

Report

Spring 2015

Recycle and Reward Pilot Report HebCelt Festival



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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

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1 Background and context

1.1 The HebCelt Festival

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.

HebCelt is a traditional and contemporary music festival in Stornoway, Isle of Lewis. It was held on 17–20 July 2013, which was the 18th year of the festival. There were 12,840 person-day ticket sales across three days (Thursday, Friday and Saturday), although with no more than 4,550 on any one day.

The festival is small by UK music festival standards (most of which are over 10,000 per day and several of which are over 80,000 a day). It is on a compact grassy site below the castle and has just two stages, one large and one small, both in covered marquees. The weather for the 2013 festival was dry, sunny and mud free throughout, helping to provide a very pleasant festival atmosphere.



Figure 1 HebCelt Festival 2013

1.2 Festival audience

Ticket sales, and hence expected audience numbers, were as follows:

- Thursday 4,507;
- Friday 3,785; and
- Saturday 4,550.

According to the organisers, around 40% of people had weekend tickets, i.e. there were around 1,700 people who attended all three days. The remainder (~2,500 people per day) attending for only one or two days. It is worth noting that the weekend ticket holders are more likely to be habituated to using the machines over the three days than the 60% who may be at the festival for only a few hours.

Around 48% were from Lewis and Harris, a further 34% from other parts of Scotland, 9% from the rest of the UK and 9% from overseas. Around 6,164 of the overall sales (potentially just over 2,000 per day) were to Lewis and Harris people, a significant proportion of the total population (which is a little over 20,000).

The age range was wide, although with 28% below 24 years of age (Table 1). A large proportion of attendees seemed to be in family groups, often with small children, or groups of friends. The festival organiser noted that the Saturday crowd is 'different', being more of a night out for the local population, and less family oriented than the Thursday and Friday crowd.

Age range	% of sales
Under 16	16
16–24	12
25–34	17
35–44	16
45–54	22
55–64	13
65+	5
Total	100

Table 1 Demographics by ticket sales

1.3 Recycle and Reward approach

There were three Recycle and Reward machines at the HebCelt festival: one stationary machine next to the main bar, and two machines in a trailer unit at the top of the green adjacent to the food stalls. The locations were chosen because of high footfall in these areas, high levels of visibility and ease of access. The machines accepted small polyethylene terephthalate (PET) plastic bottles (the usual 330-ml and 500-ml 'on the go' sizes rather than the one-litre and two-litre bottles used in the bar areas), aluminium cans, cornstarch (polylactic acid) cups (biodegradable in an in-vessel composter or anaerobic digester) and cardboard cups. The static machine was a Tomra T63, with one opening but two collection containers, one for cups and one for plastic bottles and cans. The machines in the trailer were T83s, each with one opening and one storage container, one for plastic bottles and cans, and one for cups. The machines were programmed accordingly to accept only these items. The machines are shown in Figure 2.



Figure 2 Single static (above) and twin trailer (below) reverse vending machines

A hay bale was placed below each machine to allow smaller children to reach the openings. It was noticed that some very small children had to stretch to reach the opening and one girl could not reach the opening at all, even with the hay step.

The machines had Recycle and Reward branding and there were wind dancers (tall branded flags) located beside the machines. The Green Team were litter picking throughout the festival and promoted the machines, firstly by having Recycle and Reward T-shirts and secondly by talking to people to promote their use, particularly on day one. Tomra staff, volunteers and other project partners took turns to staff the machines at all times during the festival.

There were no other recycling facilities available within the main arena for bottles, cans and cups; however, there were a number of general waste bins and food waste containers (Figure 3). Green Team volunteers also undertook a continuous litter pick around the arena to collect any waste dropped on the floor, recyclables being pulled out of this waste in the backstage area where possible.



Figure 3 Food and general waste bins

The reward for recycling at HebCelt operated on a random award of prize vouchers. Unsuccessful users were informed via the visual display on the machines to avoid creating a waste stream of unwanted tickets. There were 170 prizes in total spread over the three days, including an i-Pad, i-Pod Nanos, T-shirts/hoodies, and drink and snack vouchers.

1.4 Overall waste management arrangements

Figure 4 shows the flow of recyclable containers and the general waste management arrangements.

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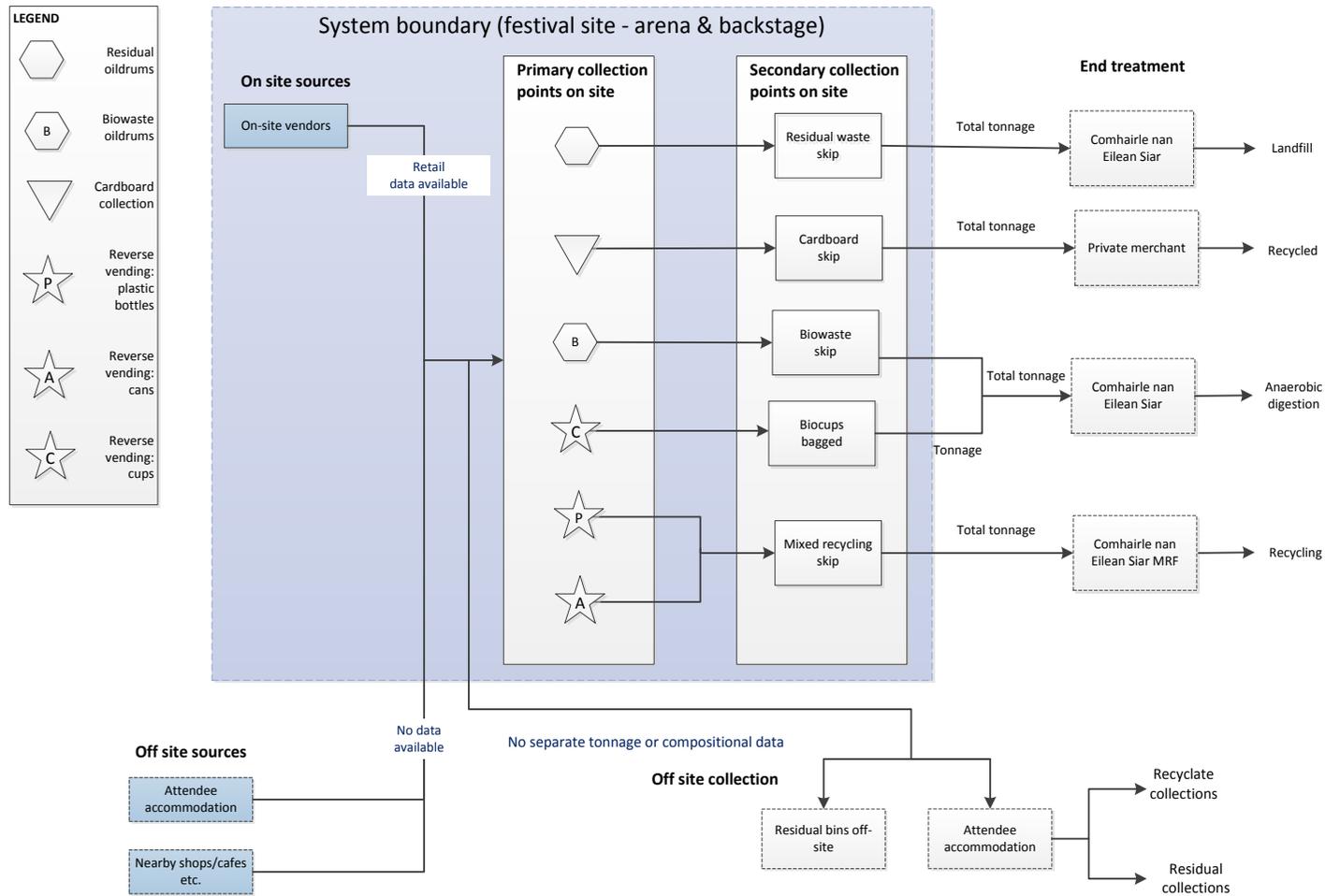


Figure 4 Material flow through the festival site

1.5 Waste management arrangements in previous years

In previous years the site used oil drums in the arena for collecting recyclables, general waste and organic waste, including food and some cardboard. Green Team volunteers emptied these containers and undertook continuous litter picks. In 2012, 800kg of general waste and 720kg of organic waste was collected, although unfortunately for this study the quantity of segregated recyclable waste was not recorded.



Figure 5 Green Team volunteers sorting waste

2 Study methodology

2.1 Strand A – waste data collection

During the Thursday and Friday of the festival all of the recyclable waste from the arena was weighed by category (cups vs bottles and cans) to give accurate data for the recyclable element of the waste from the machines versus the 'other' recyclables collected by the Green Team from the general waste and litter pick. Rejects from the machines were collected separately on the Friday to give an indication of the level of rejection and the possible reasons for it.



Figure 6 Waste compound showing machine bulk bags (foreground) and segregated cups (background)

Recyclables accepted (by numbers rather than weight) through the machines were also reported from the machines on a daily basis. Average unit weights (of cups, plastic bottles and cans) allowed these unit data to be turned into a weight figure to compare with the manual weights noted above.

At the end of the festival, the mixed recyclables, including all bottles and cans from the backstage areas (including the large plastic mixer bottles from the main bar area), were collected by the local authority and weighed on a weighbridge. These weight-based figures allowed a reasonably accurate percentage 'capture rate' to be calculated by weight and by material, e.g. the proportion of cups that went through the machines rather than being discarded on the floor or in general waste bins on the site.

Cup usage (from the main bar, cocktail bar and VIP bar) was also collated alongside sales of bottles and cans in the arena (from the bars and independent caterers) to gain an understanding of the capture rate of items, this time as a percentage of items sold in the arena (i.e. excluding bottles and cans brought into the site). Again, average unit weights were applied to translate unit numbers into weights for comparison.

The final aspects of data concerned the prize vouchers issued and redeemed. The issuing of prizes from the vouchers was recorded in the merchandise tent to allow an understanding of the interest in obtaining the prizes themselves.

2.2 Strand A – data limitations

In the weighing of bagged waste collected by the Green Team volunteers, there was the potential for mixing up waste from the backstage area with the waste from the main arena. There was also the risk that enthusiastic volunteers placed bottles and cans in the skip before they had been weighed.

To avoid this, SKM briefed the Green Team volunteers on each shift and kept a close eye on waste as it was brought in to the sorting area. Fortunately the rate of collection was reasonably slow (because of the larger volume going to the machines) and allowed fairly careful monitoring and control. The bar usage of large plastic mixer bottles (lemonade, coke etc.) was also discounted by taking the estimated weight of these units from the total collected bottle and can weights.

In cross-checking the weights, another potential data limitation was around the assumed average unit weights. Although theoretical container weights were obtained, the actual containers collected often had a trace of liquid still in them. This error was largely eliminated by weighing samples of the 'real' containers on site (e.g. 40 collected cups to obtain an average unit weight.)

A more significant issue was around the sales data. While the cups were sold only on site, at the two bars, bottles and cans were brought on to the site, as only glass was banned. On the Saturday evening in particular this was potentially a large volume, as the audience attempted to make the most of lower prices outside the arena. Another issue was that some cups and containers were taken out of the arena and off site as people left at the end of the evening (Figure 7).



Figure 7 General waste bin immediately outside the site

Finally it should be noted that the waste data for 2012 were incomplete, as detailed in section 1.4. The only comparable data were for residual waste and organics including cardboard and compostable cups (see Table 5.)

2.3 Strand B – quantitative survey and observations

The methods used to appraise the festival attendees attitudes, behaviour and experience of using the Recycle and Rewards machines at the HebCelt festival were observational analysis and quantitative face-to-face electronic surveys.

No focus groups or depth interviews were carried out as part of this Recycle and Reward pilot.

2.3.1 *Observational analysis*

Observational analysis was carried out to record:

- festival attendees' awareness of the Recycle and Reward machines;
- the range of Recycle and Reward promotional activities taking place at the festival;
- user interaction and experience of using the machines;
- the age and gender of the users;
- the types and numbers of materials being recycled in the machines;
- the peak times of use;
- any facilitators or barriers to use, for example rewards, rejection of materials, queuing; and
- when the rewards were issued and the impact on use of the machines.

The analysis was carried out by two NSA engagement officers on 19 July 2013 from 14:00 to 16:00 and from 19:00 to 21:30 in the evening at each of the Recycle and Reward machine locations. Standardised recording sheets were used. Over the observation period 731 transactions were observed.

2.3.2 *Quantitative survey*

The quantitative survey was carried out in order to assess and quantify:

- festival attendees' awareness of the Recycle and Reward machines;
 - the effectiveness of the range of Recycle and Reward promotional activities taking place at the festival;
 - the age and gender of the users;
 - the types of materials being recycled in the machines;
 - user opinions of the machines in terms of ease of use, reliability, appropriateness of reward and overall general experience of use;
-

- any facilitators or barriers to use, for example rewards, rejection of materials, queuing etc.; and
- when the rewards were issued and the impact of this on the use of the machines.

The quantitative survey was carried out by three trained NSA engagement officers on 19 and 20 July 2013 between 13:00 and 21:00 on both days in the main festival arena. Festival attendees were approached at random and invited to take part. The engagement officers were instructed to approach a mix of age groups and genders to reflect the demographic of the festival attendees. The specialist software QPSMR was subsequently used to analyse the data.

A total of 112 surveys were conducted during the HebCelt festival as detailed in Table 2.

Age	Male	Female	Total
16–18	4	5	9
18–29	13	13	26
30–44	15	15	30
45–59	15	13	28
60+	10	9	19
Total	57	55	112

Table 2 Age and gender profile of survey participants

The survey profile obtained was broadly representative of the adult festival attendees based on the available ticket sales data as outlined in Table 3.

Age	% of ticket sales	% of participants
44 and under	61	58
Over 44	40	42

Table 3 Age profile of festival attendees vs survey participants

2.4 Strand B – methodology limitations

While the survey work is believed to be representative overall, there were two key limitations:

- No children under the age of 16 were surveyed during the quantitative research assessment, because of constraints around approaching children in an unsolicited way. However, during the observational analysis it was identified that one of the key user groups of the machines was under-16s.

- The quantitative survey was a shorter version of other surveys used in the evaluation of the other Recycle and Reward pilots, as there was a limited amount of time available with the festival attendees owing to the nature of the event.

In addition, there are the usual limitations around any survey that has a small sample size, for example in regard to availability/non-response bias. These are inevitable constraints given the resource limitations for the work and are not unique to this pilot.

3 User awareness, motivation and experience

3.1 User groups

The Recycle and Reward machines were very popular at the HebCelt festival; they were used by just over half of the attendees surveyed (51%) and were used regularly throughout the festival.

The observational analysis indicated that the machines were especially popular among children, with 60% of the users being aged under 18, most of whom were young children of primary school age; 57% were boys and 43% were girls. Many children were observed collecting large stacks of cups and taking them to the machines to be recycled.

From the survey results, adult use was almost equally split between men and women; 52% male and 48% female, with younger adults between 18 and 29 the most likely to use the machines. Usage was lowest among users between 30 and 44.

Over a third of users (36%) had to queue to use the machines; this was most apparent in the evenings, when usage was higher, and immediately following a period when a number of rewards were issued within a short time (16 rewards over a 15-minute period). This caused increased interest and visits to the machine at this time. Adults were generally less willing to queue to use the machines and would often pass the materials to children.

From observations, most users (62%) used the machines as individuals, not in groups, with children frequently being handed materials by adults and then using the machine unaccompanied.

3.2 Awareness of the machines and promotional activities

The vast majority of festival attendees (89%) were aware of the Recycle and Reward machines. Awareness of which materials could be recycled in the machines was high among all festival attendees surveyed, irrespective of whether or not they used the machines. Of those surveyed, 71% were aware that corn starch cups could be recycled in the machines, 55% were aware that plastic bottles were accepted and 41% knew that aluminium cans were accepted.

In terms of promotion, 64% of all the festival attendees surveyed were aware of some promotional activities and materials. The Green Teams and the wind dancers were the most commonly recalled promotional methods at the festival, as detailed in Figure 8.

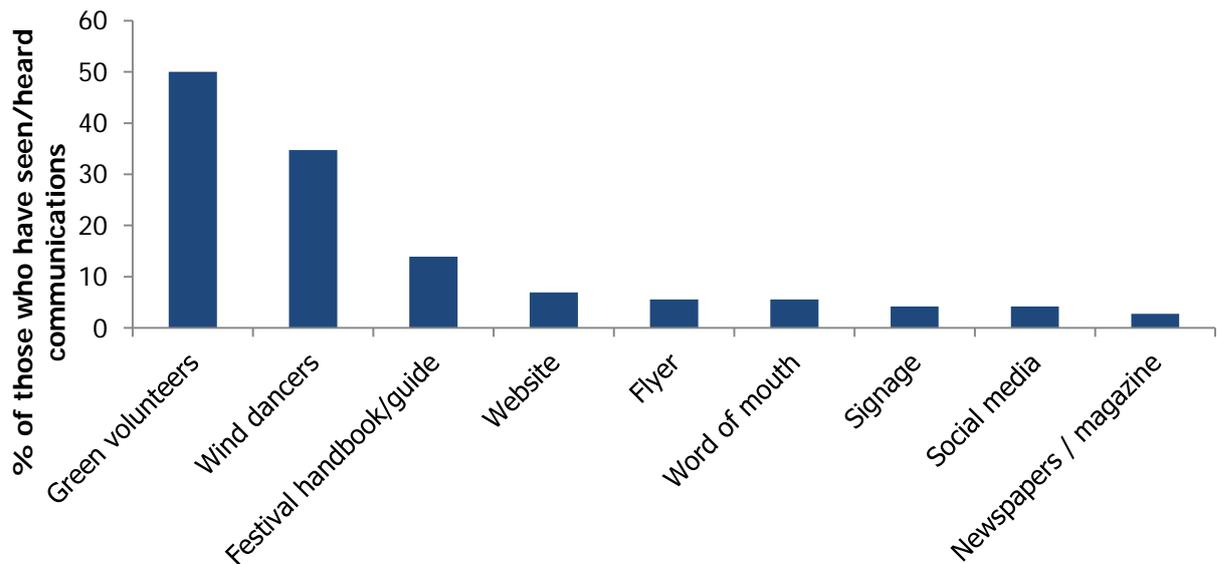


Figure 8 Promotional activities recalled by festival attendees

3.3 Motivation to use the machines

From the users questioned, the three primary reasons given for using the machines were the desire to recycle (32% of respondents), the opportunity to win the prizes (25%) and general benefits to the environment (14%). The full results are detailed in Figure 9.

It is worth noting that the reward in this case is not guaranteed, but still offers a good incentive for many. It is also interesting to note that the desire to recycle and benefits to the environment are closely linked and that the altruistic motive seems to outweigh the reward motive. The machines offer a very clear opportunity to recycle, although in fact all other waste was sorted for recycling by the Green Team. It is also notable that a desire to reduce litter came fourth.

While there was no direct question regarding children, many people mentioned the fact that hunting for cups and bottles to feed to the machines kept the children occupied and made recycling fun for them.

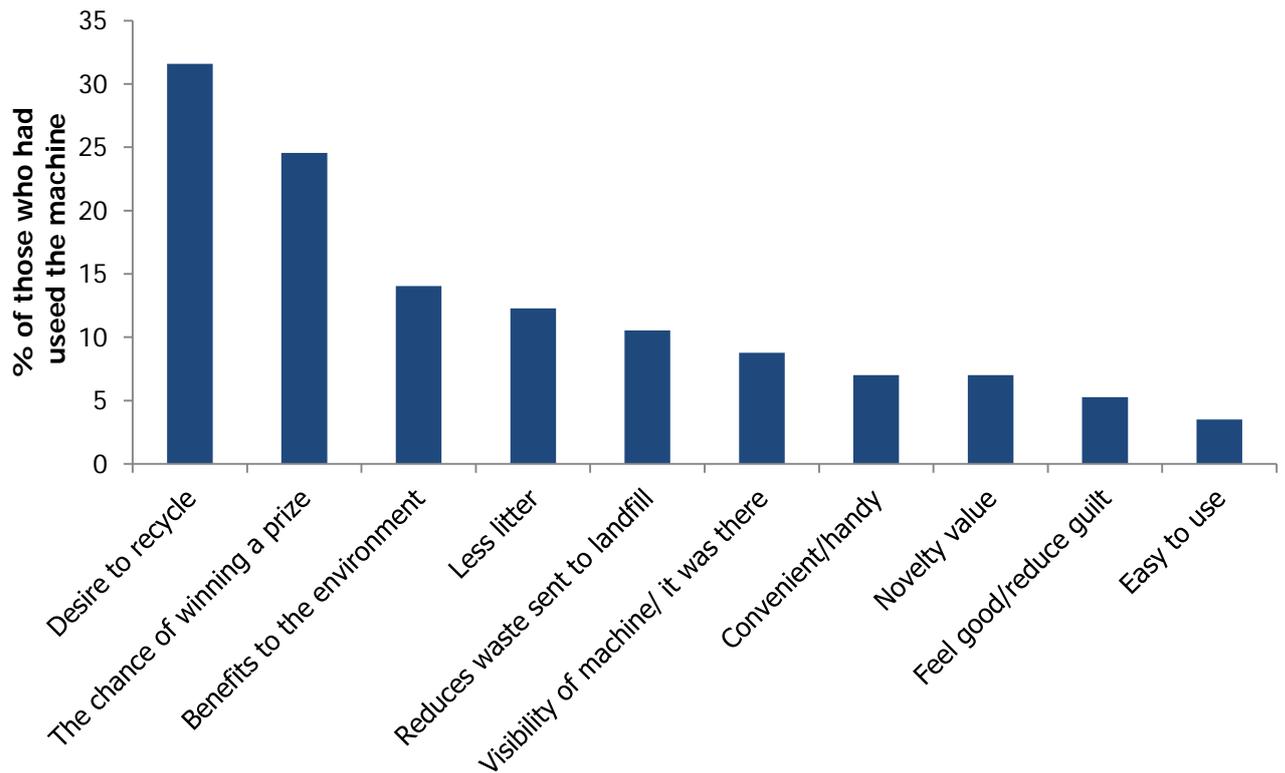


Figure 9 What motivates use of the Recycle and Reward machines

3.4 Non-users

Just under half of the festival attendees surveyed (49%) did not use the Recycle and Reward machines. It should be noted that, while they did not use the machines themselves, a large proportion were with children and the children were doing it on their behalf. The main reasons for this were identified as:

- a lack of awareness of the presence of the machines at the festival (51% of non-users);
- not using the materials that could be recycled in the machines (20%);
- queues dissuading attendees from using the machines (4%); and
- lack of prizes dissuading use (2%).

It is worth noting that the idea that 51% of non-users (25% of all attendees) were unaware of the reverse vending machines contradicts the general awareness result above that indicates that 89% of all festival goers were aware of the machines (i.e. only 11% not aware vs 25%). Despite the wording of the questions, this may reflect the difference between people having seen the machines and understanding what they do. Question sequencing in the survey may also have been a factor.

3.5 Appropriateness of the rewards

The majority of all the festival attendees surveyed (93%) were pleased with the range of rewards being offered through the Recycle and Reward scheme. It should be noted that all attendees were told what the rewards were before the question was asked, so this question did not reflect awareness of the rewards.

The positive attitude to the potential prizes is reflected in the number of people and children using the machines, and, although the primary motivation among the adult audience was to recycle, among the younger participants it was more likely to be the possibility of winning a prize.

It was evident that the children were excited about the possibility of winning prizes, and those that won iTunes vouchers, iPods and the iPad were certainly delighted. Some people, however, including the organisers, commented that the children would have been happy with smaller prizes.

3.6 User experience

The majority of the festival attendees surveyed liked the Recycle and Reward machines, with overall satisfaction and ease of use being rated very highly by 95% and 99% of users respectively. Most of the users (74%) also indicated the operating instructions were easy to follow. In addition, the presence and support provided by members of the Green Team volunteers and the Tomra staff added to the positive customer experience and understanding of how to use the machines; 49% of users indicated they had received additional guidance by this method.

Only 5% of users noted that having to queue to use the machines was a barrier. Queues of fewer than five people at a time were the norm, despite the fact that there should have been four machines and only three were available. (The original intention was to have two machines by the main bar; however, one of these failed and could not be repaired by the technician, leaving just one machine in the bar area.)

It is also worth observing that the smaller children turned the whole recycling process into a game. There was a lot of competition amongst the children to collect empty cups, bottles and cans. Two boys even played 'paper, scissors, stone' to obtain an empty beer cup from an SKM team member.

4 Pilot performance and operation

4.1 Overview

As described in the methodology, the enclosed and temporary nature of the festival allowed a comprehensive set of data to be gathered. This allowed comparison of the units being put through the machines, by weight, with those that were dropped as litter (to be collected by Green Team volunteers) or placed in general waste bins in the arena. Sales data allowed a further comparison by unit numbers rather than weight.

As Table 4 shows, the pilot was very successful in terms of attracting the drinks cups but less so in terms of capturing bottles and cans.

Observation	Material	Thursday/Friday data only	Overall festival data (Thurs/Fri/Sat)	Notes
Units collected	Cups	8,329	14,684	
	Bottles/cans	937	1,840	Bottles and cans ~11% of units collected; cans alone were 1% of units collected
Arena sales	Cups	n/a	22,620	From before and after data; boxes of cups
	Bottles/cans	n/a	3,521	Estimated, as data missing from one small trader
% capture by weight	Cups	~79%	67	Cups via machine as % of total collected including litter/general waste
	Bottles/cans	~52%	19	Bottles/cans via machine as % of total collected including litter/general waste
% capture by arena sales	Cups	n/a	65	Ties in well with weight estimate; excludes any cups taken out of the site
	Bottles/cans	n/a	52	Excludes bottles and cans brought in to the site and hence overestimates 'true' capture
Prize redemptions		n/a	92%	The only prizes not 100% redeemed were drink and snack vouchers

Table 4 Summary of HebCelt pilot results

In the strand B survey work, the festival attendees stated that they used the machines to recycle the corn starch cups (77% of respondents), plastic bottles (28%) and aluminium cans (11%). These figures overstate the recycling of bottles and cans compared with the actual data. This may be a result of a bias in the survey away from young children, who, from observations, were the ones mainly recycling the cups. There may also be confusion from users consuming multiple containers and a general overclaim of pro-environmental behaviour, which is not uncommon in surveys of this kind.

There are a number of points to be noted around these data:

- Cup recycling through the machines came close to 80% on Thursday and Friday, which was very encouraging.
- Capture of bottles and cans, in percentage terms, was lower than cups in general and far lower on Saturday night.
- High machine rejection rates for bottles and cans were a significant issue (see section 4.2). The smaller children who were doing most of the collecting presumably soon noticed that bottles and cans were more likely to be rejected than cups and hence were less willing to collect them.

- Clearly, for a child or an adult, it is a lot easier to collect large numbers of cups rather than bottles, and cans as they stack. This increases the chance of winning a prize. Hence bottles and cans are less attractive to collect.
- That said, while in absolute terms there were far more cups available overall, when the cups ‘ran out’ (i.e. they had all been collected), bottles and cans became attractive.
- Saturday clearly dragged the machine percentages down compared with Thursday and Friday (67% versus 79% for cups) and particularly for bottles and cans (19% against 52%).
- It was observed (by the SKM team) and noted (by the organisers) that the crowd was very different on Saturday evening. This is more of a night out, and perhaps attracts a much greater proportion of local residents, and is also not as family orientated as the other festival days. It took the Green Team volunteers half an hour to clear litter from the floor in the main tent after the final act: far more than any other night.
- As noted earlier, it is thought that people brought a lot of bottles and cans into the arena on Saturday, as many items were found in the litter that were not being sold on the site.

4.2 Bottle and can rejections

The main problems raised by the attendees surveyed were related to materials being rejected by the machines (noted by 23% of respondents). As detailed in Figure 10, the problem lay with bottles and cans rather than cups.

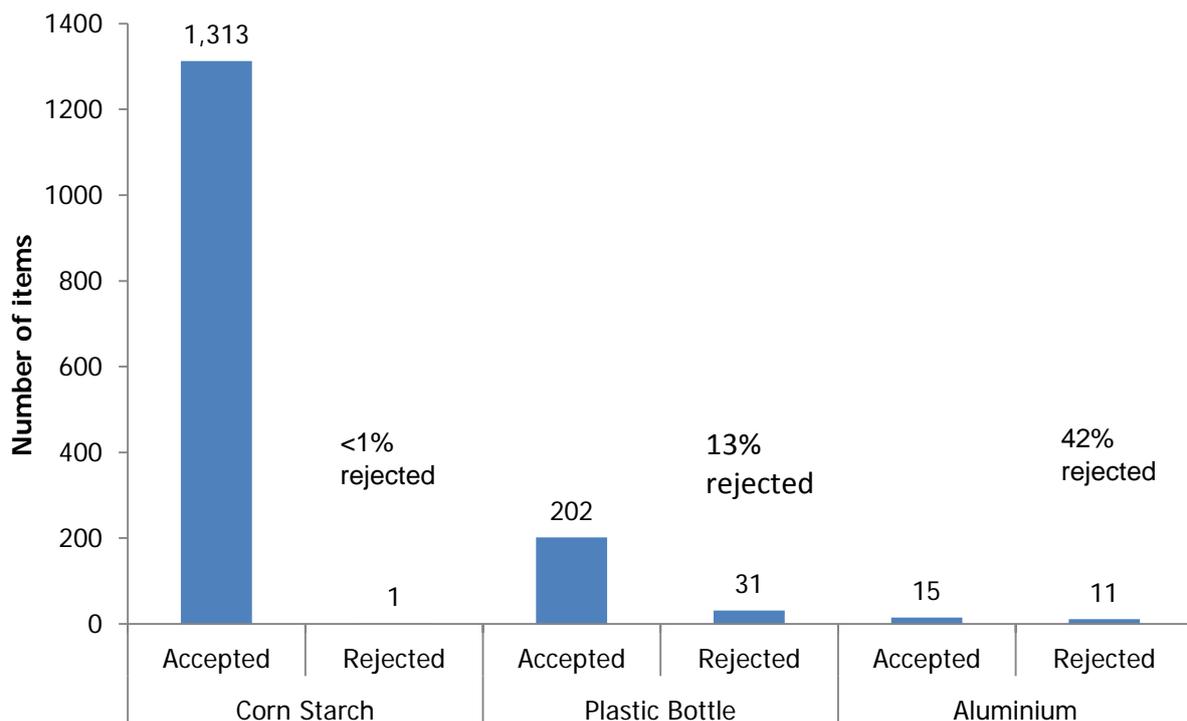


Figure 10 Observed rejection rates for materials

The aluminium cans and bottles were rejected for various reasons:

- The machines were pre-programmed to recognise the shape and bar codes of items on sale in the main arena. Items brought from outside the arena, not of the same type, were not recognised by the machines and were therefore rejected.
- Some items on sale from vendors had no bar codes (items being sold from multipacks, which should not have been sold separately by law) while some bottles lost their plastic wrap containing

the bar code. As the machine works in part from bar code recognition, these items were also rejected by the machines.

- The machines were also unable to recognise and accept any crushed or misshapen items, a particular problem with cans that have been trodden on.

The Tomra technicians collected these rejected items to be recycled later as part of the wider waste and recycling activities. On the Friday all rejected items were collected and weighed to gain a clearer understanding of the problem. Bottle and can rejects on Friday were 3.34kg, while the machines accepted 12.69kg; hence the rejection rate was very considerable, at ~21% of all those presented. Given a willingness by people to put these bottles and cans through the machines, correcting the rejection problems noted would have raised the Friday bottle and can capture rate to 70%, not far behind the 79% achieved by the cups on Friday.

4.3 Material quality and cross-contamination

The trailer machines, which were dedicated to cups on one side and bottles and cans on the other, had no cross-contamination, although some non-biodegradable cups got into the cup stream and had to be removed by the Green Team. The machines overall provided a very high quality and compacted waste stream that should be of high value. It is worth noting that avoiding the need for a materials recycling facility can turn a 'gate fee' cost into a revenue stream of several hundred pounds per tonne. (Given the small quantity – well below a tonne – this is realisable in reality only if the organisers can deliver this clean material to a local merchant or if that merchant is willing to collect. Lewis is remote but this would be a real possibility for a festival closer to an urban area.)

The static machine was a different story, as a single opening took bottles, cans and cups and directed them into two separate containers (cups in one, bottles and cans in the other). On Thursday there was around 2kg of bottles in 34kg of cups, hence around 6% contamination that had to be removed. Given the issues with some items having no bar codes and hence being rejected, on Saturday morning the bar code element of the programming was removed so that the machine would accept anything. Unfortunately the static machine seemed to default to 'assuming' that something it did not recognise was a cup. This caused a lot of cross contamination, ~34% bottles and cans by weight in the cups container in one sample load on Saturday.



Figure 11 Bottle contamination (left) separated from cups (right)

Consequently Tomra changed the programming back to how it was on Thursday and Friday; however, there was still a lot of contamination later on Saturday (Figure 12). Tomra was unable to explain this, although perhaps the machine's electro-mechanical 'selector' (diverting things to one of the two collection chambers) was being affected by the warm weather and direct sunlight.



Figure 12 Remaining bottle contamination among cups

Contamination of the compostable cups with plastic and cans is obviously a big problem, as the whole load would potentially be rejected at a composting plant without additional sorting. In this case, the sorting was done by the Green Team but would otherwise potentially incur a gate fee at a materials recycling facility.

4.4 Machine reliability and operation

There were reliability issues with the machines. Originally four machines were supposed to be available and four were delivered to the site. One of the two static machines failed immediately, however, and the technician was unable to fix the problem. A further technician was brought from overseas but was also unable to fix the machine.

The three machines that were used were generally very reliable, with only a little downtime caused by needing to empty collection containers. This did, however, cause occasional queues at the machines. In the survey work, reliability of the machines was rated very highly by 93% of users.

There was, however, a serious logistical issue with the four machine waste containers. The containers were large and heavy plastic or wooden containers on small wheels. While these could have been moved easily on a hard surface indoors, this was not an option in a sloping grassy field. The festival organisers had to source large woven bulk bags from a builders' merchant with which to line the containers. These were then lifted out by hand and, at around 15kg when full, were manageable for two people to carry although awkward for one person.

4.5 Human resources

The degree to which additional resource was needed to make the scheme function is another aspect of the pilot worthy of discussion. The machines did effectively reduce the need for Green Team volunteers, as members of the public took on part of the litter collection role to 'feed' the machines.

It was clear, however, from the team's observations, that the members of the public attending the event did need initial encouragement to use the machines (on day one), which required input from Green Team volunteers, and guidance from Tomra staff and volunteers on how to use the machines, despite the machine signage. The need for these staff would presumably diminish were such machines to be more widely used at other festivals and in Scotland more generally.

The other staffing issue is around machine operation and emptying. The machines did need some attention from the Tomra technicians during the event and their help in emptying the machines: no easy task, as noted in section 4.4. Overall, one would imagine that one or two people per machine would be required for smooth operation and user support, including at least one qualified machine technician.

4.6 Overall waste impact

It is illuminating to compare overall collected weights with 2012, although the data for 2012 were incomplete. It should be noted that there were 12,842 ticket sales in 2013 versus ~9,000 in 2012, so we might have expected 43% more waste as a result. In fact Table 5 shows a 10% decrease in general waste.

Category	2012 (kg)	2013 (kg)	2013 normalised based on 2012 ticket sales (kg)	% change
Residual/general waste	800	720	503	-37
Recyclable bottles and cans	Not known	240	n/a	n/a
Compostable cups	Not separated	220	n/a	n/a
Cardboard	Not separated	280	n/a	n/a
Organics (including food, compostable cups and cardboard)	720	800 (300 being food)	559	-22

Table 5 Overall waste data comparison, 2012 and 2013

Normalising the data pro-rata by ticket sales shows a like-for-like reduction in general waste of 37%. There is no reason to think that a lot of waste prevention occurred, hence this implies that this material has been diverted into the compostable and recyclable streams. This in turn implies that the machines, combined with the Green Team volunteers, were more effective at diverting waste than the Green Team alone.

There are no data for the dry recyclables in 2012, unfortunately, and the compostable stream, while growing in absolute terms by 11%, reduced by 22% when normalised against the 2012 ticket sales. The organisers note that there were more food stalls in 2012 and that the weather was not as good, which may have resulted in more hot food sales and potentially more food waste. Additional packaging in 2012 may also have contributed.

Finally, it is worth noting that the overall festival recycling/composting rate was 67%, a very considerable achievement for an outdoor music festival.

4.7 Impact on litter

One of the clear benefits of the Recycle and Reward machines was an improvement in cleanliness at the festival site. Outside the main tents, the site was almost entirely litter free throughout the festival, the tents themselves only being intermittently littered straight after each gig. Whereas in previous years Green Team volunteers had to do everything, this year they were supplemented by a large number of children and adults collecting and recycling litter as soon as a cup or bottle was emptied or it appeared on the ground. The organisers and regular Green Team volunteers also noted the huge improvement in site cleanliness.

Although the quantitative survey did not include a direct question about litter, 12% of the Recycle and Reward machine users identified, unprompted, that the positive impact of a decrease in littering motivated them to use the machine. In addition a further 17% of respondents commented that the festival site was cleaner than other festivals or than previous years at HebCelt.

5 Conclusions

The introduction of the Recycle and Reward machines at the HebCelt Festival was deemed to be a great success by festival attendees and the organisers. A number of attendees expressed a hope that the machines would be used at the festival the following year and noted that they could be used at other festivals. The following conclusions can be drawn from the data and observations:

- People liked using the machines and found them easy to operate, although it is worth noting the machines were manned full time to assist people using them. There were many positive comments and enthusiasm amongst adults and children for the scheme.
 - As many as 89% of festival goers interviewed were aware of the machines although only 51% stated that they used them. This relatively low figure may be because many of them had young children (who were not interviewed) who did it on the adults' behalf.
 - Of all the festival attendees interviewed, 64% were aware of some promotional activities. The Green Teams and the wind dancers were the most commonly recalled sources of information.
 - Among the users questioned, the three primary reasons for using the machines were the desire to recycle (32% of respondents), the opportunity to win the prizes (25%) and general benefits to the environment (14%).
 - Children in particular seemed to enjoy the novelty of using the machines and the opportunity of winning a prize. Many turned it into a game, collecting as many cups as possible. This might be less desirable in a less family-orientated context.
 - A high proportion of cups (65% by units sold; 67% by weight collected) were captured through the machines. This capture figure was 79% on the first two days when the crowd appeared to be more family and visitor oriented than the Saturday night 'home crowd'.
 - A smaller proportion of bottles and cans were collected through the machines, only 19% overall but 52% on Thursday and Friday. The make-up of the crowd (it is more of a 'night out', and less family orientated) seemed to be a major factor in affecting the use of the machines on Saturday evening. It appeared from the content of the litter collected on Saturday night that many more containers had been purchased off site and brought in for consumption on the final evening, perhaps in part driven by a desire to avoid perceived higher bar prices.
 - The machines did reject a significant amount of bottles and cans, around 21% on the Friday when this was monitored. This was in part, however, down to the festival traders selling units from multi-packs of drinks that did not have a bar code, an illegal practice, though one that may be encountered at similar events.
 - In the two single-stream trailer machines, materials quality was very high, the object recognition system doing a very good job in preventing unwanted items. Contamination in the multi-material static machine was a significant issue, ranging from 6% to 34% bottles and cans in the cup stream. The higher figure was, however, due to Tomra trying to reduce the rejection rate by allowing items without bar codes.
 - The three machines that were used were reliable, although one out of four did not work on arrival at the site, having been transported from the Netherlands on a heavy goods vehicle.
 - The approach reduced litter to a very low level in the arena. Anecdotal comments from the volunteers and organisers, backed up by survey responses, indicated that the site was far better in this respect than any previous year and it improved the appearance of the arena noticeably.
 - Although high recycling rates are thought to have been achieved in previous years, largely by using the Green Team volunteers to sort the waste manually, the machines seem to have increased overall effectiveness. As evidence of this, the 2013 general waste figure was down by ~37% compared with 2012 on a like-for-like basis (normalised based on ticket sales).
 - While the machines made it an easier job for the Green Team volunteers than in previous years in terms of litter picking and waste sorting, a considerable number of volunteers were still required to staff the machines to assist the public, to empty the machine containers and the food and general waste bins, and to sort the general waste and litter to extract the maximum amount of recyclables.
 - It is worth noting that purchase of machines would not be economic for a festival like HebCelt, lasting for just a few days. A reward or deposit model based on machines would depend on a
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business model where the machines could be hired for the specific event (with the provider potentially servicing multiple festivals and events over the year).

It is, finally, worth noting that we believe that these findings would apply to use of the machines at any small outdoor festival and were not significantly affected by the fact that a pilot was being conducted. The machines were new to most users and would be more familiar in future years given that the festival attracts repeat trade. This in turn may reduce the need for the machines to be staffed. It may also be of interest to note that some other festivals have experimented with deposits – for example on reusable beer mugs – using manual return and repayment.

6 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

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).

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.

	Pilot Project	Hard' Performance Data - baseline (pre-pilot)			Hard' Performance Data - during pilot							Strand B				Other information	
		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 Manager; 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 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 provided data on issued at 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.

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