University of Edinburgh Student Engagement on Waste: Exploring Strategies on Recycling, Contamination, and Food Waste Reduction

"[Universities are] important actors through research, outreach, and leadership in finding solutions to challenges threatening human existence and our planet" (Kaplowitz et al., 2009: p. 612)

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Executive Summary

From 15 January 2014 to 26 March 2014 students taking the '*Participation in Policy and Planning*' masters level course worked on a project regarding waste management at the University of Edinburgh. The main aim of the project was to create an effective engagement strategy that would lower the contamination of recycling waste and the amount of food waste occurring within the University community. Partners in the project include: Fleur Ruckley from the University of Edinburgh Estates and Buildings; Caroline Overy from the Department of Social Responsibility and Sustainability (SRS); and Ylva Haglund, representative of Zero Waste Scotland. The project members used stakeholder interviews, student surveys, and observations to elicit current problems and provide insight into potential solutions. The resulting recommendations for student engagement can be summarised as: (1) better collaboration between student organisations and departments with an interest in food waste and recycling practices; (2) improved bins and signage; (3) periodic waste audits and surveys; and (4) the rewarding and sharing of best practices across the University. In support of these recommendations an extensive literature review and 'best practice' investigation was conducted to suggest direct actions the University of Edinburgh can implement to address the problem of contamination and food waste on campus.

Introduction

Scotland has committed to an ambitious target of 70% of waste recycled by weight, by 2020 (Scottish Government, 2010). The new regulations recently passed by the Scottish Government aim to ensure that recyclable and food waste materials do not end up in landfills. Businesses are required to recycle key materials and separate out food waste, while municipalities are similarly also responsible for preventing biodegradable waste from ending up in landfills (Scottish Government, 2010). The new regulations which came into effect 1 January 2014, specifically target waste by businesses in the first few years of implementation, placing the following restrictions on commercial waste and recycling (City of Edinburgh Council, 2014a):

- All businesses and organisations to present key recyclable material for collection from 1 January 2014
- Food waste businesses producing over 50kg of food waste per week to present it for separate collection from 1 January 2014
- Food waste businesses producing over 5kg of food waste per week to present it for a separate collection from 1 January 2016
- A ban on material collected for recycling going to landfill or incineration
- A ban on municipal biodegradable waste going to landfill by 1 January 2021.

The University of Edinburgh has a vision to "reduce the use of unnecessary raw materials through the reuse of products and by encouraging and enabling

recycling, composting and energy recovery" (SRS, 2013). This is achieved through the Recycling and Waste Management Plan (2010). However, while the University is committed to waste reduction and recycling in principle and practice, there is concern for how to meet the strict requirements set out by the new regulations. Studies have been conducted in recent years to try to understand the problem. This year, the two key focuses are (Ruckley 2014, pers comm, 15 January):

(1) **Tackling and eliminating 'contamination'** within the Dry Mixed Recycling (**DMR**) stream (cans, plastics, card and paper), of which the main source is incorrectly disposed of **food waste**; and

(2) **Identifying** the **sources** of **food waste** within University buildings in order to help put the **right mechanisms in place** to tackle it.

The masters level course of '*Participation in Policy and Planning*' (*PPP*) was challenged with assisting in understanding and addressing these key concerns. The specific aim given to the class was to:

"develop an effective engagement strategy for achieving behavioural change with regards to food waste reduction and recycling within the University student community".

The first task was to develop an understanding of what is currently being done with regards to food waste reduction and recycling, both in the University of Edinburgh and the city as a whole. This was accomplished using semi-structured interviews of various stakeholders throughout the University as well as key contacts external to the University such as government departments, other universities, and NGOs working with waste and recycling issues. The class also conducted student surveys and observations in order to investigate the level of understanding within the student body and the effectiveness of signage toward changing recycling behaviour. The class then consolidated their data and analysed key findings. An extensive literature review highlighted important case studies and relevant research into behavioural change, which the class then used to support their key findings and establish the four general objectives of their engagement strategy:

1 – Make food waste reduction and recycling practices easier for students
2 – Make students more aware of waste and recycling issues/processes
3 – Increase partnerships between university stakeholders
4 – Improve monitoring and evaluation

These four general objectives were then used to summarise the various actions and ideas into four key recommendations:

Key Recommendation 1
The University should urge collaboration between student organisations and various departments with an interest in food waste and recycling practices, and should use a variety of media to consult with, engage, and educate students regarding food waste and recycling practices.

Key Recommendation 2
The University should make further changes to recycling bins and signage, both in University buildings and in student accommodation, in order to make food waste and "dry" recycling more convenient and consistent for students

Key Recommendation 3
The University should begin periodic waste audits and survey student food waste and recycling practices with the intention of disseminating the information back to the student population on a regular basis.

Key Recommendation 4
The University should reward improved food waste and recycling practices, share best-practices throughout the student community, and encourage alternative methods of reducing food-waste.

The following report provides the background information and supporting evidence for how the class established these four key recommendations listed above.

Background

Project Assignment

On 15 January 2014, the project partners, Fleur Ruckley from the University of Edinburgh Estates and Buildings; Caroline Overy from the University of Edinburgh Department for Social Responsibility and Sustainability (SRS); and Ylva Haglund, a representative of Zero Waste Scotland, briefed the students of *PPP* on the issues of food waste and contamination of recycling streams at the University of Edinburgh. The project partners requested the class to investigate current waste measures and devise a strategy to improve the waste and recycling system through effective engagement with the student community.

Key findings from the following report will be presented to the project partners and stakeholders on 26 March 2014. Copies of this report will be made available during the presentation and electronically shortly thereafter.

For further details on the specific guidelines for the project, please refer to Appendix I.

Group Work Strategy

Organisation

The 23 students of the *PPP* class carried out this project as a self-organising group. In order to effectively manage the group work, ground rules and communication methods were established in the first week of the project. In the weeks that followed, students took turns to act as the voluntary Facilitator and the voluntary Recorder. The role of the Facilitator included: leading and encouraging group discussion, accomplishing agenda items, ensuring fair representation of all group members and opinions, and facilitating group decisions via voting. The Recorder documented the meeting minutes and action items, which were saved for future reference in an online data organization system.

Group discussions were open and encouraging of ideas and criticisms. The group decided early on that important decisions would be discussed and decided by majority vote during the weekly group session, while smaller decisions could be made at the discretion of subgroups. The breakdown of the various subgroups are illustrated in figure 1.

Figure 1. The breakdown of the various subgroups utilised throughout the creation of the Food Waste and Recycling Engagement Strategy.

Communication

In order to facilitate discussion and organization of work throughout the project, the class also communicated through electronic means. First, a Facebook group was established to help manage internal communication. This proved particularly useful in terms of answering questions and discussing stakeholder interviews. Second, the group utilised Google Drive to store and organise working materials, resources, and meeting minutes. This not only allowed documents to be accessible by all group members, it also provided a record of document ownership and version histories. This proved to be an effective and versatile way to manage a large group research project.

Project Constraints and Limitations

Some of the stakeholders identified in the stakeholder analysis did not respond to our requests for an interview, while others suggested an alternative person to contact. This created a deviation from the initial methodology; though it is unlikely this caused an issue with the reliability of our data. However, this change did result in a higher proportion of stakeholders in Accommodation Services to be interviewed relative to other departments and areas on campus. Despite this, all recommendations in this report still provide valuable insight for all buildings, departments, and staff throughout the University, despite the distribution of stakeholder interviews.

As efforts have already been made to understand the main sources and practical reasons for contamination (SRS, 2013 and SRS, 2014), this report will focus on presenting an engagement strategy to achieve a sustainable, values-led change within the student community, as well as practical recommendations for ways to improve waste and recycling procedures at the University.

Current Barriers to Waste Reduction

The Waste Hierarchy

The Waste Hierarchy concept, which has dominated waste policy in the EU since the mid-1970s, ranks the possible methods of waste management into four tiers. The best solution is to reduce the amount of waste being generated. After that, reuse and repairs are preferred to recycling, which, in turn, is preferred to incineration or disposal at a landfill (Rasmussen, 2005). Through integration of the Waste Hierarchy into planning, some waste should not be produced at all, as some should be reused and repaired, some recycled or composted, and the remainder should be burnt or buried (Schall, 1992 as cited by Gertsakis and Lewis, 2003). One of the criticisms of this hierarchy is that waste contractors, individuals, industry, and governments have limited control over the production decisions that influence waste generation (Gertsakis and Lewis, 2003). This highlights the importance of having all actors on board to help solve waste management issues. For example, the restaurant industry can cut down on food waste by changing plate and portion size (Wansink and van Ittersum, 2013). In

the case of the student population at the University of Edinburgh, an engagement strategy must take existing facts into consideration, as well as involving stakeholders such as key catering staff, Accommodation Services, student societies, the Students' Association (EUSA), policy makers, waste contractors, and the students themselves.

Recycling Policy in Scotland, the United Kingdom, and Europe

Waste and recycling is a part of the powers devolved to the Scottish Government from the UK Government. However, the National Waste Strategy for Scotland does base its targets and aims on European Union Directives related to waste, as well as the Wastes and Emissions Trading Act (Scottish Government, 2003). Under this policy, Scotland was divided into a series of "Waste Strategy Areas." These are then responsible for carrying out the objectives of the Strategy and setting out local initiatives (Scottish Government, 2003). In addition, as part of the Strategy, Scotland has committed to achieving a target of 50% of waste recycled, by weight, by 2020, keeping in line with European Directives (Scottish Government, 2003). However, much like in the rest of the UK, it falls to local authorities to act as the service providers, determining how best to collect and process the waste for their respective areas within the context of the National Strategy. This legislation was replaced by an updated Zero Waste Plan, which also sets out Scotland's targets for waste reduction, recycling, and composting (Scottish Government, 2010). The main feature of the new legislation was the removal of the Waste Strategy Areas, giving local authorities the responsibility of establishing waste facilities and setting up collection systems (Scottish Government, 2010). This plan focuses on more than just municipal waste (i.e. industrial, commercial) (Scottish Government, 2010). In addition to the different classifications, the Zero Waste Plan also expresses waste targets in carbon, in recognition of waste's contribution to greenhouse gases, and sets the ambitious target of recycling 70% of waste by 2020, with a limit of 5% to landfill (Scottish Government, 2010). The Waste (Scotland) Regulations 2012 specifically target waste by businesses, placing the following restrictions on commercial waste and recycling (from City of Edinburgh Council, 2014a):

- All businesses and organisations are to present key recyclable material for collection from 1 January 2014
- Food waste businesses producing over 50kg of food waste per week to present it for separate collection from 1 January 2014
- Food waste producing businesses producing over 5kg of food waste per week to present it for a separate collection from 1 January 2016
- A ban on material collected for recycling going to landfill or incineration
- A ban on municipal biodegradable waste going to landfill by 1 January 2021

Scotland's Climate Change Act (2009) reinforces the new legislation by introducing fines for businesses of up to £10,000 for poor recycling and waste

practices. In order to ensure that the targets set out in the above legislation are met, the Scottish Environment Protection Agency is working in partnership with Zero Waste Scotland to deliver data on waste, monitoring policies and targets, and providing support for businesses, the waste management sector, and local authorities (SEPA, 2014).

University Recycling Engagement Strategy Case Studies

University of Michigan:

Kaplowitz *et al* (2009) outline the ways in which a new recycling programme was implemented and communicated to students at Michigan State University, in the United States. They suggest that literature targeting students to improve recycling must "focus on basic information needs" such as "time and space needs for recycling, an explanation of what materials can be recycled and how they should be prepared, and provision of information about where people may go for assistance," (DeYoung, 1989 in Kaplowitz *et al*, 2009: p. 614). While highlighting the importance of knowing the target audience and what students require in terms of provision, they found that members of the University community were more interested in receiving information about how to recycle properly, as opposed to the benefits of or reasons for recycling (Kaplowitz *et al*, 2009: p. 617). As such, they conclude that "removing the barriers" to recycling is very important in increasing participation (Kaplowitz *et al*, 2009: p. 619). Moreover, they found that there is no "one size fits all" model when it comes to promoting recycling across all members of the University community, and highlight the importance of using a range of promotional material (Kaplowitz *et al*, 2009: p. 619).

University of Bristol:

The University of Bristol recently proposed a project to encourage behavioural change for students by targeting student accommodation. The University encouraged students to get involved in sustainability issues, and hopes to build awareness through peer-to-peer and face-to-face engagement (University of Bristol, 2013). The University credits a number of factors for the success of the student engagement:

- Sustainability 'champions' or representatives in each of the university halls who are active from the start of term;
- A programme of sustainable living events for students, raising the benefits of shopping at food co-ops, waste recycling, and food waste reduction, as well as other issues such as energy saving;
- A student 'green ambassador' volunteer force of around 30 students;
- An information pack for all students on how to live sustainably; and

- Education for Sustainable Development: recruiting student interns to help "to deliver change within the University, both structural and curricular"

(University of Bristol, 2013: p. 6).

The University of Dundee:

The University of Dundee has a number of food waste initiatives including a newly started Creative Cooking Society, whose social media platform illustrates an awareness of the need to reduce food waste and rethink modern food culture (Creative Cooking Society, 2014). The University also participates in a "reverse vending" trial along with eight other organisations to discover whether students at the University will recycle more if they are offered vouchers in exchange for their recyclable materials (letsrecycle.com, 2014). Glasgow Caledonian University and Herriot Watt University are also participating in the trial. While this exact system is perhaps not as viable for food waste, it is an interesting insight into rewards and incentives for recycling.

In 2011-2012, Dundee universities participated in the Student Green Challenge (Solar Cities Scotland, 2014). Each month, there was a different task, and students were able to sign in to an online portal to log what they were doing (Solar Cities Scotland, 2012: p. 24). At the University of Dundee, "Reducing your food waste" had the largest number of students participating in the action, saving a total of 4,986 kg of carbon emissions (Solar Cities Scotland, 2012: p. 24).

The University of St. Andrews:

The University of St. Andrews' "Recycle on the Go" campaign has an events page for recycling initiatives at the University (The University of St. Andrews, 2014). To increase general environmental awareness, the University hosts an annual Green Week (St Andrews Green Week, 2014) and publishes a "little green guide" which has tips for students on cooking, waste, and energy efficiency (The University of St. Andrews, 2012).

University of the West of England:

In 2011 the University of West England installed food waste "caddies" in all student accommodation. The successful program saw each shared kitchen fitted with a small food waste caddy, which can then be emptied into larger bins in the main recycling areas. The University recognises the ever-changing student body, and promotes food waste recycling through a "Student Sustainability Team", as well as info stalls in their annual Sustainability Week (Roberts, 2012).

Edinburgh Napier University:

There are no individual desk bins at the new Sighthill campus, only paper bins in every room and recycling points in the staff kitchens (Edinburgh Napier University, 2011). While their recycling rate overall was 43% in 2010 (Edinburgh Napier University, 2011), it vastly increased to 80% by June 2013 (Edinburgh Napier University, 2014).

Methodology

Stakeholder Analysis

In order to investigate the extent of the issue surrounding food waste and recycling habits at the University, and how best to address it, the individuals and organizations who had a stake in, or could contribute to, the study had to be determined. To start this Stakeholder Analysis, a list was compiled of such individuals, groups, and organizations based on the suggestions of those who requested this study. Added to the list were any other individuals or organizations believed to be of interest, and also included were broad groups (i.e. "students" or "NGOs") the specific members of which would need to be identified before analysis could begin. Research of previous university studies and recycling campaigns also led to suggestions of possible stakeholder organizations. Upon creation of a master-list (Appendix II) each stakeholder was analysed to determine his/her/its level of influence on, as well as interest in, the subject at hand.

The analysis and mapping process helped to identify natural groupings of stakeholders, which were then split in to five separate stakeholder types before interviews began. These groups were: stakeholders internal to the University whose focus would be on communication with students; stakeholders internal to the University whose focus is on the practical application of recycling procedures; stakeholders external to the University whose focus is on communication about waste and/or recycling; stakeholders external to the University who deal with the practice of waste or recycling; and stakeholders within the government. While interviews were conducted with a variety of stakeholders from each of the different groups, the identified stakeholders within the University tended to have both the highest interest and highest influence in the outcome of this study. These stakeholders likely would make up the bulk of the interviews and flexibility was allowed – and encouraged – for additional individuals or organizations to be added and analysed as interviews progressed and further suggestions were made.

Stakeholder Interview Methodology

Once relevant respondents were identified through stakeholder analysis, it was necessary to determine how to obtain relevant data from them. Informative semi-structured interviews are the standard research methodology in this type of project. This technique and its advantages were reviewed by the group before being agreed upon as the standard to adopt. This decision was motivated chiefly by two considerations: First, ruling out a completely structured interview format would allow data and discoveries to emerge from the fieldwork that would not be possible with an entirely deductive approach. This is because respondents enjoy a certain degree of liberty in the elaboration of their answers, which reduces the influence of the interviewers' preconceptions on the results. However, working with professionals and organisations accustomed to research and decision making can present an additional challenge: even if interviewees

are not actively trying to direct the conversation in a particular way, they can interpret the situation and anticipate questions in order to put a message across or simple give a good impression of themselves. The second benefit of semi-structured interviewing is that researchers keep some control over the way the discussion unfolds. With an interview script prepared in advance, interviewers can orient the interview to focus on relevant questions and gather only the data they require.

A subgroup was charged with creating such an interview guide. The main concern at this stage was to reconcile the variety of stakeholders selected, for whom very different questions would need to be asked based on the relevance to their role in the issue, with the need for coherence and some continuity between interviews in order to conduct a valid, rigorous data analysis. As a solution to these conflicting imperatives, the subgroup came up with a flexible interview guide (Appendix III) organised in sections containing several questions to choose from. The expected benefit of this guide was to investigate the same themes in each interview whilst avoiding asking questions that would be irrelevant to some respondents. Four general 'areas of interest' where identified, namely attitudes and values, level of awareness, perception of the current situation, and ideas for engagement. Groups of interviewers working with similar stakeholders were then asked to meet and pick questions among those suggested in the common guide, modifying them where needed, so that coherence could be preserved at a smaller scale.

Student Observation Methodology

The aim of the Student Observation was to (1) assess if posters noticeably impacted student behaviour, and to (2) gather information on student awareness of correct waste disposal practices.

A poster (Figure 2) was created that instructed students to clean food waste from food packaging before recycling. It also instructed students to throw food packaging in the general waste if the item could not be completely cleaned. Students were first observed without the poster, and then after the poster had been up for a few days to see if their behaviour changed.

The experiment took place over the course of 12 days, starting on 7 February 2014 and ending on 18 February 2014. A total of 11 one-hour observation sessions during weekday lunch times were carried out over this period: six sessions at the Kings Buildings Library Cafe (KB) and five sessions at the Main Library Cafe. Over this time, a total of 334 students were observed. For the first three sessions at KB and the first two sessions at the main campus, the poster was not up. At the end of these sessions, the poster was placed above the recycling/general waste/food bins in the cafe and the remaining observation sessions took place while the poster remained constantly up.
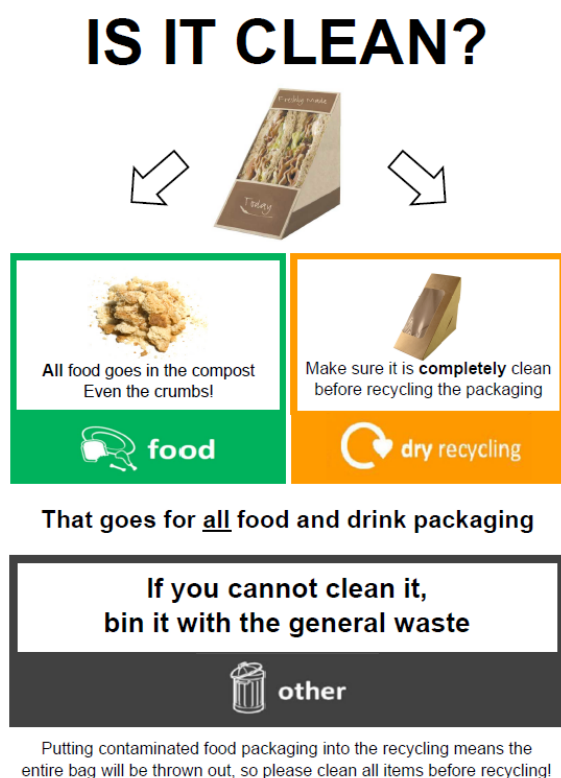
IS IT CLEAN?

That goes for <u>all</u> food and drink packaging

If you cannot clean it,
bin it with the general waste

other

Putting contaminated food packaging into the recycling means the
entire bag will be thrown out, so please clean all items before recycling!

Figure 2. A copy of the poster installed above the waste bin facilities by the student observation research group during the Participation, Policy and Planning 2014 waste and recycling project.

Observers sat close to the bins and recorded how students behaved, without interacting with them. The findings were recorded using a flowchart, a copy of which can be found in Appendix IV. Students were categorised depending on whether they hesitated before disposing of an item, if they had food packaging or not, if they recycled or threw out their food packaging, and if that action was correct or not. Because we were only interested in how behaviour in relation to food packaging changed, we did not record detailed data for items other than food packaging. Hesitation was monitored because it was interpreted as the student pausing to think about how to dispose of their item or to read the signs/poster.

In addition to observation, 10 of the 11 observers conducted two short surveys with a random sample of students, producing a total of 20 completed surveys. This survey asked questions on the students' background, asked them to self assess attention to and influence by signs, and contained a short "quiz" where students were asked to determine in which bin each of 13 specially chosen items should be placed. This survey, and the correct answers to the quiz, can be found in Appendix IV. The answers were checked against the University of Edinburgh's online A-Z recycling guide.

Key Messages from Stakeholder Interviews

Awareness

Current Student Engagement

1.0 According to interviews conducted with staff working in Pollock Halls, many initiatives have been held to raise awareness about food waste, including educational workshops and cooking classes. Unfortunately, many of those interventions were staff-led and the Residence Advisers (RA) interviewed felt that this limited the effectiveness of the strategy. They also stressed the need for more student involvement in the future.

2.0 Many stakeholders agreed that information provision through the use of posters and other informational hand-outs in student accommodations is relatively ineffective on its own. This may be because students do not pay attention to the material or because there is an oversaturation of advertising already. According to student accommodation cleaning staff, face-to-face interaction has proven successful in bringing about a change in recycling behaviour in some student accommodation facilities.

3.0 Some stakeholders noted a lack of connection between students and the food production process as a possible reason for the current issues surrounding students and food waste. In response to this, initiatives have been led at Pollock Halls to publicise where food comes from. However, respondents reported only a moderate interest among students to get involved. Furthermore, the SRS Department has organised many events on sustainable food initiatives, though they did admit that there is room to do more, focusing more specifically on food waste.

Student Awareness

4.0 Student accommodation cleaning staff reported a general upward trend in increased awareness of waste and recycling over recent years, but said there is still more to be done. Some stakeholders noted that recycling seems to be an important issue for students; who are more environmentally aware than the general public. However, according to staff at Pollock Halls, the majority of students do not consider recycling and food waste reduction to be as important as other pressures and considerations that take priority.

5.0 Some respondents argued that student laziness and a lack of commitment have caused bad recycling and wasteful behaviour; whereas others believe it is due to a lack of knowledge and awareness.

6.0 In general, catering staff felt that younger students are actually better at recycling than graduate students and international students, who often seem to have worse recycling behaviour.

Background Knowledge

Challenges and Causes

7.0 Among the findings of our fieldwork a substantial lack of knowledge on the recycling system and function was mentioned frequently. Respondents reported that students are not aware of the importance of recycling or the proper procedure for recycling in University estates and buildings, which contributes to the significant contamination of dry recycling bins. The two most common sources of contamination were said to be coffee cups and pizza boxes; two items that an uninformed student or staff member could easily mistake as recyclable cardboard materials.

8.0 Many stakeholders recognized the difficulty in building a successful engagement strategy with students for whom proper recycling practices are not a priority. A further challenge mentioned was a knowledge gap regarding the value of food and causes of food waste. Stakeholders believed the majority of students know very little about the system of food production and other practical aspects of food consumption, such as expiration dates and the importance of re-using containers.

9.0 Infrastructure was identified as one of the main causes of contamination of recycling in both University Student Accommodation and in public University locations. Stakeholders, particularly RAs, suggested convenience should be improved, especially in accommodation where students are not provided a variety of bins to sort their refuse.

Bins and Signage – Clarity or Confusion?

10.0 According to a number of stakeholders, more attention should be placed on the convenience of the design and placement of the bins. For example, having different colours for the bags, as suggested by one stakeholder, or using all clear bags and all clear bins, as suggested by another stakeholder. Davy Gray, Environmental Coordinator of EUSA, pointed to the need for improved logistics of waste collection. He also stressed the need for all EUSA sites across campus to have a unified approach to waste infrastructure and waste collection.

11.0 Many stakeholders and students mentioned issues with signage. Some of the main problems are the inconsistency of signage across all buildings and cafes within the University. In addition, an oversaturation of advertising in spaces near the bins affects the visibility and effectiveness of the waste relevant signage.

12.0 To accommodate the international student population, explanations should be provided in other languages, especially within student accommodation though this would be helpful across University campus. The strategic position of the bins is also a concern. Both respondents and student observations found that

students are more likely to think about where to put their rubbish if all three bins are placed next to each other.

Best Practices

13.0 Many successful best practices were mentioned in the interviews and could be used as examples for the future design and implementation of the students' engagement strategy at the University of Edinburgh. Sarah Lee of EAUC Scotland noted the continued use of the Waste Topic Support Network (TSN), which works on connecting different universities in Scotland, and sharing good practices and information.

14.0 The University of Dundee's "Green Day" has been successful in getting the students in touch with sustainability topics. It involved competitions and quizzes centred on environmental topics. The University is also using Vegware in a consistent and successful way. Napier University employs student ambassadors as well as posters and pamphlets to disseminate information.

Process and Organisation

Timing of engagement

15.0 Numerous stakeholders suggested that an engagement strategy will be most effective early in the academic year, when students are moving into new or different accommodation and are adjusting to new environments and new rules. It was recommended that laying firm guidelines on waste and recycling will reinforce the need for students to recycle on University campus.

16.0 Several stakeholders stated their belief that communication with students is key to establishing a lasting change in recycling and food waste habits. Waste and recycling messages should be provided at the beginning of each term and repeated regularly throughout the semester. This would require adequate preparation, planning and effort among those responsible for educating students on waste procedures. A large food and waste event, such as Dundee's "Green Day," or campaign involving face-to-face engagement could be effective if coordinated for the start of the year. Another suggestion involved the University promoting its environmentally conscious image by making current and prospective students aware of the advantages of recycling on visiting days and open days.

17.0 Any campaign, event or strategy should be implemented at the start of the year and continued throughout the year. It should be flexible and capable of adjusting to changing waste and recycling practices.

Organisation of the strategy

18.0 Several stakeholders noted that there are multiple groups working on sustainability awareness and waste/recycling and they felt that this would be

better coordinated from a centralized department. They felt that an engagement strategy should be a unified effort, with responsibilities falling on all relevant departments rather than by a single waste management officer. In addition, acquiring buy-in from senior management in colleges and heads of schools would likely improve the success of the engagement strategy.

19.0 It is important to note that an engagement strategy will need to be informative and should not assume a certain level of knowledge from the diverse student community and changing student population. As a result of high student turnover, institutional memory in organizations such as EUSA (via retained staff) will be crucial to continuing engagement. And like most awareness raising campaigns, the message should be disseminated through a variety of media.

20.0 Building on the experience of Napier University, student engagement should first involve assessing the situation as a whole, with an eye to bringing about change, and then consider an iterative process of trial and error in which different solutions will best suit certain contexts. This would ensure a flexible approach to behavioural change. He explained that learning from past experiences and incorporating continual improvements has been an important aspect of Napier's waste management strategy.

21.0 Adrian Bond, the National Operations Waste Unit Manager for SEPA commented that the starting point of a good waste management plan is to understand what, where, and how waste is currently produced by students, assessing where suitable changes can be made, and locating areas where impact is likely to be greatest, before a strategy is designed.

22.0 Other suggestions included recognizing that positive reinforcement is far more effective than focusing on negative behaviour, sharing knowledge of good practice, and supporting students who make changes. This can help build social norms, and understanding the students' interests while showing them how recycling can benefit them will be a more constructive strategy.

Monitoring, Evaluation, and Feedback

23.0 Napier University found that demonstrable impacts of recycling are better received by students. Periodic waste audits are believed, by a number of stakeholders, to be an essential effort for improving recycling rates among students. However, the effort should not stop there. Follow-up surveys and/or face-to-face meetings should reinforce long-term change. Many stakeholders felt that RAs may be ideal for monitoring waste recycling in student accommodation. Appropriate monitoring and feedback systems, in which RAs and cleaners can communicate with students on successes and/or areas for improvement, were also suggested. Continual feedback would be useful to help tailor recycling strategies and keep track of progress with the use of regular waste production assessments.

Student Engagement

Understanding

24.0 As with other areas, the concept of a unified system throughout the University was seen as vital for students to clearly understand the food waste and recycling processes. In addition, several key areas for education and engagement were identified.

25.0 Students need to understand both the positive effects of good recycling and negative impacts of not recycling properly while focusing on the economic and environmental benefits of recycling, the economic costs of not recycling, and environmental impacts of not recycling (both local and global).

26.0 A number of stakeholders believe that having a better understanding of the costs and benefits to improper and proper recycling will likely increase student investment in good recycling habits.

27.0 Stakeholders suggested ways to present these costs and benefits, which includes using RAs and staff to communicate with students. The lower turnover rate for University staff (as opposed to RAs) enables them to become better acquainted with recycling practices and the positive reasons for doing so. This puts them in a good position to pass this knowledge on. In both cases, students should be made aware of facts and figures to demonstrate impact clearly and concisely.

28.0 International student engagement can be more difficult and an engagement strategy should be created to specifically target the different needs of international students and English-as-a-Second-Language students. The key component of which would be information provided in different languages.

Food Waste and Recycling Infrastructure

Bins

29.0 The engagement strategy for bins may need separate approaches for student accommodation and public university buildings.

30.0 In student accommodation, the provision of more bins, particularly food waste bins in the kitchens, was stressed. In addition to food waste bins, implementing the same on campus multi-bin system in the common areas of self-catered flats would allow students to sort items inside and only need to dump each bin into the appropriate facility outside. As a further benefit, students would be able to become better acquainted with the recycling system in a safe environment where they can learn from their peers. For catered flats, providing a mixed recycling bin in student rooms was suggested. Currently, there is only one bin provided in rooms, which requires students to purchase additional bins in order to recycle.

31.0 On campus, additional bins were also suggested, especially in high traffic areas. Adding two bins, one for coffee cups and one for paper towels would reduce contamination from items that cause the most confusion for students. Coffee cup bins would be most appropriate in cafes and high traffic areas, while paper towel bins would be most appropriate in cafes and bathrooms. The addition of these bins would reduce both confusion and contamination by providing a clear and convenient way to dispose of these items.

Convenience

32.0 It was often mentioned that recycling should be made as easy as possible for students. One way to address this could start at the product level. For instance, all the food packaging at the cafes on campus is recyclable (generally in the dry recyclable bins). However, this is not widely advertised so students are unaware of this. One way of advertising this would be to put recycling instructions on all items bought at University, such as including information on coffee cups to explain how to properly dispose of them.

33.0 Information should also be made as easy and convenient for students as possible. One method of doing this would be to restrict advertisement in bin areas to avoid over-saturation of the communication space, making recycling instructions clear and easy to access.

Communication

Student involvement

34.0 Involving students in interventions and strategies is an element that was mentioned in many discussions from a variety of interviewees. Stakeholders recommended developing a values-led approach to engaging students. Seeing peers recycling would motivate other students to also recycle and it was suggested that the University could create the volunteer position of "recycling ambassadors" for every program/student floor/university group to help spread the message through being a role model.

35.0 Field visits to see recycling plants could potentially increase students' interest and educate them at the same time. Such activities could be organised through classes, accommodation halls, and could be advertised through the EUSA website for student events.

36.0 Involving students through consultations or focus groups was suggested to increase the likelihood of them developing a sense of ownership and responsibility. Furthermore, new communication strategies could be tested through these means. In addition, strategies should not focus merely on lecturing students about recycling and waste, but should include social events to make them realise how acting collectively can make a difference. Large food events such as "Feed the 5000" led by Edible Edinburgh could be held at the beginning of the year to inspire students.

37.0 Students attending the postgraduate course on waste recycling and reduction could be involved in a possible pilot project, which would include a compositional analysis of the waste bins in the cafés and could be conducted by student volunteers in combination with training on waste, a field trip, and a free lunch.

Face to face communication

38.0 Many stakeholders stressed the need for face-to-face communication with students. They argued that one-to-one engagement with people, where possible, is more likely to be successful than relying on signage or group mails. One recommendation was for the University to encourage student volunteers to spend one day a month trying to actively engage and speak with students in public eating areas (The Dome, KB Cafe, Library café, etc.) about recycling habits. This would allow students to ask questions on how to recycle, learn why they should recycle (environment and economic reasons), and keep recycling at the forefront of student's minds. A similar program has been introduced at Napier University. It is believed this kind of action can help students internalize the message and think about it when they go to buy, make, or order food.

39.0 A face-to-face introduction to the recycling system was recommended a number of times. This could be done through RAs or through bin monitors, as recommended by members of catering staff. Even if supervision was just for a month or at peak times and busy areas this would provide an opportunity for education and supervision of waste disposal. A workshop within the RA training program would help equip them with the knowledge and tools to deliver a waste reduction program to their students all year. Additionally, an RA suggested having regular small kitchen meetings in student accommodation to discuss those issues. An effective strategy of face-to-face discussions between housekeepers and students was also mentioned. This makes students aware of direct consequences of not recycling. However housekeeping staff noted, the message that works the best is to remind students that not taking their recycling bins out will attract mice. Due to the very diverse student population, it was suggested to make recycling mandatory and stressing that it is compulsory will have more of an effect than through environmental education.

40.0 A further proposal suggested investment in a mobile stall that would move around cafes to talk with students. Quizzes on waste with prizes could be organised to make learning fun. Finally, it was recommended that student-led and University initiatives be more fully integrated.

Signage

41.0 Coherence and understanding of signage were issues raised in many interviews. Separate stakeholders mentioned the significance of clear and consistent signage to deal with diverse populations that have a high turnover. Similarly, a representative of EUSA felt that better signage is needed. Adrian Bond from SEPA, also recommended that the University and project partners not assume any initial knowledge when designing promotional information and signage.

42.0 The design and look of the messages are very important. The University can work with students in media and arts departments to involve them in the signage design. The message should be simple and the use of bright colours may encourage students to think about recycling. Experience from EUSA cafes reveals that posters for food waste using simple statements and colour are effective. To support consistency, it was recommended that signage conventions and branding be brought along the guidelines provided by Zero Waste Scotland.

43.0 Regarding the contamination of the mixed recycling stream, it was suggested that contamination is not necessarily due to the bins being confusing but often comes from the fact that it is unclear what different materials are made of. As mentioned earlier, including recycling instructions on items most frequently purchased on campus could help reduce confusion and contamination.

Other communication methods

44.0 As mentioned in several interviews, the interventions should aim to create a social norm through clear and consistent messaging, coupled with a convenient disposal system. There were a variety of potential methods mentioned by stakeholders: posters, messages broadcast in several languages on TV screens, use of PC login screens, popup stands in foyers, use of council posters to hang on kitchen notice boards, competitions, and waste audits. In addition there were suggestions made to publicise how much waste is generated, the cost of disposal (in terms of both money and carbon), where the waste goes to, and how much money can be saved (by the individual) from reduced food waste.

45.0 Relying on one method is not enough and the engagement strategy should adopt a holistic approach. Many stakeholders stressed the importance of explaining why recycling and food waste reduction is important to both the individual and the community. However, some stakeholders believe signs and posters are not effective in engaging students due to the sheer number of posters and other advertisements that they encounter on a regular basis. As noted earlier with regards to coffee cups, it was proposed that the University use sleeves to explain how they should be disposed of. Encouraging reusable options such as the *KeepCup* sold in most university cafes was also considered.

46.0 Stakeholders also suggested providing recycling and food waste reduction advice and information in the pre-arrival online orientation for students arriving in Pollock Halls. This would enable new and foreign students to gain knowledge of recycling in Edinburgh before arrival.

47.0 To make the idea of recycling less abstract, visual or interactive programmes, e.g. having a "waste day" in George Square, could help increase student awareness. Many stakeholders suggested talking to people in terms of money, as this could be a powerful tool to change behaviour. Some argued for a charity-based focus to advertise that some people and places could benefit from the waste.

48.0 Caro Overy of SRS pointed to a German food sharing initiative, in which individuals share recipes or offer leftovers to others for free. This could be a good example of a participatory and student-led way in which to sustainably engage other students in food waste reduction.

Incentives and Rewards

49.0 A few interviewees suggested the need for considering incentives and recognition in the form of awards for proper recycling behaviour, as a source of motivation for students to recycle properly and reduce their food waste. Incentive projects could be run by student societies, both on campus and in student accommodation. Incentives could be in the form of rewards, which might include academic credits, sustainable awards, tuition fees reimbursement, or accommodation discounts. For instance, the University of Edinburgh could save up the money resulting from a decrease in contaminated recycling into a fund, which then could be used to reward students for recycling correctly. In the case of student accommodation, awards could be given to the flats that recycle best. It is important to note that challenges can be experienced in the process of monitoring recycling habits, partly because of student movement around campus and student accommodation. How much could be saved by waste reduction and recycling might resonate well with students as they realize it will save them money as well.

Further Suggestions

50.0 The interviewees provided a variety of further ideas for strategy, design, and implementation. Stakeholders noted a lack of human resources in the Accommodation Services and SRS, as well as in the Waste and Recycling Department and suggested hiring staff to segregate the dry mixed recycling stream in-house by hand to ensure there is no contamination. It was mentioned that an engagement strategy might not be the most efficient solution as it is practically impossible to reduce contamination by the amount necessary. However, the SRS sees no problem in working to change the culture surrounding recycling and will continue to do so. SRS have also previously suggested the creation of a link between the University and the city, in order to deal with the issue of contamination and hand sorting. The idea was not able to move forward as the project was deemed too costly.

51.0 The promotion of reusable containers could be beneficial, as it would reduce the amount of packaging, as well as engage students in storing leftovers to reduce food waste. Another alternative would be for the University to move towards the promotion of reusable packaging to serve food in cafes.

52.0 Representatives of the Hearty Squirrel Food Co-op and The Fife Diet both believe it is imperative for students to realize the fundamental importance of food system, including where food comes from and where it goes when thrown away.

Reflection

The results of the interviews with such a wide variety of stakeholders has made clear that, in order to be successful, any engagement strategy aiming at changing students' behaviour towards more sustainable recycling and food waste practices must adopt a more comprehensive approach targeting multiple levels of behaviours - individual, collective, and material - simultaneously.

Student Observations

As noted earlier, observation of student recycling habits took place over 12 days in the Kings Buildings Library Cafe and the Main Library Cafe. In total, 334 students were observed: 165 (49% of) students were observed *before* the poster was put up, of which 136 (82%) had food packaging to dispose of; and 169 (51% of) students were observed *after* the poster was put up, of which, 140 (83%) had food packaging to dispose of. A total of 276 students had food packaging to dispose of.

In this study, hesitation assumes that the student has either thought about where they are placing their garbage or has read the signage. Most students (86%) did not hesitate before disposing of their waste. This could imply most students do not think too much before throwing out their waste or it could mean students feel they are already aware of where items should be correctly placed. Either scenario presents a problem, as only 49% of the students correctly disposed of their waste.

Correct disposal of waste depended on whether students hesitated, whether the poster was in place or not, and whether students threw their item out or recycled it. The break down can be seen in Figures 3 and 4.

Figure 3 shows how student recycling behaviour changed according to whether they hesitated or not. Those who hesitated were more likely to recycle their rubbish, 54% of the time – compared to 33% of the time when students did not hesitate. Students were also more likely to be correct in their choice of disposal method if they hesitated (correct 54% of the time) than if they did not hesitate (correct only 47% of the time). This indicates that, when used, signage improves student recycling habits.
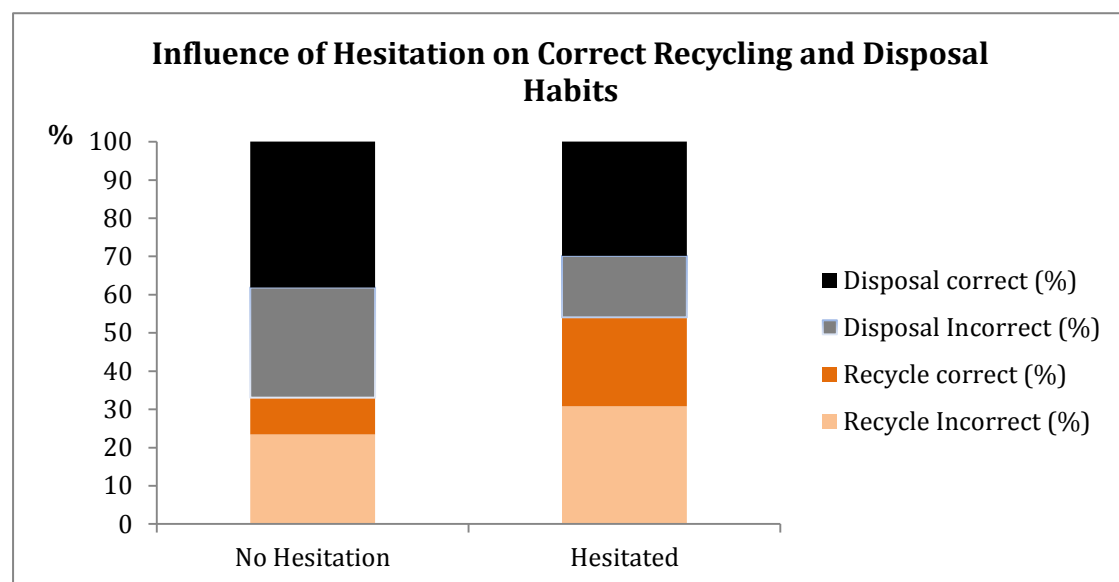

Figure 3

Figure 4 shows how student recycling behaviour changed after the poster was put up. Overall, correct disposal practices improved from 46% to 54%. The number of students recycling also increased, from 38% to 43%. These results indicate that the "Is it Clean?" poster did have a positive influence on students recycling habits.

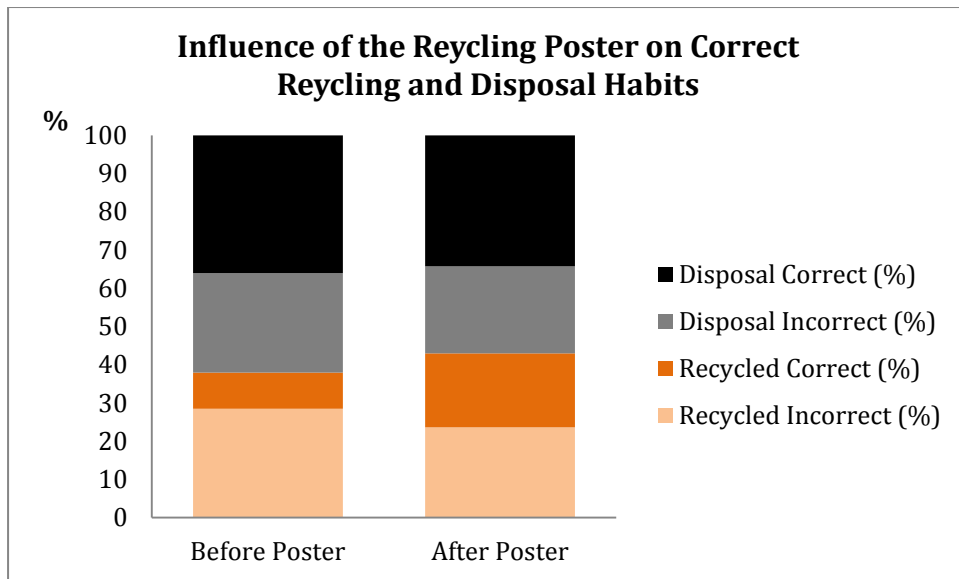**Influence of the Reycling Poster on Correct Reycling and Disposal Habits**

Figure 4

Overall, students were more likely to throw their rubbish in the general waste, and were more likely to be correct in doing so, than those who recycled. While they may have correctly thrown out the packaging due to food contamination, the optimal situation would involve the students cleaning the packaging and then recycling it. The observations imply that for many students the use of the General Waste bin is the default bin of choice. This may be due to a lack of education on the potential for food packaging to be recycled. Alternatively, it may be due to a lack of will to take the necessary steps to clean food packaging. Whatever the cause, recycling instances and likelihood of being correct increased with the introduction of an informative poster and when students consulted the signage. This observation can conclude that students are influenced by posters, but not enough to make all the difference. In light of this, it is recommended that posters should be one of many methods used to influence student behaviour.

Student Survey

Twenty surveys were conducted with students at the KB library (10) and main campus library (10) cafes. As part of the survey, students were asked to look at a list of items and determine if they should be placed in the General Waste, Food, Dry Recycling, or Paper Recycling. Below are the total percentages of all the surveys that got the answer correct on an item-by-item basis.

Table 1

High Scoring	On the Fence	Low Scoring
Item : (% of students who answered correctly)	Item : (% of students who answered correctly)	Item : (% of students who answered correctly)
Plastic Cutlery : (75)	Polystyrene : (65)	Plastic Bags : (35)
Food Scraps : (95)		Disposable Coffee Cup : (35)
Dirty Food Packaging : (80)		VegWare Coffee Cup : (20)
Tea Bags : (75)		Paper Towels : (10)
Crisp and Snack Packets : (85)		
Clean Food Packaging : (90)		
Soda Can : (70)		
Lined Paper : (70)		

Waste audits have highlighted dirty food packaging as a source of contamination for recycling. Both dirty and clean food packaging scored unexpectedly high for student awareness. This could be due to increased awareness from prior questions concerning an educational poster instructing how to dispose of food packaging. Alternatively, student perceptions of what is considered 'dirty' may differ and lead to the gap between apparent knowledge and practice.

Plastic bags, both forms of coffee cups and paper towels are the greatest source of confusion. As paper towels and coffee cups are more commonly used and thrown out by students, specific campaigns to target these items should be developed. Strategies could include targeted educational campaigns or segregated waste bins in areas of high student traffic or high use of the items.

Eighty percent of students scored between 54% and 69% (between seven and nine out of 12) on the surveys. The average score was 62%. The highest score was 92% (12/13) and the lowest score was 38% (5/13). Graduate students did better on average than undergraduate students, indicating that campaigns should prioritise targeting undergraduate students.

How often students recycled at home also had an impact on how well they scored. The more students recycled at home the more likely they were to score well on the quiz.
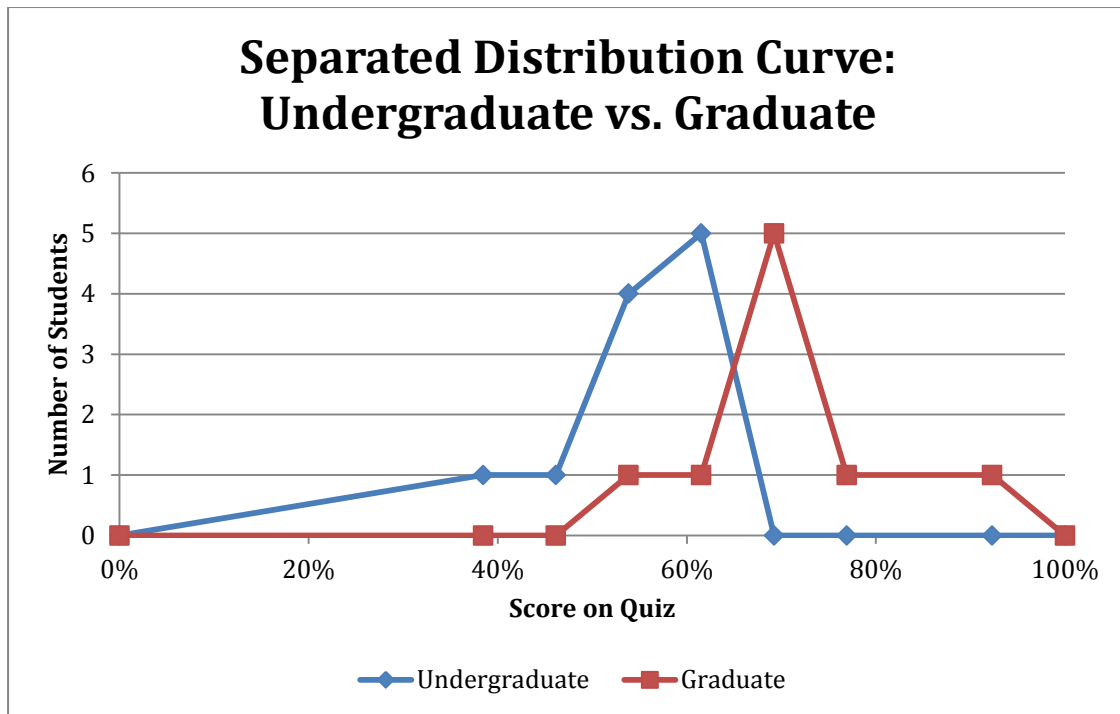
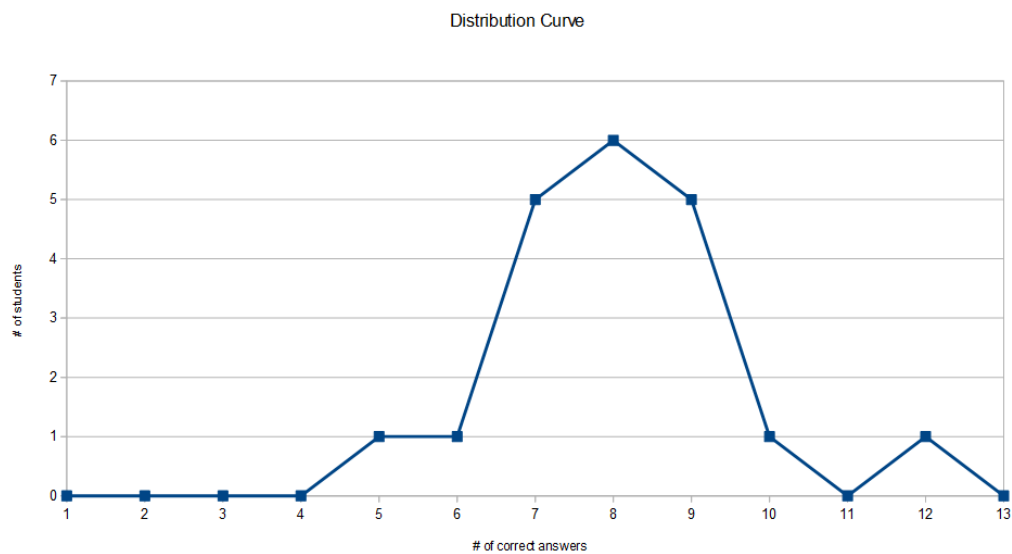Separated Distribution Curve: Undergraduate vs. Graduate

Figure 5
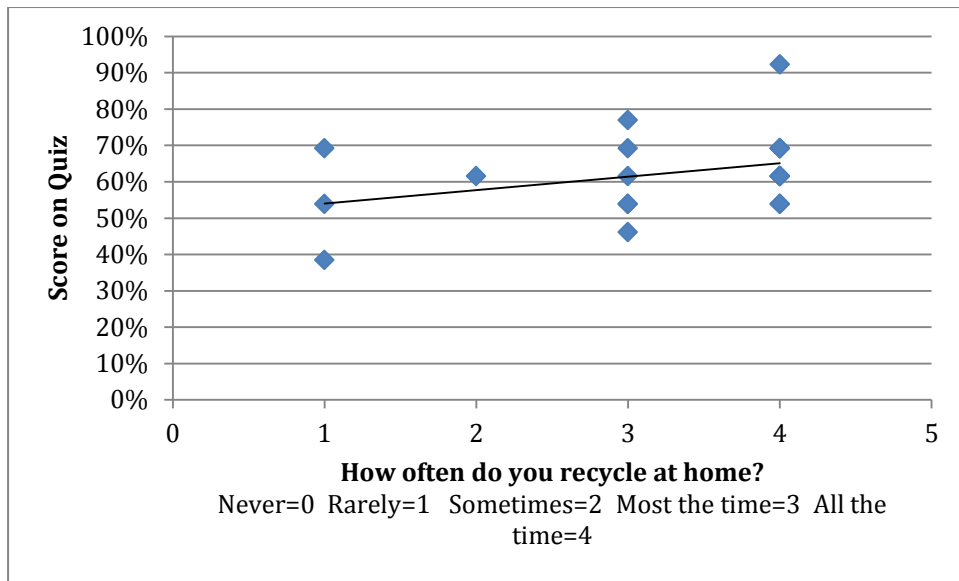

Distribution Curve

Figure 6

Figure 7

Engaging Students and Changing Behaviour

As important as understanding the reasons students choose not to recycle, or recycle incorrectly, is knowing how best to affect behaviour change among the student population. The process of recycling engagement is often theorised as a problem of awareness, where the solution is seen to lie in the provision of information and the dissemination of knowledge (Barr, 2003). Whitehair and Shanklin found that "messaging campaigns that educate individuals about the positive effects of their own actions may potentially improve their behaviour" (2013: p.64). However, a more engaged and participatory approach can have better outcomes. Timlett and Williams carried out a study involving three separate approaches to reduce contamination in waste streams (2008). Their findings show that personalised incentives and feedback are highly effective at reducing contamination. They advocate simple and low-cost methods that engage with people at the point of service delivery. A study conducted by Kaplowtiz *et al* similarly suggests that communication efforts for recycling programming should focus more on messages concerning what, how, and where to recycle, rather than messages on why to recycle (2009). Their findings also suggest that recycling engagement strategies should be specific in their mode and content for different segments of the community.

One model for behaviour change, the ISM model, is based on the theory and evidence that three different contexts – the Individual, Social and Material – influence people's behaviours. The tool is designed to help achieve a collaborative approach to define a problem, to identify solutions, and to deliver and evaluate interventions. For example, integrated efforts using the ISM model contributed to kerbside recycling becoming the "norm" in Scotland (Scottish Government, 2013: p.6). Efforts were made on all three levels:

- **Individual:** messages to the individual about the importance of recycling and "doing [their] bit…working on people's attitudes and emotions," as well as tips on how best to recycle, and the introduction of new "collections infrastructure" (Scottish Government, 2013: p.6).
- **Social:** there is some element of social pressure by which people are influenced by the visible behaviour of their neighbours (e.g., putting recycling boxes out for collection). Moreover, rolling out recycling across schools, workplaces and public areas helps reinforce the explicit social message.
- **Material:** Physical changes to recycling infrastructure and collections.

This integrated approach seems particularly applicable to the student context. As a small community in itself, it seems sensible to target the individual, social and material aspects of waste and recycling. In the context of this report, the social is particularly applicable, reinforcing the need to target students both while in university buildings and in their accommodation with diverse types of engagement.

The National Union of Students conducted a detailed study on student attitudes and behaviours towards recycling and waste (National Union of Students, SUEZ & SITA, 2013). Part of their focus was on the attitudes of students in higher education within the UK. This report noted that nearly 10% of students surveyed did not recycle at all, half of which were first year students (SUEZ & SITA, 2013: p.4). Further inquiry indicated that their main reasons for not recycling included a lack of awareness of the

recycling collections procedure and/or the perception that no one else in their accommodation recycles (SUEZ & SITA, 2013: p.5). Another 50% of respondents thought they were doing all they could in terms of recycling and the most common motivators were for its environmental benefits, along with a belief that they were simply "doing the right thing" (SUEZ & SITA, 2013: p.5).

Another approach, the "value-action gap," theorises that individual values, even when strongly held, do not necessarily result in positive environmental behaviour (Barr, 2003). This is important when considering waste and recycling policies as it implies that strategies, which focus on influencing student values, will not necessarily be effective in increasing recycling rates.

A study conducted by the Waste and Resources Action Programme (WRAP) reported barriers to engaging people in new recycling habits. A survey showed that over 50% of interviewees would recycle more if they were given positive feedback or a reward for recycling (WRAP, 2008). The WRAP report suggested including feedback on how well people recycle compared with others in leaflets and newsletters. Meneses and Palacio reported that reward incentives are one of the most effective promotion schemes (2006). However, reward schemes have conflicting effects on recycling behaviour. A study by Deci *et al.* stated that rewards could be divided into two categories: verbal rewards and tangible rewards (1999). These two types of rewards will have different effects on people's motivation for such behaviour. The study also found that verbal rewards would increase people's intrinsic motivation, but tangible rewards could have the opposite effect (1999). Another study by Hornik *et al.* found that, although tangible rewards could stimulate a desired behaviour, the behaviour would only last as long as the reward scheme lasts (1995). Thus, a verbal rewards scheme should be the primary incentive tool used.

With this information in mind, and considering all the data obtained through stakeholder interviews and student observation, we are able to make a number of recommendations with specific key actions we believe are necessary to effectively engage students on the issues of food waste and recycling. As mentioned earlier, we were able to identify four general objectives in the data outcomes of this study:

      1 – Make food waste reduction and recycling practices easier for students
      2 – Make students more aware of waste and recycling issues/processes
      3 – Increase partnerships between university stakeholders
      4 – Improve monitoring and evaluation

Each Key Recommendation pertains to one or more of these general objectives and, if taken as a whole, we believe they would make for a well-rounded and highly effective Engagement Strategy.

Recommendations for Engagement Strategy

Key Recommendation 1
The University should urge collaboration between student organizations and various departments with an interest in food waste and recycling practices, and should use a variety of media to consult with, engage, and educate students regarding food waste and recycling practices.

Objectives Targeted: 2, 3, and 4.

Key Actions:

There is significant need for collaboration among University departments and student organizations focusing on recycling and food waste reduction. Widespread collaboration will help to ensure a unified message to students and will guarantee more well-rounded engagement which takes in to account the diversity of the student population as well as changes in the ways students are most likely to receive information.

Student-to-student communication is important. Engagement with students should include the use of "recycling ambassadors" and student volunteers who are willing to discuss recycling and food waste with the student population in areas of high contamination. Student consultation or focus groups will also give greater insight in to how best to connect with students throughout the year (as well as year-to-year) and will help to provide greater buy-in by including them in the process from the start.

The influence of the Resident Assistants (RAs) and their regular contact with students should not be overlooked. RAs should (and do) train students on recycling practices at the start of each academic year. These trainings could be enhanced to help the RAs communicate more effectively with the students, provide them with information on the global environmental and economic effects, and educate them regarding the economic costs to the individual and the University.

Further Suggestions:

Other actions mentioned as possible ways in which to engage students include:

- Temporarily supervise bins to provide guidance on how to properly recycle;
- Organise social events to "develop a social norm" and demonstrate the effect collective action has on recycling and food waste;
- Create a table or stall to rotate among cafes, etc. in which volunteers engage students using quizzes and other "fun" activities;
- Organise field trips to recycling plants or farms to connect students with the entire food and recycling process.

Key Recommendation 2

The University should make further changes to recycling bins and signage, both in University buildings and in student accommodation, in order to make food waste and "dry" recycling more convenient and consistent for students

Objectives Targeted: 1, 2, and 3.

Key Actions:

One of the biggest hindrances to proper recycling mentioned by several University stakeholders and confirmed through student observation is the inconvenience and inconsistency of food waste and recycling bins throughout University spaces. Bins should be made consistent between campus and residences and clear plastic bags should be used everywhere.

On campus, there should be more bin options in high-traffic areas and separate bins for coffee cups to reduce contamination through confusion. In accommodation, there should be separate food waste bins in kitchens and "dry" recycling bins in each student room.

In order to make recycling more convenient, all food packaging in cafes should be recyclable and should be advertised as such. Recycling instructions should be added to the food packaging to reduce confusion as well (i.e., add instructions to coffee sleeves).

Signage near recycling bins should be restricted to avoid oversaturation of messages within the space. Messages should be presented in a number of languages to engage international students. Awareness posters and messages should use simple statements and include words like "landfill" as opposed to "general waste," should be disseminated in a number of languages, and should include facts and figures publicizing how much waste is generated and the cost of disposal (both monetary and carbon waste).

Other Suggestions:

Other actions mentioned as possible ways in which to clarify how to properly recycle include:

- Allowing "paper towel only" bins in washrooms;
- Incorporating bins with sound effects to help identify when items are correctly recycled;
- Broadcasting messages in several languages on TV screens;
- Include messages about recycling and food waste on computer log-in screens;
- Informational stands in campus foyers;
- Student competitions to see who can recycle correctly;
- Messages including where waste is going and how much money can be saved by reducing food waste.

Key Recommendation 3

The University should begin periodic waste audits and survey student food waste and recycling practices with the intention of disseminating the information back to the student population on a regular basis.

Objectives Targeted: 4.

Key Actions:

Waste audits should be held at least three times during each academic year: at the start of semester one, at the start of semester two, and during the final week(s) of the academic year. Information from these audits needs to be made available to students and is especially important to pass along to RAs and "recycling ambassadors" so they can tailor their messages as necessary, keep students on track, and highlight areas of concern. Waste audit analysis should not solely focus on figures from within the year, but also the year-on-year statistics to determine whether feedback is being disseminated to students and how it is affecting behaviour.

Student surveys should be performed in conjunction with waste audits to compare perceived changes in behaviour with any actual improvements in food waste and recycling practices. Effectiveness of any engagement strategy should also be evaluated through face-to-face meetings.

Key Recommendation 4

The University should reward improved food waste and recycling practices, share best practices throughout the student community, and encourage alternative methods of reducing food-waste.

Objectives Targeted: 1, 2, 3, and 4.

Key Actions:

The University should share the information obtained through its waste audits and student surveys with the student groups and various departments collaborating on food waste reduction and recycling practices. These groups can, in turn, adjust their messaging as needed. Successful reductions in food waste and increases in proper recycling should be publicly recognized.

Where success is observed the University should reward students through academic credits, sustainable awards, tuition reimbursement, or accommodation discounts. The University should determine the money saved through better food waste and recycling practices and use some of the savings to reward and cement positive behaviour change.

New waste reduction ideas like promoting re-usable containers like Tupperware or the Keep Cup could be advertised in University messaging to continue the momentum towards waste reduction.

Key #	Achieve	Action	Description	Objectives	Strengths	Cautions	Target	Priority	Timeline
1	Educate	Reconnect students to food system	Organise field trips to recycling plants and/or farms to connect students with the entire food production and waste process	2	- Opportunity to promote UofE as an experiential learning institution of social, economic, and environmental issues - Network with external organizations and partners	- Costly to run and number of participants is limited - Logistics of coordinating transportation, booking tours, and safety	All students	*	September, October
1	Educate	Supervise bins	Temporarily supervise bins to provide face-to-face guidance on how to properly dispose of waste	2, 4	- Connect and educate students who do not read signage - Immediate correction of improper bin use and positive reinforcement of proper bin use - Face-to-face engagement is effective	- Must initiate a volunteer program to conduct supervision - Program will require time and effort by staff or student organization groups to coordinate	All students, staff, and visitors	*****	September to April
1	Educate	"Waste Road Show"	Initiate a travelling "Waste Road Show" in which volunteers engage students at various locations across campus using quizzes and other fun activities to educate students on the food chain and recycling	2	- Face-to-face engagement is effective - Eye-catching - Difficult to ignore, unlike stationary signage	- Program will require time and effort by staff or student organization groups to coordinate - Only reaches students willing to engage in the interaction	All students	***	September to April
1	Share	Make it social	Organize social events to "develop a social norm" and demonstrate the effect collective action has on recycling and food waste. (ex. Feed the 5000 hosted by Edible Edinburgh in October 2013)	2, 3	- Promotes lasting change through inspiration of sustainability values	- Will only the "converted" come to an event? - Each event held would be time and resource intensive to plan	All staff and students	**	Occasional. October and February are recommended
1	Share	Collaborate efforts	Collaborate efforts among departments and student organizations to deliver a unified message/effort on increasing recycling and decreasing food waste	1, 2, 3	- Addresses the current situation of mixed messaging and overlapping efforts	- Could be difficult to coordinate schedules for meetings and different department/organization priorities	Related departments and student organizations	****	Ongoing
1	Educate	Introduce "Recycling Ambassadors" and student volunteers	Student-to-student communication is important. Use "Recycling Ambassadors" and student volunteers to discuss recycling and food waste with their peers and/or to supervise bins	2, 3	- Face-to-face, student-to-student engagement is said to be highly effective - Provides an opportunity for students to get involved and enhance their resume	- Program will require time and effort by staff to coordinate	All students	****	September: recruit October-April: run program

1	Evaluate	Student focus groups	Student consultation will provide greater insight into the needs of the student population and will increase buy-in as participants practice what they learn and share with their friends	2, 3, 4	- Allows for direct input and feedback from students on the effectiveness of an engagement strategy (signage, bins, initiatives, etc.)	- Sessions will require time and effort by staff to coordinate and report back to the appropriate people	All students	***	One focus group per semester. November and March are recommended
1	Educate	Resident's Assistants (RA) as liaisons	Expand the RA partnership by training RA's at the start of the year to deliver a student engagement program with University Accommodation throughout the academic year	1, 2, 3, 4	- A partnership with the RA's is essential to effectively connect with students in accommodations	- A waste reduction program would need to be a requirement of the RA position to ensure that adequate time was dedicated to it	Students in University accommodations	*****	September to April in undergraduate flats and September to August in postgraduate flats
2	Improve	Consistency	Introduce consistent bin infrastructure and signage across campus	1, 3	- Addresses the issue of mixed messaging and confusing bin procedures and bin signage across campus	- An overhaul of bins and signage would require substantial financial investment	All students, staff, and visitors	*****	Ongoing. Transition should start ASAP
2	Improve	Bin bags	Use clear bags in all bins or a variety of different coloured bags for different bins for easier identification once the bag has been removed from the bin	1, 3	- Prevents improper disposal of whole bags by facilities staff once the bag is removed from the bin	- Requires agreement across departments, facilities, contractors, cafes, etc.	Facilities staff	**	Ongoing
2	Improve	Paper towel and coffee cup bins	Introduce "paper towel only" bins in washrooms that still have towel dispensers and "coffee cup only" bins in cafes and other high traffic areas	1	- Addresses two significant sources of DMR contamination	- Requires more space in already congested disposal bin areas - Requires further investment to buy and maintain additional bins	All students, staff, and visitors	***	Ongoing
2	Improve	Student Accomodation bin improvement	Supply a food waste bin in all self-catered university student accomodations as well as DMR bins in all individual rooms within all student accomodations (catered & self-catered flats)	1	- Starts a food waste recycling option in student accommodations - Potential to increase recycling rates in student accommodations	- Requires further investment to buy and maintain additional bins - Addition of bins will be ineffective without proper education and instruction of use to the residents - RA's will likely be responsible for leading educational component and therefore must be committed as well	Students in University accommodations	***	Ongoing
2	Improve	Bins and sound effects	Incorporate sound effects into bins in cafes and high contamination areas that prompt users to read the signage and/or select the right bin	1	- Connect and educate students who do not read signage	- Logistics of creation and installation - Requires on-going maintenance	All students, staff, and visitors	*	Ongoing at high traffic times throughout the day

2	Educate	Messages on log-in	Include messages about recyclingand food waste on university computer log-in screens	2, 3	- Reaches all students using University computers -Uninvasive way to disseminate information	- Requires coordination with IT department - Messaging must change so students do not become immune to the message	All students and staff	****	Ongoing
2	Share	Broadcast messages on TVs	Broadcast messages in several languages with U of E specific facts and figures about food waste and recycling on TVs across campus. Include: costs and savings, tonage, area, carbon impact, global impact, etc. Also use TVs to celebrate successes	2, 3	- Reaches a large audience - Uninvasive way to disseminate information - Provides alternative messaging to suit a variety of student's needs	- Requires coordination with IT department - Messaging must change so students do not become immune to the message - Limited to areas of campus that have TVs	All students, staff, and visitors	***	Ongoing
2	Educate	Sign stands in foyers	Periodically place roller banners in campus foyers with "Did you know? messages about food waste and/or contamination	2	- Temporary use of signage prevents message from blending in with other signage	- Requires financial investment for design and purchase - Requires coordination of setup and take-down	All students, staff, and visitors	**	Periodically throughout the academic year
2	Educate	On-site competition	Test students awareness by hosting fun prize competitions at bins to see who knows their rubbish best. Events should be led by "Recycling Ambassadors"	2, 4	- Eye-catching and fun- Educational as well as evaluative	- Program will require time and effort by staff or student organization groups to coordinate- A budget for worthwhile prizes will be required- Occasional event that only reaches people in the immediate area of the event	All students and staff	***	Periodically throughout the academic year
2	Improve	Multilingual Signage	UofE is a ethnically diverse schoole and therefor bin signage should be presented in a number of languages to engage international and ESL users	1, 2	- Connects with students and users who are not native english speakers - Demonstrates UofE commitment to international student needs	- Multilingual signage will require translators to get the correct messaging - Overhaul could be expensive	International and ESL students	*****	Ongoing. Transition should start ASAP
2	Educate	Awareness posters	Awareness posters should use simple and relatable language like "landfill" instead of "general waste" and should be multilingual with facts and figures about the amount of waste generated and the associated costs	2	- Facts and figures show direct evidence of impact of positive recycling behaviour	- Many areas of campus are already oversaturated with posters and advertising	All students, staff, and visitors	**	Ongoing
2	Improve	Recyclable food packaging	All food packaging sold in cafes on campus should be recyclable and the packaging itself should say so	1, 3	- Removes the question of "is this recyclable?" - Consistency across campus decreases confusion for students	- Packaging would still require a rinse before it can be put into the DMR bin - Third party providers of the food might not be able to meet this request	All students, staff, and visitors	*	Ongoing

2	Improve	Restrict posters near bins	Restrict signage near waste bins to avoid oversaturation of posters and messaging	1, 3	- Removes the oversaturation of posters and messaging to allow for more visibility of bin related signage	- Could be difficult to keep unwanted signage from going up	All staff and students	****	Ongoing
3	Evaluate	Waste audits	Conduct public waste audits in high traffic and high contamination areas across campus	4	- Provides feedback on the effectiveness of initiatives used to date - Informs whether or not adjustments need to be made to the strategy - Alternative way to educate students on proper recycling behaviour	- Program will require time and effort by staff or student organization groups to coordinate - Must find people willing to look through bins	All students, staff, and visitors	***	September to April
3	Evaluate	Student surveys	Perform student surveys in conjunction with waste audits to compare perceived changes in behavior with any actual improvements and food waste and recycling practices	2, 4	- Evaluation of behavioural change is best conducted through face-to-face communication - Alternative way to educate students on proper recycling behaviour	- Program will require time and effort by staff or student organization groups to coordinate - Requires time and effort by staff or student organizations to coordinate and report back to the appropriate people	All students	*****	September to April
4	Share	Share statistics	Share waste audit and student survey statistics with students and departments running waste/recycling programs to adapt programming as necessary	1, 2, 3, 4	- Provides feedback on the effectiveness of initiatives used to date- Informs whether or not adjustments need to be made to the strategy	- Statistics are only useful if they are used to make necessary changes to the engagement strategies	Related departments and student organizations	*****	Ongoing
4	Improve	Allow and promote reusable packaging in cafes	Encourage students to bring their own reusable food and drink containers to use in University cafes. (ex. Reusable take-away food containers and KeepCups)	1	- Reduces food waste as students can store food or drink to finish later - Reduces the amount of disposable packaging required within cafes	- Is this practice food safe?	All cafes and eateries	*****	Ongoing
4	Celebrate	Reward positive change	Reward good practice through academic credits, sustainability awards, tuition reimbursements, or accommodation discounts. Money saved in improved practice should go back to students via rewards to cement positive behavioral change	4	- Provides incentive for students to participate - Demonstrates UofE willingness to reward positive change	- Evidence shows that incentive schemes are only effective for the length of the incentive scheme itself - Requires financial investment from the University	All students	****	September to April

Conclusion

Throughout the course of this study, we examined a wealth of literature, various case studies, and undertook interviews and observations of our own in an attempt to gain a better perspective as to how to tackle the issues of waste and recycling at the University of Edinburgh. In the end, our findings clearly identified areas in which the University can do a better job in communicating to students the importance of recycling and waste management around campus. We saw an inconsistency in signage throughout various areas across campus as a key issue in fostering a sense of confusion regarding proper recycling practices, leading to carelessness when it comes to the disposal of waste. Our studies also revealed that there are minimal efforts made to communicate to students to whom English is a second language, further promoting bad practices across campus. Strategies have been developed not only to combat these attitudes within the student population, but also to reinforce sustainable practices throughout the course of the year. Underlying all of this is the issue of behaviour change and how to achieve it.

The strategies that we have laid out seek to change the perception that students have of recycling and waste through consistent and repeated communication. In doing so, the culture surrounding it can change and ultimately social norms can be affected. However, the responsibility lies within the University to take the initiative and put into place various mechanisms to both promote and sustain these practices. As we have mentioned, this includes a closer working relationship with the staff of various student accommodation sites, as well as collaborative efforts between departments to develop consistent messaging and bin signage to limit confusion amongst students. There are clearly a number of obstacles that must be overcome if we are to achieve success in recycling and waste reduction, and the initiatives laid out in this report represent a first step in fostering a better atmosphere of awareness and participation throughout the University of Edinburgh.

References

ANDREWS, A. ET AL. (2013). Comparison of recycling outcomes in three types of recycling collection units. *Waste Management.* 33(3). pp. 530-535.

BARR, S. (2003). Strategies for sustainability: citizens and responsible environmental behaviour. *Area.* Vol. 35 (3). Pp. 227-240.

BLAKE, J. (1999). Overcoming the 'value-action gap' in environmental policy: Tensions between national policy and local experience. *Local Environment: The International Journal of Justice and Sustainability.* Vol. 4 (3) Pp. 257-278.

BERNSTAD, A. AND LA COUR JANSEN, J. (2012). Review of comparative LCAs of food waste management systems - Current status and potential improvement. *Waste Management.* 31(12), 2439-2455

BRUNNER, P. H. AND RECHBERGER, H. (2000). *Practical handbook of material flow analysis.* Reviewed in: *The International Journal of Life Cycle Assessment.* Volume 9, Issue 5, pp 337-338

CITY OF EDINBURGH COUNCIL, (2014a). *Commercial Waste Collection and Recycling.* City of Edinburgh Council. [Online] Available at: https://www.edinburgh.gov.uk/info/53/commercial_waste-collection/559/commercial_waste_collection_and_recycling/4 [Accessed: 04/03/2014].

CITY OF EDINBURGH COUNCIL, (2014b). *Rubbish and Recycling.* City of Edinburgh Council. [Online] Available at: http://www.edinburgh.gov.uk/info/1054/rubbish_and_recycling [Accessed: 03/03/2014].

CREATIVE COOKING SOCIETY - UNIVERSITY OF DUNDEE. (2014). *Creative Cooking Society - University of Dundee. Facebook page* [Online] Available at: https://www.facebook.com/CCSUOD [Accessed: 09/03/2014].

DECI, E.L., RYAN, R.M. AND KOESTNER, R. (1999) A Meta-Analytic Review of Experiments Examining the Effects of Extrinsic Rewards on Intrinsic Motivation. *Psychological Bulletin*, 125(6), pp627-668

DEPARTMENT OF ENVIRONMENT, FOOD, AND RURAL AFFAIRS, (2013). *Waste Legislation and Regulations.* DEFRA. [Online] Available at: https://www.gov.uk/waste-legislation-and-regulations [Accessed: 04/03/2014].

DUPRE, M. (2014). How to communicate on sorting? Several individual definitions and several strategies. *Waste Management* 34(2), pp. 247-248.

EDINBURGH NAPIER UNIVERSITY, (2011). *Universities and Colleges Climate Commitment for Scotland: Edinburgh Napier Report, May 2011.* Edinburgh Napier

University. [Online] Available from:
www.eauc.org.uk/file_uploads/edinburgh_napier_university_progress_report_m
ay_2011_1.pdf [Accessed: 04/03/2014]

EDINBURGH NAPIER UNIVERSITY, (2014). *Waste and recycling*. Edinburgh
Napier University. [Online] Available from:
http://www.napier.ac.uk/about/campuses/sustainability/Pages/Waste.aspx
[Accessed: 04/03/2014].

FREEDMAN, M.R. AND BRACHADO, C. (2010). Reducing portion size reduces
food intake and plate waste. Obesity, 18, 1864 - 1866

GERTSAKIS, J. AND LEWIS, H. (2003). Sustainability and the Waste Management
Hierarchy. A discussion paper prepared for EcoRecycle Victoria.

HANSMANN, R., BERNASCONI, P., SMIESZEK, T., LOUKOPOULOS, P., SCHOLZ,
R.W. (2006). Justifications and self-organization as determinants of recycling
behavior: The case of used batteries. *Resources, Conservation and Recycling* 47
(2006) 133-159

HORNIK, J., CHERIAN, J., MANDANSKY, M. AND NARAYANA, C. (1995).
Determinants of Recycling Behavior: A Synthesis of Research Results. *The Journal
of Socio-Economics*, 24(1), pp105-127

HARGREAVES, T. (2011). Practice-ing behaviour change: Applying social practice
theory to pro-environmental behaviour change. Journal of Consumer Culture,
11(1): 79-99.

IYER, E., AND KASHYAP, R. (2007). Consumer recycling: Role of incentives,
information and social class. *Journal of Consumer Behavior*, 6, pp32-47.

KAPLOWITZ, M. D., YEBOAH, F. K., THORPE, L., WILSON, A. M. (2009). Garnering
input for recycling communication strategies at Big Ten Universities.*Resources,
Conservation and Recycling*. 53. p. 612-623.

KAPLOWITZ, M.D., YEBOAH, F.K., THORP, L., WILSON, A.M. (2009). Garnering
input for recycling communication strategies at a Big Ten University.*Resources,
Conservation and Recycling* 53: 612-623

KELLY, T., MASON, I., LIESS, M,. AND GANESH, S. (2006). University community
responses to on campus resource recycling. *Resources, Conservation and
Recycling*. 47: 42-55

KOLLMUSS, A., AGYEMAN, J. (2002). Mind the gap: Why do people act
environmentall and what are the barriers to pro-environmental
behaviour?*Environmental Education Research*. Vol. 8 (3). Pp. 239-260.

LETSRECYCLE.COM, (2014). *Scottish reverse vending trial to reward recycling*.
[Online] Available from: http://www.letsrecycle.com/news/latest-news/waste-

management/scottish-reverse-vending-trials-to-reward-recycling. [Accessed: 09/03.2014].

LISA, P., SHANNON, T.,LAWRIMORE, K., MCGEE, A., TAYLOR, M. AND LAMOREAUX, G. (2003). Science education and sustainability initiatives: A campus recycling case study shows the importance of opportunity. *International Journal of Sustainability in Higher Education*. 4(3):218-229

MENESES, G.D. AND PALACIO, A.B. (2006). Different kinds of consumer response to the reward recycling technique: similarities at the desired routine level.*Asia Pacific Journal of Marketing and Logistics*, 18(1), pp43-60

MORRIS, J., MARZANO, M., DANDY, N. AND O'BRIEN, L. (2012). Forestry, sustainable behaviours and behaviour change: Theories. *Forest Research*. [Online] Available from: http://www.forestry.gov.uk/pdf/behaviour_review_theory.pdf/$FILE/behaviour_review_theory.pdf [Accessed: 05/03/2014].

MORRISSEY, A. J. AND BROWNE. J. (2004). Waste management models and their application to sustainable waste management. Waste Management 24(3), pp. 297-308.

NATIONAL UNION OF STUDENTS, SUEZ & SITA. (2013). *Lifting the Lid: Student Attitudes and Behaviours Towards Recycling and Waste*. National Union of Students, SUEZ & SITA. [Online] Available from: http://www.eauc.org.uk/file_uploads/sita_uk_report_-_liftingthe_lid.pdf [Accessed: 05/03/2014].

OREG, S. AND KATZ-GERRO, T. (2006). Predicting Proenvironmental Behaviour Cross-Nationally: Values, The Theory of Planned Behaviour, and Value-Belief Norm Theory. *Environment and Behaviour*. Vol. 38 (4). Pp. 462-483

RAMAYAH, T., LEE, J., LIM, S (2012). Sustaining the environment through recycling: an empirical study. *Journal of Environmental Management* 102: 141-147

RASMUSSEN, C. ET AL. (2005). Rethinking the waste hierarchy. *Environmental Assessment Institute*. Copenhagen (Denmark).

ROBERTS, P. (2012). *University of the West of England's Food Waste Collections*. University of the West of England. [Online] Available from: http://peopleandplanet.org/dl/uwe_casestudy.pdf. [Accessed: 04/03/2014].

SCHALL, J. (1992). *Does the Solid Waste management Hierarchy Make Sense? A Technical, Economic and Environmental Justification for the Priority of Source Reduction and Recycling*. Working paper #1, Program on Solid Waste Policy, Yale University.

SCOTTISH ENVIRONMENT PROTECTION AGENCY, (2014). *Waste*. SEPA. [Online]

Available at: http://www.sepa.org.uk/waste.aspx [Accessed: 07/03/2014].

SCOTTISH GOVERNMENT. *Climate Change (Scotland) Act*. Scottish Government. (2009). [Online] Available at: http://www.legislation.gov.uk/asp/2009/12/contents [Accessed: 08/03/2014].

SCOTTISH GOVERNMENT. *Influencing Behaviours, Moving Beyond the Individual: A User Guide to the ISM Tool*. Scottish Government. (2013). [Online] Available at: http://www.scotland.gov.uk/Resource/0042/00423436.pdf [Accessed: 09/03/2014]

SCOTTISH GOVERNMENT. *Influencing Behaviours: Moving Beyond the Individual*. Scottish Government (2013). [Online] Available from: http://www.scotland.gov.uk/Resource/0042/00423436.pdf. [Accessed: 09/03/2014].

SCOTTISH GOVERNMENT. *National Waste Strategy Scotland*. Scottish Government. (2003). [Online] Available at: http://www.scotland.gov.uk/Resource/Doc/47133/0009763.pdf [Accessed: 04/03/2014].

SCOTTISH GOVERNMENT. *Scotland's Zero Waste Plan*. Scottish Government. (2010). [Online] Available at: http://www.scotland.gov.uk/Resource/Doc/314168/0099749.pdf [Accessed: 04/03/2014].

SIA, A., HUNGERFORD, H.R., AND TOMERA, A.N. (1986). Selected predictors of responsible environmental behavior: An analysis. *Journal of Environmental Education* 17(2), pp31-40

SOLAR CITIES SCOTLAND, (2012). *Decentralising Dundee II*. Solar Cities Scotland. [Online] Available from: http://www.solarcitiesscotland.org.uk/media/3814/Decentralising%20Dundee%202012%20Part%202.docx. [Accessed: 09/03/2014].

SOLAR CITIES SCOTLAND, (2014). *Student Green Challenge*. Solar Cities Scotland. [Online] Available from: http://www.solarcitiesscotland.org.uk/dundee-green-challenge/student-green-challenge.aspx [Accessed: 09/03/2014].

THE UNIVERSITY OF GLASGOW (2014). Image. [Online] Available from: http://www.gla.ac.uk/services/estates/organisationstructure/estatesoperations/recycling/ [Accessed: 09/03/2014]

THE UNIVERSITY OF ST. ANDREWS, (2012). *A Little Green Guide*. [Online] Available from: http://www.st-andrews.ac.uk/media/estates/documents/GreenGuide2012%20(reduced).pdf [Accessed: 09/03/2014].

THE UNIVERSITY OF ST. ANDREWS, (2014). *Recycle on the go events*. [Online]

Available from: http://www.st-andrews.ac.uk/environment/events/recycleonthegoevents/ [Accessed: 09/03/2014].

THE UNIVERSITY OF ST. ANDREWS, (2014). *St. Andrews Green Week*. [Online] Available from: http://standrewsgreenweek.com/. [Accessed: 09/03/2014].

TIMLETT, R.E., WILLIAMS, I.D., (2008). Public participation and recycling performance in England: A comparison of tools for behaviour change. *Resources, Conservation and Recycling*. Vol. 52 (4). Pp. 622-634.

TONGLET, M., PHILLIPS, P., BATES, M. (2004). Determining the drivers for householder pro-environmental behaviour: waste minimisation compared to recycling. *Resources, Conservation and Recycling*. Vol. 42 (1). Pp. 27-48.

TUCKER, P. (1999). Normative influences in household waste recycling. *Journal of Environmental Planning and Management* 42(1), pp63-82

UNIVERSITY OF BRISTOL STUDENTS' UNION (2013). *University of Bristol Students' Union 'Green Transformation Project'*. The University of Bristol Students' Union. [Online] Available from: http://www.ubu.org.uk/pageassets/about/jobs/University-of-Bristol-Union-Bristol-Union-Green-Transformation-Project-final.pdf [Accessed: 04/03/2014].

VERPLANKEN, B. AND W. WOOD (2006). Interventions to Break and Create Consumer Habits. *Journal of Public Policy & Marketing* 25(1): 90-103

VICENTE, P., AND REIS, E. (2008). Factors influencing households' participation in recycling. *Waste Management and Research*, 26, pp140-146.

WANSINK, B. & VAN ITTERSUM, K. (2013). Portion size me: Plate-size induced consumption norms and win-win solutions for reducing food intake and waste.*Journal of Experimental Psychology*. Applied 19(4): p320-332.

WOOD, W., WITT, M, G,. AND TAM, L (2005). Changing Circumstances, Disrupting Habits. *Journal of Personality and Social Psychology* 88 (6): 918-933

WRAP (2008) *Barriers to recycling at home*. WRAP. [Online] Available from: http://www.wrap.org.uk/sites/files/wrap/Barriers_to_Recycling_at_Home_Technical_Report.pdf [Accessed: 04/03/2014].

WANSINK, B. AND VAN ITTERSUM, K. (2013). Portion size me: Plate-size induced consumption norms and win-win solutions for reducing food intake and waste. Journal of Experimental Psychology. Applied 19(4): p320-332.

WHITEHAIR, K.J., SHANKLIN, C.W., AND BRANNON, L.A. (2013). Written Messages Improve Edible Food Waste Behaviors in a University Dining Facility.

Appendix I. Project Guidelines

The following guidelines were provided by the Course Coordinator:

Effectiveness of Current Initiatives

How are students currently being engaged on the topic? How Successful (or not) is this engagement?

What are the challenges and drivers?

What awareness is there of the issue among students?

Where is the additional potential for food waste reduction and recycling?

What incentives need to be in place to reduce food waste both at home (in accommodation) and in campus outlets?

Engagement Strategy

Who are the key stakeholders and interested communities in the key aspects of food waste reduction and recycling within Edinburgh?

What are the most effective techniques, mechanisms and infrastructure that might be used to secure and sustain student involvement in food waste reduction and recycling (and in reducing challenges such as contamination)?

How to maintain momentum in an ever changing student population (long-term action)?

What engagement is already in hand (e.g. successful research and projects)?

How to disseminate the Group's research findings to stimulate and inform the debate?

Requirements

Review of relevant literature and documentation

Selection and interviewing of key information

Synthesis of the results in the form of a report and group presentation given to the stakeholders

Appendix II. Stakeholders Interviewed

Within the University – Communication with Students

Dave Gorman – Director, SRS
Caro Overy – SRS
Joseph Farthing – SRS
Justina Adomavičiūtė – Former Communications Facilitator, SRS
Chris Middleton - RA Warden, Richmond and Roxburgh Place
CheungHo Nam Amy - RA, Richmond Place
David Wood – RA, Churchill House
Lexi Sharabianlou – RA
Maximo Cirio – President, Sustainable Development Society

Within the University - Practical Food Waste and Recycling

Davy Gray - Environmental Coordinator, EUSA
Jennifer Loney – Catering, EUSA
Jennifer Thomasi – Catering, EUSA
Chris Shrive – Catering, EUSA
Sam Brear – Manager, EUSA
Sandra Kinnear - E & S Coordinator, Accommodation Services
Jacqueline McKinney - Accommodation Manager
Janet Ness - Domestic Supervisor, Sciennes Student Accommodation
Ian MaCaulay - Assistant Director, Catering Services
Agnieszka Jakoniak - Catering Supervisor, Main Library cafeteria
Emily Bancroft – Treasurer, Allotment and Permaculture Society
Sophie Rippinger - Waste and Recycling Officer
Frederick Smith - Cleaning staff/Porter, Richmond Place
Helen Reid – Administration Manager, Richmond Place

Outside the University – Communication with Students

Sarah Lumsden – Student Union Environment and Ethics Officer, Queen Margaret
University
Sarah Lee - EAUC Scotland
Miriam Adcock – Zero Waste Scotland
Ylva Haglund – Zero Waste Scotland
Mags Hall – Membership and Outreach Coordinator, Fife Diet
Cornelia – Volunteer, SHRUB
Finn – Volunteer, Hearty Squirrel Cooperative

Outside the University – Practical Food Waste and Recycling

Eilidh Brunton – Recycling Consultant, Vegware and Food Waste Network
John Aitken – Operations Manager, Napier University
Kathleen Vaughn – Changeworks
Adrian Bond – National Operations Waste Unit Manager, SEPA
Gordon Manson – Operations Manager, Mitie

Policymakers – Edinburgh City and Scottish Government

Jackie Horne – Behaviour Change Team
Stuart Greig – Waste Team
Alison Johnstone – Green Party MSP for Edinburgh
Graeme Cook – Scottish Parliament Information Centre (SPICe)
David Fairhurst – Environmental Manager, Scottish Parliament
Iain Thom – Scottish Green Party
Jim Orr – SNP Councillor, City of Edinburgh Council

Some stakeholders wished to remain anonymous. Though they are not included
in this list, we would like to thank them for their time and insights as well.

Appendix III. Interview Questionnaire

Attitudes / Values

What do you personally think about food waste and recycling?

Do you think it is an important issue for students?

Can you describe the recycling habits in your home country?

How carefully do you recycle?

Awareness

Of what measures/initiatives of the University of Edinburgh are you aware in terms of food waste reduction/recycling?

Do you remember the University doing any campaign on this issue?

Do you think the university is doing enough?

Current Situation

What are you/your department currently doing to reduce food waste? Who (inside or outside the department) initiated this strategy?

What was the rationale behind the current system/these measures? How did you decide it?

Who do you work with on this issue? (Describe relationships, weaknesses and strengths)

What strengths/weaknesses do you see in the current system?

In your position, what are the biggest struggles in regards to food waste reduction?

Where do you think the biggest contamination of recycling streams happen? Why?

Ideas for Engagement Strategy

Practical Recycling: Do you have any ideas that might make the system work better?

If you were in charge of waste management at the University, how would you encourage students to reduce food waste and improve recycling?

How would you account for the diversity of the student community (undergraduate/postgraduate; foreign students etc.)?

How could an engagement strategy work in the long run when students come and go?

What would you be willing to do in order to reduce food waste and/or improve recycling? (Either as an individual or as an organisation.)

Would you be willing to participate in a food waste reduction and recycling campaign?

Is there anything else you want to add?

Appendix IV. Materials from student observations
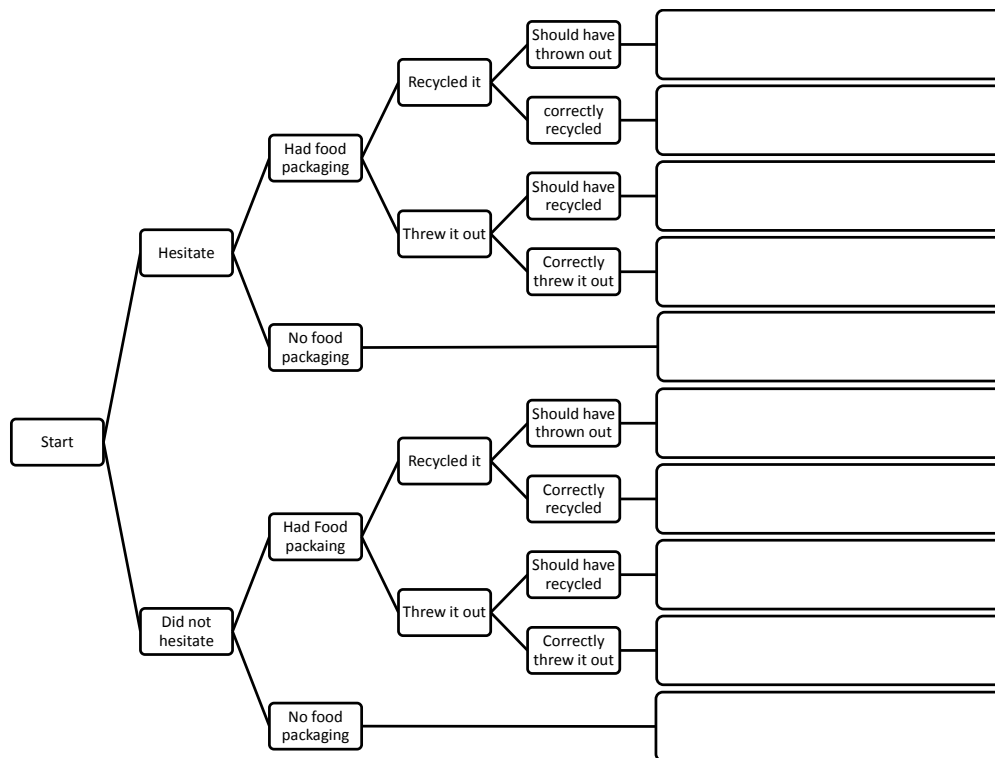
Figure 8 Flowchart used to record student behavior

1) Are you a: Postgrad   Undergrad
2) Are you: An International Student   From Scotland
3) Did you consult the recycling signage before decided how to dispose of your items?   Yes   No
       a. Did you base your actions on the information provided   Yes   No
4) Did the "IS IT CLEAN?" poster change your behavior?   Yes   No
5) Do you find the general recycling Instructions to be clear?   Yes   Somewhat   No
6) How commonly do you or your family members recycle when at home?
       All the time   Most the time   Sometimes   Rarely   Never
7) Please check which bin you would place each item

Figure 9 Student Questionnaire

Figure 10 Questionnaire answers

Figure 11 Poster used in Student Observation