

# Report

Spring 2015



## Recycle and Reward Pilot Project Report Glasgow Caledonian University



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Zero Waste Scotland works with businesses, individuals, communities and local authorities to help them reduce waste, recycle more and use resources sustainably.

Find out more at [zerowastescotland.org.uk](https://zerowastescotland.org.uk)

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#### **Acknowledgements**

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## 1 Executive summary

**Zero Waste Scotland supported a number of Recycle and Reward pilot projects in 2013. Each site has a separate report on its performance, and an overview report is also available.**

**Cordia (Services) LLP and Glasgow Caledonian University participated in the Recycle and Reward pilot project, funded by Zero Waste Scotland, to pilot how incentivised recycling facilities may affect recycling of packaging (drinks containers) and wider recycling behaviour within the university campus. The university installed six Recycle and Reward machines across two locations on its main campus in March 2013. These automated machines provided a reward (5p money-off voucher for use in campus retail outlets) in exchange for empty drinks containers returned for recycling through this facility.**

In addition a small number of Golden Tickets, entitling the recipient to a week's worth of free meals in the refectory, were awarded on a weekly basis. Target materials for this pilot project included aluminium cans, PET plastic bottles and paper cups. Evaluation and monitoring of the pilot project was conducted by SKM and Nicki Souter Associates (NSA), to provide an independent assessment of performance and public acceptability of the system. The pilot monitoring period ran from 14 March 2013 to 27 September 2013. The machines complemented the existing recycling and general waste infrastructure on the campus.

In terms of overall pilot performance:

- A total of 11,778 containers were returned to the machines.
- Retail data were available for the period from the end of April to the end of September. Over this period, 16% of the containers estimated to have been sold on campus were recycled through the machines (with the recognition that some containers recycled may have been brought from elsewhere, and that, conversely, this figure does not reflect containers bought on site but consumed off site).
- The capture rate (by sales) via the machines fluctuated significantly over the period, from 7% to 34%. For that period, the average machine capture rate for each container type was 12% for cans, 21% for plastic bottles and 14% for paper cups.
- The quantities collected by the scheme were 0.7 tonnes, ~6.1% of total recycling on the campus overall.
- Surveying on site suggests that 16% had used the scheme at least once and 7% of respondents were regular users.
- As many as 93% of users rated overall satisfaction with the machines and ease of use very highly.
- Of the standard 5p rewards issued, 51% were redeemed. In contrast, 68% of the Golden Tickets issued were redeemed, building to an average of 89% over the last 12 weeks of the pilot.
- These figures, combined with survey and focus group responses, suggest that this type of prize draw for a better reward was more effective than a guaranteed 5p reward, which some saw as too small or even demeaning to claim back.
- Of those surveyed, 4% claimed to be recycling more bottles on campus, 2% recycling more cans and 3% recycling more paper cups, as a result of the scheme.
- It appears, from transaction data and survey responses, that a disproportionate amount of paper cups were recycled by catering/cleaning staff rather than students.
- A large majority of respondents (92%) wanted to see the scheme continue, and 85% were keen to see similar schemes of this kind become more widespread in Scotland.

Implementation issues, around machine location and poor perceived reliability, appear to have hampered the scheme's performance at the outset. In particular, one location was closed for refurbishment for a significant proportion of the pilot period, resulting in zero throughput for three of the six machines for 14 weeks. It should also be noted that the pilot monitoring was undertaken mainly out of term time, when relatively few students were on site. The fact that existing recycling facilities remained during the pilot, combined with the short period of term time (at the start and end of the

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monitoring period), may have also reduced machine usage. A longer period of student exposure to the machines may well improve performance significantly. Zero Waste Scotland intended to continue to monitor this scheme throughout the autumn term, but, because university staff were absent, the data collected during this period were less consistent than those gathered during the pilot period. Unfortunately, it is not possible, therefore, to determine the extent to which autumn term-time performance saw an increased volume of recycling (which was observed at some other university pilot sites).

## 2 Pilot description

**This section describes the pilot site at Glasgow Caledonian University campus, and the population targeted by the pilot. It then considers waste management systems in place before and during the pilot period, and then the detail of the Recycle and Reward scheme, including sections on the communications and site resourcing requirements of the pilot. A final section describes any changes to it introduced during the pilot period.**

### 2.1 Background and context



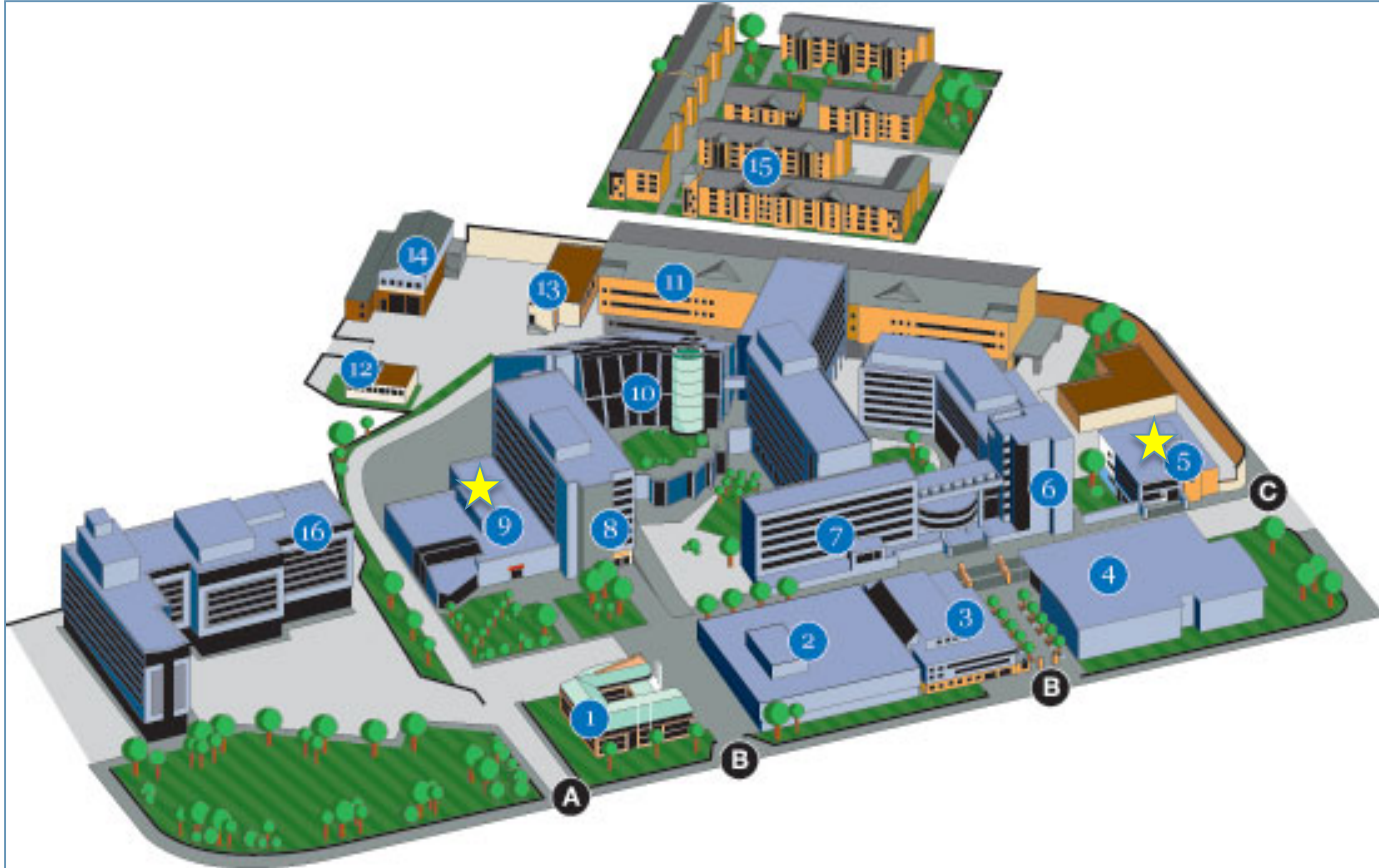
**Figure 1 Glasgow Caledonian University**

Glasgow Caledonian University (GCU) is one of the largest in Scotland with nearly 17,000 students and 1,800 staff. The campus is self-contained but it is situated right in the heart of the city of Glasgow; office buildings, retail outlets and public transport hubs all share the immediate vicinity. The main city centre campus ('the campus') is located to the north-east of the city centre, opposite the city's main bus station (Buchanan Street Bus Station) and around 700m from one of the city's two main train stations (Glasgow Queen Street). It is bounded by Cowcaddens Road to the south, Dundas Street to the west, Dobbies Loan to the north and North Hanover Street to the east.

The campus comprises 13 buildings accommodating teaching and support functions, all sharing waste management facilities; in addition, the university library is housed in the Saltire Centre, which also contains a café and reading area, and sports facilities are contained in the Arc Health and Fitness Facility. The layout is indicated in Figure 2. Main entrances are indicated as A, B and C; however,



further entrances are open between buildings 12 and 14 and between buildings 14 and 13. Halls of are immediately adjacent to the main campus (15). There is one complex of university-owned student accommodation off the main campus area in Caledonian Court, which was deemed to be sufficiently distinct to be excluded from the Recycle and Reward pilot monitoring.



**Figure 2 Site map of Glasgow Caledonian University city centre campus: Recycle and Reward recycling facilities in the refectory (9) and the Students' Association Building (5) are indicated with stars**

The refectory (9) is immediately adjacent to a main teaching block in the Hamish Wood Building (8). The Students' Association is housed in a dedicated building on the east of the campus and hosts vending machines and a café, which has recently been refurbished into the Bistro. There is also a café in the basement of the Saltire Centre (10) and in the Govan Mbeki Building (6); vending machines can also be found in the Arc (4). There are also a large number of cafés and shops close to the campus. The catering is run by a contractor, Cordia (Services) LLP, which hosted the machines in the refectory and a café.

As the campus is open, it also acts as a public thoroughfare, and both the nature of the scheme and the location meant that it was quite possible for drinks containers bought off site, and indeed users from off site, to access the machines. At the same time, as return points were internal, and within catering facilities, it seems likely the scheme favoured the return of items purchased on campus.

## 2.2 Waste management arrangements before the pilot

GCU is responsible for waste and recyclables arising in its teaching and administrative buildings and general waste bins on the streets within the campus area.

GCU already provided recycling facilities throughout its premises and all of these provisions have continued throughout the duration of the pilot. These comprise three blocks of source-segregated bins: in the main foyer of the Saltire Centre; in the small courtyard immediately outside the Saltire Centre; and near the main entrance to the campus directly across from the entrance to the Britannia Building. These bins accept segregated newspapers and magazines, mixed glass, cans, and plastic bottles (Figure 3a).



**Figure 3 (a) Segregated recycling blocks; (b) 'tree hugger' mixed recycling**

The remaining recycling provision across the campus accepts mixed dry recyclate. Each corridor within the teaching buildings hosts approximately six to eight 'tree hugger' boxes (Figure 3b) accepting paper, cans and plastic bottles, while a range of bin types, with variable degrees of signage, accept mixed dry recyclate.

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Recycling bins are indicated by white bin liners. All white bag material is collected and stored at a central point in a skip in the waste compound. Black bag residual waste is also collected in a variety of bins around campus, also stored in a compactor in the waste compound. Waste and mixed dry recyclate are collected from the GCU premises by Shanks and taken to its waste management facilities (landfill and materials recovery facility (MRF)). Shanks provides monthly updates on tonnages for total residual and total dry recyclate to GCU in the middle of each subsequent month. It does not provide detail of contamination rates for the recyclate, although there is a threshold above which the recyclate will be rejected and sent to landfill with GCU being notified if this should happen.

Figure 4 shows how the materials targeted by the Recycle and Reward scheme flow through the site. This is a site with very open boundaries in very close proximity to the city centre and other retail outlets, and multiple waste management routes both within and outwith the campus. Students also have full access to the other waste and recycling facilities in the immediate vicinity including street litter bins and 'Recycling on the Go' (ROTG) receptacles.

Material flows onto and off the site could not be monitored.

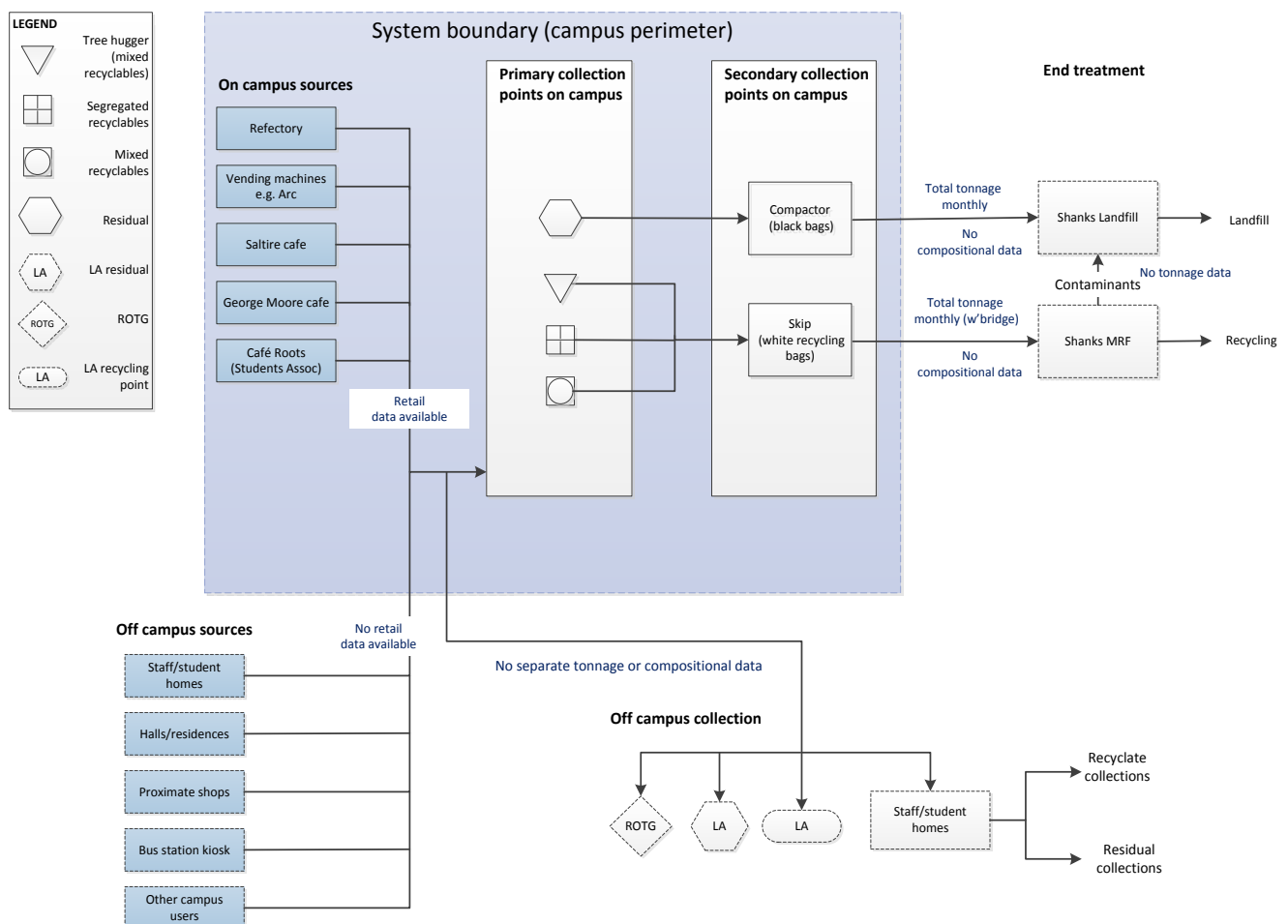


Figure 4 Flow of waste and waste data before reverse vending pilot

## 2.3 Target population

GCU has a core student body of 17,000, plus 1,800 staff. The student population is roughly 40% male and 60% female, based on 2012 figures. Some of these students are housed in the adjacent student residences. The main student population reduces during the summer recess period from the end of May to the beginning of September, but the campus is still well utilised by staff, summer schools, and



conferences and seminars. In addition, anecdotally, there is some use of services by staff from local businesses.

## 2.4 Recycle and Reward approach

The materials targeted were aluminium cans, PET plastic bottles and paper cups. Reverse vending equipment was supplied by Revendit and six machines were installed at two different locations on campus: the refectory and the café within the Students' Association Building (formerly Café Roots, latterly the Bistro).

The pilot was launched on 14 March 2013 as part of the 'Green Week' environmental programme, with machines at both sites being active immediately. These locations were initially chosen because of their central location on campus, their high footfall and the high level of engagement of the Students' Association. However from early May to the end of September, Café Roots was closed for refurbishment; data for this period therefore refer only to the utilisation of the refectory machines. Café Roots was reopened as the Bistro in the last week of September 2013. It seems likely, therefore, that pilot monitoring will underestimate the potential of the site. The café was felt to be a good location for the machines in the long term, but the refurbishment does limit the available data for the SKM monitoring period.

The rewards for recycling at GCU were vouchers worth 5p that could be redeemed in any of the Cordia (Services) LLP outlets on campus. In addition, users of the machines could win a 'Golden Ticket', which were distributed randomly by the machines and entitled the winners to one week's free meals on campus.

There were three Recycle and Reward automated machines at each location that accepted empty drinks containers and issued vouchers. At each site a Flex Interactive machine collected aluminium cans, a second Flex Interactive collected PET plastic bottles and an Ecovend machine accepted paper cups. It was also possible to recycle materials that had been purchased off campus using the machines. Incorrect materials, such as steel cans, were rejected. While the campus is considered a porous site in our analysis, and containers could be brought on site to be placed in the machines, the location of the machines within the buildings could be perceived as 'closing' the system somewhat.

The machines are shown in Figure 5 and the contents as collected in Figure 6.

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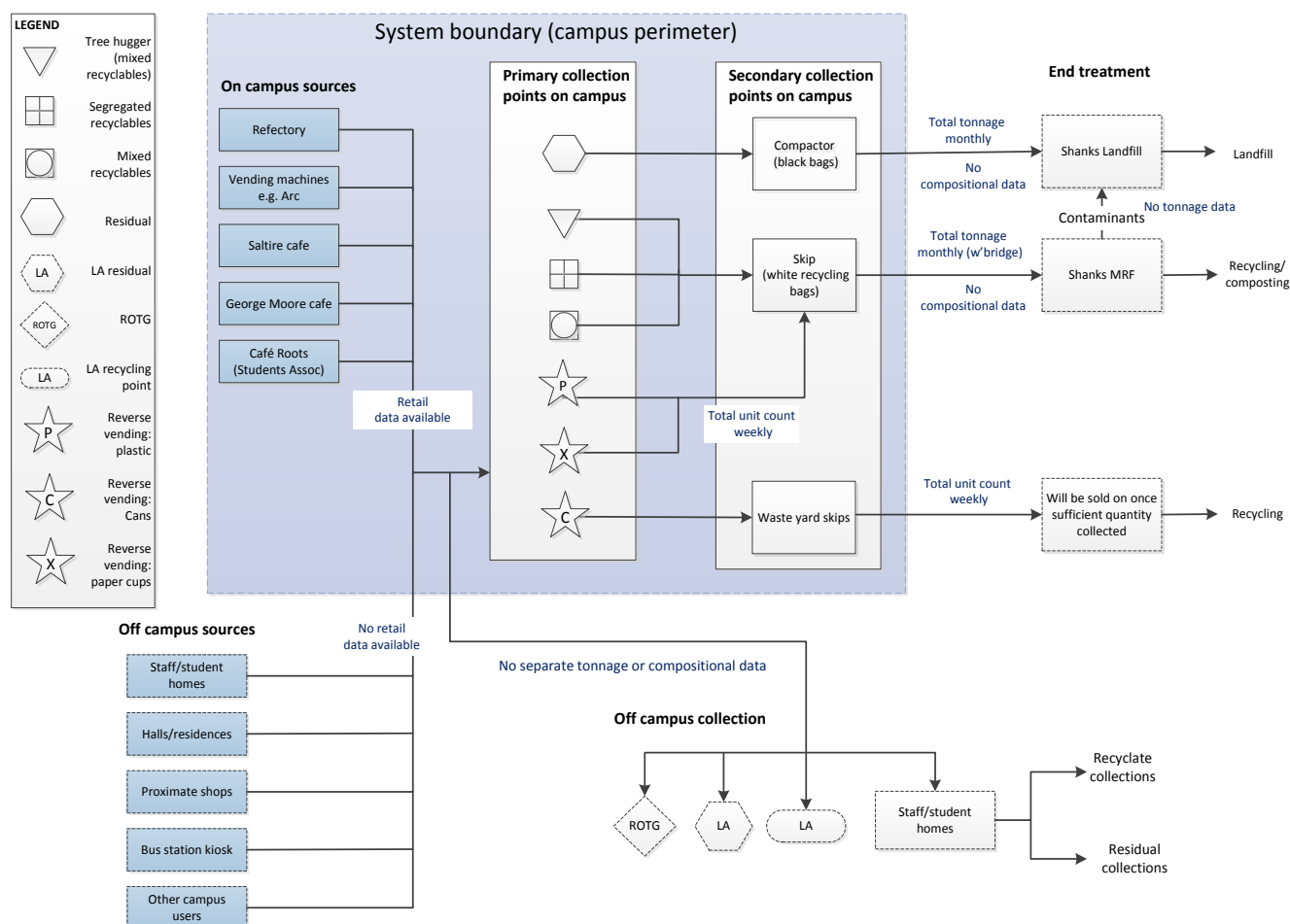
Figure 5 EcoVend machine and two Flex Interactive machines in the refectory



**Figure 6 Crushed plastic bottles and cans from the Flex Interactive machines; paper cups in the Ecovend machine receptacle**

The plastic bottles and cans collected were stored centrally with the other dry recyclate collected in the waste yard on campus. The cans were stored for sale when a sufficient quantity was collected. The flow of waste materials and associated waste data through the campus during the pilot scheme is shown in Figure 7.

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**Figure 7 Flow of waste and waste data after Recycle and Reward pilot project implementation**

Although the data collection period for this study ended on 27 September 2013, the university is continued the Recycle and Reward scheme beyond this pilot period.

## 2.5 Promoting the scheme

Zero Waste Scotland provided communications support and resources to assist Glasgow Caledonian University develop a communications plan and timetable of activities for the pilot project. The plan was approved by Zero Waste Scotland, as were all graphics materials and supporting text.

The primary audience was students aged 19 to 30 years old, of both genders and all ethnicities, who study full-time at GCU. This demographic makes up about 70% of the student population at the university. The demographic is very price sensitive and responds well to discounts and special offers. The secondary audience is the 12 student leaders who are based on campus, which is why the machines were located at Café Roots within the Students' Association, as well as the main refectory. These people are opinion leaders and have an influence on the behaviour of students on campus. They engage regularly with students through student group meetings, emails and events. They were targeted to act as champions of the project.

Glasgow Caledonian University wanted to make staff and students aware that reducing waste and recycling means less going to landfill. A secondary purpose was to educate staff and students on the reason for recycling, and what happens when their waste is recycled. By promoting these benefits GCU hoped customers would become increasingly committed to recycling.

The university noted at the outset of the communications strategy that it would need to relaunch the initiative at key points in the year, to raise awareness among new students and visitors to the university, who have had no previous exposure to its communications. Freshers' week in September is a key time to target new students and before it a summer campaign for conference visitors was deployed. Any promotions that run throughout the year on campus and that are linked to drinks containers were required to highlight the initiative in all promotional materials.

As with all new projects undertaken between Encore (Cordia (Services) LLP hospitality services company) and GCU, Encore promoted the project through a media/press launch. Encore has a partnership with a leading Scottish public relations company, The BIG Partnership, and used the latter's expertise to work alongside Encore's in-house marketing department.

### 2.5.1 Staff engagement

In the week before the launch event, Cordia (Services) LLP staff ensured key staff were trained on how to use the machines, what the vouchers looked like, how the redemption procedures worked etc. They delivered a briefing session to the estates team, which runs the waste management contract at the university, including the janitorial team, which is responsible for picking up litter, cleaning and maintenance. They were advised of the benefits but were also asked to champion the initiative to students. Following the launch of the project, Cordia (Services) LLP also delivered a briefing session to the university chaplaincy team (Muslim, Church of Scotland, Roman Catholic and Humanist). The chaplaincy team was also asked to champion the initiative and communicate the message to their members who may have a wider interest in the environment and recycling.



**Figure 8** Examples of signage at (clockwise from top left) the Students' Association Building, mid-campus and the refectory



### 2.5.2 Media/public relations

A programme of media/public relations opportunities progressed throughout the duration of the project. The main target media were local press and local websites, such as that of the Chamber of Commerce. The formal launch of the Recycle and Reward project took place on 14 March 2013. The launch activities included a formal opening by a member of the local council. It also included an appearance by Eco-man – the university's environmental mascot – and a demonstration by Zero Waste Scotland volunteers of the benefits of recycling the materials and types of products that could be manufactured from recycled packaging materials. A relaunch during freshers' week, the third week in September, was also undertaken.

### 2.5.3 Marketing communications

In the week before the launch, table talkers and posters were installed in the two main catering facilities. In addition, directional signage was provided, directing students and staff to the nearest Recycle and Reward machines. Pop-up banners were placed in locations adjacent to the machines and at locations close to the point of sale for drinks containers. These banners displayed maps of the user's current location and the location of the Recycle and Reward machines. A5 leaflets were also produced and placed in locations of high use and in the catering facilities around the campus.

Other promotional materials included features in *Caledonian Connect*, the in-house publication for the university. A promotional and informative video was produced and shown on plasma screens around the campus and on the university's Facebook page. Signage for Recycle and Reward was clearly visible at each machine site.

The university was closed to undergraduate students from June 2013 to the third week in September 2013. During this period, communications were maintained for visitors using the conference facilities and halls of residence. Leaflets about the project were included in conference delegate packs and an A5 leaflet was placed in each room in the Halls of Residence.

### 2.5.4 Freshers' week

GCU planned for enhanced communications during fresher's week, which began on 20 September 2013. Refresher training for staff and a refresh of general communications was supplemented by a new student awareness campaign targeting the new intake of students. For example, Encore held an information stand at Freshers' Fayre with pop-up banners, flyers highlighting the project and location of Recycle and Reward machines. At tills within the catering outlets, A5 flyers were placed in Perspex presentation holders. Shelf talkers were also placed in the drinks refrigerated units and vending machines at the point of sale. Flyers and posters were placed throughout the campus and in as many buildings as possible, including the gym and student residences.

## 2.6 Changes during the pilot period

The pilot at GCU functioned consistently from the outset in terms of customer service. From early May to the end of September, Café Roots was closed for refurbishment and there was no staff or student access to the Recycle and Reward machines in the Students' Association during this period. One further point of note is a power supply failure across the campus in mid-June, during the summer recess. This meant Recycle and Reward machines were not able to be used at either location, until power was restored.

## 3 Study method

**The overview report on the pilots gives greater detail on the method selected and the reasons for this. This section focuses on how these were applied in this specific location, first describing the approach to data collection on performance, and then the approach taken to the**

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**social research (obtaining user, non-user and staff feedback at the site). A final section considers challenges encountered in practice, and how far this affects the conclusions that can be drawn about pilot performance.**

### 3.1 Performance data collection

Quantitative data were gathered in various ways, described below. Although the desired level of granularity for the waste data was not available (either at an individual building or by material type) because of the waste management structures in place (section 2.2 above), there was a high level of engagement from Cordia (Services) LLP, the university and Revendit staff, who provided sales and redemptions data to compare with the machine returns data.

#### 3.1.1 *Machine throughput*

All of the equipment installed included unit counters to collect data on total number of containers collected, which were read weekly (every Friday) where practicable by a Cordia (Services) LLP staff member. These data were then returned to SKM in a basic spreadsheet. In addition, data were collected remotely by the Flex Interactive machines using remote telemetry and then forwarded to SKM approximately once a week by the machine supplier. The Ecovend machine did not have this telemetry function.

These data were available disaggregated by machine and the quantities of each material type at each site could be evaluated, although one site was closed for the majority of the pilot period. Throughout the data collection period, manual and telemetry data were sense-checked separately as they were submitted, and cross-referenced and compared to ensure general consensus in results.

Any anomalies were then addressed through dialogue with the Cordia (Services) LLP, GCU or machine supplier representatives but these were largely limited to minor variations in the time period or typos in completing the spreadsheet. For example, no data were provided on the week commencing 14 June 2013, whereas the data provided for the following week (commencing 21 June 2013) were unusually high, and it was clarified that these comprised the preceding two weeks' data; these data were therefore subsequently divided evenly across the two weeks. The collated data were also reviewed with the general manager at site visits.

Total rewards issued could be calculated based on the number of units inserted. Details of rewards claimed, including Golden Tickets, were submitted by the students' union staff on a weekly basis as part of the spreadsheet.

Machine downtime was included on the spreadsheet but this information was not available from the university staff. Records were provided by the machine supplier but the data were only high level, noting if a machine had been down during the week but with no indication of the duration of the downtime.

#### 3.1.2 *Waste and recycling data*

Baseline data were available for 2012 for total monthly tonnages of residual and total dry recyclate. During the pilot, total waste and recyclate amounts were collected on a monthly basis. The weight of material diverted through the machines was also estimated using average weights per container and total number of containers (units).

Photographic audits of the material types found in both the residual and recycling bins were also undertaken over the course of the pilots. This comprised compiling a photographic record of the contents of both recycling and residual bins on campus and in the vicinity of the machines. Areas audited included the refectory, the Hamish Wood Building, the Saltire Centre, the Students'

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Association Building, the main concourse and the main thoroughfare through the campus from North Hanover Street to Cowcaddens Road. Baseline audits were undertaken on 13 December 2012 and 16 January 2013 before the pilot period, and on 26 April 2013 and 2 September 2013 during the pilot period.

### 3.1.3 *Retail and rewards data*

Baseline retail data were not available on a weekly basis by product sold. Some monthly data for units purchased for resale were available for part of the period and used as a proxy value for units sold; however, a comprehensive dataset was available only for paper cups. A similar approach was used to provide data for the duration of the pilot, with data for cans, plastic bottles and paper cups all being available for the majority of the pilot period.

Recycle and Reward machine returns data can be compared with the sales data to gain some understanding of the 'capture' of relevant containers sold on site. Sales for the same timeframe in 2012 were provided as monthly sales values for comparison.

The redemption of rewards from the machines was also tracked. Data on rewards claimed were obtained from vouchers returned at point of sale in the various retail outlets.

In assessing the capture rate at GCU, it is important to remember the open nature of the scheme, and of the site. Containers bought off site could be placed in the machines, and received a reward. Conversely, containers bought on site may have been consumed and disposed of off site. There is no way to take these 'imports' and 'exports' into account.

## 3.2 Social research – quantitative survey and observations

**The methods used to appraise the attitudes, behaviour and experience of people using the Recycle and Reward machines at Glasgow Caledonian University were:**

- observational analysis (two days, 23 and 26 September);
- quantitative face-to-face surveys (250, 23–26 September); and
- focus groups (two: one user and one non-user group, 1 October).

Greater detail on the methodologies employed is available in the appendix. This section highlights considerations that are unique to this site.

Since the research at Glasgow Caledonian University was carried out between 23 and 26 September, i.e. early in the 2013/14 academic year, during the second and third week of teaching, it is possible that newer students may have been relatively unfamiliar with the scheme.

### 3.2.1 *Observational analysis*

The observational analysis was carried out on Monday 23 and Thursday 26 September between 09:30 and 17:30 by NSA engagement officers at each of the two areas where the machines were located. At each location an average time of eight hours of observations were carried out and recorded using standardised recording sheets.

Thirty-seven people were observed using the Recycle and Reward machines over the two days; 29 in the Students' Association Building and eight in the refectory. Four of the users in the Students' Association Building were cleaning staff. More women than men were observed using the machines, as summarised in Table 1. Given the relatively small number of transactions observed, only a qualitative insight into user activity and behaviour was possible.

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Users	Number	%
Male	14	38
Female	23	62
<b>Total</b>	<b>37</b>	<b>100</b>

**Table 1 Profile of observational analysis sample at Glasgow Caledonian University**

The observed proportion of male to female users is similar to the proportion across GCU overall, which is roughly 40% male and 60% female (based on 2011/12 data).

### 3.2.2 Quantitative survey

The quantitative face-to-face survey was carried out by two NSA engagement officers over five days (from 23 to 27 September) between 10:00 and 18:00. Participants were approached at random and invited to take part. The engagement officers approached students and staff, with the primary target audience being the machine-using student population at the two areas on campus where the machines were located. Male and female students of mixed ages were canvassed to take part in the survey. All students or staff observed using the machines at the time of surveying were approached to take part in the survey.

A total of 250 surveys were carried out at GCU, as detailed in Tables 2 and 3.

Age	Male	Female	Total	%
Under 18	11	10	21	8
18–29	84	98	182	73
30–44	25	14	39	16
45–59	2	4	6	2
60+	1	1	2	1
<b>Total</b>	<b>123</b>	<b>127</b>	<b>250</b>	
<b>%</b>	<b>49</b>	<b>51</b>		

**Table 2 Age and gender profile of survey participants**

Personnel	Number
Staff	17

Undergraduates	208
Postgraduates	20
Visitors	5

**Table 3 Staff/student/visitor profile of survey participants**

The overall profile of the surveyed population is summarised in Table 4.

Participants	Number	%
Surveyed	250	100
Non-users	209	84
Users	41	16
Regular users	18	7
Regular users plastic	14	6
Regular users cans	11	4
Regular users paper	8	3

**Table 4 Survey profile – users vs non-users**

The subgroups of users do not add up to the total as they are not mutually exclusive.

### 3.2.3 Focus groups

One group was carried out with people who had used the Recycle and Reward scheme at GCU more than once (users), and one group with those who had never used the scheme or who had used once or twice but claimed they would not use it again (non-users, including lapsed users).

Each group included both men and women from a spread of year groups. To ensure good group dynamics, no participants were chosen who rejected the idea of recycling or were active members of environmental groups.

Focus groups were conducted with students at GCU on 2 October 2013. The first focus group, for users, took place between 17:30 and 19:00; the second, for non-users, took place between 19:30 and 21:00.

There were nine participants in the user focus group: six women and three men; four first-year students, two second-year students, one third-year student and two fourth-year students.



There were 10 respondents in the non-user group: seven women and three men; seven first-year students, two second-year students and one third-year student.

### 3.3 Challenges encountered during the fieldwork

We encountered a number of challenges in delivering the planned monitoring at this complex and comparatively open site. These are detailed in this section, including any implications for what can be concluded from this pilot.

The most significant issues are described below.

**Sales data:** Data on the sales of each container type in 2012 were available but only as a monthly (calendar) figure. In addition, the procurement process at GCU bases monthly purchase of drinks cans not on the preceding month but on a recognised seasonal pattern and therefore is not immediately responsive to fluctuations in the on-site consumption of goods outwith these parameters. For this reason, quantitative assessment of changes in sales is limited. Originally retail data was to have been very detailed, as GCU had intended to apply bar-coded stickers to all materials sold on campus, traceable to the electronic point of sales system; however, this was found to be too labour-intensive and the idea was dropped before the pilot began.

**Machine data:** The Recycle and Reward machines used in the GCU pilot recorded units of bottles and cans and not the number of units inserted per transaction. This limits the understanding of how people are using the machines, although further information could be derived from the strand B work (see Appendix). The machine data were provided weekly, and this is therefore the smallest unit of analysis for changes over time.

No data on machine downtime were available from the site. Some data were provided by the equipment supplier but this was only in the form of noting which machines had had downtime each week, not the duration or frequency of the downtime. It is therefore impossible to provide quantitative evaluation of the machine reliability during the pilot, with only qualitative/anecdotal feedback available.

**Waste data:** Recyclables from the Recycle and Reward machines were added to segregated recyclables from the university's teaching and administration buildings. No weight data were available for this bulked up material, as it was collected on a round before crossing a weighbridge. In addition, the Shanks data gave only overall monthly recycling figures rather than figures by particular material.

We can, however, estimate the weight information for the recyclables from the machines in isolation, based on the number of containers counted, with a reasonable level of accuracy. The material diverted by the Recycle and Reward machines mostly comprises light-weight plastics and aluminium, however, so the weight of material being collected by the Recycle and Reward machines is relatively low compared with the combined weight of the other recyclable materials, which includes heavier materials such as paper. The impact of the machines on overall recycling quantities is therefore difficult to discern.

The residual waste data from Shanks provides only total campus-wide tonnages. Building-by-building data on residual waste from the campus is not available, because of how this is collected and bulked centrally. To provide greater insight into any changes in the university's waste and recycle collections in the relevant areas, visual inspection of residual and recycling bins within the buildings and grounds was undertaken on four site visits by the monitoring team (two before the pilot and two during the pilot), who collected photographic evidence. This, of course, only gives a very crude indication of any changes that might have occurred as a result of the pilot.

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**Figure 9 Examples of photographic recording of (a) residual and (b) recycling bins**

These restrictions mean that our understanding of the waste flows on campus is very limited in some key respects.

Summation of early data: Most data for the initial period up to 3 May 2013 were recorded and provided as total sums for the period rather than by week; therefore, evaluation of scheme performance at a weekly level is possible only for the period from the week commencing 3 May 2013 to the week commencing 27 September 2013.

Pilot timing: Much of the pilot project monitoring was over the quieter summer recess period, which is not representative of the university in full operation, and this may therefore reflect lower than normal sales, recycling and waste. That said, the university remained open and functional, with students attending for summer schools or resits, and the university facilities were in use for conferences and similar events.

Because of when the pilot ran, much of the social research at the university was carried out early in the new academic year (during the first two weeks of teaching from Monday 23 September 2013). This may have resulted in new students not having time to become aware of the machines, but equally awareness may have been high as students would have been introduced to the machines as a recent, novel, experience. As the autumn term recommenced on the last day of the pilot period, it is not

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possible to determine the subsequent trend associated with the return of students from the previous year. In the survey, only students' undergraduate or postgraduate status was recorded so it was not possible to take account of any 'fresher' bias.

Although the bulk of the pilot ran during the recess, the data can be split between term time and non-term time, and the dates of key events (e.g. exams, freshers' week) are known. It seems likely that any effect of surveying early in the academic year would be to understate awareness of the scheme.

Within the 250 responses to the survey, it is worth noting that users are a relatively small sub group. Thus, while analysis of this data is valuable, some subgroup conclusions need to be interpreted more cautiously.

## 4 Pilot performance and operation

**The following sections contain detailed quantitative and qualitative analyses of the scheme's performance. Sections 4.1 and 4.2 compare the machine data with the reported recycling behaviours from the social research, which are broadly complementary. Section 4.3 considers the rewards issued and claimed in more detail, while sections 4.4 and 4.5 focus on people's familiarity with the machines and how often they use them. Finally, sections 4.6 to 4.10 explore the potential wider implications of the pilot. This includes consideration of possible impacts on litter, net waste on site, any boost to sales on site and improvements in recyclate quality. Finally we consider operational aspects of the pilot, focusing on machine reliability (both actual and perceived) and staffing implications.**

### 4.1 Overview

Table 5 provides a summary of the overall pilot performance over the period from 15 March to 27 September 2013. Overall machine throughput data in terms of returns and rewards are shown with estimated weights for cans (~14g per can), bottles (~22g) and paper cups (~0.11g) taken from SKM data gathering.

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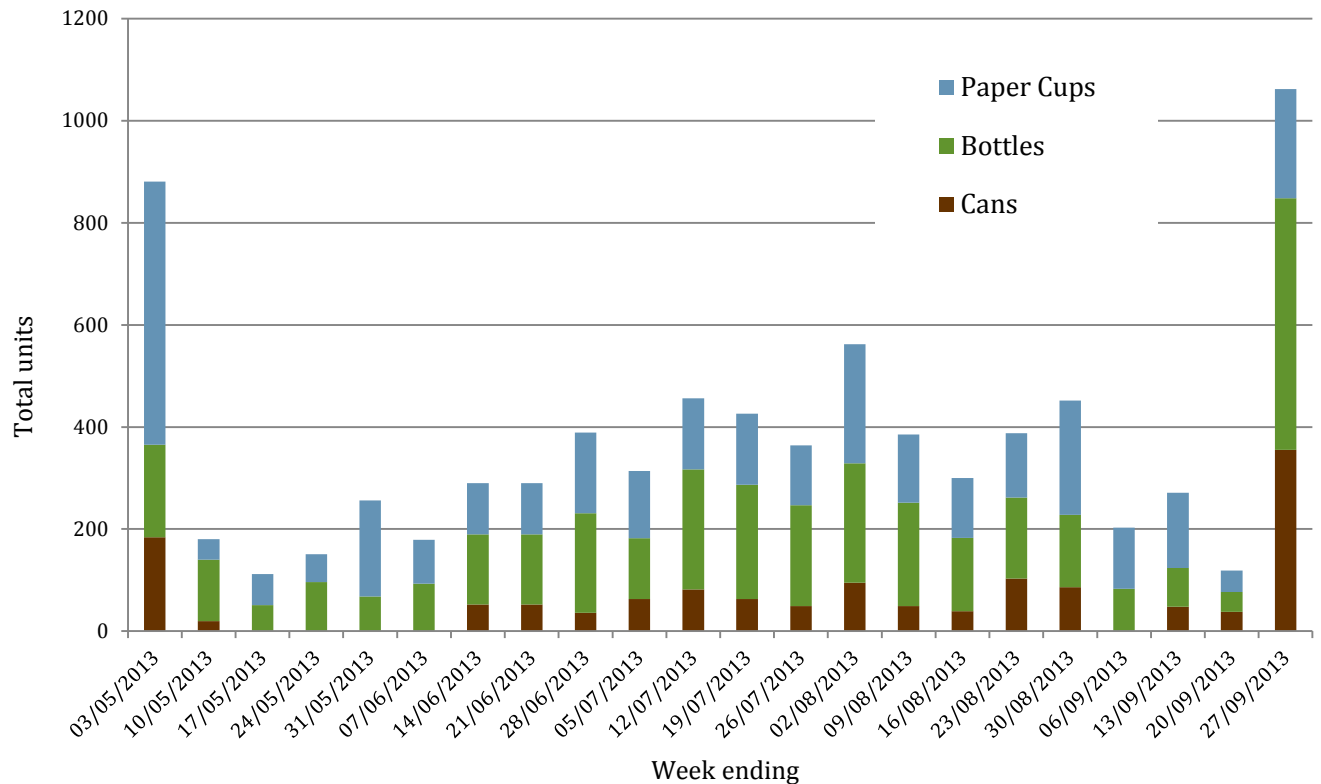
Throughput	Data category	Refectory	Café Roots (Students' Association)	Total
Returns by unit	Total cans (units)	1,168	651	1,819
	Total plastic bottles (units)	3,602	1,259	4,861
	Total paper cups (units)	4,256	842	5,098
Returns by weight	Total cans (kg)	n/a	n/a	26
	Total plastic bottles (kg)	n/a	n/a	105
	Total paper cups (kg)	n/a	n/a	561
Rewards (vouchers)	Total rewards issued (units)	9,026	2,752	11,778
	Total rewards claimed (units)	5,568	408	5,976 (51%)
Rewards (prize tickets)	Total Golden Tickets issued	n/a	n/a	123
	Total Golden Tickets claimed	n/a	n/a	84 (68%)

**Table 5 Summary of returns and rewards, 14 March to 27 September 2013**

In total, 11,778 units were collected via the Recycle and reward machines: 4,861 plastic bottles, 1,819 cans and 5,098 paper cups. These data mainly reflect activity relating to the three refectory-based machines, as the Students' Association Building was closed for refurbishment for 14 weeks over the period 10 May to 20 September 2013 (inclusive). The data show obvious peaks of activity when the student population is at its greatest (first week before exam period/summer recess) and in the last week (term recommencement). However, there is also a steady utilisation of the machines throughout the quieter summer period.

The bias towards cups is contrary to the reported higher awareness levels around bottles and cans; however, sales of items, and hence their availability to recycle, also have to be taken into account (see capture rate discussed in section 5.1.2 below). It is worth noting that the paper cups contain hot drinks, which are more likely to be finished close to the site of purchase, and also close to the machines in the refectory and Café Roots. Cold drinks sold in cans and bottles are more mobile in that they can be taken and drunk more readily on the move or on a later occasion.

Data were collected every Friday, so the x-axis in Figure 10 represents the week ending (w/e) date. The summer recess period ran from 6 May 2013. International Orientation Week was held w/e 13 September, induction week was w/e 20 September and teaching recommenced w/e 27 September. The summer teaching period ran from 13 May to 16 May 2013. To a large extent, the pattern of machine utilisation mirrors these fluxes in the student populations.



**Figure 10 Weekly quantity of materials collected by material type**

The weekly numbers of containers placed in the Recycle and Reward machines were compared with the number of containers of each type sold on the campus. It is recognised that this analysis cannot take into consideration containers bought off campus that were placed in the machines or items purchased on campus and disposed of outwith the campus. However, it does provide an indicative 'capture rate'.

Over the pilot period, an average of 16% of the total containers sold on campus were placed in the Recycle and Reward machines. The highest capture rate was for plastic bottles, at 21%, with 14% of cups and 12% of cans disposed of through the machines. A breakdown of the data by week is shown in Table 6. This shows a very wide swing in capture rates on a weekly basis, e.g. from 5% to 81% for cans, but this may reflect hoarding prior to use of the machine.

For the period 17 May to 7 September 2013, no cans were recorded by the university as being collected in the machines. However, when this was cross-referenced with the data from the machine supplier, the university data recorded a marginally (1.56%) higher value for the total number of cans collected over the whole pilot period. Thus, while it is acknowledged that there may be some variation in the weekly numbers around this period, there is confidence in the value for the total number returned via the machines.



Week ending	Cans	Plastic	Paper cups	Total
26 April	10	27	14	16
3 May	37	30	34	34
10 May	5	13	3	7
17 May	0	9	7	7
24 May	0	19	6	9
31 May	0	17	19	17
7 June	0	23	10	13
14 June	43	26	15	22
21 June	48	30	15	24
28 June	38	48	23	32
5 July	60	27	12	19
12 July	81	42	6	15
19 July	61	21	24	25
26 July	5	17	11	11
2 August	10	20	21	18
9 August	5	17	12	12
16 August	4	12	11	9
23 August	11	14	11	12
30 August	9	12	20	14
<b>Average</b>	<b>12</b>	<b>21</b>	<b>14</b>	<b>16</b>

**Table 6 Capture rate: percentage of units through Recycle and Reward machines compared to containers sold on campus for period April to August and averaged over period (period for which complete data is available)**

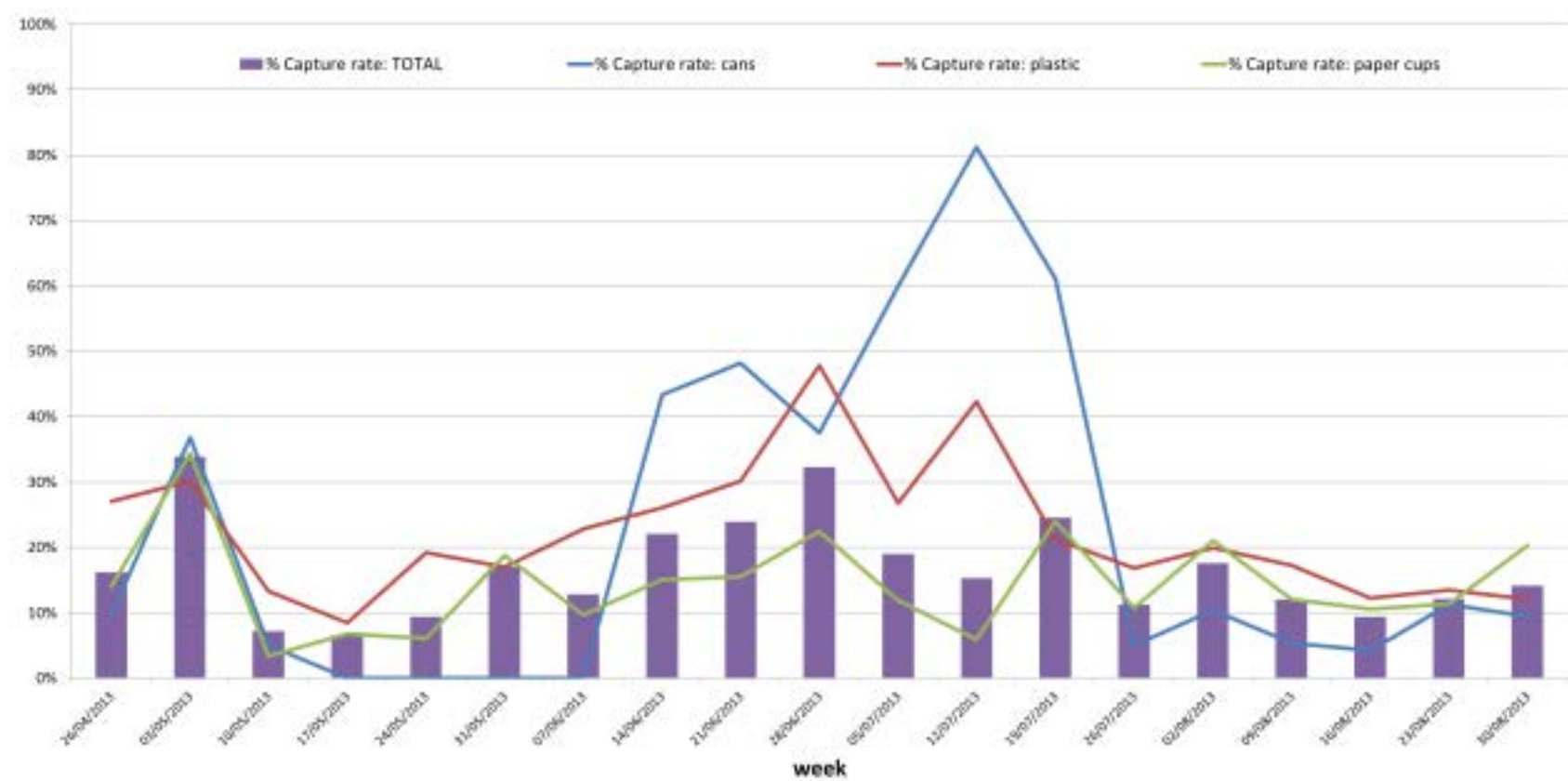


Figure 11 Weekly unit capture rate by material

## 4.2 Social research insight into items recycled

Of the Recycle and Reward users in the survey group, 76% claimed they had recycled plastic bottles, 34% paper cups and 29% cans. This is in contrast to the machine data, which showed a higher throughput of paper cups than both plastic bottles and cans. Some members of the cleaning staff were observed collecting items from the two catering areas and then recycling the items in the machines, which may have had some impact on this. These staff may have been recycling the majority of the paper cups but were not represented in the survey. During the observational analysis, over two days, 37 plastic bottles, 10 paper cups and three cans were observed being successfully recycled, while one can and two plastic bottles were observed being rejected.

While it is recognised that the sample numbers are small, the following data do provide some further indicative insights:

- 12% (31) of the total surveyed population (users and non-users) had recycled plastic bottles in the machines;
- 4% (10) claimed that they now recycled more bottles on campus since the machines had been introduced; and
- 4% (nine) claimed that they now recycled all or almost all of the bottles they bought on campus.

Before the machines were introduced, the repeat users, 6% of the total sampled population (13 people), had disposed of their plastic bottles in the following ways:

- put them in a waste bin (seven people; 50%);
- recycled their bottles on campus (four people; 29%); and
- recycled their bottles elsewhere (two people; 14%).

For aluminium cans the survey results indicated that:

- 5% (12) of the total surveyed population (users and non-users) had recycled cans in the machines;
- 2% (five) claimed that they now recycled more cans on campus since the machines had been introduced.
- 2% (six) claimed that they now recycled all or almost all of the cans they bought on campus.

Before the machines were introduced, the repeat users, 4% of the total sampled population (9 people), had disposed of their cans in the following ways:

- put their cans in a waste bin on campus (five people; 45%); and
- recycled their cans on campus (four people; 36%).

For paper cups the survey results indicated that:

- 6% (14) of the total surveyed population (users and non-users) had recycled cups in the machines;
- 3% (seven) claimed that they recycled more cups on campus since the machines had been introduced; and
- 3% (seven) claimed that they now recycled all or almost all of the paper cups they bought on campus.

Before the machines were introduced the repeat users, 3% of the total sampled population (eight people), had disposed of their cups in the following ways:

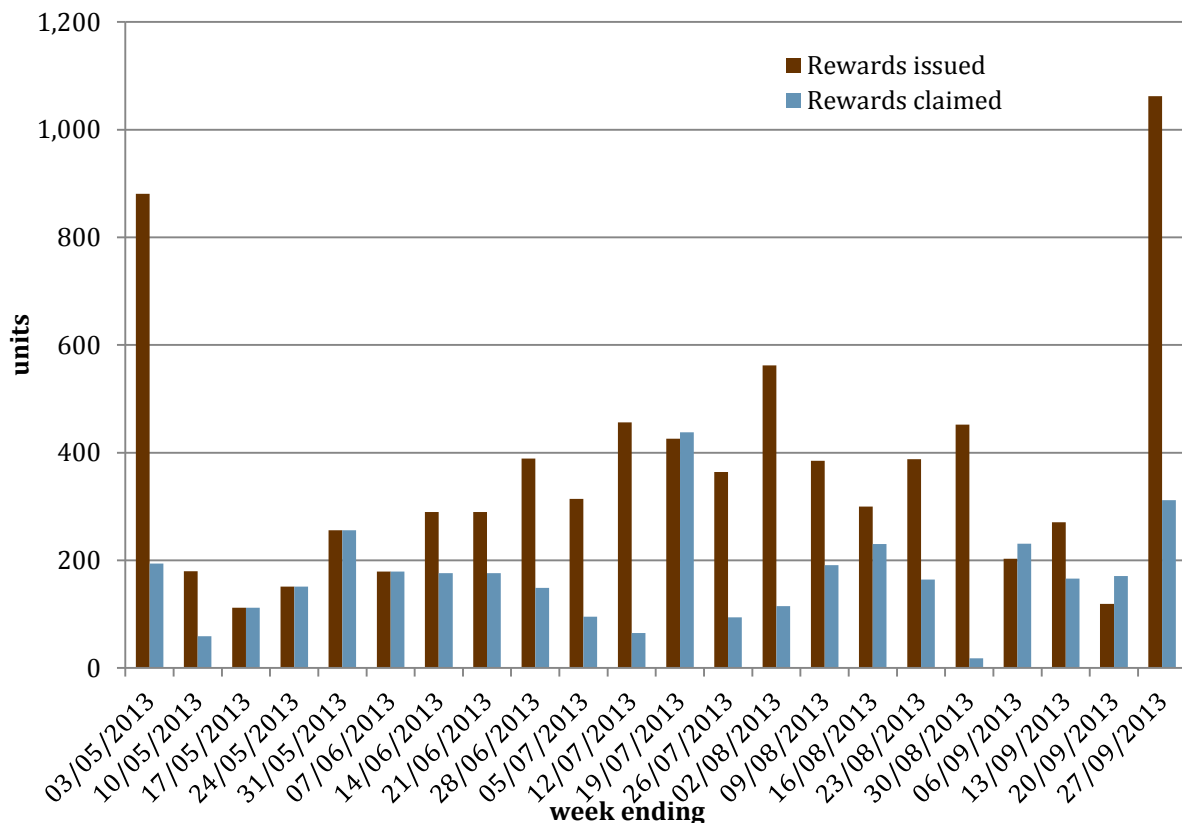
- put their cups in a waste bin on campus (six people; 75%); and
- recycled their cups on campus (two people; 25%).

While the sub-group sample sizes are small, the data suggest a significant switch from non-recycling behaviour to recycling using the Recycle and Reward machines.

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### 4.3 Rewards issued and claimed

Data on the rewards issued are based on the manual readings taken directly from the machine and have been cross-referenced with the telemetry data for additional validation. In total, over the pilot period, 11,778 rewards were issued plus a further 123 Golden Tickets. Overall there was 51% redemption (units) of the 5p rewards; the weekly trends are shown in Figure 12.



**Figure 12 Rewards issued and rewards claimed per week**

As noted above, data were collected every Friday and therefore the X-axis represents the week ending (w/e) date. The summer recess period ran from the 06/05/13 with teaching recommenced w/e 27/09/13 and the summer term lasting from 13/05/13 to 16/08/13. As with machine use, the pattern of issuing and claiming of rewards again appears to mirror the general flux in student populations. The weekly range of redemptions was 4% to 144% by value, confirming that some users were saving up vouchers and carrying them over to be redeemed in subsequent weeks. This is corroborated by the social research (see below) which shows that some people save vouchers for future use.

Redemption of the Golden Tickets was consistently and increasingly higher than for the 5p vouchers and 68% overall. The weekly redemption ranged from 17% to 100% but in the final 12 weeks of the pilot never fell below 67%. These data support the findings from the social research suggesting that the Golden Ticket reward was more popular than the 5p voucher; however a longer period of analysis may have shown some increase in 5p voucher redemptions due to the lag caused by voucher hoarding.

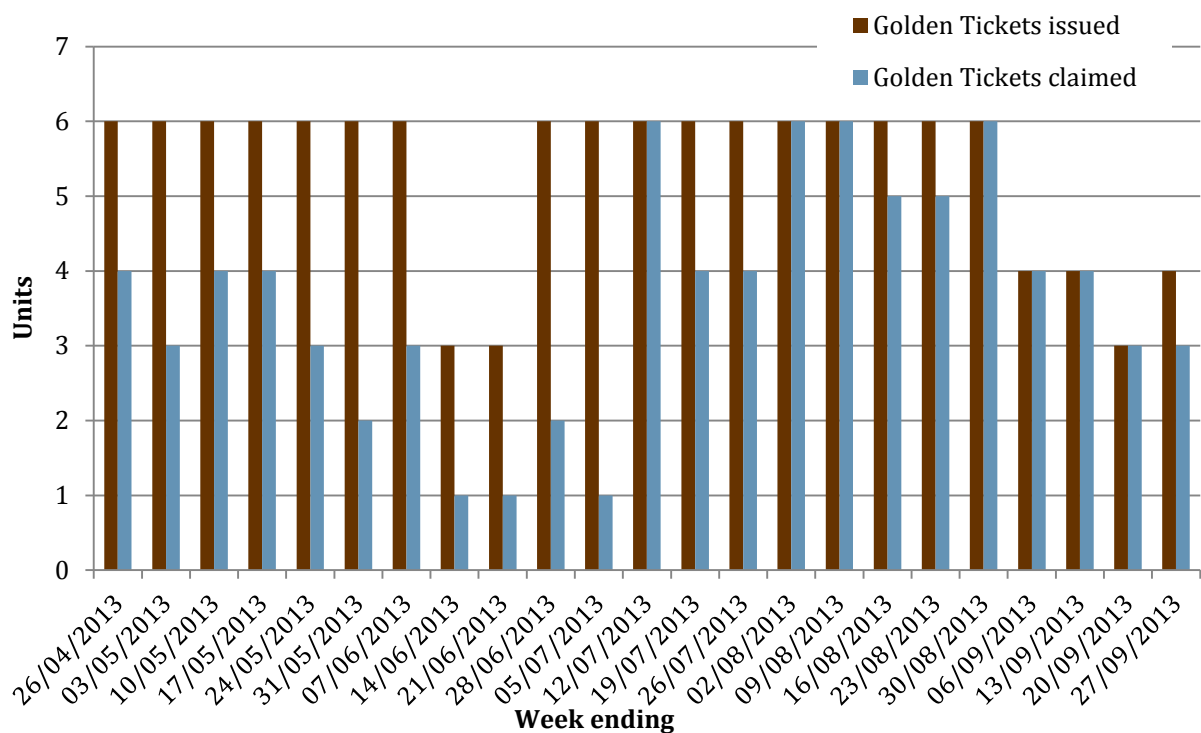


Figure 13 Golden tickets issued and claimed per week

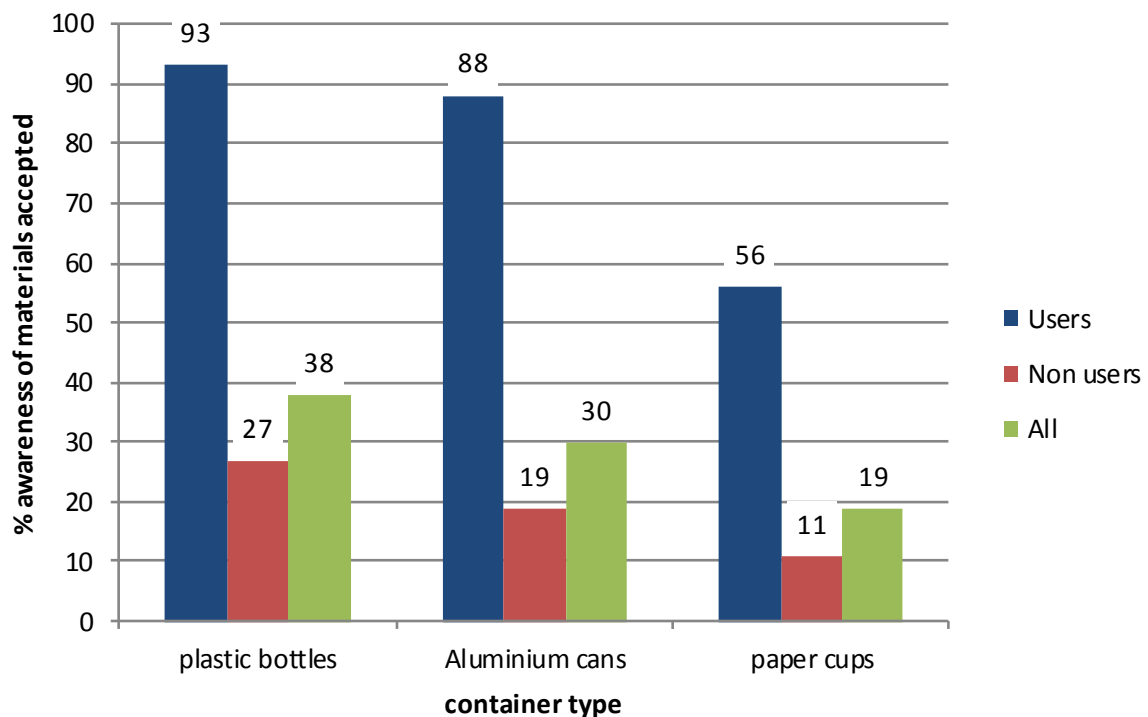
From the survey results, the majority (76%) of users had claimed not to have redeemed the vouchers, among whom 45% were saving them, 13% had lost them and 10% had not received (or taken?) a voucher. Of those who had received a voucher, half usually used the vouchers next time they bought something, 30% saved the vouchers and 20% used them straight away. From the observational analysis 78% kept the vouchers, 14% redeemed the vouchers immediately and 8% did not leave with a voucher, either because the machines did not issue vouchers or because people left the vouchers at the machines.

4.4 Awareness of the machines and their correct use

Of the 250 surveyed, over half (59%) were aware of the Recycle and Reward machines on campus. Awareness of what the machines accepted was higher among users than non-users for PET plastic bottles (users 93% and non-users 27%), cans (88% and 19%), and paper cups (56% and 11%).

It is interesting to note that there is a higher awareness of plastic and cans whereas the machine data demonstrate a higher throughput and capture rate (as calculated against container sales on campus) for paper cups than plastic bottles and cans. In particular, before the pilot there was already a facility for recycling bottles and cans on campus but the existing paper recycling excluded drinks containers. It may therefore be that the cans and bottles are a more familiar stream that springs to mind more readily than the ‘new’ stream.

The reported breakdown of awareness for users and non-users is displayed in Figure 14.



**Figure 14 Awareness of materials accepted by the Recycle and Reward machines**

Awareness that the machines accepted paper cups was lower than for the other materials. This fact was substantiated during the focus groups among both the users and non-users. No-one from the user group reported having recycled paper cups, which is strange given the high number of cups recycled through the machines, again perhaps implying that a small number of individuals (most likely amongst the catering or cleaning staff) were recycling the cups but were not proportionally represented in the survey and focus group samples.

Approximately one third (32%) of those surveyed were aware of activities carried out to promote the Recycle and Reward machines on campus. Relatively low awareness of the promotional materials is likely to have had an impact on the awareness of the machines themselves. Awareness was higher among the users: 56% noticed promotions compared with 27% of non-users, and the promotions were rated more highly by the users (83%) than the non users (55%). The most common forms of communications recalled were posters (54%), word of mouth (27%), email (14%), signage (13%) and social media (10%). Others had seen table talkers (6%), flyers (6%) and information on the university website (5%).

## 4.5 User groups and usage practices

Of those surveyed, only 16% had used the Recycle and Reward machines on campus, far fewer than the approximately 59% that claimed to be aware of the machines. Of the 16% that had used the machines, 44% (equating to 7% of the total sampled population) were classed as regular users. The patterns of use are displayed in Figures 15 and 16. Of the users, 56% (23) were classed as irregular (used only once) while 44% (18) were classed as regular (used two or more times). The high number of irregular users may relate to surveying taking place near the start of the academic year.



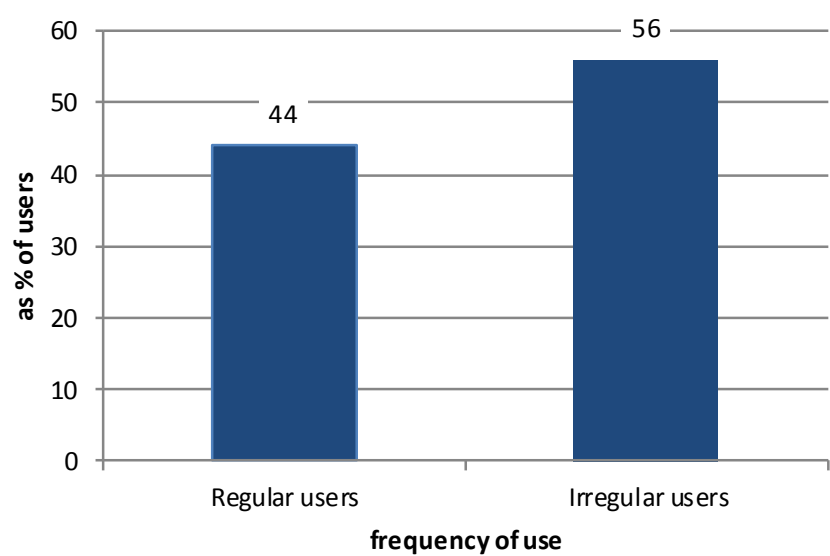


Figure 15 Frequency of using the Recycle and Reward machines: split by regular and irregular users

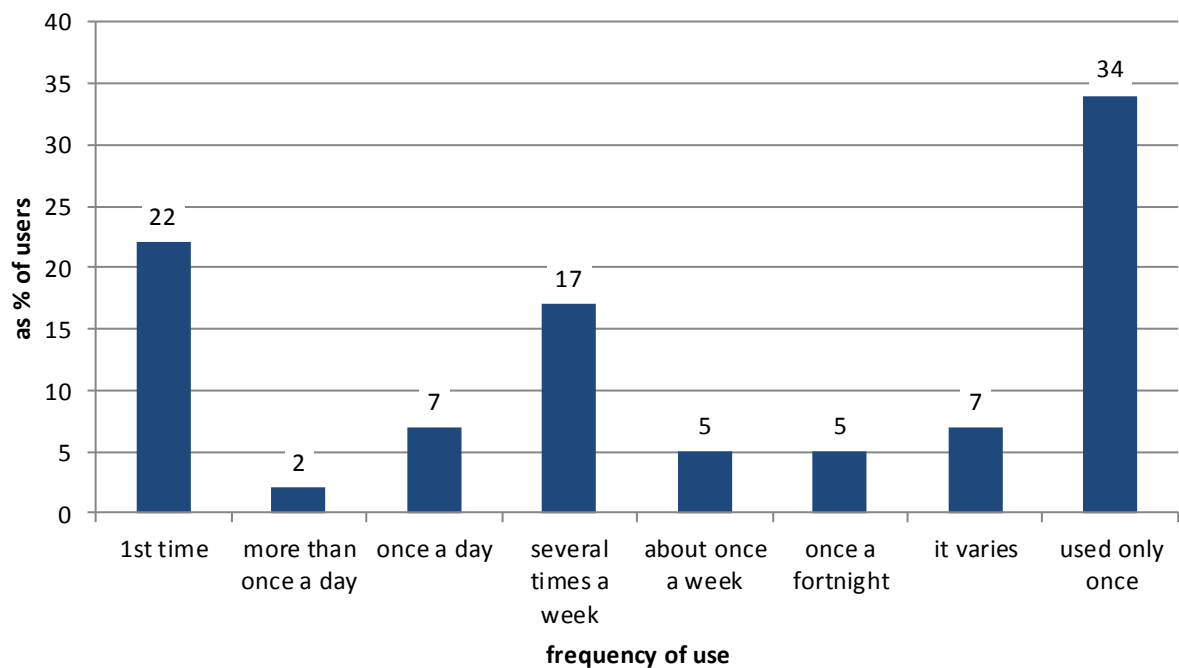


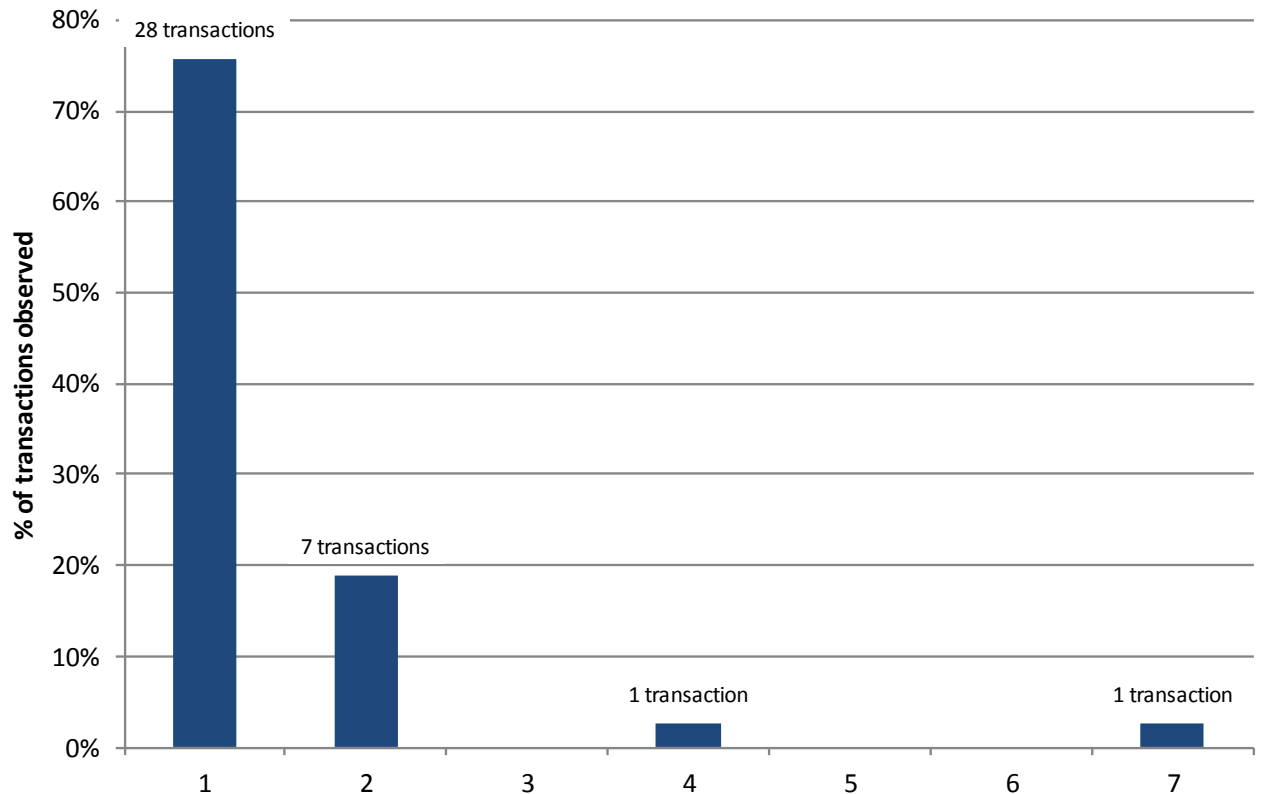
Figure 16 Frequency of using the Recycle and Reward machines: full disaggregation

The high proportion reporting using the machines once or for the first time is reflected in the overall trend identified in the machine data, where peaks of use could be seen occurring at either end of the pilot period, coinciding with the end and recommencement of term (the lower usage period in the interim ran concurrently with the reduced summer campus population). First-time users may have been new to the university, given when the fieldwork was conducted.

Women appeared to use the machines more than men: in the quantitative survey 56% of all users were female and 44% were male, despite the genders being evenly matched within the user sample. The overall survey profile of users comprised 73% undergraduates, 20% staff and 7% postgraduate

students; no users were visitors. The postgraduate group is 16% of the overall university community, and so is under-represented among the users – though this group may also spend proportionately less time on campus.

During the observations, the majority of people visited the machines alone (70%) and most of the rest in pairs (24%). Eight students were observed using the machines at the refectory and 29 people (25 students and four staff) were observed using the machines in the café/bistro area. The number of items inserted per visit is detailed in Figure 17.



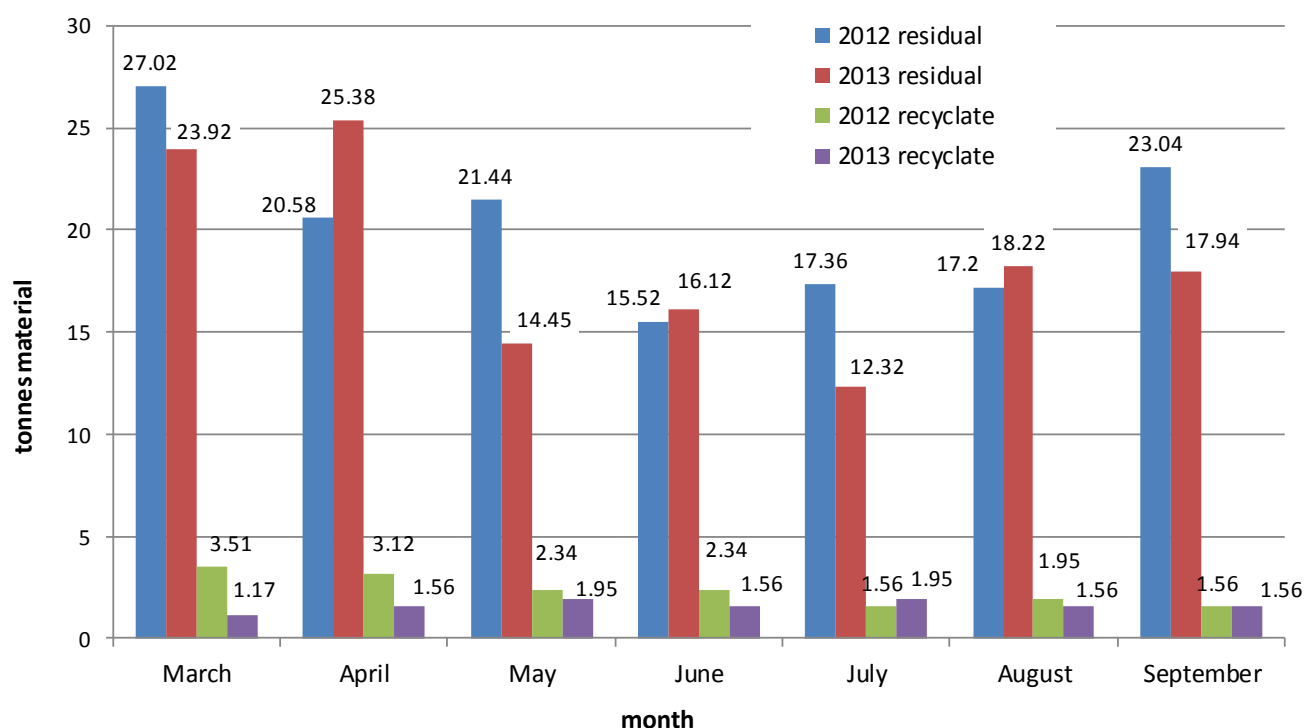
**Figure 17 Number of items returned to the Recycle and Reward machines**

## 4.6 Impact on litter

During the social research, 23% survey respondents mentioned reduced littering as a potential benefit of the pilot and, when asked directly, 18% of survey respondents people felt that the introduction of the Recycle and Reward machines had made a difference to litter levels at the university. No specific analysis was undertaken to assess the actual impact of the pilot on litter at the university.

## 4.7 Impact on overall waste

The monthly waste and recycle collected for the pilot period are shown in Figure 18.



**Figure 18 Comparison of waste and recycle 2012 and 2013**

Both residual and recycle tonnages drop over the summer months, when the campus is less busy. Overall, total residual weights for the March to September period reduced by 13.81 tonnes, or 10%, in 2013 compared with 2012. However, the total weight of recycle for the same period (including the plastic bottles and paper cups collected via the Recycle and Reward machines) also decreased by 5.07 tonnes or 4%. The cans collected through the machines were stored separately to be sold for income when a sufficient quantity had been collected, and therefore are not included in the returns from the waste contractor relating to recycle tonnages (their weight was just 26kg, however). Based on these data, no conclusions can be drawn regarding any impact on the overall waste and recycling quantities caused by the existence of the machines.

The weights of material being diverted through the Recycle and Reward machines were estimated using unit weights gathered by SKM. The proportion, by weight, of the plastic bottles and paper cups diverted through the Recycle and Reward machine during the pilot period averaged 6.1% of the total recycle collected (Table 7). Quantities of plastic bottles, cans and paper cups have all been included, although it must be remembered that (a) the target materials were very light compared with some of the other recyclables (e.g. paper) and (b) half of the machines, in Café Roots, were unavailable for most of the pilot.

Waste stream category	Mar	Apr	May	Jun	Jul	Aug	Sep
Total recycling (t)	1.17	1.56	1.95	1.56	1.95	1.56	1.56
Total weight (all materials) through Recycle and Reward machines (t)	0	0.25	0.11	0.06	0.08	0.12	0.08
Proportion of total recycling through Recycle and Reward machines (%)	0	15.8	5.6	4.0	4.0	7.4	6.1

**Table 7 Estimated weights and proportions of materials collected through the Recycle and Reward machines**

As noted, because of the manner in which residual and recyclable materials are collected at the university, it was not possible to quantify the impact on the material composition of the residual and recycling streams. However, as noted, photographic observational surveys of bins were undertaken to provide a proxy evaluation of the ongoing impact on the range of materials collected within these streams.

It is important to note that other sustainable waste management promotions, including improved labelling for regular recycling bins, were running concurrently with the Recycle and Reward pilots. This may have diverted attention from the Recycle and Reward machines to some extent, although this was not raised in the focus group or survey responses.

Figures 19 and 20 provide an illustration of the photographic record collected at the observational bin audits; the photographs shown in Figure 19 were taken on a pre-pilot audit and those in Figure 20 on an in-pilot audit. As a series of snapshots, these pictures are not conclusive, although it is significant that Figure 20 shows that (a) there are still a significant number of plastic bottles, cans and cups being disposed of in the non-machine facilities and (b) there is still significant contamination of the residual waste stream.



**Figure 19 Examples of contamination on first observational bin audit: (a) mixed dry recyclate; (b) can recycling**



**Figure 20 Examples from September observational bin audit: (a) residual waste; (b) plastic recycling; (c) can recycling**

Although the evidence is weak, the implication is that the reward from the machines has not driven a wholesale switch from the un-rewarded recycling facilities.

## 4.8 Impact on container sales

With regard to the impact on container sales, comparative data were unavailable for cans and plastic bottles; however, data were available for May to September for paper cups. While this showed an overall trend for higher sales in 2013 than 2012 (Figure 21), it is not possible to assign this to the Recycle and Reward system encouraging customers to use the campus outlets. Many other factors could account for the difference seen, and the social research with the student population does not support the contention that more purchases are being made on site as a result of the scheme.

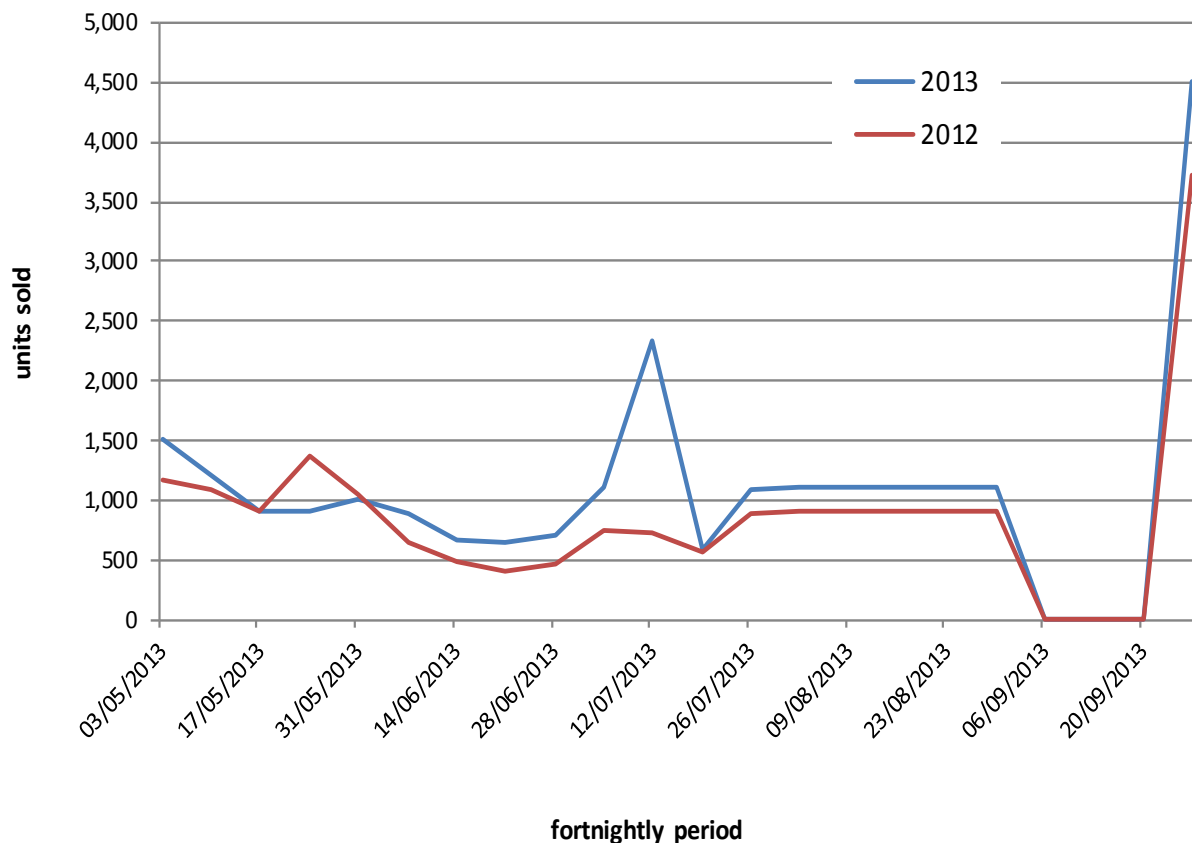


Figure 21 Comparative retail figures for paper cups 2013 and 2012

## 4.9 Impact on material quality

Each of the Recycle and Reward machines installed at GCU was set up to accept only one container type: PET plastic bottles, aluminium cans or paper cups. The machines are designed to accept only items fitting the weight/size/shape criteria of the accepted material. No data are available regarding any contaminants found in the machines, although site observations indicated that contamination levels were negligible (Figure 6 above).

Some users reported that items they attempted to insert were rejected. It is not possible to say whether these rejections were 'correct' (i.e. the machine refusing to accept an un-targeted item such as a plastic milk bottle) or 'incorrect' (i.e. where the machine fails to recognise a legitimate item).

In theory, the machines collect very pure material, potentially of higher value than those coming from the other recycling facilities, as the latter exhibit a considerable level of contamination. However, given that the amounts collected in the pilot are very low compared with the rest of the university's recyclate, any cost benefit is unlikely to be realised without all material being recycled through the machines. Aluminium cans may be an exception, as these were being stockpiled separately for eventual sale.

## 4.10 Operational factors

**This section considers the machines' technical reliability, and also how reliable the users and staff thought them. It also considers the resourcing implications of the scheme for the site; specifically where these diverged from initial expectations.**



#### 4.10.1 *Machine reliability*

Although machine downtime records were provided by the machine supplier, the university staff did not record data on machine downtime. Supplier records for the Flex Interactive showed machines being reported as experiencing downtime in eight of the 29 weeks, excluding the period when the Café Roots area was closed. There were no data for the Ecovend machines. Anecdotally, the service response in sending out a technician was prompt when requested, helping to keep downtime to a minimum.

Of the users surveyed, 7% claimed that the machines would not accept the containers they were attempting to recycle. This may of course represent the machine functioning correctly and refusing incorrect items as noted above; however, it seems highly likely that rejections do influence user perceptions of reliability. In addition, 20% of the users surveyed suggested that they had encountered machines that were full or broken and out of operation. Some 10% of users surveyed said they had experienced the machines not issuing a voucher, although again this may be partly because containers were rejected.

#### 4.10.2 *Resourcing the scheme*

No additional manpower was required for the implementation of the pilot. Cordia (Services) LLP's general manager for catering services was very enthusiastic about the pilot, regularly engaging with users in the refectory to encourage and assist use of the machines. The weekly manual data recording was undertaken by an existing Cordia (Services) LLP staff member as part of regular maintenance of the catering areas, e.g. vending machine stocking.

Data on rewards claimed were recorded electronically at point of sale by the tills. The general manager also collated and returned the pilot performance data on a weekly basis using the form provided by SKM. Waste management data were provided by the acting sustainability coordinator, who also played a crucial role in promoting and facilitating use of the recycling facilities in general, including the Recycle and Reward machines. Specific promotion of the machines was integrated into general 'green' events on campus, as well as stand-alone promotion, and was supported by existing university staff in the marketing department.

The acting sustainability coordinator assisted SKM staff with the photographic audits undertaken of the materials collected in both the residual and recycling bins at site visits, and also undertook additional audits personally. As the remit of the acting sustainability coordinator includes promotion and improvement of the on-campus waste management services, this meant that, again, the resource was already available at this site.

While extra work was clearly required, most of the additional work (compared with dealing with a normal recycling bin) was related to the pilot monitoring rather than the essential operation of the machines. In addition, the monitoring was a relatively 'easy fit' with existing practice and job descriptions, making the process less burdensome.

## 5 Public reactions to the pilot

**In assessing public reactions, this section considers the views of only the target population for the scheme (which was also the target population for the social research) plus any staff or site insight into the pilot. This section first considers user and non-user views in isolation, before discussing the extent to which the rewards themselves were seen as appropriate more generally. It then discusses the legacy of the system: the extent to which users and the site wish to see it continue, and whether or not it will. A final section summarises the perceived benefits of the scheme and also highlights any questions raised about the scheme, and user suggestions for changes.**

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## 5.1 User views and motivation

The majority of users liked the Recycle and Reward machines, rating both overall satisfaction and ease of use very highly (93%). Most of them rated the operating instructions as easy or very easy to follow (93%). However, the users are a small group (only 16% overall in the strand B surveying). From the focus groups, it also emerged that users found the machines easy and convenient to use and during the observations 76% of users appeared confident using the machines.

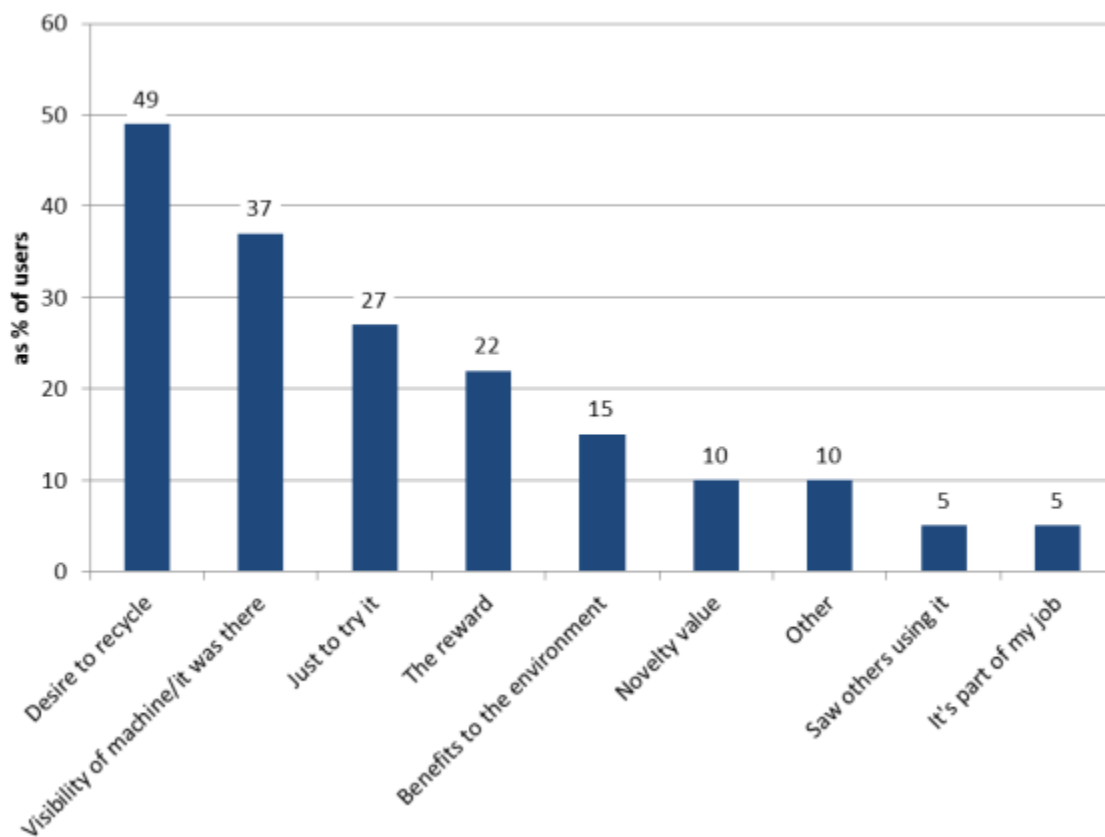
Some users, who could not recycle at home for lack of facilities, welcomed the machines as they provided them with a method of recycling. This may become less significant in the context of increased roll-out of home recycling provision under the Waste (Scotland) Regulations.

As noted above, difficulties encountered by users were:

- full or broken machines that were out of operation (20%);
- blank or no vouchers issued (10%); and
- materials rejected (7%).

Additionally, users suggested that it would help to encourage them to continue to use the machines if it were made clearer that paper cups could be recycled. Better clarification of the benefits of using the Recycle and Reward machines, rather than other recycling bins located across the campus, would also help to motivate further or increased use. The issue of the environmental impact of the machines, including continued power use and the materials used for construction, was raised by a few students in both user and non-user groups and remains a perceived downside of their continued use.

The desire to recycle (49%) and the physical presence of the machines/just to try it (64% combined) were the primary motivations for students and staff to use the machines, as displayed in Figure 22. Interestingly, only 22% noted the financial reward as being a motivator. Note that survey respondents were allowed to select more than one option.



**Figure 22 Motivation to use the Recycle and Reward machines**

These motivations were emphasised during the focus group research.

- Users had used the machines because they were keen to recycle.
- They were easy to use and conveniently placed when they had drinks containers to discard.
- Some users wanted to 'play' with the machines.
- The reward was appreciated but for some it was 'too small' an amount to be the main reason to recycle.

People identified the primary benefits of the machines as:

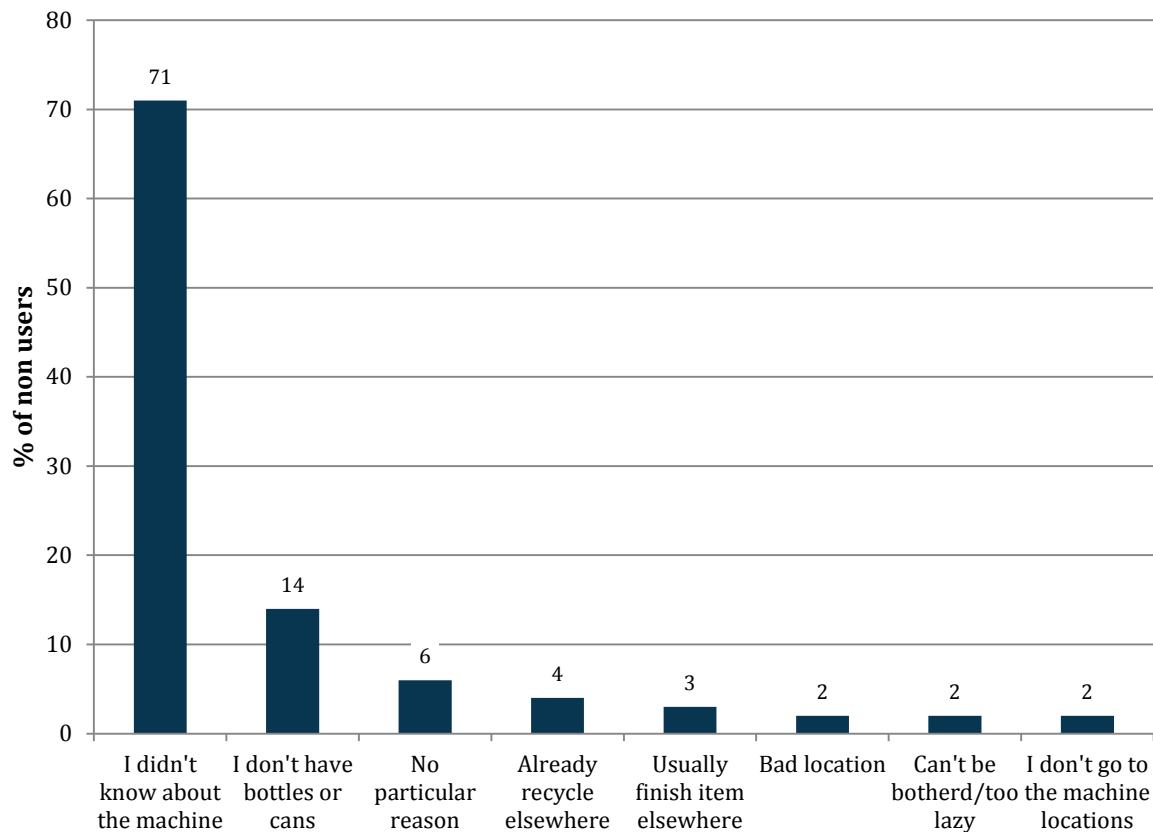
- improving recycling rates on campus;
- motivating and encouraging to get people into the habit of recycling; and
- reinforcing recycling as a positive action.

The findings suggest that user commitment to recycling, convenience and innovation were the greatest drivers for machine use.

The main benefits identified during the social research (users and non-users) with the Recycle and Reward scheme were that it improved the quality of the environment and recycling rates, caused less pollution and reduced waste sent to landfill (79%). Another potential benefit identified was enhancing the corporate reputation of the university as an environmentally responsible organisation (6%). The main downsides to the scheme were identified as the financial and environmental impacts of installing and running the machines, although this was merely a personal view and not based on any data around the operation.

## 5.2 Non user views

Of those surveyed, 84% did not use the Recycle and Reward machines. The primary reason for this was that they were not aware of the machines (71%). Other reasons are shown in Figure 23. The lack of awareness of the machines is surprising because, as mentioned in the methodology, the surveys were carried out near the machine locations. In addition, campus-wide signage was erected and there was a wide range of other promotional activities undertaken, as discussed in section 2.5. The survey did not provide further data to explore this. Only 14% said that they did not have the containers to recycle and even fewer (4%) said that they already recycle elsewhere.



**Figure 23 Reasons for not using the Recycle and Reward machines**

The justifications for non-use identified during the focus groups were similar to those found in the survey.

- People were not aware of the machines.
- Location of the machines was identified as inconvenient. Some non-users did not know where the machines were located. Most claimed to be rarely in the vicinity of the machines when they had finished drinks containers and would not make a special trip solely to recycle their materials.
- It was easier to use the recycling bins around campus when they wanted to recycle these containers. The benefit of more sophisticated machines over simple recycling bins was also queried.
- The scheme and the machines were, as yet, not salient for them and for a very small minority recycling was not a priority, perhaps even 'not worth it', in the global scheme of things.

The primary changes that non-users stated might encourage them to use the machines were:

- if they were made aware of the Recycle and Reward machines on campus (39%);
- if there were more promotion, advertising and information to support the scheme (25%);
- if the machines were in more suitable areas (20%);
- if they used the packaging materials (bottles, cans and paper cups) the machines accepted (10%); and
- if the reward were better or different (7%).

During the focus group, several non-users suggested they would be more inclined to use the machines if there were more of them spread around the campus:

- in the sports complex, as drinks were regularly consumed and containers discarded there; and
- at the main campus exits, which were busy and were also locations where students might wish to get rid of empty drinks containers.

The non-users suggested making it clearer that paper cups could be recycled. Also, clarifying the benefits of using the Recycle and Reward machines rather than other recycling bins located across the campus would help to encourage them to use the machines.

Despite the various barriers noted above, 90% of the non-users surveyed indicated that they would now consider using the machines as a result of becoming more aware.

### 5.3 Appropriateness of the rewards

Of all survey respondents, both users and non-users, 85% indicated that the rewards offered were appropriate. However, in contrast, some in the user focus group, although they appreciated the rewards, deemed that the 5p voucher was too small, was a waste of paper for each transaction and would not encourage people to recycle. The contrasting views may represent the difference between an instinctive quick survey answer and a more considered focus group one.

Two users from the focus groups had redeemed their vouchers to claim money off purchases in the catering outlets, one was saving them in the (mistaken) belief that she could claim 50p cash off in one transaction with 10 vouchers, and a few had discarded or lost their vouchers, suggesting they were of little value to them. There was a suggestion of potential embarrassment at both being seen to be recycling for such a small amount and the need to claim such an amount. These views tie in with the relatively low redemption rates recorded (51% overall).

Only a few of the non-users were aware that the reward was a 5p voucher and, when made aware, some suggested this made it even less likely that they would make an effort to use the Recycle and Reward machines, presumably since the 5p was not a big enough motivator.

Suggestions made for alternative rewards included using the student matriculation card as a loyalty card with points being added to the card at the machine each time materials were recycled. It was also suggested that it should be possible to redeem these points at as many campus outlets as possible, including for printing. This seemed to add value to the scheme for these students. It is worth reflecting that the appropriateness of the reward may relate as much to the convenience of keeping and claiming it as to the financial value itself.

None of the students (users and non-users) in the focus groups were aware that they could win a Golden Ticket and no-one was seen winning a ticket during the observational period. This idea was, however, very enthusiastically received, to the extent that most non-users claimed they might now be inclined to seek out the Recycle and Reward machines. This reward also removed any potential embarrassment at being seen to participate for such small rewards. The 'Golden Ticket' was viewed

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as being much more appealing than the 5p per container in terms of both the fun associated with potentially winning and the prize of free meals on campus. These findings were supported by the higher redemption rate for the Golden Ticket: 68% overall, and 89% for the last 12 weeks of the monitoring work.

The higher value of the Golden Ticket may make it a more appealing reward, while lower-value (and in particular paper voucher) rewards may be perceived as 'more trouble than they are worth'. This may indicate that the Golden Ticket 'prize draw' approach alone may be sufficient to sustain the use of the machines, allowing the 5p voucher to be dropped and hence reducing the financial outlay for the university. It was also suggested that the prizes should be varied as a means of maintaining interest in the longer term, perhaps using different value prizes with bronze and silver tickets. The need to provide 5p for each recycled item was questioned if forfeiting it meant more or better prizes.

## 5.4 Legacy of the Recycle and Reward scheme

The majority of participants (92%) were clear they would like the Recycle and Reward scheme to continue in the university and 85% were keen to see similar schemes become more widespread across Scotland. During the focus group, those who had used the scheme and several of those who had not yet used it wanted to see it continued and extended. They indicated they would like more machines around the campus to make it more convenient to use, and a campaign to be run to raise awareness of the Golden Ticket initiative.

## 6 Conclusions

**The machines were liked by the majority of users, with overall satisfaction and ease of use both rated very highly (93%). The scheme was well received by key staff at Cordia (Services) LLP and Glasgow Caledonian University, being consistent with the university's drive to improve its environmental standing. During the pilot period the university was awarded the Ecocampus Gold Phase Award on 30 August 2013 and the Best Partner Award for the Scottish Resource Efficiency Conference on 2 October 2013. The Recycle and Reward pilot was included in the submission for the latter. The university continued the scheme beyond the pilot period, although Zero Waste Scotland has not received a status update for the current academic year.**

Just over 11,700 containers were recycled via the Recycle and Reward machines during the pilot period, with the seasonal variations in university life reflected in the weekly data. This represents 16% of the containers estimated to have been sold on campus during the period, recognising that some containers recycled may have been brought from elsewhere, and that, conversely, this figure does not reflect the fact that some drinks were taken off site for consumption. The machine capture rates for individual materials were 21% for bottles, 14% for paper cups and 12% for cans.

The overall capture rate (by sales) via the machines fluctuated significantly over the pilot, from 7% to 34%. The pattern of throughput showed a sharp drop over the summer recess with greater use at both the end of the spring term and the beginning of the autumn term. Further monitoring was planned for the Autumn term, but was not possible due to staff unavailability. However, other university sites that ran pilots saw increased usage in the Autumn term.

The actual tonnages collected by the scheme were ~0.7 tonnes, 6.1% of the total dry recyclate, reflecting both the relatively low capture rate noted above and the low weight of the targeted materials compared with all recyclables including paper. The total quantity of material collected will have been affected by the closure of the café/bistro where half of the machines were located. This venue was selected because of the good level of interest and engagement demonstrated by the Students' Association, and the positive impact of the reopening of the refurbished venue was becoming apparent in the last sets of data. The site was seen as a good choice going forward.

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User surveying suggests that, while 16% of respondents had used the machines, only 7% of respondents were regular users of the scheme, with a further 9% having used it only once or for the first time. Some 4% claimed to be recycling more bottles, 2% claimed to be recycling more cans and 3% claimed to be recycling more paper cups as a result of the scheme.

The primary reason given among the non-users for not using the machines was lack of awareness of their presence and purpose (84%). The primary changes respondents identified that would encourage non-users to use the machines were greater awareness, knowledge and a fuller understanding of what the machines were for and their benefits (39%). More promotion and advertising to support this (25%) and locating the machines in more suitable areas such as the Arc Sports Centre or entrances/exits to the campus (20%) were suggested.

There appears to have been no significant gender bias and the majority of people visited the machines alone. The desire to recycle (49%) as well as the physical presence of the machines and a desire to try them out (64% when combined) were the primary motivations for students and staff to use the machines. Only 22% identified the financial reward as a motivator. Cups are interesting in that they tend to be emptied where they are bought (a hot drink being more difficult to carry than a can or plastic bottle) and that few survey respondents were aware that they could be recycled using the machines. It appears from the transaction data and the survey responses that a disproportionate number of the paper cups were being collected by catering and cleaning staff in the refectory.

Although the rewards offered were deemed to be appropriate by the majority of people, some felt the 5p reward was too small, seemed like a waste of paper for each transaction and would not encourage people to recycle. As many as 76% of users surveyed stated that they had not redeemed their vouchers. Suggestions were made for alternative rewards, including using the student matriculation card as a loyalty card, with points being added to the card for recycling at the machines; rewards being able to be reclaimed in as many campus outlets as possible, and rewards being exchangeable for campus services, such as printing, in addition to goods.

The Golden Ticket reward was favoured over the standard 5p voucher. An average of 68% of the Golden Tickets were redeemed, compared with 51% of the 5p vouchers, and the redemption rates for the Golden Tickets was increasing as the pilot progressed (89% over the last 12 weeks). The Golden Ticket was viewed as being much more appealing than the 5p reward per container in terms of both the fun associated with potentially winning and the prize of a week's free meals on campus. However, actual awareness of this prize appeared to be low. It was also suggested that the prizes should be varied to maintain interest in the longer term, perhaps using different value prizes with bronze and silver tickets. The need to provide 5p for each recycled item was questioned if forfeiting it meant better prizes.

Analyses of the findings from the GCU Cordia (Services) LLP pilot therefore suggest a number of recommendations for future implementation of Recycle and Reward schemes. Rewards should be carefully considered, as the nature of the reward can be perceived as both encouraging and offputting. For example, the 'lottery' of the Golden Ticket was more popular than the 5p token, even though there was a 'chance' element to the reward; i.e. making it a game seemed to appeal to the student population.

The suggestion of widening the range of rewards to include, for example, on-campus printing services would work best for schemes that are isolated to a specific site, e.g. a campus. Similarly, use of the matriculation card as a 'loyalty' card proxy could be explored to establish efficacy but again would be appropriate/feasible only for a campus environment. If there is broader rollout then coordinating the rewards with the wider locale may prove complex unless linked to a UK scheme such as Nectar.

There were some questions around the environmental impact of making and running the machine versus the benefit of recycling the materials in this way. This was not a concern that was widely

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expressed, but is something that might benefit from being addressed in communication around any future schemes.

The majority of participants (92%) were clear they would like the Recycle and Reward scheme to continue in the university, with 85% keen to see similar schemes become more widespread across Scotland. During the focus group, those who had used the scheme and several of those who had not yet used it wanted to see it continue and be extended. They indicated they would like more machines around the campus to make it more convenient to use, and a campaign to be run to raise awareness of the Golden Ticket initiative.

## 7 Glossary of terms

- Capture rate: the proportion of targeted containers that are recycled through the system.
- Collection: the return of containers to the reverse vending machine.
- Deposit: the 10p charge placed on an in-scheme container.
- In-scheme: a container that was sold within the university with a deposit charged.
- Non-user: person who has not used the Recycle and Reward scheme, or has used it but does not intend to again.
- PET: polyethylene terephthalate.
- Reverse vending: accepting an item for recycling in a machine that issues a reward or other incentive.
- Shelf talker: card or sign attached to a shelf to highlight a product or promotion.
- Transaction: a visit to the reverse vending machine by a user placing one or more collected containers in the machine.
- Units/containers: the aluminium cans, PET plastic bottles or cups.
- User: person who has used the Recycle and Reward scheme more than once.

## Appendix: monitoring methodology

The monitoring and evaluation work for the pilots was led by SKM Enviro (SKM), working in partnership with Nicki Souter Associates (NSA). At the educational sites, Zero Waste Scotland undertook additional data collection outside the trial period, so a complete dataset could be obtained for the autumn term.

The range and number of data collected varied somewhat by site, reflecting constraints on what sites knew, and the cost-effectiveness of obtaining certain types of data in some contexts. As the pilots progressed, the balance of monitoring was adapted to concentrate on those sites which would be most likely to provide useful learning. This particularly affected strand B, where it was felt that, firstly, concentrating some resources on key sites could help offset some of the limitations on the strand A data and, secondly, some sites were experiencing relatively low footfall and would be far less cost-effective to target in data collection terms.

Data collected and methods employed included the following. Some differences between sites are highlighted here, whilst the approach for specific sites is in tabular form below.

## Strand A

**Baseline retail sales data for the site** – some sites had only annual data, others monthly and some only partial data. In one case (HebCelt) there were no historic data, and in another (Troon HWRC) no sales data were collected either before or during the trial, as the target area was too broad.

**Pilot period retail data** – all sites but Troon HWRC provided these data. Typically data were either weekly or monthly depending on the sales systems and number of outlets that were relevant to the site.

**Baseline waste management data for the site** – some sites had monthly data and one site (Dundee) sought to estimate weekly information. However, several sites had no baseline data. All sites struggled to provide detailed waste information (e.g. the composition of drinks containers by stream, or weights rather than volume-based estimates).

These are common challenges in trials of this type, and could be comprehensively tackled only by a year-long resource intensive pre-pilot monitoring period. In an attempt to improve understanding, in two cases (Heriot-Watt and the North Ayrshire schools) waste compositional analysis was undertaken before and during the trial. Site visits in all cases where it was appropriate also included visual estimates of container fill rates and contamination, and discussion with site staff to understand collection frequency, but, while this improved our understanding of material flows, it was insufficiently sensitive in itself to highlight change over the trial period.

**Waste management data during the pilot period** was available for all sites, but granularity and quality varied. Most sites knew their overall waste arisings and some knew recyclates within that. In two cases (as noted above) compositional analysis was undertaken to try to understand residual composition. Sites provided data from a mix of volume-based measures, weight information, and site and waste contractor information.

**Returns data from the recycle and reward machine(s) and/or manual data during the trial period** were collected. Where both were available they were sense-checked against each other. Typically the manual data were preferred in those cases where there was a contradiction (for example, switching the power on and off was found to have led to the machine resetting the count at one site).

Machines recorded transaction data in different levels of detail (daily, weekly or by individual transaction). Most machines recorded data by container type; in one case the machine collected mixed plastics and cans in a single receptacle and in this case the split of material was estimated during site visits.

The level of analysis that these data could be subjected to varied according to the format obtained.

**Downtime data during the pilot period** – some machines also provided telemetry data when they were offline (either for servicing or emptying, or because of a problem), and some sites provided these data. However, it was not always clear at all sites how long machines were down for.

**Redemption rates during the trial period** – the machines identified how many vouchers were issued (where this differed from the number of containers returned, e.g. where some containers did not attract a reward, or rewards were given to charity). Voucher redemption data were collected from the retail outlets either monthly or weekly. The level of analysis that these data could be subjected to varied according to the format obtained, and how closely they matched the machine data in time periods covered.

**Site visits were conducted** to understand waste management practice, to help gather baseline data and to build a relationship with the sites to facilitate the overall monitoring. SKM staff originally

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proposed to visit each site (with the exception of HebCelt, which it was sensible to visit only during the pilot) at least twice (once before the pilot and once during it). However, for some sites the number of visits was increased, where it was felt this would enable the collection of better baseline data, addressing some of the gaps in pre-existing records.

Although not formally part of the monitoring process recorded here, all sites (except HebCelt, though other Zero Waste Scotland staff were present) received multiple visits from the Zero Waste Scotland project manager. Especially during the early trial period, these were often weekly for some of the bigger sites. Zero Waste Scotland staff were also available to troubleshoot problems remotely (by phone and email) and this also means we obtained data on much of the learning around set-up and installation. These visits were therefore invaluable both in delivering the pilots and also in providing insight into how they were functioning on the ground, and what was and was not working well. Visits included an assessment of reliability, and material quality, on several occasions. Zero Waste Scotland also made several other visits to sites to assess communications and scheme performance; these included informal 'mystery shopper'-style use of the machines. NSA also visited all sites where they conducted fieldwork at least once, and provided feedback on how well the scheme was functioning at the time of their visits.

Throughout the pilot period SKM, NSA and Zero Waste Scotland liaised closely on issues encountered.

In some cases, site visits included visual (including photographic) inspection of residual bins, recycling bins or the recyclate collected from the machines. In a few cases, site waste management staff were able to supplement data gathered this way independently of a visit from the monitoring team.

## Strand B

**Focus groups** were concentrated on the university sites, which saw relatively high levels of use, and an audience that was accessible for this form of research. Despite the variation in scheme design, these three institutions are of course broadly similar in function, so it was also felt cross-site comparison would add most value to focus groups conducted in these contexts.

**Face-to-face (and online) surveying** was concentrated on the university sites and HebCelt, as these saw the highest footfall and were thus most appropriate for an in-situ survey technique. Thanks to patterns of use at these sites, an in-situ technique also has a good chance of reaching a representative set of users, and (albeit to a somewhat lesser extent) relevant non-users (i.e. those who use the public areas targeted, but not the scheme). The samples obtained in these cases do allow for quantitative analysis.

At Dundee, an online survey to students managed by the university also asked about reactions to the Recycle and Reward scheme, and the results were kindly shared with Zero Waste Scotland. These provide an interesting perspective, as the respondent base and time period differ somewhat from the external monitoring undertaken.

At the Ikea stores and Troon Household Waste Recycling Centre an interviewer was placed on site for a day in each case, but, as expected, relatively few interviews were obtained because of the lower footfall. The responses obtained here provide customer insight, but are too small to be analysed quantitatively.

In the school context it was felt that an online survey was a cost-effective alternative to face-to-face surveying (all students can be contacted in this way, and can be encouraged to participate by staff). Numbers were relatively small, but can be considered quantitatively (with caution).

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An online survey was made available at Whitmuir (using its customer database), as it was felt that on site surveying would yield too few users to be worthwhile. Very little feedback was obtained via this route (which is also a somewhat selective sampling method, as not all customers are on the database – though regular customers, which the scheme expected to target primarily, were).

**Observations** were also concentrated on sites where footfall was highest, but were employed to some extent at all sites except Marr (as Zero Waste Scotland considered the schools in North Ayrshire to provide sufficient insight) and Whitmuir (where machine use was very low). The extent to which the observations can be analysed quantitatively is dependent on the number of transactions actually observed in each case.

Insight from formal observations is supplemented by the insight gained during site visits by SKM, NSA and Zero Waste Scotland throughout the trial period, and feedback from site staff (about both what they have observed, and what customers have told them). This provides a useful perspective, in conjunction with other sources, both on changing behaviour over time (in particular the extent to which the observed periods at the universities may have been atypical, as they were near the start of term) and on behaviour outwith the monitoring period (for example, use by cleaning staff at some sites particularly in the early morning).

**In-depth interviews** were carried out by NSA at a smaller number of sites. These sites were selected by Zero Waste Scotland on the basis that they would provide most additional insight. The interviews targeted a range of site staff including management, cleaning and retail staff. The excluded sites were those where Zero Waste Scotland had had particularly extensive contact throughout the trial period, and it was felt staff insight and reactions were already well understood. Zero Waste Scotland has fed into the reporting process in all cases.

## General

Although presented as strands A and B in research design, with SKM undertaking the fieldwork and analysis for strand A and NSA doing so for strand B, the final reporting and analysis for all cases, and the overview report, have been led by SKM, working closely with both NSA and Zero Waste Scotland. Throughout the process, the project team across the three organisations met regularly to exchange information and insight, and, particularly in terms of insight into site management and scheme performance, all three organisations gained insight from their respective site visits. The reporting should thus be seen as an integrated report, drawing on both technical data and analysis, and quantitative and qualitative social research.

Key challenges in interpretation and analysis are highlighted in the main report at section 2.4, and where appropriate when presenting specific findings. Table A1 shows the detail of monitoring across sites, including variation.

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		Hard' Performance Data - baseline (pre-pilot)				Hard' Performance Data - during pilot						Strand B				Other information	
	Pilot Project	Baseline retail data	Baseline waste management data	RVM data manual record	RVM data telemetry	Retail data	Voucher data	Waste Management data	Machine downtime	Site visits	Other in depth analysis	Focus Groups	Depth interview (days)	Observational analysis (days)	Face-to-face surveys (total number)	Site Specific data limitations	Other supporting information
Universities	GCU	Supplied approximately weekly by the General Manager of Catering Services	Supplied as monthly data by the Sustainability Coordinator	Supplied approximately weekly by the General Manager of Catering Services	Machine supplier provided data approximately weekly.	Supplied approximately weekly by the General Manager of Catering Services	Supplied approximately weekly by the General Manager of Catering Services	Supplied monthly by the Sustainability Coordinator	Limited data from machine supplier (machine ID but not date/duration)	5	Photographic/ observational bin audits (6:5 by SKM staff; 1 by GCU staff)	2	0	3	250	Early weeks recorded as a total value. No machine downtime data provided by GCU. Procurement of drinks containers based on existing process rather than sensitive to current patterns.	
	HWU	Comparable data not available	Annual data available	N/A	Machine supplier provided weekly; data available at an hourly level	Supplied weekly by the Hospitality Services Manager and Student Union Manager	Supplied weekly by the Hospitality Services Manager and Student Union Managers; machine supplier provided weekly data on vouchers issued	Unavailable so waste compositional analyses undertaken	Machine supplier provided weekly	3	2 waste compositional analyses (prior and during trial)	3	1	2.5	500	The data provided by Hospitality Services of units sold in retail outlets was initially understood to be PET bottles only as no cans were sold in retail outlets. However it became apparent in the latter stages of the trial that a small quantity of cans is indeed sold in retail outlets. This has led to an unidentifiable but small number of cans sales being reported as PET bottle sales	
	UoD	Provided by DUSA based on actual sales in the two campus shops during one term-time week, an estimated figure for weekly term-time vending machine sales and an estimate for expected sales (from shops and vending machines) during holiday periods.	Estimated weekly data on segregated recyclables provided by University based on container fullness rather than weight; estimated annual tonnages of segregated recyclables from teaching and admin buildings supplied by University waste manager; also monthly residual data excluding May to July 012	Supplied approximately weekly by the Environment and Sustainability Officer	Machine supplier provided data approximately weekly.	Supplied monthly by the Environment and Sustainability Officer/DUSA Shop and Vending Manager	Environment and Sustainability Officer provided data on the total amount invoiced by DUSA (variable frequency)	Data on for recycling from RotG banks, Halls of Residence supplied monthly by Dundee City Council; University Waste Manager supplied weekly data on University residual waste	Supplied approximately weekly by the Environment and Sustainability Officer; limited data from machine supplier (machine ID but not date/duration)	1	N/A	2	0	3	250		
HWRC	Troon	N/A	No data available	Total units data provided weekly by Council staff; data on bottle/can split only provided as overall ratio provided at end of trial	N/A	N/A	Monthly data provided by HWRC staff at end of trial	Material collected in combination with other recyclates so no data available	No data	2	N/A	0	1	1	1 day		
Schools	Marr College	Baseline vending sales data was available from DC7 Ltd but not from the school canteen	No data available	Weekly data provided by the community policeman	N/A	Weekly data supplied by canteen staff and monthly data for the vending machine was provided by DC7 Ltd	Data provided by the community policeman and the eco-committee	Only estimated data available	No data	2	N/A	0	1	0	50		
	NAC Schools	Monthly data supplied by each school's canteen staff	No data available	Janitor from each school provided a weekly record excluding summer holiday period	N/A	Monthly data supplied by each school's canteen staff	Monthly data supplied by each school's canteen staff	Only estimated data available so waste compositional analyses undertaken	Janitor from each school provided a weekly record excluding summer holiday period	3	2 waste compositional analyses (prior and during trial)	0	0	1	50 per school		
Retail	IKEA Edinburgh	Monthly data for Britvic vending machine sales only	Very little data available; initial visual inspection/weighting of recyclables to provide indicative daily data undertaken by SKM staff but access limited latterly	N/A	Daily data provided by machine supplier	Approximately four weekly provision of weekly data for relevant items sold in the restaurant and the Swedish Food Market by sustainability staff; data for store sales have been provided for PET and glass bottles	Approximately four weekly provision of weekly data for voucher redemption figures provided by sustainability staff	Some data on recyclables for a proportion of the trial period only	No data provided	4	Granular level telemetry data analysis	0	1	2	1 day per store		
	IKEA Glasgow	Monthly data for Britvic vending machine sales only	Monthly average residual waste data estimated based on volumes provided by store	N/A	Daily data provided by machine supplier	Approximately four weekly provision of weekly data for relevant items sold in the restaurant and the Swedish Food Market by sustainability staff; data for store sales have been provided for PET and glass bottles	Approximately four weekly provision of weekly data for voucher redemption figures provided by sustainability staff	Weekly residual data provided	No data provided	1	Granular level telemetry data analysis	0	1	2	1 day per store		
	Whitmuir	2012 unit sales provided for same period as pilot	Very little data available; initial visual inspection/estimation by volume of recycle and residual bins to provide indicative daily data undertaken by SKM staff; not possible to estimate fullness of glass banks (opaque)	N/A	Machine supplier provided at a weekly level	Weekly data provided by WO staff every few weeks	Machine supplier issued data on a weekly level; weekly data on total redemptions provided by WO staff every few weeks	Weekly observations by WO staff of bags in the dry recyclables storage shed and residual bins where practicable	Machine supplier provided at a weekly level	1	N/A	0	1	0	Online - no target	Machine downtime data conflicting with staff experience due to issues with the quality of barcode stickers applied causing difficulty in machine reading	
Festival	HebCelt	None available	General waste and organics only for the 2012 festival	N/A	Machine supplier provided at a daily level	HebCelt (beer cups; via Caroline) and 4 other vendors (bottles and cans); Based on stock purchased and left at end	Festival and machine supplier provided data on vouchers issued for prize winners	Council provided weighbridge data; supporting waste data gathered by SKM/HebCelt team during festival via waste analyses	Manual observations only	Staff on-site the duration of entire festival	General waste analysis from litter pick / general waste	0	0	2	100		

Table A1 Breakdown of monitoring activity undertaken at each site





**Zero Waste Scotland** works with businesses, communities, individuals and local authorities to help them reduce waste, recycle more and use resources sustainably.

Find out more at **[zerowastescotland.org.uk](http://zerowastescotland.org.uk)**  
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