can certainly add to the security and traceability aspects of a DRS, the orchestration of a full-scale DDRS that is fraud-proof and convenient for consumers, as a standalone collection system is yet to be seen.

Update on DDRS trials

Operators and innovators in the recycling sector are actively experimenting with diverse digital approaches for collecting post-consumer containers. While many of these tech-driven initiatives primarily focus on incentives and rewards, only a few have progressed to an actual DDRS implementation. This section provides a summary of these trials, and also offers updates on trials mentioned in our previous DDRS fact sheets.[XXI]

Dublin, Ireland (Jul-Aug 2021)

The world's first trial of a Digital Deposit Return System (DDRS) was held in Dublin, Ireland over a four-week period. Conducted by Re-Universe, in collaboration with the Irish Waste Management Association and Panda, the trial involved 200 households. Participants were required to download a smartphone app and pay a **£0.25 deposit** on HDPE milk containers, which was refunded upon recycling through uniquely coded kerbside bins (by scanning the code with their smartphone). Each HDPE container was uniquely coded, facilitating tracking. A dedicated truck collected these containers from the bins. Although it was the first of its kind, the trial's limited sample size raised concerns,[XXII] and there were gaps in information about the milk container processing. The trial, however, achieved a 94% return rate (655 of 700 containers purchased were recycled through the app), indicating positive citizen engagement.[XXIII]

Conwy, Wales (Jun-Jul 2021)

The Welsh Government, along with partners, conducted a **digital incentive system** trial in Colwyn Heights from 7 June to 15 July 2021. In collaboration with Polytag Ltd, Conwy County Borough Council, and WRAP, 263 households received uniquely tagged plastic water bottles. Participants scanned bottles using a free app before placing them in their kerbside recycling bin. Upon collection, households received a £0.20 digital token for each scanned bottle. Results from October 2021 revealed that 90% of households scanned at least four bottles, with 73% scanning all six. Overall, the trial noted a 97% engagement rate.[XXIV] The small sample size and processing details post-collection were not provided. Notably, no initial consumer deposit was involved. While this trial did not include glass bottles in its scope, PolyTag has expressed support for the inclusion of glass in future DRSs in the UK.[XXV]

Recently, it was reported that Polytag has created a prototype scanner that can be added to recycling equipment in local recycling plants. This scanner reads information from the unique barcodes found on most items.[XXVI] The extent to which this technology contributes to the advancement of DRSs in the UK remains to be seen.

Whitehead, Northern Ireland (Sep 2020 - Jan 2021)

The Whitehead Pilot in Northern Ireland marked what was claimed to be the world's first public "Digital DRS trial", conducted in collaboration with Bryson Recycling, MEA Borough Council, and support from Britvic Ireland, PepsiCo, and Encirc. Queen's University Belfast independently assessed the trial to understand consumer attitudes and engagement. The Reward4Waste pilot involved 3,000 households in a self-contained town over four months, without a deposit but instead with a **reward system**. Containers in the system included uniquely coded PET bottles, cans, and glass bottles purchased from a local SPAR.[XXVII]

Residents, using a downloaded app, scanned codes on home recycling boxes and out-of-home bins to register recyclables, redeeming instant reward points for empty containers.

Glasgow & West Central, Scotland (Feb 2022)

In 2022, conducted by HELPFUL and Mastercard in collaboration with the Scottish Grocers' Federation, a trial operating on a **rewards-based system**, rewarded consumers with £0.20 for each scanned single-use plastic bottle (up to 750ml) placed in a smart recycling bin or returned to participating stores.[1] Operated through the Recycle Glasgow mobile app, the pilot engaged 4,000 consumers and achieved the return of 5,000 bottles.

Wimbledon 2022 (Jul 2022)

At the 2022 Wimbledon tennis tournament, Evian and Reward4Waste trialled a digital **incentive system**. Visitors scanned a QR code on the recycling bin, which directed them to a web app. They then scanned the barcode on their Evian drinks container before recycling it. Recycling through the app automatically entered users into a draw for Wimbledon 2023 Women's Finals tickets.[2] The limited-time exercise aimed only at understanding consumer behaviours and assessing their potential implications for future DRS technologies. As of February 2024, the outcomes of the trial remain unpublished. This initiative remains a one-off event, with no plans announced for the upcoming July 2024 championship.

Greasby, England (Oct - Dec 2019)

In 2019, Polytag, in collaboration with Ecosurety and Econpro, conducted a digital **incentive** trial in Greasby, north-west England.[XXIX] Sixty households participated, each receiving two Polytagged items – a Palmolive bottle with a unique code and a Lynx deodorant can with a code on a sticker. Participants scanned the codes using Polytag's app after product use. Over 40 days,[XXX] Polytag collected and recycled the items at its facility, marking them as recycled in their system. Polytag reported a recycling rate of over 91%[XXXI] from the limited trial, the incentive being a donation to a local school. However, no deposit was involved.

Portugal (Oct 2022)

In October 2022, Empower, a Norwegian startup, introduced the Deposit App to facilitate a digital **incentive system** initiative in the West Region of Portugal. The project, backed by nearly €1 million in funding and co-financed by EEA grants, encourages consumers to utilise RVMs under the Oeste + Recicla Project.[XXXII] By depositing their empty single-use beverage containers, consumers receive monetary discounts on Transport Passes via the Empower Deposit App. The initiative spans 12 municipalities, deploying a total of 18 machines – no results have been made publicly available.

[1] "Digital Reward System Launched Ahead of Glasgow Deposit Return Scheme Trial," Packaging Scotland, (February 2022), https://packagingscotland.com/2022/02/digital-reward-system-launched-ahead-of-glasgow-deposit-return-scheme-trial
[2] "The Evain Project at Wimbledon," Re-universe, Available https://re-universe.com/our-projects/the-evain-project-at-wimbledon/

Brecon, Wales (Jul - Nov 2023)

A Scan|Recycle|Reward scheme led by the DDRS Alliance, Kezzler, WRAP Cymru, and Powys County Authorities, took place between 13 July and 2 November 2023, in the town of Brecon, Powys County, Wales.[XXXIV] The voluntary trial amassed participation from 4,300 households, wherein a **£0.10 incentive** for each scanned drink container was awarded to participants. Each container bore a unique QR code. Sponsors including producers and government funded the trial. Returnable containers included cartons, cans, plastic, and glass bottles (excluding multipacks). Welcome packs containing introductory letters, information leaflets, and stickers for household recycling containers were distributed to participating households.[XXXV] Kezzler facilitated the verification of codes via API.[XXXVI] The trial's online app, accessible without a special smartphone app, tracked recycling progress and allowed users to bank or donate rewards upon reaching £5. WRAP Cymru stated that 18,794 rewards were claimed through the trial. The participants were allowed to return eligible containers via four different methods, accommodating those without smartphones[3]:

- **Kerbside:** Used existing home recycling services to credit rewards to an online account; smartphone needed – *Accounting for 58% of the material collected*
- **Automated Return Point (ARP):** Operated like a traditional reverse vending machine, crediting rewards to either an online account or a printed voucher; smartphone optional - *Accounting for 18% of the material collected*
- **Community bins:** Outdoor option crediting rewards to an online account; smartphone needed. Included major retailers in the area - Aldi, Co-op, Morrisons, and Greggs - *Accounting for 3% of the material collected*
- **Over-the-Counter return (OTC):** Rewards redeemed in-store as cash; no smartphone required – *Accounting for 21% of the material collected*

The return of glass containers was restricted to kerbside bins or, in some places, Cafecrush DDRS reverse vending machines,[XXXVII] not OTC. However, this trial did not involve a deposit amount paid by and returned to the consumer.[XXXVIII]

Source: BBC https://www.bbc.com/news/uk-wales-66948446

[3] WRAP Cymru. "Digital Deposit Return Scheme (DDRS) trial in Brecon." (April 2024). Available: https://wrapcymru.org.uk/sites/default/files/2024-04/WRAP-Cymru-DDRS-Trial-Report-ENGLISH-V2.pdf

Blenheim Palace, UK (Jul - Nov 2023)

After an incentive-based pilot in 2022-2023, Blenheim Palace implemented a deposit-based DDRS in January 2024, for reusable coffee cups, covering the entire estate and catering to over 600,000 annual visitors.[XXXIX] The DRS involved a relatively high **deposit amount of £2.00** for each reusable cup, specially manufactured by Circular & Co.[XL] The system is ongoing, but the organisers estimate that it will put an end to the disposal of 400,000 coffee cups which the estate utilises annually.[XLI] The system, facilitated by Re-Universe's digital platform and smartphone app, employs a simple return process without smart bins. Customers must download the app and create an account at the time of purchase. Scanning a QR code marked at the return point dispenses a refund to the consumer's online wallet attached to their account, which can be cashed or donated to the palace's charity. The cups are washed onsite and reused.[XLII] A comprehensive data dashboard offers consumers and administrators real-time inventory tracking and calculates carbon emissions saved, accessible through the mobile app.

Source: re-universe, 2024

Ocado Pilot, UK (Jul - Oct 2023)

In July 2023, Ocado Retail piloted a **reward-based system** involving more than 3,000 customers, offering a **£0.20 reward** for Ocado's own-brand plastic milk bottles.[XLIII] Each bottle featured unique QR codes provided by PolyTag and their partners, Ineterket, which could be scanned and then disposed of in registered kerbside bins, utilising existing recycling systems. A smartphone app developed by Bower facilitated the process, requiring users to operate the app, create an account, link a bank account, and add recycling bins independently. The app's GPS validation ensured recyclables were deposited only in registered bins. Throughout the trial, more than 8 million bottles were equipped with unique QR codes, with over 20,000 subsequently scanned and placed in kerbside bins,[XLIV] for a total reward payout of £4,000.[XLV] The 12 -week trial garnered positive feedback from 93% of participants, with 71% expressing a willingness to use QR codes for deposit claims.[XLVI] Invisible UV tags on labels enabled tracking to designated recycling centres, providing brands and retailers insights.

Source: Polytag

Flemish Region, Belgium (Ongoing)

In the Flemish Region of Belgium, a DDRS is being considered with unique serialised codes, such as Dot Matrix, implemented at locations like Corda Campus in Hasselt and KBC in Leuven. The system involves the use of "Smart Bins", with approximately 135,000 bins proposed initially, each requiring an authorisation code. However, concerns have been raised about the performance and material quality of these "smart" bins compared to the control offered by RVMs. Additionally, there is an ongoing discussion about standardising 1D and 2D markers on containers for the DRS, with potential challenges related to cross-border movement and harmonisation with neighbouring countries such as the Netherlands, Germany, and France.

Zrenjanin, Serbia (Mar - Nov 2023)

In Zrenjanin, Serbia, a "SMART DRS" pilot was trialled jointly implemented by GIZ, Ball Packaging, Sekopak, Solagro Smart Recycling, Mercator-S and Reverse Logistics Group (RLG), in cooperation with NALED and the "Every Can Counts" programme.[XLVII] The initiative covered glass, beverage cartons, PET, and cans, with 12 collection points including return-to-retail (R2R) and non-retail site kiosks. The system involved smart labelling and mobile technology, utilising a new Data Matrix label and security pigment applied through manually activated stickers.[XLVIII] The process includes manual activation of codes at Mercator store locations before products reach the shelves. With 584 users in the first nine months, the SMART DRS method focuses on initial code activation and subsequent validation at collection points. Participants receive points for discounts and monthly prizes through a mobile app as a **reward/incentive.** The Serbian startup, Solagro, is responsible for gamifying the process and integrating the system into Mercator's IT infrastructure through its mobile consumer reward app.[XLIX] The pilot, conducted city-wide in Zrenjanin until 30 November 2023, involved 20 collection devices in 12 locations. The results of the pilot – yet to be published – are to inform and contribute to the development of a nationwide DRS expected in 2027.

Kedarnath, India (May 2022 - present)

Recykal's DDRS in Kedarnath, Uttarakhand, India, was initiated in May 2022. Visitors to the holy shrine of Kedarnath paid a **₹10 (INR) deposit** for QR-coded food and beverage packaging. Consumers received a 10-rupee refund for each pack returned after scanning the QR code at designated Recykal refund or collection centres.[L] The pilot initially covered a 50-55km stretch, involving 733 shops and 12 return points.[LI] The DDRS has now expanded to 7 of the 13 districts in the state of Uttarakhand. The system employed the use of informative stickers or labels bearing QR codes, stuck manually to the container, at the point of sale. Recykal produces these stickers, offsetting the cost by material ownership. The system allowed for cash refunds or instant UPI (Universal Payment Interface), and cash transfers at the return points. The pilot project, in collaboration with the Rudraprayag District Administration and the Government of Uttarakhand, has reported the return of 1,600,000 units (bottles and MLPs or multi-layer plastics) as of 2023. With good rates of return reported, talks of a state-wide expansion are underway.[LII]

While the collection process did not initially involve smart bins or automated collection points, the scheme involved various aspects of a classic DRS, including a deposit amount, and immediate refund upon receiving containers via clean return pathways. As of March 2024, Recykal has begun trialling automated collection and consumer awareness programmes to support it, in a small segment of the Kedarnath trail.

Source: Recykal

Cuttack, India (Nov 2022)

In Cuttack, Odisha, a DDRS was trialled during the Bali-Jatra festival from 8-16 November, 2022. The system involved the collection of PET bottles and food in MLPs at 50 designated collection points, with 18 dedicated stalls specifically allocated for plastic waste collection.[LIII] Participants paid a **deposit of ₹5** at the time of purchase which was refunded upon returning the containers bearing QR code stickers to designated collection points.[LIV] This initiative, organised by the Cuttack Municipal Corporation (CMC), has been a one-off event. In 2023, instead of the deposit return, the CMC announced monetary incentives for vendors at the event to return a variety of plastic products in bulk, with different prices per kilogram of plastic materials.

Scheme operators and innovators such as Fost Plus, Polytag, Re-Universe, and Recykal continue to trial different digital modes of post-consumer container collection systems. However, so far the majority of these digital schemes have been incentive/reward-based, with only a few actually implementing a DRS (such as Recykal and Blenheim Palace).

Our analysis of trials so far

This section evaluates and compares the various container-return trials conducted against four standard/widely accepted components of a DDRS:

> unique marking codes,
> consumer-facing smartphone app,
> smart collection points, and
> complex IT orchestration platforms.

A brief description of these components is provided here, and you can also learn more about them in our 2022 fact sheet on DDRS. The primary factor to consider is whether the trial incorporates an upfront "deposit" paid by consumers or if producers or system operators offer a reward or incentive to encourage container recycling. Based on this fundamental criterion, only four of the trials discussed have implemented a DDRS.

A comparison of these trials and the "digital" aspects of the reward/incentive-based trials is summarised in *Table 2*.

a. Unique Marking Codes

A distinctive identifier, typically a unique serialised QR code affixed to or printed directly on the container, enables the recognition of unique markings on used beverage containers.

b. Consumer-facing Smartphone App

Assuming that all users possess smartphones, the mobile app is used to scan the QR code before the container is returned. The app ordinarily utilises the phone camera, geolocation, and NFC for location verification, enabling users to confirm their presence at the collection point.

c. Smart Collection Points

Typically, in a DDRS, "smart bins" would be employed, possibly utilising current kerbside recycling bins, and introducing collection points in public areas. In all cases, consumers are required to scan their container's QR code before disposal. Aside from these, options include returning containers to retailers via a reverse vending machine (RVM) or manual take-back. The latter two options offer proven return pathways that ensure universal accessibility, providing greater consumer convenience without relying on smartphones or specific apps, and benefiting consumers of all ages by being more inclusive.

d. Complex IT Orchestration Platforms

An IT platform, such as one based on blockchain, is necessary to monitor all containers in real-time as they progress through the supply chain. This platform would oversee and transfer deposits, while also offering a digital record for each deposit.

Table 2
A Comparative Analysis of DDRS Trials

TRIAL REGION	RETURN MOTIVATOR	COMPONENTS OF A DIGITAL DRS			
	Deposit, Reward, or Incentive?	Unique marking codes	Consumer- facing smartphone app	Smart collection points	Complex IT orchestration platforms
Dublin, Ireland	**Deposit Return** £0.25 (32c USD)	✓	✓	✓	Unknown
Blenheim Palace, UK	**Deposit Return** £2 (2.50 USD)	✓	✓	✓	✓
Kedarnath, India	**Deposit Return** ₹10 (12c USD)	✓	✓	✗*	✓
Cuttack, India	**Deposit Return** ₹5 (6c USD)	✓	✗	✗	✗
Conwy, Wales	**Reward** £0.20 (25c USD)	✓	✓	✗	Unknown
Whitehead, Northern Ireland	**Reward** (Unknown)	✓	✓	✗	Unknown
Glasgow & West Central, Scotland	**Reward** £0.20 (25c USD)	Partial – for return points only	✓	✓	Unknown
Brecon, Wales	**Reward** £0.10 (13c USD)	✓	✓	✓	✓
Ocado Pilot, UK	**Reward** £0.20 (25c USD)	✓	✓	✗	Unknown
Portugal	**Reward** (Unknown)	Unknown	✓	✓	Unknown
Flanders, Belgium	**Reward** (Unknown)	✓	✓	Unknown	Unknown
Wimbledon 2022	**Incentive** to enter a draw for tickets	✓	✓	✗	Unknown
Greasby, north-west England	**Incentive** of unknown value donated to local school	✓	✓	Unknown	Unknown
Zrenjanin, Serbia	**Reward/Incentive –** points for discounts and monthly prizes	✓	✓	✓	✓

While the primary goal of most of these trials was to assess the effectiveness of digital "deposit" return systems, the majority of them have predominantly relied on rewards or incentives instead of a monetary deposit paid by (and later refunded to) consumers. Consequently, these trials cannot truly replicate the results of a deposit-based system, making conclusions about their effectiveness, without considering all five components of a DDRS, misguided.

In addition to *Table 2* parameters, assessing classic DRS features such as consumer convenience and programme scope is vital. A more comprehensive evaluation of these trials is necessary to determine their success rate effectively.

*While the initial trial in Kedarnath only offered manual take-back pathways, in March 2024, Recykal began trialling an RVM-based return system.[LV]

Conclusion

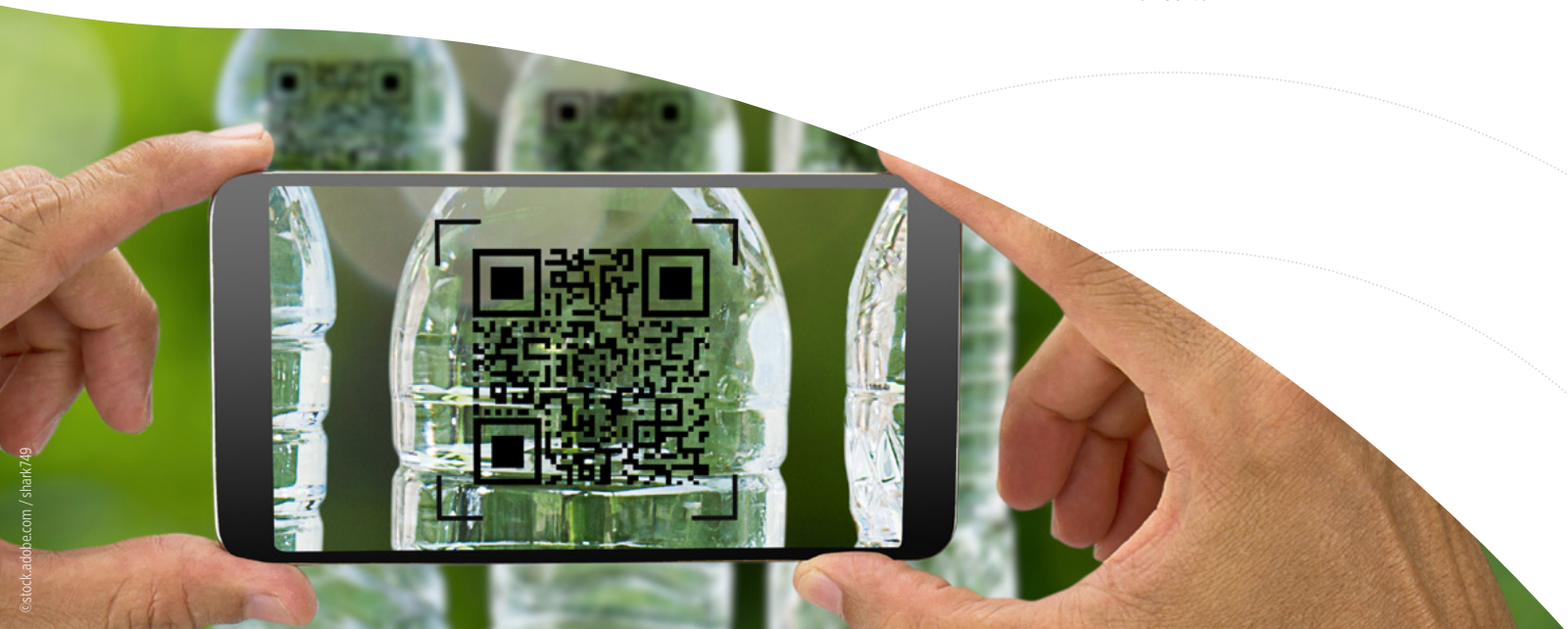
Conversations surrounding Digital Deposit Return Systems (DDRS) are complex, incorporating diverse trials and perspectives. While there is some interest in implementing DDRS by certain stakeholder groups, it's important to distinguish between classic DRS and initiatives primarily focused on rewards or incentives for demonstration purposes. It's also crucial to recognise that the complexity of a classic DRS extends beyond a simple rewards-based system and requires extensive, intricate, and sophisticated infrastructure to effectively manage substantial financial transactions (that is, large amounts of money) across the system in an equitable manner. Although many producers may be willing to finance small-scale, one-off pilot projects involving small cash rewards or other incentives, they may be reluctant to assume broader environmental and social responsibilities when faced with the prospect of funding a large-scale DRS.

Despite the promise of DDRS and the fact that some trials have shown consumers like it for ease and convenience, there remain many unanswered questions and areas of concern, including around cost, implementation, material quality, lack of conclusive results on litter reduction, accessibility issues, and unresolved fraud risks, as seen in the case of the Flemish region of Belgium. Moreover, an important consideration in DDRS implementation is equity, particularly in regions where the informal sector plays a significant role and internet connectivity may be limited. The assumption of universal internet access and seamless digital engagement overlooks the realities of many communities, highlighting potential disparities in participation. The inclusion of small producers in DDRS initiatives also warrants attention, as their participation and compliance may present unique challenges.

Industry pushback against DDRS has also emerged. In response to the results of trials and assessments of DDRS feasibility, organisations like Alupro have raised concerns about the complexity of sorting non-target materials in kerbside collection systems, highlighting potential inefficiencies compared to classic DRS.[LXI]

In conclusion, while the PwC study and other reports have presented a DDRS as a cost-effective and efficient alternative to classic systems, criticisms and concerns have arisen regarding its feasibility and effectiveness, as well as the assumptions on which these studies have relied. Analysis by The Fair Resource Foundation highlights uncertainties surrounding litter reduction, accessibility issues for consumers, and the system's reliance on digital technology. Furthermore, according to Eunomia, while there is merit in the widespread adoption of serialised container labelling that could potentially enhance cross-border DRS compatibility in the future, addressing technical challenges such as label standardisation and geofencing is essential for supply chain accessibility beyond domestic markets.

As policymakers, industry stakeholders, and researchers navigate the complexities of digital DRS, it is imperative to approach innovation with caution. The studies so far fail to address crucial factors such as data privacy, fraud prevention, and compliance with regulations, while feedback from industry stakeholders raises doubts about the practicality and cost-effectiveness of implementing a DDRS.[LXVI] With unresolved issues regarding fraud prevention, recycling quality, and the potential burden on municipalities, the widespread adoption of a DDRS remains uncertain.



Endnotes

[i] "Goa: Soon, give single-use cans bottles to deposit stations get a refund," The Times of India. Available: https://timesofindia.indiatimes.com/city/goa/soon-give-single-use-cans-bottles-to-deposit-stations-get-a-refund/articleshow/100779015.cms

[ii] Unesda, "Deposit Refund Systems". Available: https://www.unesda.eu/deposit-refund-systems/

[iii] National Environment Agency, "The Beverage Container Return Scheme Highlights Singapore's Commitment to Tackle Packaging Waste." Available: https://www.nea.gov.sg/media/news/news/index/the-beverage-container-return-scheme-highlights-singapore-s-commitment-to-tackle-packaging-waste

[iv] "ST-7859-2024-INIT," European Council. Available: https://data.consilium.europa.eu/doc/document/ST-7859-2024-INIT/en/pdf

[v] Notably, it's worth mentioning that the PPWR makes no mention or reference to digital or serialised deposit return systems.

[vi] "Growing Bottle Bill Modernization and Momentum," Plastics Recycling Update. Available: https://resource-recycling.com/plastics/2023/12/12/growing-bottle-bill-modernization-and-momentum/

[vii] Recycle Cartons, "Ontario consults, Québec accelerates, New Brunswick prepares, and B.C. succeeds: Canada's Deposit Return Systems continue to evolve." Available: https://www.recyclecartons.ca/newsletter/ontario-consults-quebec-accelerates-new-brunswick-prepares-and-b-c-succeeds-canadas-deposit-return-systems-continue-to-evolve/

[viii] "11 Advantages of a Digital Deposit Return Scheme," Polytag Blog. Available: https://blog.polytag.io/11-reasons-to-pursue-a-fully-digital-deposit-return-scheme/. See also: https://spnews.com/drs-not-fit-for-the-21st-century-ceo-of-digital-drs-platform/, https://www.circularonline.co.uk/opinions/a-technical-solution-for-ddrs-exists-and-should-be-implemented/

[ix] "Every Packaging Counts - DDRS Blueprint Consolidated report (2022)," PwC.

[x] "Digital divide: Half of Belgians lack essential online skills," The Brussels Times, 2 September, 2022. Available: https://www.brusselstimes.com/282545/half-of-belgians-lack-essential-digital-skills

[xi] "Analysing the Digital Deposit Return System proposition of the Belgian industry," Fair Resource Foundation (formerly Recycling Network Benelux). Available: https://fairresourcefoundation.org/en/digital-deposit-pwc-study-weak/

[xii] "Digital Deposit PwC Study Weak," Fair Resource Foundation, Available: https://fairresourcefoundation.org/en/digital-deposit-pwc-study-weak/

[xiii] "Digital Deposit PwC Study Weak," Fair Resource Foundation, Available: https://fairresourcefoundation.org/en/digital-deposit-pwc-study-weak/

[xiv] "Addendum bij de impactanalyse van het invoeren van een statiegeldsysteem op eenmalige drankverpakkingen in Vlaanderen," CE Delft, Available: https://ce.nl/wp-content/uploads/2021/03/Addendum-bij-Impactanalyse-invoeren-Statiegeldsysteem-DEF.pdf

[xv] "Kosten en effecten van statiegeld op kleine flesjes en blikjes," CE Delft, Available: https://ce.nl/wp-content/uploads/2021/03/CE_Delft_2L17_Kosten_en_effecten_statiegeld_Def.pdf

[xvi] Serialised Deposit Return Systems - An assessment of the feasibility and desirability of container serialisation and alternative DRS return pathways in Belgium (September 2023) https://fairresourcefoundation.org/wp-content/uploads/2024/04/Serialised-DRS-Assessment-FINAL.pdf#new_tab

[xvii] Serialised Deposit Return Systems - An assessment of the feasibility and desirability of container serialisation and alternative DRS return pathways in Belgium (September 2023) https://fairresourcefoundation.org/wp-content/uploads/2024/04/Serialised-DRS-Assessment-FINAL.pdf#new_tab

[xviii] "UV Tag Reader," Polytag Blog. Available: https://blog.polytag.io/pilots/uv-tag-reader/

[xix] "RFID with Flexible Integrated Circuits," Pragmatic Semiconductor. Available: https://www.pragmaticsemi.com/rfid

[xx] "DDRS The Facts Jan 2022," Reloop Platform, p. 2. Available: https://www.reloopplatform.org/wp-content/uploads/2023/05/DDRSthefacts_Jan2022_hq-1.pdf p2.

[xxi] "RELOOP Factsheet Digital-DRS-An-Update Jan 2023," Reloop Platform. Available: https://www.reloopplatform.org/wp-content/uploads/2023/05/RELOOP_Factsheet_Digital-DRS-An-Update_Jan-2023_Web.pdf

[xxii] "RELOOP Factsheet Digital-DRS-An-Update Jan 2023," Reloop Platform. Available: https://www.reloopplatform.org/wp-content/uploads/2023/05/RELOOP_Factsheet_Digital-DRS-An-Update_Jan-2023_Web.pdf

[xxiii] re-universe, " Projects". Available: https://re-universe.com/our-projects/

[xxiv] "Conwy Pilot," Polytag Blog. Available: https://blog.polytag.io/pilots/conwy-pilot/

[xxv] "Digital Deposit Return Scheme by Deeside Company in Abergele," North Wales Pioneer. Available: https://www.northwalespioneer.co.uk/news/20297541.digital-deposit-return-scheme-deeside-company-conwy/

[xxvi] "Digital Deposit Return Scheme by Deeside Company in Abergele," North Wales Pioneer. Available: https://www.northwalespioneer.co.uk/news/20297541.digital-deposit-return-scheme-deeside-company-conwy/

[xxvii] "RELOOP Fact sheet Digital deposit return systems: An update January 2023," Reloop Platform. Available: https://www.reloopplatform.org/wp-content/uploads/2023/05/RELOOP_Factsheet_Digital-DRS-An-Update_Jan-2023_Web.pdf

[xxviii] "GS1 UK - re-universe Digital pioneers 191023," GS1UK. Available: https://www.gs1uk.org/sites/default/files/GS1%20UK%20-%20re-universe%20Digital%20pioneers%20191023.pdf

[xxix] "RELOOP Fact sheet Digital deposit return systems: An update January 2023," Reloop Platform. Available: https://www.reloopplatform.org/wp-content/uploads/2023/05/RELOOP_Factsheet_Digital-DRS-An-Update_Jan-2023_Web.pdf

[xxx] Ecosurety-funded trial of disruptive 'tag and trace' recycling technology launches," Ecosurety. Available: https://www.ecosurety.com/news/ecosurety-funded-trial-of-disruptive-tag-trace-recycling-technology-launches/

[xxxi] "Greasby Digital DRS Pilot," Polytag Blog. Available: https://blog.polytag.io/pilots/greasby-digital-drs-pilot/

[xxxii] "Deposit Return Scheme," Sustainability Beat. Available: https://www.sustainability-beat.co.uk/2023/06/09/deposit-return-scheme/

[xxxiii] "Empower Deposit App Goes Live in Portugal Providing Incentives from RVMs Directly Into Your Phone," Medium. Available: https://medium.com/empowerplastic/empower-deposit-app-goes-live-in-portugal-providing-incentives-from-rvms-directly-into-your-phone-21ddf3a93755

[xxxiv] "Scan Recycle Reward," Powys County Council. Available: https://en.powys.gov.uk/recyclereward

[xxxv] "Digital Deposit Return Scheme Trialled in Wales," Packaging Europe. Available: https://packagingeurope.com/news/digital-deposit-return-scheme-trialled-in-wales/10085.article

[xxxvi] "Kezzler helps power Brecon digital deposit return pilot programme." Kezzler. Available: https://kezzler.com/news/scan-recycle-reward-digital-deposit-return/

[xxxvii] "Recycling DDRS Stop Littering," LinkedIn post by Jonathan Dormer. Available: https://www.linkedin.com/posts/jonathan-dormer-58340698_recycling-ddrs-stoplittering-activity-7089997753056940033-upOH?utm_source=share&utm_medium=member_desktop

[xxxviii] "Brecon Scan|Recycle|Reward Trial Review." WRAP Cymru. Available: https://wrapcymru.org.uk/sites/default/files/2024-04/WRAP-Cymru-DDRS-Trial-Report-ENGLISH-V2.pdf

[xxxix] "Great news: Our returnable Cups Scheme is back for good," Blenheim Palace. Available: https://www.blenheimpalace.com/stories/returnable-cups-scheme-back/#:~:text=Once%20visitors%20are%20finished%20with,of%20the%20year%2C%20Yellow%20Submarine.

[xl] "SMART Cup Technology," Circular and Co. Available: https://circularandco.com/smart

[xli] "This is not a trial – No Disposable Cup Day - Reuse," LinkedIn post by re-universe. Available: https://www.linkedin.com/posts/re-universe_thisisnotatrial-nodisposablecupday-reuse-activity-7115300522491817985-ccSS?utm_source=share&utm_medium=member_desktop

[xlii] "Cup - re-universe," re-universe. Available: https://re-unverse.com/cup/

[xliii] "20p reward for recycling with Ocado Retail, Polytag and Bower," Ocado Retail Sustainability. Available: https://sustainability.ocadoretail.com/dev/wp-content/uploads/2023/10/Polytag-report-Ocado_for-Bower.pdf

[xliv] "Ocado's digital deposit return scheme trial yields positive results," Edie.net. Available: https://www.edie.net/ocados-digital-deposit-return-scheme-trial-yields-positive-results/#:~:text=The%20end%2Dof%2Dtrial%20report,of%20up%20to%20%C2%A34%2C000.

Endnotes

[XLV] "Ocado's game-changing digital deposit scheme shows potential as three-month pilot comes to an end," Zero Carbon Academy. Available: https://www.zerocarbonacademy.com/posts/ocados-game-changing-digital-deposit-scheme-shows-potential-as-three-month-pilot-comes-to-an-end

[XLVI] "First nationwide DDRS trial: 20,000 Cash Rewards Redeemed by Ocado Retail customers," Envirotec Magazine. Available: https://envirotecmagazine.com/2023/10/24/20000-cash-rewards-redeemed-by-ocado-retail-customers-in-first-nationwide-ddrs-trial/

[XLVII] "Serbia among the first to test the innovative packaging waste collection system," NALED. Available: https://naled.rs/en/vest-srbija-medju-prvima-testirala-inovativni-sistem-za-prikupljanje-ambalaznog-otpada-8468

[XLVIII] "Driving Change: Exploring the Impact of RLGS Deposit Return System Pilot in Serbia," Reverse Logistics Group. Available: https://rev-log.com/driving-change-exploring-the-impact-of-rlgs-deposit-return-system-pilot-in-serbia-with-business-development-manager-jelena-simic/

[XLIX] "SMART DRS: The Future of Waste Collection Starts in Serbia," Reverse Logistics Group. Available: https://rev-log.com/smart-drs-the-future-of-waste-collection-starts-in-serbia/

[L] "India's First Digital Deposit Refund System Wins Digital India Awards 2022," Recykal. Available: https://recykal.com/blog/indias-first-digital-deposit-refund-system-wins-digital-india-awards-2022/

[LI] "Rudraprayag admin's QR code scheme gets 'Digital India' Award," The Times of India. Available: https://timesofindia.indiatimes.com/city/dehradun/rudraprayag-admins-qr-code-scheme-gets-digital-india-award/articleshow/96825652.cms

[LII] "Report by Uttarakhand SPCB in EA No. 27 of 2023 in OA No. 561 of 2022 Urvashi Shobhna Kachari vs Union of India & Ors," Green Tribunal. Available: https://greentribunal.gov.in/sites/default/files/news_updates/REPORT%20BY%20UTTARAKHAND%20SPCB%20IN%20EA%20NO.%2027%20of%202023%20IN%20OA%20NO.%20561%20of%202022%20URVASHI%20SHOBHNA%20KACHARI%20VS%20UNION%20OF%20INDIA%20&%20ORS.pdf

[LIII] "Go Green at Bali Jatra 2023: The Largest Open-Air Festival in Asia Returns with Thrilling Attractions While Promoting Sustainability," PR Newswire. Available: https://www.prnewswire.com/in/news-releases/go-green-at-bali-jatra-2023-the-largest-open-air-festival-in-asia-returns-with-thrilling-attractions-while-promoting-sustainability-302001869.html

[LIV] "Bali Jatra 2022: Get a Refund on Returning Plastic Items; Know How," Odisha Bytes. Available: https://odishabytes.com/bali-jatra-2022-get-a-refund-on-returning-plastic-items-know-how/

[LV] "Digitizing the Waste Management System." Available: https://www.linkedin.com/feed/update/urn:li:activity:7175791516026576896/

[LVI] Introducing a deposit return scheme for drinks containers in England, Wales and Northern Ireland (2023), Government Response https://www.gov.uk/government/consultations/introduction-of-a-deposit-return-scheme-in-england-wales-and-northern-ireland

[LVII] "Together for a smart deposit scheme: first pilot projects start in Flanders," Fost Plus. Available: https://www.fostplus.be/en/blog/together-for-a-smart-deposit-scheme-first-pilot-projects-start-in-flanders

[LVIII] "Consigne sur les canettes et bouteilles: présentation des résultats de l'etude de faisibilité au arlement de Wallonie," Tellier Wallonie. Available: https://tellier.wallonie.be/home/presse--actualites/communiques-de-presse/presses/consigne-sur-les-canettes-et-bouteilles--presentation-des-resultats-de-letude-de-faisabilite-au-parlement-de-wallonie.html

[LIX] Assessment of RDC-study on deposit schemes for the Walloon Government: How to move forward with a deposit refund scheme in Belgium (Jan 2024), Recycling Network Benelux

[LX] "UVCW Environment News," Union des Villes et Communes de Wallonie. "Implementation of a deposit system for used plastic cans and bottles in Belgium: the opinion of the UVCW." Available: https://www.uvcw.be/environnement/actus/art-8648

[LXI] "Aluminium sector 'does not support' digital deposit return scheme," Circular Online. Available: https://www.circularonline.co.uk/news/aluminium-sector-does-not-support-digital-deposit-return-scheme/

[LXII] "Packaging deposits, packaging EPR get federal attention," Resource Recycling. 19 March 2024. Available: https://resource-recycling.com/recycling/2024/03/19/packaging-deposits-packaging-epr-get-federal-attention/?fbclid=IwAR0-8JaOdddmZp8b0evNPoNcXXToU8jHsmLiuV1SF-p-Ti-MBKqLxL0p0MI

[LXIII] "DRS Fact Sheet Deposit Return Systems Reduce Litter," 5FEB2021," Reloop Platform. Available: https://www.reloopplatform.org/wp-content/uploads/2021/02/DRS-Factsheet-Litter-long-5FEB2021.pdf

[LXIV] Resource Recycling. (19 March 2024). Packaging deposits, packaging EPR get federal attention. Available: https://resource-recycling.com/recycling/2024/03/19/packaging-deposits-packaging-epr-get-federal-attention/?fbclid=IwAR0-8JaOdddmZp8b0evNPoNcXXToU8jHsmLiuV1SF-p-Ti-MBKqLxL0p0MI

[LXV] Resource Recycling. (19 March 2024). Packaging deposits, packaging EPR get federal attention. Available: https://resource-recycling.com/recycling/2024/03/19/packaging-deposits-packaging-epr-get-federal-attention/?fbclid=IwAR0-8JaOdddmZp8b0evNPoNcXXToU8jHsmLiuV1SF-p-Ti-MBKqLxL0p0MI

[LXVI] "Alupro rejected digital deposit return schemes (DRS) for aluminium cans," Alcircle. Available: https://www.alcircle.com/news/alupro-rejected-digital-deposit-return-schemes-drs-for-aluminium-cans-101963

unger+

reloop

resources
remain
resources

www.reloopplatform.org

Follow us