



# Plovie App Paper Cup Recycling Pilot

## Evaluation Report



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# Executive Summary

The Cardiff Plovie\* Paper Cup Recycling Pilot was the world's first initiative to combine AI-enabled cup recognition with consumer rewards to influence on-the-go recycling behaviour. The project demonstrated that digital technology can meaningfully increase correct cup disposal, generate verifiable environmental data, and engage consumers across multiple brands and locations.

## Key Outcomes

- High consumer engagement: An average of 20 cups recycled per active user.
- Behaviour change delivered: 3,822 cups were scanned and 3,384 correctly sorted (89% accuracy), resulting in 50.99 kg CO<sub>2</sub> saved.
- Waste reduction at bin level: A 70% reduction in paper cups found in general waste, and an 83% reduction for participating brand cups at analysed sites.
- Gamification worked: 78% of users who started the Cup Challenge completed it, demonstrating the motivational impact of rewards and challenges.
- AI technology validated: Plovie's system reliably recognised cups in real-world environments and provided accurate, auditable data without requiring barcodes or packaging changes.

## Behavioural Insights

The pilot revealed strong public willingness to recycle when the process is simple, rewarding, and visible.

- Peak participation occurred during commuter hours and Fridays, suggesting recycling as part of morning routines and end-of-week "clear-out" behaviour.
- Middle-aged adults and women were the most engaged demographics.
- However, a consistent intention–action gap emerged: while many users scanned cups, fewer returned them to stores.
- Convenience remains the biggest barrier; placing cup bins at natural drop-off points is essential for scaling.

## System-Level Challenges

- Confusion about Welsh recycling legislation
- Uncertainty around different cup materials (plastic-lined, compostable-lined, lids)
- Concerns about contamination under the Workplace Recycling Regulations
- Perceived tension between promoting reuse vs. recycling
- To enable broader uptake, future rollouts must clarify how reuse and recycling complement each other, with reuse prioritised and recycling offered when reuse is not feasible.

\* Plovie was previously known as **Bower**. Recently, and since the conclusion of our campaign, Bower has rebranded to Plovie in the UK. It will be referred to as Plovie throughout the report.

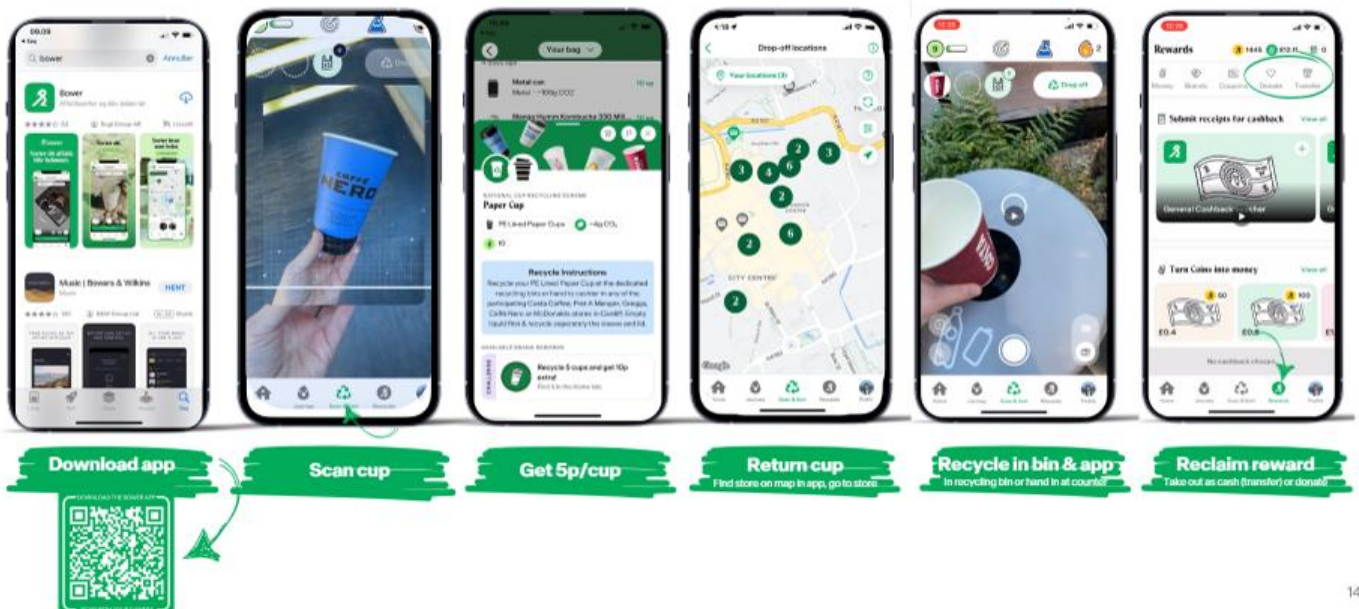
# Executive Summary

## Operational Learning

- Awareness among management was strong, but frontline staff engagement varied. Enhanced staff training, incentives, and clearer point-of-sale prompts will be critical to embedding consistent recycling behaviours.
- Recommendations for scaling
- Strengthen pre-launch awareness
- Introduce frontline staff incentives and ongoing training.
- Improve reward visibility and provide real-time feedback to reinforce participation.
- Focus rollout on high-footfall commuter hubs, workplaces, and transport locations.
- Support users with image-capture guidance to improve AI recognition.
- Streamline messaging around reuse-first, recycle-when-needed.

## Conclusion

The Cardiff pilot offers a strong proof of concept for digital, reward-driven recycling. It demonstrates that when aligned with infrastructure, incentives, and social cues, AI can transform everyday sustainability behaviours. By reducing friction, clarifying messaging, and deepening staff and employer engagement, the approach has significant potential to scale across cities and materials, turning cup recycling into a mainstream, routine habit and supporting Wales' wider circular economy ambitions.



# Background To The Campaign

Single-use takeaway paper cups remain a persistent environmental challenge in the UK.

Despite growing adoption of reusable cups, an estimated 2.5 billion disposable paper cups are used annually, with many ending up in landfill or as litter due to poor recycling practices. Only around one in 400 cups are currently recycled, while approximately 500,000 are littered every day (UK Parliament, 2018).

The main barrier is the composition of these cups: high-quality paper fibres are fused with a thin plastic lining to make them waterproof, preventing them from being recycled with standard paper waste. Specialist facilities are required to separate these materials. As a result, most cups are discarded in public or general waste bins, beyond the reach of regular recycling collections.

When processed correctly, the materials can be recovered efficiently: the fibres are recycled into new paper products such as packaging and stationery, while the plastic lining is repurposed into items like garden furniture and cable ties. However, public awareness of these specialist routes remains low, and few local authorities currently offer dedicated cup-recycling schemes.

In response, this pilot recycling initiative, launched in Cardiff in 2025 tested a world's first AI return-and-reward system for takeaway cups, ensuring they were directed to specialist recycling facilities.

Cardiff, with its dense urban layout, café culture, and strong recycling performance, provides an ideal setting to explore how consumer incentives and targeted infrastructure can reduce litter and recover valuable materials. This pilot has been designed to demonstrate a scalable model for cities seeking to integrate paper cup recycling into broader circular-economy strategies.



# Aims and objectives

The campaign was designed to test a new approach to paper cup recycling while simultaneously gathering valuable insights into how people respond to reward-based environmental initiatives.

The campaign analytics were then used to explore the behaviours behind these insights and to understand the potential for scaling the campaign further.

**The key campaign insights being explored were:**

## 1. Adoption

Are consumers willing to participate in reward-based paper cup recycling?

## 2. Behaviour Change

Will the rewarding drive a change in consumer recycling behaviour?

## 3. Environmental Impact

Will the rewarding increase collection and recycling rates?

## 4. Scalability

Can this campaign be scaled up efficiently?

**The key campaign deliverables were:**

- To collect 100,000 cups
- In the Cardiff city centre area
- Between 22<sup>nd</sup> April and 22<sup>nd</sup> July (later extended to 31<sup>st</sup> August)



# Outline of Public Campaign

## A World-First AI- Based Paper Cup Recycling Initiative in Cardiff

On 22 April 2025, a groundbreaking AI-based pilot initiative to tackle paper cup waste launched in Cardiff city centre, in a partnership between:

- [Keep Wales Tidy](#),
- [National Cup Recycling Scheme](#) and
- Innovative waste sorting app, [Plovie](#).

Customers purchasing drinks in paper cups were invited to download the Plovie app, scan their cup with the AI photo-scanner, and return it to a participating store for proper recycling. Each returned cup earned a reward via the app, incentivising disposal and ensuring the cups were fully recycled.

The initiative was a unique collaboration between competing brands, uniting in the fight against landfill waste and enabling residents, visitors and commuters in Cardiff, to recycle their used paper cups at participating Caffè Nero, Costa Coffee, Greggs, McDonald's and Pret a Manger stores in return for a 5p reward.

The app-based campaign was supported by in-store POS activity; targeted social media; Out of Home media; broadcast media; and trade and consumer press coverage.

The activity was originally due to last for three months but was extended for a further month to 31 August, at which point the original 5p reward was increased to 50p per cup to increase participation.

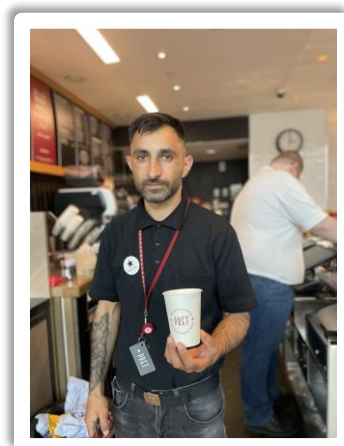
# Campaign Support Activity

## Campaign set-up

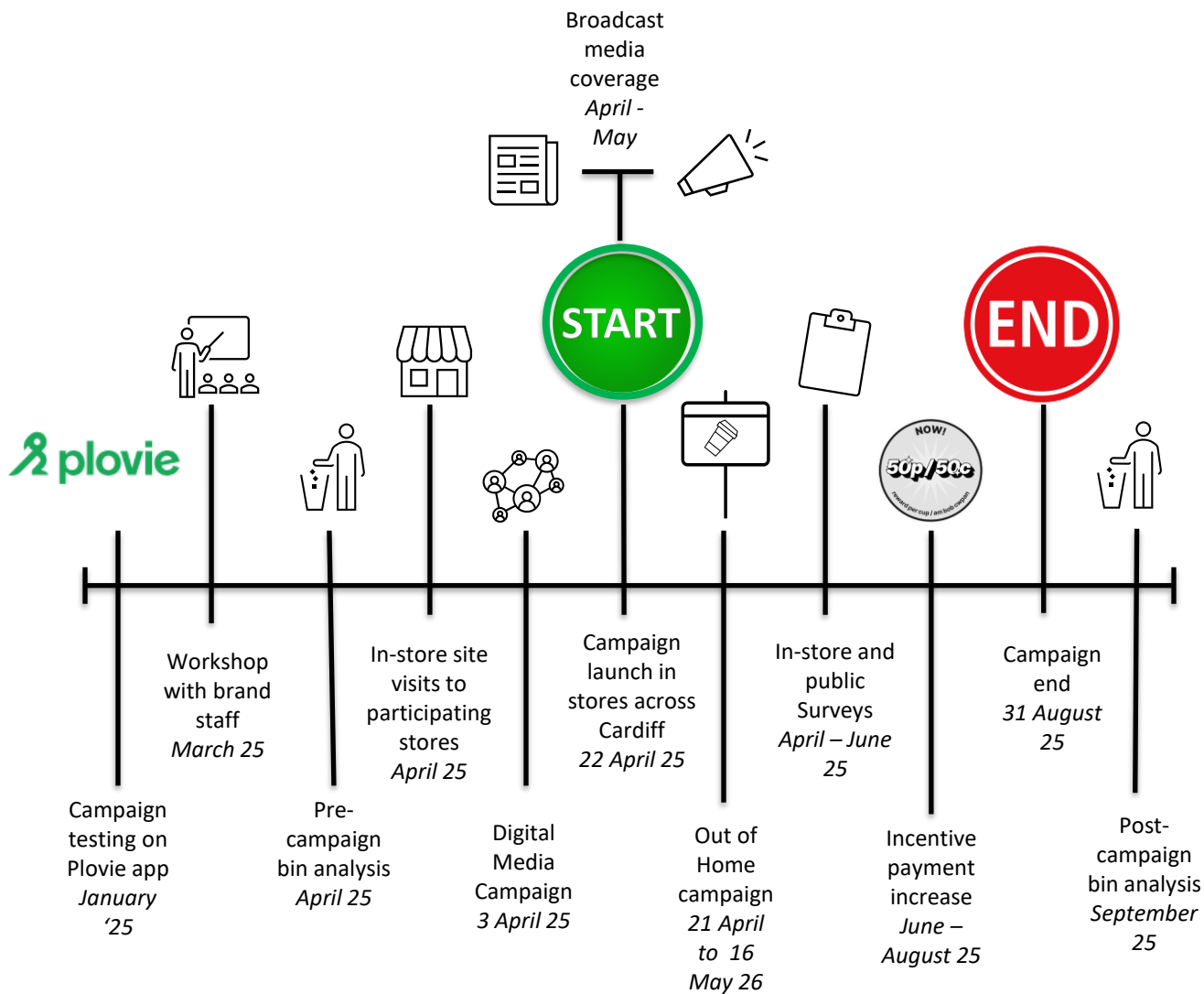
- Pre-campaign workshop held with brand staff to explain the campaign and encourage supportive participation by National Cup Recycling Scheme, Keep Wales Tidy and Plovie teams.
- Pre-Campaign in-store visits to all participating sites by Keep Wales Tidy and National Cup Recycling Scheme staff to explain activity to staff, set up POS collateral and encourage staff participation.
- An approach by Keep Wales Tidy to corporate businesses across Cardiff to invite them to participate in the campaign.
- Mid-campaign in-store visits to hand out new posters, POS and increased reward stickers and to talk to staff.

## Analysis

- Bin compositional analysis of 10 bins across Cardiff city centre in March 2025 and September 2025 to compare paper cup content composition between the beginning and end of the campaign.
- In-store Customer surveys
- In-store staff surveys
- General public survey (via social media and Bower app)



# Activity Timeline



## Plovie

Plovie is an award-winning consumer engagement app designed to increase recycling and encourage more sustainable everyday behaviours. The app enables users to scan packaging, receive clear guidance on how to recycle it correctly, and earn rewards such as points, discounts, or donations for taking positive environmental actions.

By combining behavioural insights, incentives, and digital technology, Plovie helps bridge the gap between sustainability intentions and real-world action. The platform provides brands, organisations, and communities with a practical way to engage consumers, improve recycling participation, and support behaviour-change initiatives at scale.

Plovie has received industry recognition for its innovative approach, including support through a Google grant for social good, reflecting the platform's potential to deliver measurable environmental impact through digital innovation. Plovie was also named People's Choice Winner at the Global Startup Awards 2023, recognising its innovative, consumer-focused approach to driving recycling and sustainable behaviour at scale.

Collaborative digital recycling pilot with Ocado & Polytag: Plovie app (Bower) partnered with Ocado Retail and recycling technology firm Polytag on a world-first initiative testing a digital deposit return scheme (DDRS).

To avoid any confusion, Plovie was previously known as **Bower**. Recently, and since the conclusion of our campaign, Bower has rebranded to Plovie in the UK. This reflects a refreshed identity while maintaining their ongoing commitment to sustainability and reducing environmental impact.



## The Plovie App – Pioneering innovation

The Plovie App is a world-first platform designed to help individuals and organisations measure, understand, and reduce their environmental impact. By tracking consumption and providing actionable insights, the app empowers users to make informed, sustainable choices in their daily lives.

A key innovation within the app is an AI-powered scanning solution, developed in partnership with Google.org, which provides users with accurate, real-time sorting guidance for recyclable items worldwide.

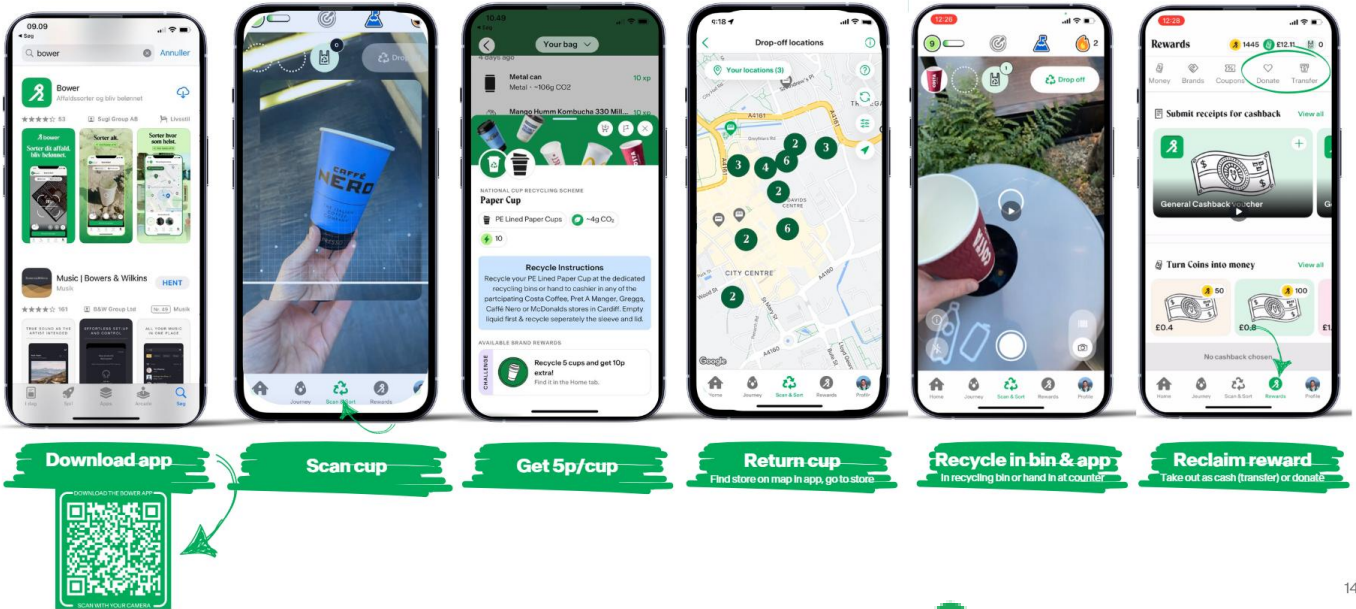
This system combines object and material detection to identify recyclable items, including a world-first capability to identify paper cups, with an impressive 80–90% accuracy rate. Unlike traditional barcode scanning, Plovie’s object detection approach makes it easier for users to log items quickly, connecting everyday behaviours to measurable environmental impact and driving positive behaviour change.

Further to this, Plovie’s approach seamlessly integrates data-driven carbon footprint analysis with practical guidance, allowing users to see the real-world effects of their actions and explore sustainable alternatives.

As the first app of its kind to combine personal and organisational sustainability tracking with AI-powered object detection, it represents a pioneering step in making environmental responsibility easy, measurable, and actionable for everyone.



## The Plovie App



## National Cup Recycling Scheme

The National Cup Recycling Scheme by Valpak is a pioneering, industry-led initiative aimed at increasing paper cup recycling across the UK.

Launched in 2018, the scheme brings together major retailers, waste collectors, and recyclers to ensure that more takeaway cups are captured and processed responsibly.

By funding incentives for waste collectors, the National Cup Recycling Scheme makes it easier for businesses and consumers to recycle their cups, helping to drive a more circular economy.

The scheme is about more than just cup collection, it's about driving real, measurable change. The seven retailers who fund the National Cup Recycling Scheme also support innovative projects designed to make recycling simpler and more engaging for everyone.

Initiatives like Cupround, #TakeItBack, and the Plovie project have all benefited from National Cup Recycling Scheme funding, increasing consumer participation and improving collection rates across the country.

Through collaboration and innovation, the National Cup Recycling Scheme continues to lead the way in making cup recycling accessible, effective, and impactful, helping the UK move towards a more sustainable future.



## Keep Wales Tidy

Keep Wales Tidy is the charity working across Wales to protect our environment now and for the future. Every day the charity works towards:

- Eradicating litter and waste
- Setting standards for environmental excellence
- Creating and restoring green spaces
- Empowering young people

Keep Wales Tidy is a strong and credible partner for this campaign.

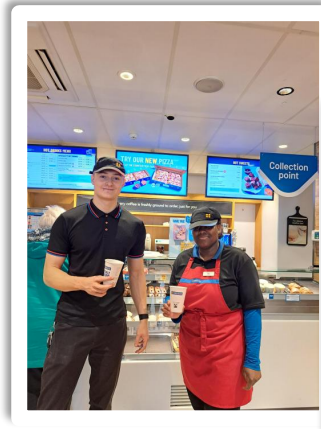
As a well-established environmental charity, Keep Wales Tidy combines hands-on community action with a sophisticated policy and research team who have a reputation for rigorous environmental surveys. The team are responsible for the All Wales Report, and the quality of the LEQ (Local Environmental Quality) surveys which sit behind them. The charity also harnesses data collected through volunteers to influence national policy.

Through the Caru Cymru initiative, Keep Wales Tidy runs frequent behaviour-change campaigns and pilot projects aimed at reducing litter, waste, and single-use plastics. Their track record, from grassroots clean-ups to influencing legislation, makes them ideally placed to help shape a cup-recycling campaign in Cardiff that is both effective and rooted in strong environmental evidence.



# Participating Sites

- Caffè Nero, St David's Shopping Centre
- Caffè Nero, Trinity St
- Costa Coffee, The Hayes
- Costa Coffee, St David's Shopping Centre
- Costa Coffee, Queen St
- Costa Coffee, Cardiff Central Train Station
- Costa Coffee, Park Place
- Greggs, Central Square
- Greggs, The Hayes
- Greggs, Caroline St
- Greggs, St Marys St
- Greggs, 34 Queen St
- Greggs, 140 Queen St
- Greggs, Park Place
- Greggs, St David's Shopping Centre
- Greggs, Cardiff University Park Place
- McDonald's, St Marys St
- McDonald's, Queen St
- Pret a Manger, Central Square
- Pret a Manger, St David's Shopping Centre



*"As outlined in The Greggs Pledge, we're committed to reducing waste and making it easier for our customers to recycle. Being part of this initiative allows us to trial a simple and rewarding way for people to return their used cups, while ensuring they are properly recycled. By working together with other brands and using technology like Plovie, we can explore new, innovative solutions and drive positive change by increasing cup recycling, supporting a circular economy, and giving these materials a second life."*

**Paul Irwin-Rhodes, Head of Sustainability & SHE at Greggs**

*"As a founding member of the National Cup Recycling Scheme, Costa Coffee is committed to increasing cup recycling across the UK. This pilot with Plovie is an exciting opportunity to test new ways to engage customers and reward them for recycling their cups. By working together with our partners, we can continue to innovate and find practical solutions that make recycling easier and more accessible for everyone."*

**Darren Hughes  
Waste and Recycling Specialist, Costa Coffee**

Bilingual English / Welsh copy was created to explain and promote the campaign.

A number of assets were created based on this copy including:

- A3 and A4 posters.
- POS Table Tents
- Social Media Templates for Meta channels.
- Social media videos for Meta channels.

**NATIONAL CUP RECYCLING SCHEME**

cadwch keep gyffwrdd mewn wales cadwch i'fdd

Learn more.  
Dysgwch fwy.

**GET REWARDED 5p FOR RETURNING YOUR PAPER CUP**

- 1 Enjoy your drink
- 2 Download the Bower app
- 3 Scan your paper cup
- 4 Return it to a participating store – and place it in a cup bin or hand it in to staff
- 5 Receive 5p in app

When you recycle your paper cup you save it from becoming waste and help save CO2 as well!

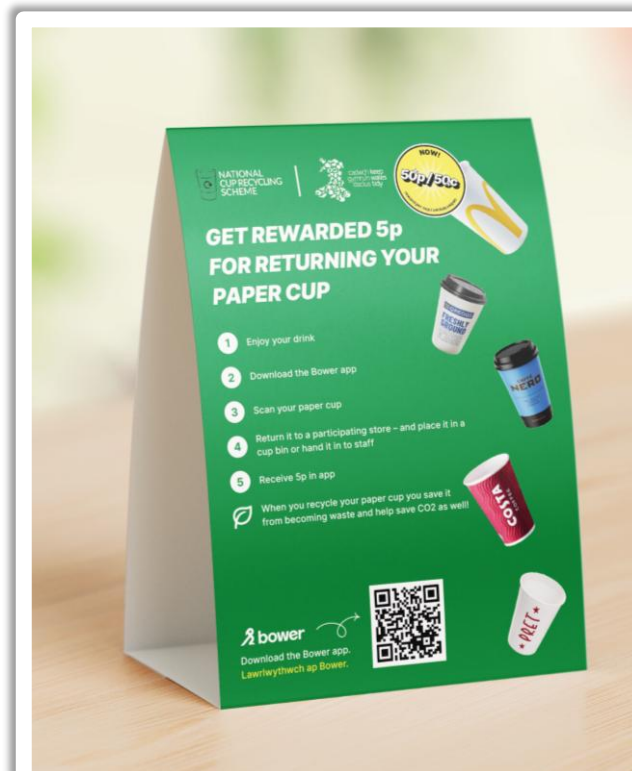
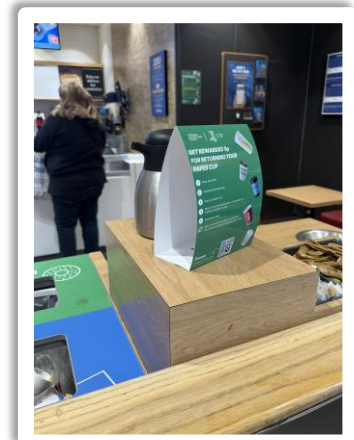
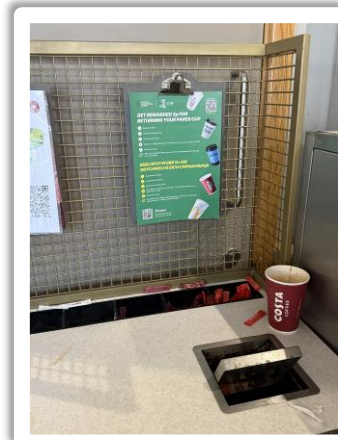
**ENILLWCH WOBR 5c AM DDYCHWELYD EICH CWPAN PAPUR**

- 1 Mwynhewch eich diod
- 2 Lawrlwythiwch ap Bower
- 3 Sganiwch eich cwpan papur
- 4 Dychwelwch ef i siop sy'n cymryd rhan – a'i roi mewn bin cwpanau neu ei roi i mewn i'r staff
- 5 Derbyd 5c yn yr app

Pan fyddwch chi'n ailgylchu eich cwpan papur rydych chi'n ei arbed rhag bod yn wastraff ac yn helpu i arbed CO2 hefyd!

Download the Bower app.  
Lawrlwythwch ap Bower.

# Brand Assets



# Store Staff Engagement

Ahead of the campaign launch, representatives from participating brands were invited to Keep Wales Tidy's offices in Cardiff for a dedicated staff engagement workshop. The session brought together the full project team from Keep Wales Tidy, National Cup Recycling Scheme, the Plovie app development team, and participating store managers, creating a valuable opportunity for everyone involved in the pilot to connect directly.

Attendees were given a comprehensive introduction to the pilot, including an overview of the National Cup Recycling Scheme and Keep Wales Tidy, along with a detailed walkthrough of the Plovie app and its innovative capabilities. This included a live demonstration of the app, the staff training video, and practical guidance on how store teams could support customers using it.

The group were also shown the proposed campaign branding and communications assets, offering an early look at the materials designed to drive consumer engagement. Expectations for each participating brand and store were clearly outlined, ensuring clarity on roles, responsibilities, and how collaboration across organisations would underpin the success of the pilot.

An interactive discussion followed, giving attendees time to ask questions, share insights, and explore logistical considerations across brands and locations. The conversation was positive and constructive, reflecting a shared commitment to delivering an impactful and achievable pilot.

Overall, the workshop highlighted the strong sense of partnership driving this initiative and equipped store teams with the understanding and confidence needed to help make the pilot a success.

# Store Visits

## Store visits

In the two weeks leading up to the campaign launch, representatives from Keep Wales Tidy and the National Cup Recycling Scheme carried out a series of visits to each participating store.

These visits were an important opportunity to meet store teams in person, ensuring everyone felt confident about the campaign, and provide the materials needed for a strong and consistent launch.

During each visit, the Keep Wales Tidy and National Cup Recycling Scheme team handed over the full suite of campaign materials, including posters and point-of-sale table tents, and talked through how these assets should be displayed to achieve maximum visibility.

They also, where possible, took time to walk on-duty managers through the aims of the campaign, what customers can expect, and how the store teams can support positive engagement on the ground.

To help build momentum, photographs were taken in each store to be used as part of the wider social media launch activity, showcasing the enthusiasm and commitment of participating retailers. These visits played an essential role in strengthening relationships, ensuring local teams were well-prepared, and creating a sense of collective excitement ahead of the campaign going live.



# Social Media Campaign

The core social media campaign was launched across Keep Wales Tidy's social media accounts on and from here was shared and re-posted onto partner and stakeholder accounts.

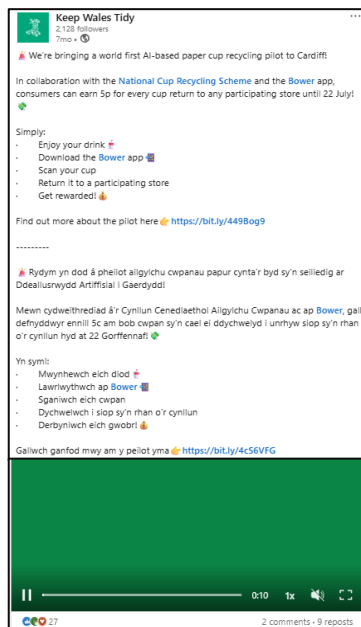
The campaign ran from 22<sup>nd</sup> April to 30<sup>th</sup> August 2025

Month	Message
	Launch
April	Return your cup to earn 5p
May	Introducing the brands
June	Return your cup to earn 50p
July	Return your cup to earn 50p
	Return your cup to earn 50p
August	Ending soon

The campaign was posted on:

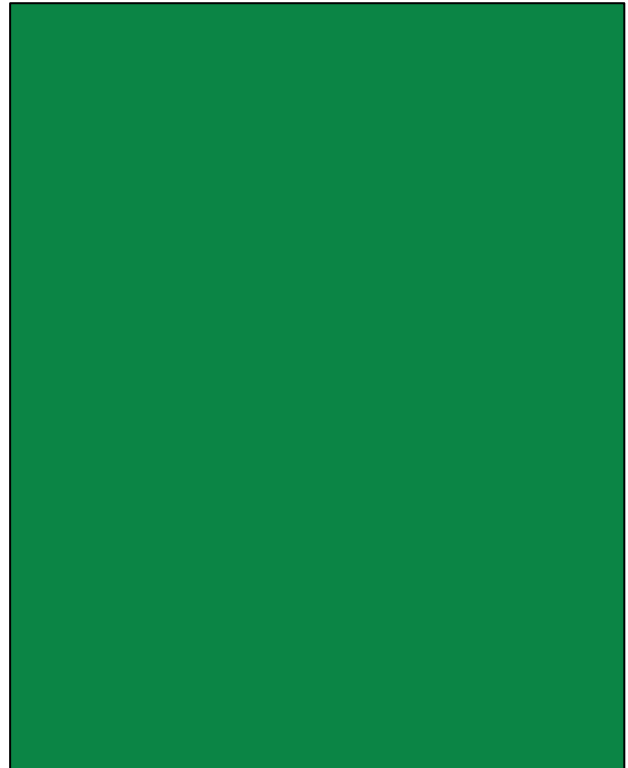
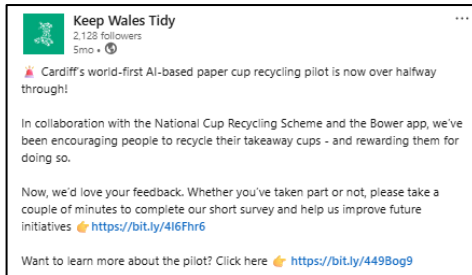
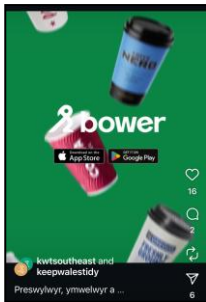
- Keep Wales Tidy Facebook page
- Keep Wales Tidy's South-East Facebook page
- Keep Wales Tidy's Instagram page
- Keep Wales Tidy's South-East Instagram page
- Keep Wales Tidy's LinkedIn page
- Keep Wales Tidy's BlueSky page

The below organic campaign was supported by a short paid for campaign of boosted posts in July.



LinkedIn launch post

# Social Media Campaign



Hover over the above to view digital post.

# Social Media Campaign

## Keep Wales Tidy social media campaign achievement

### Meta (Facebook and Instagram)

#### Organic campaign

The Meta campaign delivery includes Instagram collaborations with Route Media and influencer Cardiff Mummy Says.

Keep Wales Tidy	
Number of posts	11
Views	14,020
Reach	4,707

### LinkedIn

#### Organic campaign

The LinkedIn campaign was re-posted by Valpak, Plovie, National Cup Recycling Scheme and other Keep Wales Tidy partner organisations

Keep Wales Tidy	
Number of posts	4
Impressions	2,399
Average Engagement Rate	10.05%
Total Engagements	233

### Paid Campaign

Keep Wales Tidy	
Link Clicks	1.264 (£0.19 per click)
Video Plays	49,935
Video Hook Rate	28% (up to 3 secs)
Video Hold Rate	33.46% (over 3 secs)
Male Audience	31%
Female Audience	66%

# Broadcast and Press Activity


The campaign garnered

- 21 online press posts
- 1 BBC Radio interview with Keep Wales Tidy CEO Owen Derbyshire

Title	Medium
Business News Wales	<a href="#">World First AI-Based Paper Cup Recycling Initiative Launches in Cardiff</a>
Green Economy Wales	<a href="#">World First AI-Based Paper Cup Recycling Initiative Launches in Cardiff</a>
Nation Cymru	<a href="#">World first AI-based paper cup recycling initiative launches in Cardiff</a>
Let's Recycle	<a href="#">AI paper cup recycling scheme launches in Cardiff - letsrecycle.com</a>
Packaging Scotland	<a href="#">AI-based paper cup recycling initiative launched in 'world first'   Packaging Scotland</a>
Yahoo! Finance	<a href="#">Cardiff launches AI-based paper cup recycling scheme</a>
Environmental Data Interactive Exchange	<a href="#">McDonald's and Costa Coffee among brands trialling AI-enabled cup recycling - edie</a>
Resource.co	<a href="#">AI app rewards paper cup recycling in Cardiff trial</a>
Circular	<a href="#">AI-based paper cup recycling pilot launches in Cardiff</a>
Wales 247	<a href="#">World first AI-based paper cup recycling initiative launches in Cardiff</a>
Cardiff Life	SOCIAL MEDIA (Instagram 70K+ followers) <a href="https://www.instagram.com/p/DIzK4pooayP/?img_index=1">https://www.instagram.com/p/DIzK4pooayP/?img_index=1</a>
Sustainable Times	<a href="#">Costa Coffee Among Brands to Trial AI-Enabled Cup Recycling</a>
Packaging Gateway	<a href="#">Cardiff launches AI-based paper cup recycling scheme</a>
Packaging Insights	<a href="#">Cardiff City introduces "world first" AI paper cup recycling scheme</a>
Sustainable Packaging News	<a href="#">World-first AI-based paper cup recycling initiative launches in Cardiff - Sustainable Packaging News</a>
Packaging Europe	<a href="#">AI-powered paper cup recycling: McDonald's and Costa Coffee join the effort   Packaging Europe</a>
BBC Radio Cymru	BROADCAST Owen Derbyshire interview on Prynawn Da
Quality Food Awards	<a href="#">UK Quality Food Awards   The longest-running, most prestigious food awards in the UK</a>
Green Retail World	<a href="#">AI and sustainability: Costa, Pret, and Greggs in Cardiff paper cup recycling scheme</a>
Food & Beverage Business	<a href="#">Cardiff Introduces Groundbreaking AI-Powered Initiative for Paper Cup Recycling - Food and Beverage Business</a>
Paper Industry Technical Association	<a href="#">World-first AI-based paper cup recycling initiative launches in Cardiff - PITA - Paper Industry Technical Association</a>
Packaging News	<a href="#">'World's first' AI-based paper cup recycling initiative launches in Cardiff</a>
The Packaging Portal	<a href="#">AI-based paper cup recycling initiative launches in Cardiff – ThePackagingPortal.com</a>

Including:

**NEWS**  
**World first AI-based paper cup recycling initiative launches in Cardiff**  
22 Apr 2025 4 minute read



Support our Nation today - please donate here

*Picture by meineresterampe from Pixabay*

Cardiff's consumers can earn 5p for every paper cup they return to store in a new city centre campaign launching today (April 22).

The AI-based pilot initiative to tackle paper cup waste is operated by Keep Wales Tidy in partnership with the National Cup Recycling Scheme and innovative waste sorting app, Bower.

The three-month pilot will enable residents, visitors and commuters to Cardiff to recycle their used paper cups at participating Caffè Nero, Costa Coffee, Greggs, McDonald's and Pret a Manger stores in return for a 5p reward, incentivising disposal and ensuring the cups are fully recycled.


[Read More](#)

**SUSTAINABLE TIMES**  
Connecting sustainable startups and investors

AI News CleanTech Green-energy Green Transport Sustainable Housing Health More

News/2025 Apr 22 11:00am

### Costa Coffee Among Brands to Trial AI-Enabled Cup Recycling



A recycling initiative combining artificial intelligence (AI) with consumer incentives is

**BusinessNewsWales**

### World First AI-Based Paper Cup Recycling Initiative Launches in Cardiff

f X in



**A groundbreaking AI-based pilot initiative to tackle paper cup waste is launching in Cardiff city centre.**

Keep Wales Tidy is partnering with the National Cup Recycling Scheme and innovative waste sorting app Bower on the three-month pilot.

It will enable residents, visitors and commuters in Cardiff to recycle their used paper

# Out of Home Campaign

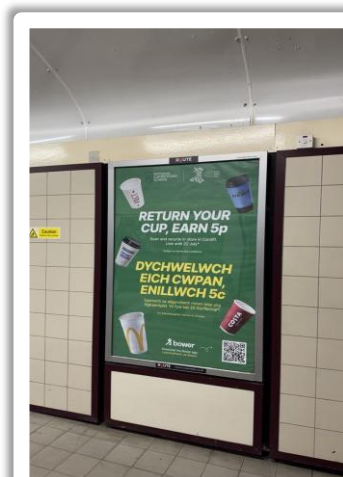
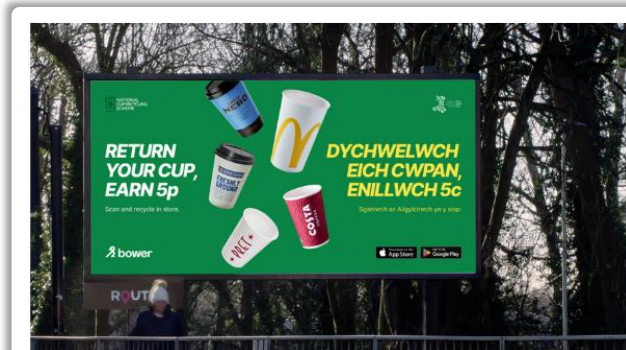
The out of home (OOH) campaign ran between the 21<sup>st</sup> April and 18<sup>th</sup> May 2025 at key commuter sites across Cardiff.

Media type	Quantity	Location
Static 4 Sheet	16	Cardiff Central Station
Static 4 Sheet	8	Cardiff Queen Street Station
Digital 48	1	Westgate Street
Mega 6	1	Newport Road
Digital 6	1	Cardiff Queen Street Entrance
Digital 6	1	Cardiff Central Station Subway
Digital 6	1	Cardiff Central Main Entrance
Digital 48	1	North Road
Totem	3	Cardiff Bus Interchange

Campaign reach:

Month	Repetitions	Impressions
April	68,051	915,349
May	26,391	295,536
<b>Total</b>	<b>94,442</b>	<b>1,210,885</b>

The campaign further achieved an average of 24,000 Daily Faces.



# Corporate Partner Participation

Keep Wales Tidy invited 31 Cardiff based organisations with large numbers of staff to participate in the activity in their own offices and buildings.

7 organisations agreed to participate. The organisations were encouraged to display posters in cafeterias and bin stations and share information about the campaign through internal staff communication.

Business	Yes / No	Additional Information
Blake Morgan	Yes	will send to staff
Capital law	Yes	will circulate to staff (no single use on site)
Cardiff University (Spark)	Yes	will share and we can put up posters in Spark
Eversheds	Yes	happy to share and put up posters
HMRC	Yes	Will advertise with posters and digital screens
Hugh James	Yes	will send to staff and ask Milk&Sugar to display
Orchard Media	Yes	will share with their Eco team

# Corporate Partner Participation

## Feedback from one large partner organisation outlines several challenges to participation:

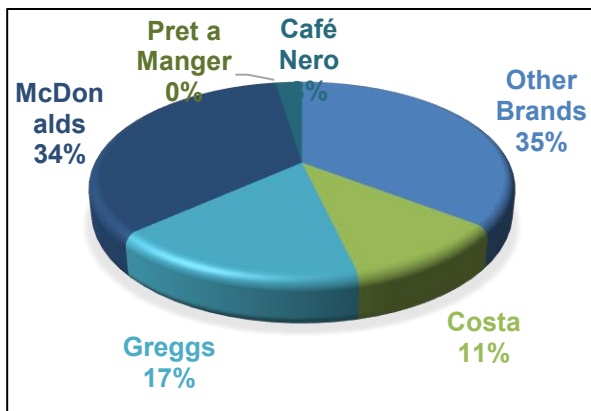
- *“Promoting this initiative could cause confusion with our current disposable cup messaging which is to dispose of them in the non-recyclables bin.*
- *Since the Workplace Recycling Regs came into force, cardboard rejection rates due to contamination have skyrocketed with over 9 tonnes of cardboard lost to date. Having reviewed Biffa failed collection reports (the driver takes photos of the recycling bins they have rejected) a very large proportion of them are due to disposable cups.*
- *As a large organisation with multiple sites all across the city, purchasers have access to a multitude of different hot drink outlets – all using different cups, whether these be plastic lined (plastic stream), compostable lined (can’t go in food waste stream or plastic stream), some with white lids (recyclable) some with black plastic (not recyclable) lids. Each different variation of cup by their nature will contaminate any recycling stream they enter. As such, we do not want them in our recycling bins.*
- *We have a branded coffee outlet on site where the disposable cups they encourage people to bring to their outlet for recycling are actually disposed of as general waste.*
- *Actively promoting a ‘your cup is recyclable’ message it would contradict our own ‘please don’t place your cups in our recycling bins’ message. Until the government mandate that food outlets use only one type of disposable cup then there will never be one recycling message we can promote.*
- *We are actively promoting the use of reusable cups as an alternative to disposables and are participating in the Cardiff Refill Return Cup scheme that was launched in October 2024.*
- *I’m really sorry we are unable to support your initiative. However, if the Plovie app runs any initiatives focussed on e.g. plastic or glass bottles, we would be happy to support with messaging.”*

# Bin Compositional Analysis

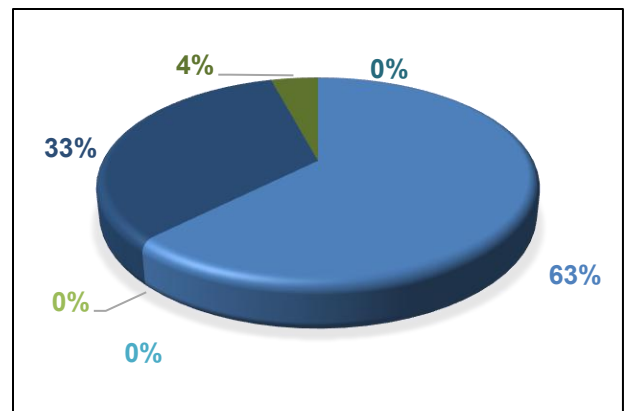
## Summary of Findings

A compositional analysis of 10 Cardiff city-centre bins, carried out by a member of the Keep Wales Tidy Policy and Research team, revealed a significant reduction in discarded paper cups between April and September. Overall, paper cup waste decreased by 70%, dropping from 82 cups in April to 24 in September. Participating brands saw an 83% reduction, while 'other' branded cups decreased by 48%. The largest share of discarded cups in April came from McDonald's (34%) and other brands (35%), whereas by September, other brands accounted for 63%, with McDonald's at 33%.

	Other Brands	Costa	Greggs	McDonalds	Pret a Manger	Café Nero	Total
Apr-25	29	9	14	28	0	2	82
Sep-25	15	0	0	8	1	0	24



April '25



September '25

# Plovie App Insight

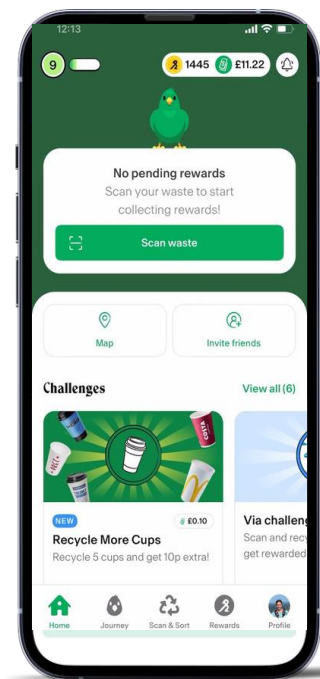
The Plovie app data indicates that the pilot achieved strong user engagement, measurable environmental impact, and clear behavioural patterns, making it a compelling case study for scaling similar initiatives.

## Some engaging statistics

- 3,822 paper cups were scanned during the campaign.
- 3,384 cups were correctly sorted, showing an 89% success rate.
- Each participant recycled an average of 20 cups, indicating consistent repeat behaviour.
- The scheme saved 50.99 kg of CO<sub>2</sub>, a tangible environmental benefit.

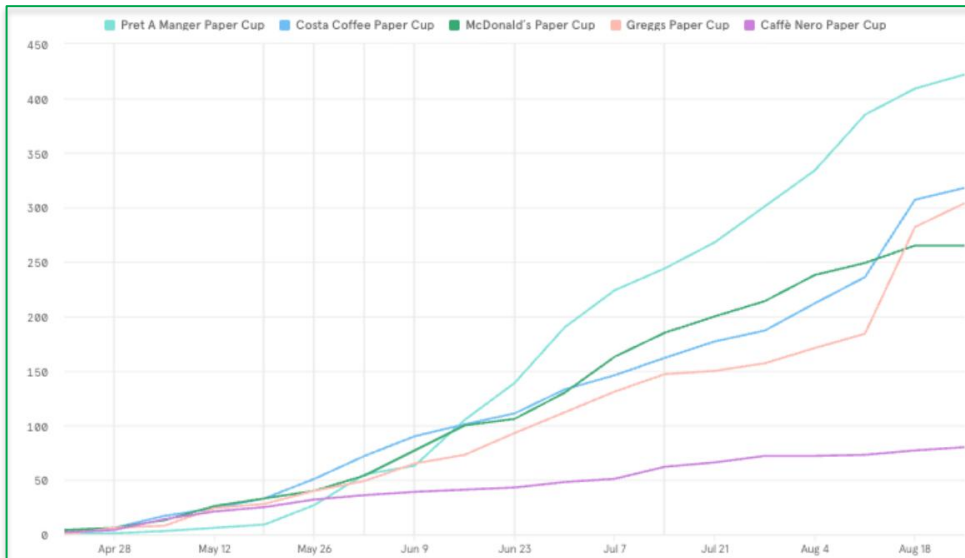
## Individual engagement

- 318 app downloads with 17 users completing the full flow.
- This is 55% of downloads converted into active recyclers.
- 223 users scanned at least one cup and 176 followed through with proper disposal

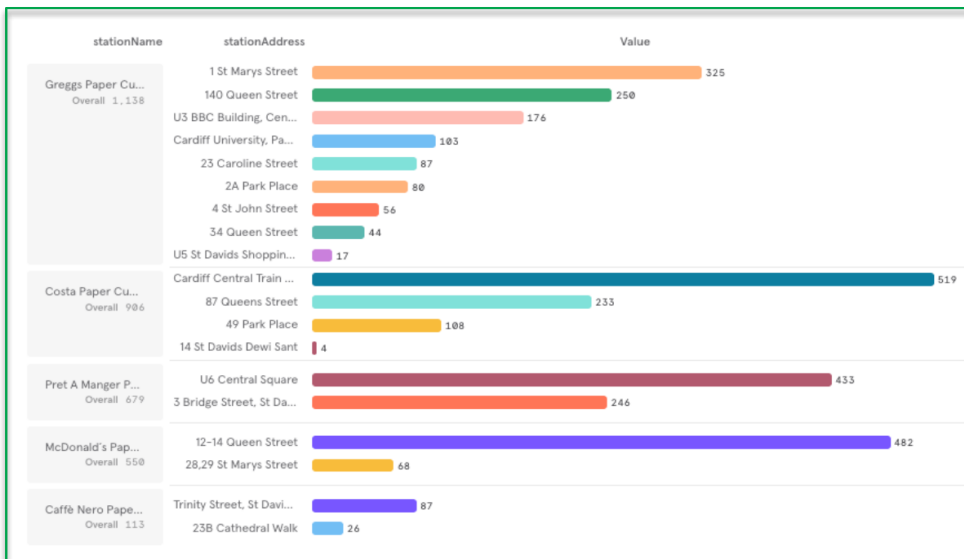


## Geographic patterns

Recycling activity varied by store and location. Pret in Central Square was the most popular brand overall for recycling, though McDonald's on Queen Street and Cardiff Central Train Station were the busiest individual locations with 482 and 519 cup drop-offs, respectively. These patterns suggest that footfall, convenience, and brand presence influence participation, with transport hubs and high-traffic areas performing best.



Graph showing the scanned and dropped off cups over time divided by identified brand



Graph showing the popular drop off points



## Gamification

The Cup Challenge, which rewarded users with 10p for sorting five cups, proved highly effective. Of the unique users who clicked on the challenge, 78.2% completed it. This indicates that gamified incentives can successfully motivate users to engage with recycling consistently.

## Users outside of Cardiff

As it was not possible to limit the cup scanning feature to users inside of Cardiff, there were engaged users using the feature to scan cups outside of Cardiff. There were 282 users that have not been included in this data set that had scanned cups and a few even attempted to set up recycling points for cups in their home cities. This shows there is genuine interest within the Bower universe in scanning cups and being rewarded.

282

Users outside Cardiff

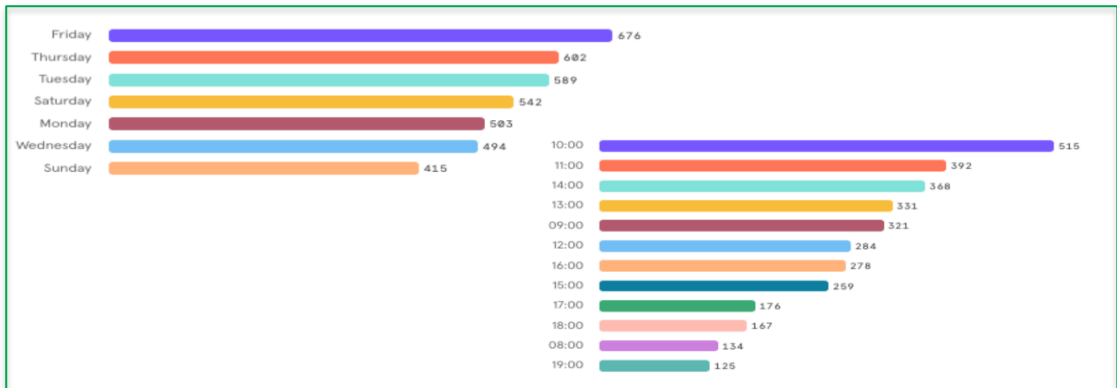
## Cup Type and Detection Issues

Non-branded cups were the most recycled, however, McDonald's cups had the highest rate of missed AI detections and user-reported errors, indicating challenges with image recognition accuracy for certain designs. Greggs cups may also have higher actual recycling than recorded, due to similar minor detection errors. This may have been due to the AI detecting branded cups with different designs from what it was trained on, cluttered background and strange angles.

## Routine patterns

Participation peaked on Fridays, with 676 drop-offs, and the most active time of day was between 9 and 10 a.m., aligning with commuter routines and morning coffee consumption.

This end-of-week peak may also reflect a “clearing” mindset, where users accumulate cups throughout the week and return or scan them on Friday as a final tidy-up. This pattern suggests that people treat recycling not just as a momentary action, but as a weekly routine, combining convenience with a sense of completing a task or finishing the week responsibly.



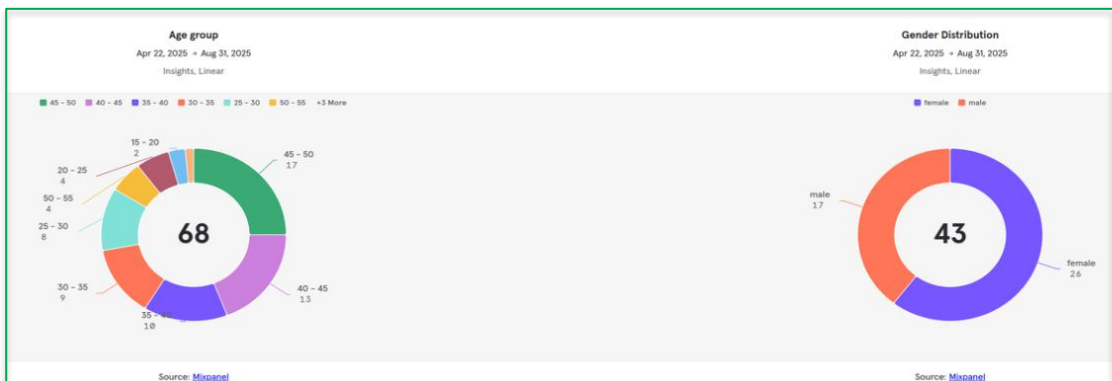
Graph showing day and time for recycled cups in store.

(Note the time is in CET not, GMT).

## Demographic insights

The most engaged age group was 45–50, followed by 40–45 and 35–40, suggesting that middle-aged adults are particularly responsive to reward-based recycling initiatives.

Female participants were more engaged than male participants across all metrics.



Graphs showing age group and gender distribution of users who shared this information

# Plovie App Insight

## What can we learn?

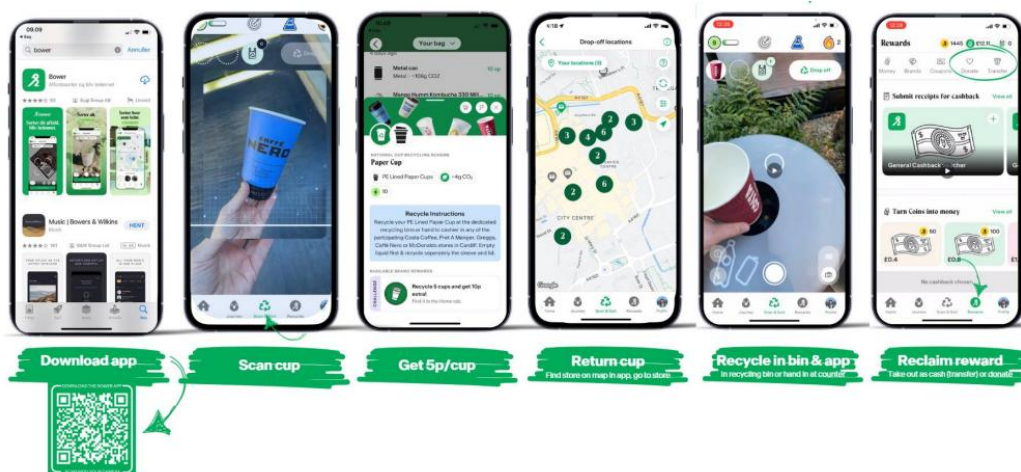
More than half of downloads led to active participation, suggesting strong motivation when rewards are tied to sustainability.

With over 20 cups recycled per person, users didn't just try once they kept returning, showing habit formation and behavioural stickiness.

Environmental Impact at Scale: If scaled beyond Cardiff then we could see environmental impact at scale, the CO<sub>2</sub> savings could multiply significantly. For example, 10,000 users recycling 20 cups each could save over 1.6 tons of CO<sub>2</sub>.

While 3,822 cups were scanned, only 3,384 were properly sorted. This 12% drop-off gap highlights an opportunity to improve user education or app nudges.

The pilot created a base of 223 supporters engaging with the scheme. This group could be leveraged as ambassadors for future campaigns.



## Public survey

The public survey was carried out through an invitation posted on Keep Wales Tidy's social media accounts.

The survey, which gathered 12 responses, shows strong support for cup recycling but highlights a need for clearer guidance.

92% of respondents consider recycling cups very important, and most agree with positive recycling statements.

83% are willing to take cups home but a significant 83% want more information to feel confident about recycling correctly.

Preferred solutions include returning cups to stores (42%) and deposit bins in city locations (33%), with home recycling less favored.

Respondent information suggests a local and engaged audience. but highlights a need for clearer guidance and a simpler process.

## Staff survey

Staff at all participating brand outlets were invited to complete a survey on their understanding of paper cup recycling via a link sent by Keep Wales Tidy

The survey garnered 7 responses but did not see any responses from on the ground staff.

There is a clear awareness of the campaign at management level, but it does not show what the awareness levels are with front of house staff.

Management feedback suggests a review of additional POS and bespoke cup recycling bins and enhanced staff training options.



## Plovie app user survey

### Pre Campaign Behaviour

#### Usage Patterns

- At the start of the campaign, disposable cup consumption among respondents was high: roughly one-third bought more than five cups a week and another third purchased three to five. This indicates strong potential impact for any recycling intervention.
- Most drinks were purchased during work hours (39%), followed by commutes (26%) and leisure time (23%), reinforcing the need for recycling points across workplaces, transport hubs and popular leisure venues.

#### Current Disposal Behaviours

- Mixed recycling bins (42%) and home recycling (36%) were the most common disposal routes, showing that users are trying to recycle but may be putting cups in the wrong bins.
- Takeback to store (32%) performed well, while general waste (26%) remained significant. Encouragingly, littering was recorded at 0%.

Feedback highlights ongoing confusion, signaling a need for clear, consistent guidance on where cups should go.

#### Barriers to Recycling

- Convenience is the biggest issue: 80.6% felt that recycling options near them are not easy to access.
  - More accessible bins (65%) and clearer on-cup labelling (39%) were the most requested improvements.
  - Nearly half (45%) said they would recycle more if they understood the benefits better.
- Together, this shows that clarity and convenience, not willingness, are the main barriers.

#### Motivations and Influences

- Rewards and incentives prompted the strongest reaction, with 71% saying they would recycle more if rewarded.
- Environmental concern also plays a role for over half of respondents (52%).
- Social pressure or peer influence had limited impact (~25%).

This suggests that a blend of tangible rewards and environmental messaging is most likely to drive behaviour change.



## Plovie app user survey

### Pilot Experience in Cardiff (*Uptake in this survey was lower than pre-campaign*)

#### **Motivations and Influences**

- Incentives and rewards were still the strongest influence on recycling behaviour, with 80% of respondents citing them as the primary motivator.
- More convenient recycling points would encourage 60% of respondents to recycle paper cups
- Users reported learning that cups *can* be recycled in the UK, but that the process is not straightforward.
- Support for cup recycling bins in high-footfall areas was strong: 64% said they would support their introduction, while a further 36% said “maybe,” contingent on bins being easy to locate, simple to use, and regularly maintained.

#### **Awareness and Marketing**

- In-store visibility was mixed: stickers were noticed by 46% of respondents and till-point posters by 27%.
- Out-of-store promotion was limited, with 64% of respondents reporting they had not seen any campaign activity.
- On social media, Facebook performed best (27%), though the majority (55%) did not recall seeing any adverts.

Overall, awareness efforts lacked consistency and reach, highlighting the need for a more coordinated campaign strategy.

#### **Takeback Experience**

- The majority of respondents (64%) had not returned a cup during the pilot.
- Among those who did participate, over 64% found the bins well signposted with clear directions, but 18% experienced staff uncertainty regarding the process.

These insights indicate that clearer signage, more prominent bin placement, and improved retailer training are essential to build trust and increase participation.

# Behaviour Change Insights

## Intention- Action Gap

The campaign successfully influenced consumer habits, demonstrating that technology and rewards can motivate sustainable behaviour, but also highlighting a crucial distinction between intention and action, a recurring challenge in behaviour change. While many users scanned cups, signalling a desire to recycle, this did not always translate into the physical act of returning the cup to store.

The effort required to carry a used cup back, even when incentivised, remained a significant barrier. This “intention–action gap” is consistent with behavioural science evidence showing that people often intend to act sustainably but are deterred by small amounts of friction, inconvenience, or uncertainty. Reducing this friction is therefore critical to sustained change. For cup recycling, this means locating bins at natural drop-off points, exits, transport hubs, and high-footfall areas so that the act of recycling requires minimal effort. When recycling becomes the path of least resistance, even people who are otherwise uninterested are more likely to participate.

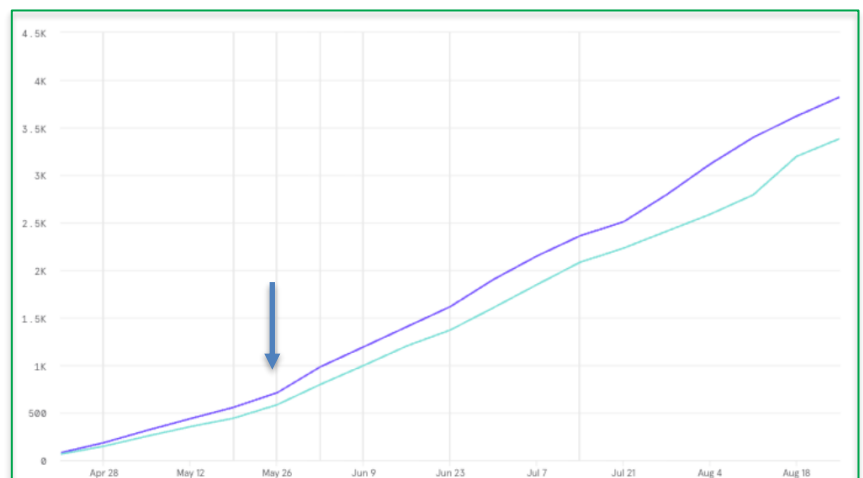
## Reward Incentives: Cups vs. Typical Bower Use

The Bower app is typically used for packaging that people scan at home and place straight into their kerbside recycling. Cups, by contrast, must be kept separate, stored, and taken back to a participating store. This added effort represents a consistent barrier to cup recycling and significantly affects how users respond to incentives.

Increasing the reward to 50p resulted in a clear spike in scanned rates (see graph), demonstrating how strongly perceived value influences short-term motivation. However, it still did not increase the number of cups being returned to stores.

**Graph showing the scanned and dropped off cups over time.**

**Purple:** Scanned cups  
**Blue:** Cups taken back to store for recycling.



## Recycling Made Simple

Another key insight concerns social proof and visibility. Public displays of participation, such as visible cup-recycling bins, live counters, or messages like “200 cups recycled here today,” can normalise the behaviour and encourage others to join in. Similarly, staff prompts at the point of purchase or return “Don’t forget to recycle your cup for your reward” can serve as low-effort, high-impact nudges, bridging the gap between intention and action.

For those with little or no interest in recycling, engagement depends on making the process effortless, rewarding, and socially reinforced. This includes providing clear, visual instructions, ensuring the reward is instant and easy to redeem, and linking participation to identity such as “Smart commuters recycle their cup”. Gamification elements such as leaderboards, or community targets, can further motivate participation among less-engaged audiences by making recycling feel fun, competitive, or routine rather than moral or effortful.

The pilot also underscored the importance of staff engagement as a behaviour-shaping factor. When staff are informed, motivated, and visibly supportive, they create social reinforcement that encourages consumers to follow through. Conversely, lack of staff awareness or inconsistent messaging can weaken the behavioural cues at the point of action. Ongoing staff training, incentives, and recognition for promoting cup recycling could therefore strengthen behavioural consistency across locations.

Overall, the Cardiff pilot confirmed that behaviour change around on-the-go recycling requires a layered approach: combining technology, rewards, accessible cup bins, and social reinforcement (staff, signage, and visibility). While the pilot succeeded in stimulating intent and measurable reductions in cup waste, the next phase should focus on closing the intention–action gap by reducing friction, enhancing feedback, and embedding cup recycling into daily routines.

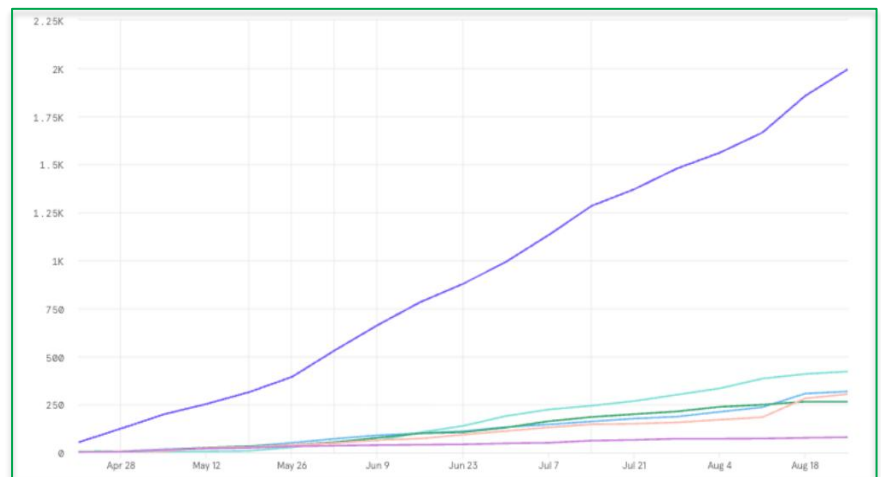
# Behaviour Change Insights

## Technology and Innovation

At the heart of the campaign, Plovie's AI system represented a world-first in on-the-go recycling technology, capable of recognising paper cups in real-world environments. While the system reliably identified cups for reward purposes, it was sometimes less accurate in identifying branding. This resulted in fewer branded cups and more non-branded cups being logged, largely due to variations in photo quality, lighting, background, or the user's ability to capture the cup correctly.

**Graph shows scanned and dropped off cups over time divided by identified brand.**

**Dark blue:** No brand was detected.



Despite this, the system successfully democratised participation, making rewards accessible to all consumers regardless of cup brand. By linking environmental action to instant feedback, the pilot leveraged a strong behavioural loop: recognition → reward → repetition.

Early signs of habit formation were observed, illustrating that people respond well when sustainable actions are simple, transparent, and immediately rewarding. This pilot represents a global milestone, demonstrating that AI can accurately and reliably identify recyclable packaging in fast-moving, real-world settings without the need for barcodes or additional packaging modifications. Refining the system further and supporting users to capture optimal images will strengthen accuracy and engagement as the system scales.

By making recycling simple, visible, and immediately rewarding and by aligning infrastructure, incentives, and social cues, the scheme can reach beyond environmentally motivated early adopters to engage those who would otherwise never take part. This inclusive, data-driven approach represents the next step in turning cup recycling from a conscious decision into an unconscious habit.

The Cardiff Plovie paper cup recycling pilot tested an ambitious proposition: could an AI-enabled, reward-based digital system change on-the-go recycling behaviour and produce verifiable environmental outcomes? As the first pilot of its kind globally to pair AI recognition of paper cups with consumer rewards, the project delivered important insights into technological capability, consumer motivation, and operational considerations for future scaling. While the campaign's initial ambition to capture 100,000 cups was not achieved, this target was intentionally ambitious designed to test engagement potential and operational capacity rather than purely volume.

## Strengths and validated outcomes

- **Technology validated:** Plovie's AI identified paper cups and converted scans into verifiable reward events, providing high-quality, auditable data on individual recycling actions, an important advance for traceability and impact reporting.
- **Environmental outcome at bin level:** Bin composition analysis demonstrated a measurable behavioural shift at source: a 70% reduction in paper cups in general waste across analysed sites and an 83% reduction for participating brand cups, showing that improved infrastructure and visibility can reduce litter and increase correct disposal.
- **Consumer engagement:** The pilot attracted 318 app downloads, with 176 users completing the full scan-and-return journey. Early adopters returned an average of 20 cups each, showing strong stickiness. Gamified incentives, such as the Cup Challenge, were highly effective, with 78 percent of participants completing it, illustrating the motivational power of rewards combined with interactive challenges.
- **Consumers demonstrated a willingness to engage with reward-based recycling.** The campaign attracted 318 app downloads, 176 users completing the full scan-and-return journey, and 3,822 cups recycled, equivalent to 50.99 kg of CO<sub>2</sub> saved. Engagement increased significantly when the reward rose from 5p to 50p, reinforcing the motivational role of financial incentives. Public surveys indicated that 63% of respondents supported cup recycling bins in high-footfall areas, with a further 36% saying they might participate if bins were more accessible.

# Scalability and Collaboration

The pilot demonstrated that collaboration between major brands is achievable. The AI system's performance validated its potential for large-scale rollout, and early engagement shows that public interest extends beyond a single city. Future campaigns should focus on:

- Deepening store-level participation and staff support to embed recycling practices.
- Introducing staff incentives to further motivate frontline teams to engage with and promote the scheme effectively.
- Maintaining consistent consumer incentives and clear communication of rewards.
- Combining digital engagement with visible, on-the-ground awareness activities to maximise reach and conversion.
- Providing guidance or tips to help users take photos that improve AI recognition accuracy.

Together, these steps will ensure the system can scale effectively while retaining its inclusive, data-driven approach to recycling.

Feedback from a large employer highlighted additional system-level barriers that must be considered for scalability. Many organisations are managing significant confusion around Welsh recycling legislation, cup recyclability and the correct handling of different cup formats (plastic-lined, compostable-lined, varied lid types), which contributes to contamination risks particularly for cardboard streams under the Workplace Recycling Regulations. This has led some workplaces to instruct staff to dispose of all cups as non-recyclables, creating a perceived conflict when encountering initiatives that promote cup recycling. Their experience also reflects an increasing organisational focus on reuse schemes, which can feel at odds with recycling campaigns.

This feedback suggests that future rollouts must support organisations by clarifying how reuse and recycling work together, with a clear hierarchy: prioritise reuse wherever possible, and recycle responsibly when reuse is not an option. Addressing confusion on materials, legislation and messaging will be critical to enabling more employers to participate confidently and consistently in return-reward schemes like Plovie.

# Recommendations For Next Phase Scaling

- **Prioritise awareness and trust:** Short pre-launch campaigns with strong co-branding (Local Authority, National Cup Recycling Scheme, retailers) and local ambassadors to familiarise the public with the app.
- **Introduce staff incentives and training:** Recognise and reward frontline staff who actively support and promote cup recycling, alongside ongoing training to embed recycling practices into daily store operations
- **Refine incentives and feedback:** Ensure rewards are immediately visible and redeemable, and consider live counters or social proof at participating locations to reinforce engagement
- **Support optimal app usage:** Provide guidance to users on how to take photos for the AI system (lighting, angle, background) to improve recognition accuracy and minimise errors.
- **Understanding the Optimal Reward Level:** The pilot highlighted the importance of testing incentives before rollout. Without pre-surveys or A/B trials, the initial 5p reward proved insufficient to motivate cup returns. Participants were willing to scan their cups, but the low value did not justify the additional effort required to return them.
- **Strategic rollout:** Focus initially on high-footfall commuter hubs and workplaces before expanding to retail and university networks
- **Evaluation improvements:** Increase survey sample sizes and strengthen data reliability by conducting surveys in person, including street surveys and staff interviews. Future pilots should incorporate face-to-face surveys, qualitative interviews, and controlled testing of incentives, messaging, and in-store prompts.
- **Operational KPIs:** Examples include number of trained frontline staff, staff incentive uptake, in-store activations, social media promotion, and app conversion within the first week.

# Closing Statement

The Cardiff Plovie pilot successfully demonstrated that AI-enabled, reward-based recycling can drive measurable behaviour change, reduce waste, and provide robust, auditable environmental data. As the first initiative globally to recognise and reward paper cup recycling through AI, the pilot proved that complex sustainability behaviours can be made simple, intuitive, and inclusive. The system worked reliably in real-world conditions, engaging consumers across multiple brands and locations, and showing how technology, incentives, and infrastructure can combine to shift everyday habits. Rewards and incentives continue to be the strongest driver of behaviour, with environmental concern also playing an important role. Social pressure has limited influence, suggesting that tangible benefits combined with clear messaging are the most effective levers for change.

The results show clear reductions in cup waste supported by bin composition analysis and strong engagement among early adopters, with participants recycling an average of 20 cups each. Financial incentives played a critical role: engagement rose significantly when rewards increased, confirming their value in motivating on-the-go recycling. Gamified challenges further boosted participation, demonstrating that rewards combined with interactive design can create a powerful behavioural loop of recognition, reward, and repetition.

However, the pilot also highlighted the persistent intention–action gap that shapes real-world recycling behaviour. Many users showed a desire to recycle but did not always return cups to the correct bins, underscoring the importance of convenience and frictionless design. Locating cup bins in natural decision-making points at transport hubs, exits, workplaces, and high-footfall areas will be essential to scaling participation provided that bins are easy to find, simple to use, and regularly maintained.

Importantly, feedback from a major employer revealed wider system challenges that influence scalability, particularly confusion around Welsh recycling legislation, mixed cup materials, and the apparent tension between reuse and recycling messages. This confusion contributes to contamination risks and inconsistent workplace guidance. Future phases must therefore support employers with clearer messaging that positions reuse first, with recycling as the correct fallback when reuse is not possible. Simplifying guidance and aligning messaging across government, retailers, and workplaces will strengthen confidence and consistency.

# Closing Statement

The pilot also reinforced the central role of staff in shaping consumer behaviour. While management awareness was strong, frontline staff engagement varied. Enhancing staff training, introducing incentives, and providing stronger point-of-sale cues will improve behavioural consistency and help embed cup recycling into daily store operations.

Overall, the Cardiff pilot provided a compelling blueprint for scaling digital recycling systems. It showed that technology and incentives achieve maximum impact when paired with visible infrastructure, seamless user journeys, social reinforcement, and coordinated partner support. It also demonstrated that digital tools can generate real-time, traceable environmental data, offering an evidence base for policy design and accountability.

By reducing friction, maintaining consistent incentives, supporting both consumers and staff, and clarifying the relationship between reuse and recycling, future phases can broaden participation and transform cup recycling from a conscious choice into an unconscious routine. The insights gained create a strong behavioural and technological foundation for expansion, unlocking the potential for AI-enabled, data-driven circular behaviour not only in Cardiff, but across cities and materials.



# Contact

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