

Review of food and packaging waste recycling at Queen Margaret University

Bright Green Environmental Placement Programme funded by Zero Waste Scotland

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Executive Summary

Food waste has become a major environmental concern with the contribution of large amounts of green house gas (GHG) emissions when sent to landfill. Furthermore the reduction in waste is of prime importance as the production and transportation of food is also a huge contributor to GHG emissions.

Zero Waste Scotland (ZWS) and WRAP are currently conducting work to reduce food waste and the associated packaging waste in the Hospitality and Food Service (HaFS) sector.

This report aims to evaluate and assess the food waste and associated packaging waste produced at Queen Margaret University (QMU). QMU has been separating food waste for recycling since September 2011. This research is intended to inform ZWS and WRAP of waste arisings within a higher education facility in addition to making recommendations on any improvements that can be made to reduce waste and increase the recycling rates at QMU.

A review of food waste recycling in Scottish Universities (p7) was carried out to provide an overview of the current initiatives being carried out by higher education facilities in relation to reducing and recycling food and packaging waste.

A case study of Queen Margaret University has been developed (p11) which includes information on waste data (p15) and carbon savings (p18) at QMU. An estimated saving of 588 tonnes of carbon emissions was made from the waste segregated for recycling between September 2011 and August 2012.

Recommendations for an improved communication system (p20) have been discussed to help QMU reduce, reuse and recycle more:

- the formation of a Green Team involving both staff and students;
- Regular updates of recycling rates and initiatives at QMU through the use of various communication pathways;
- A website with links to recycling and waste awareness websites and links with national events;
- The formation of QMU personalised visual displays designed by QMU's own students; Campaigns involving third parties to deliver recycling messages.

Recommendations for the catering service (p23) include:

- purchasing reusable plastic beakers in place of disposable plastic cups;
- promoting reusable mugs and water bottles to reduce waste produced at QMU;
- work with catering suppliers to secure agreement for them to take back packaging material that materials are delivered to the site in.

Acknowledgments

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Introduction

Zero Waste Scotland (ZWS) and WRAP are currently conducting work to reduce food waste and associated food packaging waste in the Hospitality and Food Service (HaFS) sector. An agreement has been developed with a focus on reducing food waste; optimise packaging; and increase recycling rates in the HaFS.

ZWS and WRAP are working towards two main targets:

- To reduce food and associated packaging waste by 5% by end of 2015; and
- To increase food and packaging waste being recycled, sent to Anaerobic Digestion or composted to at least 70% by end of 2015.

In addition, the new Waste (Scotland) Regulations 2012 require that all waste producers, including those in the private and public sectors, will be required to separate all waste at source including glass, metal, plastic, paper, card and also food if produced at 50kg or more by 1st January 2014.

Queen Margaret University (QMU) has been separating food waste for recycling since September 2011. This report seeks to evaluate and assess the food waste and associated packaging waste produced at QMU and to make recommendations on any improvements that can be made to reduce waste and increase the recycling rates at the university.

Aims and Objectives

The key aims and objectives of the project are to:

1. Review information on other Scottish universities who are already running a successful food waste recycling campaign;
2. Establish a food waste and packaging baseline;
3. Conduct a compositional analysis of avoidable and unavoidable food waste;
4. Increase student and staff awareness and participation in recycling food and other segregated waste within the university campus;
5. Investigate the potential of introducing segregated food waste into the student halls of residence which is owned by Sanctuary housing;

Methodology

- An extensive internet search and literature review of Scottish Universities was conducted in order to establish current food waste recycling initiatives;
- Meetings with the Catering Manager, Facilities Manager and Housing Officer were made to establish the current situation regarding food waste recycling and packaging waste;
- Food waste analysis was conducted over a 5 day period to establish the amount of avoidable and unavoidable food waste produced. This involved sorting and separating the food waste from the food court which contained both leftover food plate scrapings and kitchen waste;
- A case study was developed on the food waste recycling and packaging waste at QMU based on the information supplied by QMU and from the food waste analysis;
- Recommendations were then made based on the information acquired.

Review of Food Waste Recycling in Scottish Universities

An internet search of Scottish Universities was conducted. This section provides an overview of the initiatives related to reducing, reusing and recycling food waste and the associated packaging by some of Scotland's universities.

Edinburgh University

Edinburgh University is currently looking into food waste recycling. At present most food waste produced at the University is sent to landfill, however research into a variety of options is in progress to ensure that in the future this is no longer necessary. Some of the initiatives currently in process include the following:

- Working with MITIE's CORE programme to collect food waste from the EUSA kitchens at Teviot Row House and the Edinburgh First kitchen at Swann Café. Food waste collected from these two areas is taken by MITIE CORE to Scottish Water's Anaerobic Digestion plant at Cumbernauld. Here it is converted into fertiliser and Methane which is used to generate electricity.
- Edinburgh First have their own in vessel compost bin (called a Rocket) which allows them to compost food waste (including meat and cooked foods) on site.
- Some offices have been provided with domestic sized compost bins within their grounds and kitchen caddies. All uncooked food waste, coffee grounds and teabags are placed by staff into these bins for on-site composting.

The new Waste & Recycling contract includes a biodegradable waste collection element and it is anticipated to be able to offer suitable food waste solutions for all areas of the University in time.

In the meantime, members of staff are encouraged to trial a domestic compost bin in suitable areas outside their offices. Members of staff are also encouraged to nominate a recycling/green champion in the office to facilitate the use of the compost bins.

Edinburgh Napier University

Edinburgh Napier University is currently recycling waste. A full education campaign, including better signage on the bins will be launched in 2012/13. The University has signed up to the Halving Waste to Landfill initiative run by the Waste and Resources Action Programme (WRAP).

Students living in accommodation managed by Edinburgh Napier University are encouraged to use two bins provided in every kitchen. Students are asked to segregate their waste in the kitchen bins and to empty the waste collected into the larger external recycling bins found outside each accommodation site. One bin is for the collection of packaging materials such as cans, cardboard, food packaging and envelopes. The other is for the collection of glass and paper. Each kitchen has an information poster clearly stating what can be recycled in the boxes.

Heriot-Watt University

Recycling and Waste Management is coordinated by the Energy and Environment function with the assistance of various resources throughout the university. Wherever possible and economically viable surplus and waste materials are segregated on campus and disposed of in an environmentally sound manner.

The small recycling team works in cooperation with Cleaning Services, the grounds maintenance service, supply services and all the users of the estate to deliver the above objective. The newer student residences all have recycling facilities in their refuse rooms. The older residences only have outside glass and can recycling bins. Currently food waste does not appear to be recycled at HWU.

In May 2011 Herriot-Watt University (HWU) set up Transition Herriot-Watt (THW) with funding from the Climate Challenge Fund and under the Transition Network umbrella. Transition has already been put in place in several Scottish Universities including St Andrews, UWS, Aberdeen and Edinburgh. THW aims to make it easier, cheaper and healthier to be sustainable by helping people maintain their own bicycles, training students to be energy ambassadors to give energy advice to staff and students. THW will work with the Healthy Working Lives group and Hospitality Services at HWU to help reduce carbon associated with wasted food and the use of processed foods, helping the community eat more healthily and cheaply. The project will provide free cookery lessons, especially for Freshers, and free occasional healthy lunches where we can engage people as they eat, attracting people from all over the community, providing a great social benefit at the Chaplaincy kitchen. They will run a "Beat the Takeaway" style programme based on the BBC TV programme, putting it up on social media and YouTube and focus on using left-over's and fresh, seasonal food.

Glasgow Caledonian University

Glasgow Caledonian University (GCU) entered a new Waste Management contract with Shanks which took effect from 1st September 2011 delivering a mixed recycling compactor in addition to a separate food waste service. Food waste will now be collected within all the university catering outlets and stored separately in dedicated brown bins which will be lined with clear plastic bags. Food waste in pantries will be collected in bespoke bins with signage in place showing what food items can be recycled. Bins are checked daily with a contact number to call when full. MITIE Core will collect food waste through a programmed uplift and on-call basis. All food will be taken to an Anaerobic Digestion Plant for process.

GCU has an EcoCampus Team including three students who make a valuable contribution to the team. GCU has established a fun and accessible way of communicating its green agenda to staff, students and other stakeholders through EcoMan, the university's very own environmental superhero. EcoMan was originally created during a marketing challenge where students were involved with helping GCU reach its target of 20% carbon emission savings by 2014. EcoMan was launched in February 2011, with support from the communications department and the University Executive.

EcoMan who is a Marketing student spends time giving advice on environmentally friendlier lifestyles and taking environmental pledges from staff and students. Wearing a costume of recyclable materials designed by GCU fashion students, EcoMan's pledge of 'To sustainability...and beyond!' is becoming familiar across campus. He has visited lectures, offices and social spaces to advise people what they can do to help the environment. Twitter and Facebook sites reinforce the message and encourage two-way communication, and EcoMan also provides a consultancy service for environmental queries or suggestions.

In the weeks leading up to EcoMan's launch, a teaser campaign took place, with banners displaying the logo and launch date appearing on campus plasma screens, the university website, social media

sites, university e-zines and the university magazine. To coincide with his launch, a special 'green' edition of the university magazine was also produced.

On Love Your Planet Day, EcoMan got more than 50 people to make pledges about how they would change their environmental habits. The majority replied that they would walk into university or use public transport, with other suggestions including 'switching off my skybox at night' and 'recycling everything I can'.

It is hoped that EcoMan will become a recognisable brand for GCU and the wider community, playing a key part in helping GCU to achieve its environmental sustainability targets.

University of Strathclyde

Currently much of the food waste at the University is disposed of with the mixed, general waste, a significant percentage of which (e.g. approximately 40%) may end up in landfill. However, the University is gradually introducing food waste collection services across the campus. Staff and students are advised that the food caddies can take all unwanted food. Both food and its packaging (e.g. sandwiches and their wrappers) can also be put into the caddies. However, the caddies should not be used for empty packaging - separate containers are available in central locations.

Food waste caddies are lined with biodegradable, purple plastic liners. The University's cleaning and light duty staff will then monitor how full these are and, when ready for emptying, will take the contents to external, 240 litre food waste bins labelled "Food waste – not for human consumption". The contractor will then collect these bins on a regular basis.

Packaging will be separated from the food waste at the contractor's facility (Shanks), where the food waste will then be used as input material for anaerobic digestion plant, producing digestate (for subsequent composting), biogas and electricity.

Scottish Agricultural College (Aberdeen)

Catering food waste from the canteen both front and back of house is collected in bins lined with compostable bags. These bags are then stored in an outside 240L bin which is then emptied once a week by Keenan's and taken to their facilities in New Deer, Aberdeenshire where it is turned into BSI accredited compost. To avoid contamination of the food waste, the diners (staff and students) take their trays to a central location in the dining hall, where the canteen staff (Sedexo) separate out the food waste from the other recyclables. This arrangement came about as a result of problems with diners causing contamination.

There is intention to introduce food waste recycling into the halls of residence from 1st October 2012, when the SAC students return. Two small worktop bins will be in each kitchen in the halls. Initially, the Sedexo staff will be responsible for emptying these bins on a daily basis, however, this may change over time and responsibility will be given to the students.

Robert Gordon University

RGU is collecting food waste from the catering areas however there are no food waste bins available in office areas due to the costs involved in the collection of the bins. In recognition of food waste standardised portions have been created and details and photos are now on the website for staff ordering catering. Coffee grinds will also contribute to the recycling figures.

A discount of 5p is available for staff and students using their own mugs at Costa and insulated mugs with safe lids are on sale at the outlets for £2. The cups are advertised on the university bulletin and weekly student emails.

University of St Andrews

At the University of St Andrews one or two labelled bins have been placed in a central area within each campus which are emptied daily. Staff who are concerned about smelly food items being left overnight in office bins are encouraged to make use of the Food Waste bins. Information for students and staff is available online including posters and reminders.

University of Abertay Dundee

University of Abertay Dundee (UAD) recognises its responsibility to provide healthy and sustainable food and drink to its customers. UAD work to incorporate environmental, ethical and social considerations into the products and services provided. UAD also work alongside suppliers and contractors to reduce any harmful environmental, ethnic and social effects associated with the products and services provided. Part of this commitment is to maintain UAD's Fairtrade status and support the Rainforest Alliance and Marine Stewardship Council.

UAD offers awareness and training in relation to sustainability by:

- Raising awareness of the universities environmental good practice;
- Communicating internally and externally the university's environmental objectives and performance;
- Providing training and educational programmes for staff and students and encouraging staff and student engagement in environmental initiatives.

University of Stirling

The University of Stirling introduced a food waste recycling scheme within one of its commercial catering operations on site over 2 years ago. From the beginning of August 2012, this is being extended to all of its commercial kitchens.

To encourage the reduction of disposable cups a campaign for a Hug for a Mug was initiated where free reusable coffee mugs were given out in exchange for a hug. By using these mugs staff and students pay less for their coffee.

The University has an action plan to continue to improve performance on waste which is to encourage a reduction in waste generated, but also to make it easier to recycle. New external bins and compaction units are being installed over the next few months and food waste will soon be collected from the main catering outlets. Some of the waste that is difficult to recycle (or becomes heavily contaminated) will be sent to a mixed recycling facility (MRF) where it will be sorted into the various recycling streams.

Queen Margaret University Case Study

The University

Queen Margaret University (QMU) is a small university which has recently had a new state of the art campus built just outside Musselburgh which opened to students in August 2007. QMU leads the field in higher education sustainable design. The new campus is designed to exceed current environmental standards and sets a new benchmark in sustainable design with over 80% of the materials within the campus from renewable sources. QMU has around 323 full-time staff and 138 part-time staff, 6333 students with 71.6% being undergraduate students and 28.4% postgraduate students. Onsite accommodation for 800 students is available for both undergraduate and postgraduate students.

Green Awards

QMU has won and been shortlisted for numerous awards in recognition of their efforts in sustainability. QMU won a Silver Award at the National Green Apple Awards which took place at Edinburgh Castle on 10th September 2012. The UK Green Apple Awards were launched in 1994, but this is the first time there has been a separate event for Scotland.

Recycling

Segregated recycling including food waste was initiated in September 2011. Colour coded bins provided by the waste management provider Shanks were installed throughout the university and the student union. Colour coding provided by Shanks can be viewed in Table 1.

Colour of bins	Recyclable material
Green	Plastics
Red	Glass and Cans
Blue	Paper and Card
Brown	Food waste
Yellow	General waste

Table 1 Colour code of recycle bins

Food bins are located at two main areas in the food court (Figure 1 shows one of these areas), with an additional food bin located towards the far side of the food court increasing the capture rate. Food waste bins are also located in offices, and areas around the campus where computers and vending machines are situated. With the new coffee pod in the atrium of the campus which is producing food waste and coffee grounds two food bins have been positioned here.



Figure 1 Recycling point in food court

Clear signage above all the recycling points has been developed by the university with a colour coded visual description of what should go where which includes photographs of items in order for easier and quicker recognition. In addition bins have stickers on the side which can be seen from a distance and the lids of the bins state on them what should be placed in them. The bins and signage of an office recycling point can be viewed in Figure 2.



Figure 2 QMU recycling bins and signage

In addition to inside the facilities there are also bins situated outside the building at various points which provide two bins one for mixed recycling and one for general waste Figure 3. The Facilities Manager is currently looking into funding for colour coded closed bins to replace these. Having the outdoor colour coded bins will lead to increased awareness and greater recycling rates.



Figure 3 QMU outdoor recycling point

Water filling stations

Replacement of the old water coolers with refilling stations from tapwater.co.uk has taken place at the university. tapwater.org is a not for profit organisation which promotes the drinking of tap water in the UK with the aim to reduce the use of expensive and environmentally damaging bottled water. All profits from the sales of the tapwater.org's life bottle will be used to raise awareness of the damaging effects on the environment. The life bottle which is a high quality stainless steel re-usable bottle has a unique compartment in the cap which allows the storage of effervescent flavoured tablets (taptabs). The bottle also keeps water cool for up to 20 hours. A number of these bottles which are £12 each were given out to students at the Fresher's Fair if they took an interest and signed up to be a member of the Green Team. Installing these water filling stations into the university will mean plastic disposable cups will eventually be eradicated and the volume of plastic water bottles used will be reduced.

Catering

BaxterStorey

As from 10th September 2012 catering for QMU is provided through BaxterStorey an independent food service management company for business and industry. BaxterStorey are committed to using fresh, locally sourced, seasonal ingredients, helping to sustain local supply chains and reduce energy usage and transportation costs. BaxterStorey have signed up to WRAPs hospitality and Food Service Agreement. This is a voluntary agreement which supports the hospitality and food service sector in reducing waste and recycling more.

In 2008 BaxterStorey diverted 300 tonnes of coffee grounds from landfill through their 'grounds to grounds' scheme. Which allowed customers to take home coffee grounds home to use as a natural fertilizer for their gardens for a voluntary donation to charity (Hanson, 2010).

Food packaging and disposable cutlery and napkins are made from biodegradable and compostable material. Napkins are unbleached with the 'Recycle Now' logo. The compostable materials are made from corn starch and when composted turn into compost in 8-12 weeks.

Currently sachets and packets of sauces, butter, milk, sugar, and salt are still in use. Customers are now charged for the sauces and butter which will prevent customers taking more than they need.

The Catering Manager wants to use sauce dispensers in place of the sachets, and to also stop the use of the single milk portions.

There is no prepare food to order system in place however this is something this may also be introduced in the future.

Italian Summer Students

Before BaxterStorey took over the catering service the catering was all in-house. The system in place produced large amounts of food waste through making too much food per head. This was particularly evident for functions which the university regularly caters for various events throughout the year including graduation functions with the month of July being one of the busiest months for the catering services. In addition to this the Italian summer students stay on campus through July and August. The catering service provided 800 Italian summer students with a full board package including breakfast, packed lunch and evening meals this summer. The amount of food wasted increased significantly during this time which was predominantly due to the fact they are on an 'all you can eat' type catering service leading students to load their plates and trays full of food. QMU had to increase the number of food bins from 2 times 240L bins to 4 times 240L bins during this period. When too much food was prepared such as cakes, these were given away free to staff and students to avoid going to waste. In addition to the increased food waste the amount of packaging waste as a result of the large amount of food prepared also increased by at least 2-fold.

Fairtrade

The Catering Manager stocks and uses Fairtrade products in the university shop and catering including University hoodies, tote bags, tea, coffee, wine. Biodegradable disposable bags are also available from the shop (these are currently not labelled as biodegradable which is something the Catering Manager is looking into).

New Coffee Pod in Atrium of QMU

BaxterStorey are introducing a new coffee pod in the atrium of the university. Staff and students get to decide whether it is Costa or Starbucks that will take occupancy of the coffee pod. Both coffee suppliers took turns at the coffee pod over two weeks each. Staff and students will vote online with the results released on Thursday 4th October. In addition to coffee cakes, muffins and biscuits are also available to purchase at the coffee pod. The addition of the coffee pod will lead to an inevitable increase in waste in both food waste and packaging.

Freshers' Fair

Freshers' Fair takes place over one day during the first week of term. In addition to a variety of different information and promotional stands providing students with goody bags and fliers for different events, Dominos Pizza also come to the fair giving out free pizza slices to the Freshers. This leads to large volumes of pizza boxes and food waste for Facilities Management to deal with.

Student Halls

The student halls are currently owned by an external company Sanctuary Housing therefore QMU has no control over the waste management of the halls. The waste management provider is the same as QMU therefore it would seem beneficial to both QMU and Sanctuary Housing to come to a deal with Shanks Waste Management as the pick-up of waste will tie in with one another. The Facilities Manager had already been in contact with the Sanctuary Supervisor based at the halls prior

to this project. It makes sense to have consistency across the campus, student union and student halls by doing this there will be more awareness and therefore higher recycling rates. There are nine blocks of flats each with flats for 3, 4, 5, or 6 students sharing. Each flat has a communal kitchen with a waste bin and a green mixed recycling tub. There is room for a food bin in addition to this and flats with 5 or 6 sharing may require two food bins. There are rooms for 800 students and this year the halls are full. According to Ventour, (2008) on average every one of us wastes 70 kg of avoidable food waste alone each year, therefore based on students staying at the campus for an eight month period this would amount to 37.33 tonnes of avoidable food waste alone. The halls Accommodation Manager has informed that students are actively looking to recycle therefore it is a matter of Sanctuary going ahead with the segregation of food waste in the student halls. Currently there is only one area between the nine blocks of flats that provides students with Eurocarts for the mixed recycling and glass bottles. With only one recycling point students living further away from this point are tempted to put all their waste into the nearest landfill waste bin. An update with the Sanctuary officer based at the halls of residence reported that introducing food waste collections into the student halls is in the pipeline however there was no urgency there. Following this a discussion with Shanks' Key Account Manager regarding the halls of residence occurred resulting in the Key Account Manager seeking to speak with Sanctuary Housing in the anticipation of accelerating the process.

Waste Data and Carbon Savings

The waste management provider for QMU is Shanks. The separated food waste is taken to their anaerobic digestion plant Energen biogas in Cumbernauld by MITIE. Energen biogas was specifically set up to divert food waste away from landfill and to create a renewable energy and fertiliser through the process of anaerobic digestion (AD) where organic matter is broken down by bacteria in the absence of oxygen. The biogas process takes just 40 days and is chemical free.

The remaining segregated recycling waste and general waste is taken for recycling and bulking at their transfer and recycling centres. In the Residual Materials Recovery Facility (MRF) and transfer station source segregated waste and residual waste undergoes separation and preparation of recyclable materials for marketing to end-user manufacturers. Source segregated waste remains separated from the mixed general waste. By this means as much of the general waste stream is recycled as possible. This is where the importance of separating food waste from the general waste stream is of great importance whereby keeping other types of waste as clean as possible this means a higher percentage of the materials being recovered for recycling.

Waste data

QMU monthly waste reports are provided by Shanks which provide figures for the segregated waste produced by QMU including any recyclable material recovered from the general waste stream.

The segregated waste data reviewed for this project includes paper and card, glass and cans, plastic, and food waste (includes coffee grounds). Other materials are segregated and sent for recycling including confidential paper waste, batteries, electrical, clothing etc however these have not been included in this study which is based on food waste and the associated packaging.

Savings in Landfill Tax have been calculated based on £56 per tonne until 1st April 2012 and £64 per tonne thereafter.

Food waste

Food waste has been separated at QMU since September 2011 and the volume of waste diverted from landfill to AD can be viewed in Figure 4. A total of 7.6 tonnes of food has been diverted from landfill via this method saving QMU £454 in landfill tax.

The total amount of waste in a 12 month period between September 2011 and August 2012 can be viewed in Figure 5.

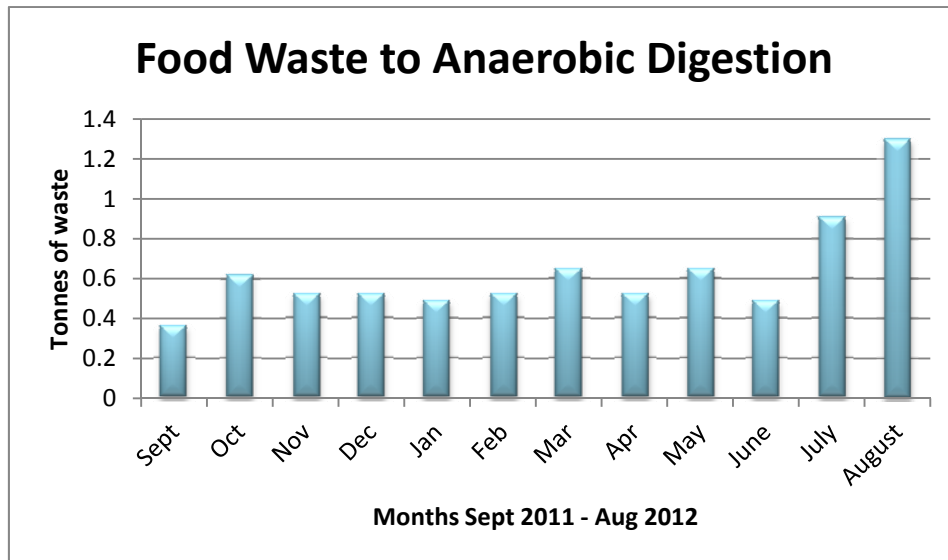


Figure 4 Food Waste Sept 2011 - Aug 2012

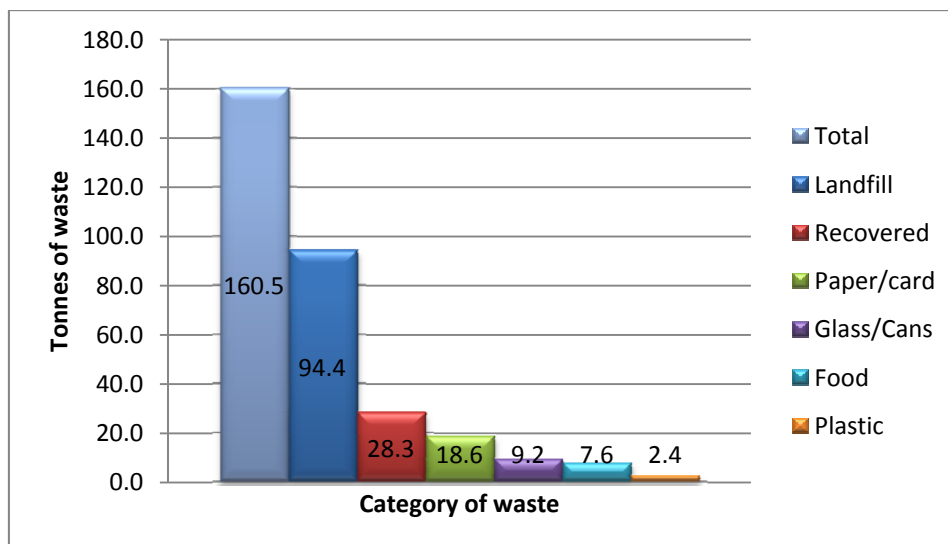


Figure 5 Tonnage of categorised waste from Sept 2011 - Aug 2012

Packaging

A 6.1 m³ Front End Loader (FEL) is the waste disposal and collection method for paper and card on campus. In previous years a monthly uplift of the FEL was in place incurring large costs to QMU where the costs incurred are per uplift and not by weight. The investment of a compactor has led to reducing the volume of paper and card packaging waste by up to 75% depending on the type of

packaging. This was especially valued when the summer Italian students were at the University with the catering system in place at that time incurring large volumes of packaging waste. The compactor can also be used for plastics.

Paper and Card

During Sept 2011 to August 2012 a total of 18.6 tonnes of paper and card have been diverted from waste in 5 uplifts. This compares to Sept 2010 – Aug 2011 where 20.4 tonnes were collected from 10 uplifts. Therefore the compactor has led to a 50% reduction in uplifts accounting for a cost saving of almost in waste management charges £600.

Plastic

Over the 12 month period 2.4 tonnes of plastics have been segregated for recycling. The installation of the tap water.org water fillers around the university to encourage the use of reusable water bottles is anticipated to see a reduction in the amount of plastic waste produced at QMU in the form of both disposable plastic water bottles and cups. Currently there are still disposable plastic cups available in the food court and function area which are made from recyclable materials (PS6), however there are no cups available at the other 3 fill stations encouraging the reuse of long-life bottles and cups.

Exact figures for the volume of plastic cups and the cost of these were not available from the Catering Manager therefore to estimate these values the university population of staff and students is approximately 6800. An internet search on wholesale plastic water cups (CupsDirect, 2012) costs reported to be approximately 1p each. As some of the staff and students are part-time and given not everyone will use the plastic cups half the population was used in this estimation. Therefore if 3400 people were to use one cup each over a 5 day period this would cost £170. Over an academic year (based on 32 weeks) using these figures this could amount to cost savings of approximately £5440.

Food waste to onsite compost heap

In addition to the diversion of food waste to anaerobic digestion raw food from the kitchen consisting mainly of fruit and vegetable peelings and also coffee grounds are diverted from landfill to a compost heap on the grounds of QMU managed by the onsite gardener. An average of two 240L wheelie bins per week are used for the compost. In addition to this approximately 250L of waste coffee grounds are produced in a week used for compost heap and also directly as a fertiliser onto the university grounds. This amounts to an estimated 23.5 tonnes of food waste diverted from landfill which amounts to an estimated saving of £1340 in landfill tax during Sept 2011 – Aug 2012.

Cooking Oil

Used cooking oil is collected by Agri Energy. Agri collects and processes organic waste. The used cooking oil is refined into a range of products such as industrial oils or renewable fuels. Between September 2011 to August 2012, 930 litres of oil was collected from QMU by Agri and diverted from landfill. The diversion of oil from landfill gives an estimated saving of £55 in landfill tax.

Landfill tax savings

Based on the information provided over the period of September 2011 to August 2012, (Figure 5), waste diverted from landfill (collected by Shanks) amounts to approximately £3914 savings in landfill tax. In addition to this including the estimated savings from food to compost (£1340) and oil collected by Agri (£55) amounts to an estimated £5300 in landfill tax savings.

Carbon Savings

The carbon savings achieved by diverting waste from landfill between September 2011 and August 2012 have been estimated using the Carbon Metric Calculator (2012) available from <http://www.zerowastescotland.org.uk/carbonmetric> based on the tonnes of waste diverted from landfill. The carbon savings by QMU diverting waste from landfill is an estimated 833 tonnes (CO₂e). The categorised carbon savings can be viewed in Table 2.

Recycled Material	Estimated Carbon savings (tonnes of CO ₂ e)
Paper and Card	164
Glass and Cans	206
Plastic	31
Food waste to anaerobic digestion	53
Food waste to onsite compost	127
Cooking oil	7

Table 2 Carbon Savings

Food waste compositional analysis

In order to determine the extent of avoidable food waste being thrown out, waste from the canteen bins was reviewed after lunchtime service (on week days) over a five day period. The bins contained food from customers' plates and from kitchen waste. The analysis took place on the first week of term when all students and staff were back to capture more realistic values. This entailed proportioning the waste into the following categories and weighing out each portion.

Categories:

Fresh salad and vegetables; fruit; meat and fish; bakery (cakes and bread); dairy; meals (cooked food including chips, potatoes, etc.); plastic packaging (cups/wrappers etc.); sachets of unopened sauces and unavoidable waste (banana skins, apple cores etc.).

On inspection of the individual food categories each bin bag varied in composition. Figure 6 shows the separation of one food bin which included a knife and fork. The catering staff are aware of knives and forks going missing which is likely to be due to customers dropping their cutlery into the bins whilst clearing their plates.



Figure 6 Photograph of compositional analysis

The pie chart in Figure 7 shows the average percentage of each category taken from the 5 day analysis.

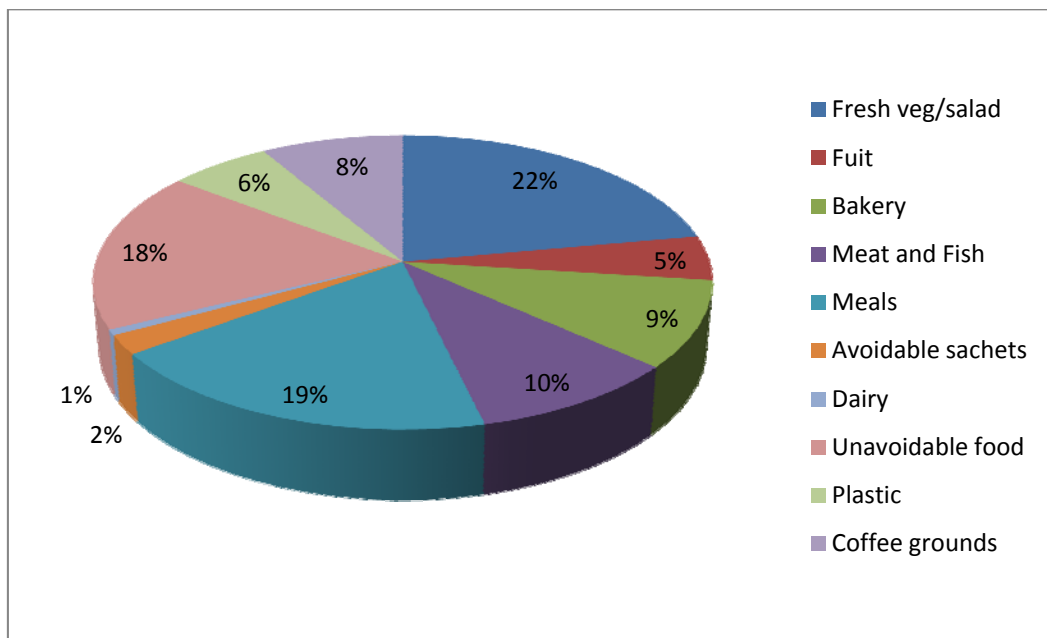


Figure 7 Food waste compositional analysis

Fresh vegetables and salad accounted for 22% of the waste which is the largest portion. Upon inspection looked as though there was too much prepared or portion size was too big. There was little evidence of the fresh vegetables and salad showing signs of wilting and therefore not thrown out due to past its best. There was very little wasted fruit found (5%) and this was in the form of half eaten bananas and apples and untouched orange in one case which looked in perfect condition therefore this looks as though customers are taking more than they need and then throwing it away. In the case of bakery which accounted for 9% of the waste consisted of half eaten baguettes cakes and muffins. The category of meat and fish (10%) discovered no fish items. Meat was largely pieces of chicken or bacon or ham from the filling of a baguette or bread roll. In one bag there were 4 or 5 cooked chicken breasts which may have been past their best. In the meals category which was 19% of the waste – the second largest portion consisted of chips, baked potatoes, boiled potatoes. Dairy

only consisted of 1 % of the waste and this was in the form of single butter portions in foil wrapper. Contamination with plastic packaging was 6%. Unopened sachets of sauce constituted just 2% of the waste; this is from customers taking more than they need. Coffee grounds constituted 10% of the waste analysed.

Recommendations

This section provides advice and recommendations to QMU on how to further reduce, reuse and recycle their food waste and its associated packaging.

Communication System

In order to motivate behaviour change in both students and staff a more effective communication system is required. The following information is given as a guide as to how QMU can improve their communication systems.

Green Team

Recruitment of volunteers for role of Green Champion - An effective communication system will require participation of staff and students therefore volunteers for the role of Green Champions in each department and also student volunteers would be needed for this to be successful. By involving students into the team a greater awareness campaign will succeed. An attempt to develop a Green Society was unsuccessful in the previous year's attempt by the Environmental and Ethics Officer from the Student Union due to lack of both interest and awareness. Consideration into the approaches by other universities such as Glasgow Caledonian University could be followed as a guide to increase the chances of success. A clear barrier that QMU faces in student involvement is the lack of environmentally focussed degree courses and the enthusiastic and environmentally aware students that these courses attract. However QMU has established a green curriculum working group which has introduced green courses to the curriculum in support of their strategy to create graduates equipped with sustainable knowledge and practice. Targeted students to become effective members of a Green Team would be on courses such as Hospitality and Tourism, Events Management and Tourism and Marketing. In addition Drama and Media students could be valuable for campaigns in relation to recycling and reducing waste.

Green Champions to promote recycling in all areas of the University - Green Champions to promote recycling in all areas of the university including the campus, class rooms, student union, and also the student halls when segregated recycling comes into play would lead to greater awareness and participation. By starting now there will be support for both the students living in the halls and the staff servicing them. This will be particularly important when the university decides to roll out food bins into the halls, potentially making it a smoother process.

Green Champions to attend sustainability meetings -Sustainability meetings currently only include dedicated staff members. If student Green Champions could be encouraged to attend these along with a member of staff from across the different departments (including BaxterStorey, the cleaners and janitors) any issues brought up during the meetings can be discussed more widely with the anticipation of better solutions.

Regular updates

Provide staff and students with regular updates on recycling rates and initiatives - Regular updates of the recycling rates of QMU by means of Moderator emails, the use of Facebook and Twitter, newsletters and poster boards. These means of communication can also be used for initiatives such as for example tip of the week/month to promote the reusable mugs and water bottles or to advise people to bring a tub/reusable sandwich wrap if purchasing food to go from the food court – this could be especially effective for staff who prefer to eat in their office where there is a means to wash the tubs in the office kitchen sink.

Website

QMU currently has a webpage with information about waste recycling and contacts, and also a sustainability webpage with a link to the waste reduction action plan. An updated webpage could be developed or a link to another web page containing information about recycling in general in addition to the QMU's activities. These have been included below for information purposes.

- **Love Food Hate Waste (LFHW)** found at <http://scotland.lovefoodhatewaste.com>: LFHW is in partnership with Zero Waste Scotland, LFHW work with a wide range of partners, from community organisations, chefs, UK businesses, trade bodies and local authorities through to individuals looking for practical advice to achieve the best results. LFHW develop schemes and initiatives which help people reduce the amount of food wasted and therefore helping people and organisations to save money. Scotland's LFHW has also developed a site for students 'Savvy Students Save Cash found at <http://scotland.lovefoodhatewaste.com/content/savvy-students-save-cash>. This site helps students with portion sizes, recipes for leftovers, and tips on how to store food so that less food and money is wasted.
- **Every Can Counts** found at <http://www.everycancounts.co.uk> aims to make it easier to recycle your drink cans and make a difference. The partnership between drink can manufacturers and the recycling industry, aims to encourage you to recycle more whether it be at work, at college, at an event or festival or whilst you are out and about. This year Every Can Counts launched a search for three student recycling champions to work at Reading Festival. The students were there to promote the recycling of drinks cans by mingling and chatting with people in campsites, helped man the Every Can Counts football challenge. There was also a wristband initiative run at the goal and at the campsites recycling points for those that went to the extra effort of recycling a whole bag of cans, the uniquely numbered wristbands go into a draw for next year's tickets.
- **Changeworks** found at <http://www.changeworks.org.uk> are a recognised leader in the delivery of solutions that enable people to live and work more sustainably. Changeworks' website gives tips on reducing waste and energy usage and saving money. Zero Waste Scotland Volunteers are also based here.
- **Community Resources Network Scotland (CRNS)** found at <http://www.crns.org.uk> represents recycling and re-use organisations across Scotland on issues of sustainable community resource management.

Prior to a dedicated website students are advised to look at the OURED website which is aimed at all students in Edinburgh which imitated as an Edinburgh University website which can be found at www.oured.ed.ac.uk.

In addition to links to other websites links to national events could be highlighted through the website or through emails, news articles, Facebook or Twitter. Morton and Cross, (2012) have identified key national dates or events that can be used to base activities around. The key international and national awareness days and events include can be viewed in Table 3.

Event	Date
European Week for Waste Reduction	17th – 25th November 2012
St. Andrew's Day	30th November 2012
Rabbie Burns' Day	25th January 2013
Climate Week	4th - 10th March 2013
Earth Day	22nd April 2013
Compost Awareness Week	5th – 11th May
World Environment Day	5th June 2013
Recycle Week	17th – 23rd June 2013
Scottish Food Fortnight	7th – 22nd September 2013
The Clean Up the World Weekend	14th-15th September 2013

Table 3 National Events (adapted from Morton and Cross, (2012))

Visual displays

Use of range of display options for promotion of recycling - Video screens and poster boards have been used to promote recycling at QMU. Keeping these fresh and related to university life will catch the eye of students further more. By making use of the facilities within the university this could be achieved by QMU's own students by means of the Media and Drama students to make an eye-catching fun video that will catch the attention of both staff and students. In addition the use of posters designed by QMU students with the use of the 'Recycle now' logo will not only bring more attention to the idea of recycling but involve more interest in the subject. This could lead to more publicity to the University in recognition of their sustainable thinking students in line with the sustainable and green image the university already has.

Campaigns

Use of third parties to deliver recycling waste messaging - An effective way of delivering a message is through face-to-face advice and information sharing. This was and can further be achieved by inviting people to come to the QMU to set up stands and talk to passersby on their way to or from the food court where there is a lot of through put as this is where students and lecturers will also pass on their way to classes. These opportunities are discussed further below.

Shanks Waste Management Ltd.

Following a site visit to the AD plant in Cumbernauld which allowed us to find out about where the food waste goes, the processes it then goes through and the end products produced, the Key Account Manager for Shanks came to the QMU to set up a stand to promote food waste recycling and to inform both staff and students of where their food waste goes and how it is recycled through the process of AD. With floor stand displays, chocolates and stress balls in the form of an orange with the statement '*Shanks + food waste = energy*' printed on the side were used to entice people to come over to find out information. This proved very successful considering it was a particularly quiet Friday. The Key Account Manager has agreed to come to the QMU at regular intervals throughout the year to capture more people in order to get the message across.

Zero Waste Scotland Volunteers

The Changeworks' Zero Waste Scotland Volunteer Project (formerly known as the Master Composter Project) has recruited and trained volunteers from across Edinburgh and the Lothians who can give waste prevention advice within their local communities. Zero Waste Scotland Volunteers attend events and deliver talks and workshops to community groups giving information and advice on the following Zero Waste Scotland waste prevention campaigns:

- Home Composting
- Love Food Hate Waste
- Stop the Drop (unwanted mail)
- Positive Packaging

It is anticipated that Zero Waste Scotland Volunteers will come to QMU as an additional information supply for all staff and students to encourage people to reduce the amount of waste produced including food waste and offer tips on recipes that will save money by using leftovers. If this is a success it would be beneficial for the volunteers to come to the university before festive times including both Christmas and Easter.

BaxterStorey

BaxterStorey are signed up to the Hospitality and Food Service Agreement and are actively conscious about food and packaging waste. The catering service is still new to the university so are continually looking into portion sizes and menus.

In addition to the reusable mugs which are currently available to buy from the university shop, reusable long-life water bottles could also be available to buy here to encourage reuse. Purchasing washable plastic beakers for the food court could be a possibility for people who want to sit down and eat their meal with a glass of water rather than a bottle reducing the use of disposable cups which are still available in the food court. The new Coffee Pod should also promote reusable mugs when in place.

Packaging

QMU should work with their catering suppliers to secure agreement for them to take back packaging material that materials are delivered to site in. In particular, opportunities for reusable packaging should be investigated – for example plastic long-life crates are sturdy and can be used multiple times before being recycled. This displaces the need for other packaging material such as cardboard and plastic wrapping.

Dominos Pizza

To avoid the waste created by the free pizza slices provided by Dominos Pizza for next year Freshers' QMU could work with Dominos Pizza to take back the pizza boxes with them. An incentive for the students to return the pizza box to the Dominos stand at Freshers' Fair could be looked into to prevent waste boxes across the university grounds. For example an incentive could be a money off coupon for Dominos Pizza.

Additional issues

Additional issues highlighted during this research have been included below:

- **Colour coding:** The colour coding is not consistent throughout Scotland or the UK therefore there is always going to be some confusion where people are used to different colours at home. This is something that will have an effect on the participation in recycling. More consistency in the colour coding would be beneficial however as the colour schemes are already in place the cost factor in changing this would not be feasible.
- **Campaign material:** Campaign material aimed at the Higher education sector is difficult to find. Campaign material produced has been designed for local authority and schools. From the review of universities it is clear that larger education facilities have the means and staff to produce their own campaign material whereas smaller facilities including QMU do not have these resources and therefore educating through the means of posters and websites is not such an easy solution for smaller higher education facilities.

Conclusion

Research into the food waste and packaging recycling currently in place at QMU has been conducted and a case study developed. A food waste compositional analysis of the food waste from the canteen was undertaken and a review of Scottish universities was to assess food waste reduction and recycling initiatives in higher education facilities across Scotland. Recommendations were then made from the information gained in order to help QMU reduce the amount of waste produced by increasing awareness of reusing and recycling more.

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