

University for the Common Good



Waste Composition Analysis (Britannia Building)

19 April 2017

Executive Summary

The University is committed to safeguarding the environment (by amongst others) producing less waste by through waste minimisation, re-use and recycling opportunities. To better understand the potential for such opportunities, the University has a Waste Minimisation and Recycling Plan that highlights the need for a deeper understanding of the waste produced at the University.

This report presents the findings from the first waste composition analysis (WCA), which was carried out on 17 February 2017 with assistance from students from the School of Engineering and Built Environment's Environmental Assessment module.

Due to time constraints and design, the only building whose waste could be totally evaluated was the Britannia, which on the day presented 75 kg of waste in 19 clear bags (recycling) and 23 black bags (general waste). Recycling accounted for 52% of the waste presented, whilst general waste the remaining 48%.



The WCA showed that, whilst there is scope for improvement, in general terms the current waste systems are effective (83% of the contents of clear bags was recyclable, whilst 64% of black bag waste could not be recycled). It also identified a number of short, medium and long-term opportunities for improving the quantity and quality of materials separated for recycling.

The experience gained from this WCA provides a good starting point for developing our understanding of the wastes produced at the University and implementing new waste minimisation and recycling initiatives.

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Introduction

The University's Environmental Policy¹ outlines its commitments to safeguarding the environment, by amongst other measures, producing less waste by pursuing waste minimisation, re-use and recycling opportunities.

To better understand the potential for re-use, minimisation and recycling and identify where such opportunities might be available, the University developed a Waste Minimisation and Recycling Plan² that highlights the need for a deeper understanding of the waste produced at the University.

This report presents the findings from the first waste composition analysis (WCA), which was carried out on 17 February 2017 with assistance from students on the School of Engineering and Built Environment's Environmental Assessment module.

Aims & Objectives

The aim of the WCA was to help Glasgow Caledonian University (GCU) purse waste minimisation, reuse and recycling opportunities by:

- Quantifying the composition of waste produced at the University.
- Identifying which wastes are and aren't being recycled
- Determining whether there any building-specific patterns or trends.
- Benchmarking the effectiveness of current waste minimisation, re-use and recycling initiatives.

Methodology

A designated location was identified and cordoned off for the WCA. On the day, GCU's Central Stores transferred waste presented for collection in either black (general waste) or clear (recycling) bags into the WCA area and separated it according to building of origin.

Waste sorting took place in two 3-hour sessions (morning and afternoon) on 17 February 2017 by two groups of approximately 25 each students, assigned to either data entry or waste separation duties.

Prior to each session starting, students were reminded of the methodology, safety and data confidentiality, which had previously been circulated as part of the method stamen (available as Appendix 1) and accompanying Health & Safety risk assessment.

Waste separation students selected buildings to work on and opened bags of waste/recycling on tables and separated the constituent parts into pre-weighed, 5L plastic tubs for individual categories (derived from the categories used by Zero Waste Scotland³ and listed in Appendix 2). The tubs were

¹ <u>Glasgow Caledonian University - Environmental Policy</u>

² Available on request from <u>sustainability@gcu.ac.uk</u>

³ Zero Waste Scotland (2012) The Composition of Mixed Waste from Scottish Health and Social Care, Education, Motor, Wholesale and Retail Sectors in 2011 (<u>www.zerowastescotland.org.uk</u>)

weighed and their weights recorded using Microsoft Excel forms (Figure 1). A separate record was also kept of bags (general waste or recycling) that contained food items.

	▼	material (dropdown):	Weight (in grams) - numbers only:
How were the waste	materials contained?		
C Clear bag	C Black bag	C Loose or boxed	O Other (add to notes)
lotes			

Figure 1 Screenshot of data entry form with fields used.

Data was subsequently processed to remove duplicate entries and consolidate waste categories used. The final categories are also presented in Appendix 2.

Results

During the waste sorting session, 178kg of waste in 87 bags from the Britannia, G. Mbeki and H. Wood/Saltire Centre was sorted into individual waste categories.

The Britannia is mainly used for office accommodation; the G. Mbeki includes office accommodation, teaching spaces and a small catering outlet; whilst the H. Wood/Saltire Centre are two buildings, whose waste is collected together and which includes office accommodation, teaching spaces and a large catering outlet.

Due to time constraints and the design of the sorting sessions, the only building to have all of its waste (for the day) sorted was the Britannia and as bias in the selection of bags could not be excluded for the other buildings, their data is excluded from this analysis. The WCA data for the Britannia building is available from the <u>data section of GCU's sustainability pages</u>.

The University's Waste

Table 1 details the waste categories used in the WCA, which are an amalgamation of a slightly broader classification used on the day (see Appendix 2), and whether the materials they represent can be recycled (by the University's waste contractor).

Category	Description	Readily Recyclable?
Cardboard	Mainly corrugated cardboard for the	Yes
	delivery/transportation of good. May include lighter card.	
food items	Un-eaten food and food items, such as fruit peels,	Separately
	sandwiches, tea bags and coffee grinds.	
Food packaging	Mainly plastic film used to package food (e.g.	No
- film	sandwich/confectionary wrappers).	
Food packaging	Miscellaneous food packaging materials, such as takeaway	No
- other	containers, sandwich packs, soup tubs. Some potential	
	cross-over with "food packaging – rigid" and "paper –	
	cups".	
Food packaging	Mainly rigid plastic containers. Some cross-over with	No
- rigid	"food packaging – other"	
Glass – jars	Glass jars and bottles.	Separately
Metal - all	Any metal item, including food and drink cans.	Yes
Paper - cups	Disposable paper cups.	No
Paper - other	Printed paper, whole or shredded. Includes leaflets. Excl.	Yes
	paper with visible traces of food (e.g. packaging)	
Paper - tissue	Tissue paper/serviettes from bathroom waste bins and	Yes
	catering.	
Plastic - bottles	Plastic bottles with and without fluids.	Yes
Plastic - film	Plastic film, such as plastic bags (but excluding food	Yes
	packaging). Waste/recycling bags were excluded.	
Plastic - other	Mainly non-food, misc. plastic packaging and other items	No
	(e.g. office stationary).	
Other	Any item not accurately described by the other categories.	No

Table 1 Description of waste category used in the WCA. Recyclability of each constituent part was provided by theUniversity's waste contractor (Feb 2017).

Waste Composition

On the date of the WCA, the Britannia building presented in 19 clear bags for recycling and 23 black bags of non-recyclable general waste (in a total of 42 bags that together, weighed 75kg).

Figure 2 and Table 2 show the composition of the Britannia building's waste by main containment type, with 52% of waste presented in clear bags (used for recyclable waste) and 48% in black bags (used for general waste or non-recyclable wastes). Of the total waste presented, 41% was [printed] paper (whole and shredded), 14% food items and 12% food packaging and disposable paper cups. The weight of these materials is included as Appendix 3.

The most predominant materials presented for recycling (in clear bags) were paper (66%), plastic bottles (8%), food items (5%), paper – tissues (4%), other plastics (4%) and cardboard (3%). For general waste (presented in black bags), the most predominant materials were food items (24%), food packaging (16%), paper (13%) and paper – tissues (10%).



Figure 2 Waste composition by containment type (black or clear bags).

Waste Stream	Black Bag	Clear Bag	Combined
Cardboard	3%	3%	3%
Food items	24%	5%	14%
Food packaging - film	1%	0%	0%
Food packaging - other	16%	1%	9%
Food packaging - rigid	1%	2%	1%
Glass jars	0%	0%	0%
Metal - all	2%	1%	2%
Paper - cups	5%	2%	3%
Paper - other	13%	66%	41%
paper - tissue	10%	4%	7%
plastic - bottles	7%	8%	7%
Plastic - film	1%	2%	1%
Plastic - other	9%	4%	6%
Other	8%	1%	4%

Table 2 Waste composition (%) by [main] containment type (black or clear bags).

Food Contamination

Of the 19 clear bags presented for recycling from the Britannia, 7 (37%) had food items in them, whilst 19 black bags had food items in them (at 83%).

Opportunities

Although the analysis focuses on waste from one building and half of the waste surveyed, it provides valuable insights into the University's waste management arrangements, their effectiveness and where further re-use, minimisation and re-use opportunities exist.

The WCA showed that, whilst there is scope for improvement, in general terms the existing waste arrangements at the University are effective (83% of the contents of clear bags was readily recyclable, whilst 64% of black bag waste could not be recycled).

Immediate opportunities for improvement, i.e. those that could draw on existing arrangements, include more recycling of cardboard (50% of cardboard is placed in black bags), plastic bottles (40% of plastic bottles are placed in black bags) and less food waste (37% of clear bags had food items in them, accounting for 5% of the weight of recycling bags).

Medium-term opportunities include collecting food waste (14% of total waste analysed) separately and reducing the amount of disposable paper cups used, which although only constitute 3% of the University's waste, if placed in recycling bins can compromise the quality of materials separated for recycling.

To capitalise on these opportunities, the University is currently running an advanced food waste collection pilot from departmental kitchens and pantries and when this is rolled out, it is expected to capture a significant proportion of the food items currently placed in black and clear bags. For disposable cups, the University already has an initiative with its catering contractors to encourage those purchasing hot drinks to use re-useable mugs, but recognises that there is scope for promoting these more and better.

The last two opportunities have the potential to improve the University's recycling rate by increasing the amount of material separated for recycling (particularly food waste) and reducing the incidence of contamination of materials separated for recycling.

A longer-term opportunity around food packaging, which including disposable paper cups represents 17% of the total waste produced, may be available but needs to be explored with other partners (e.g. catering contractor and GCU Students Association).

Other opportunities may exist, but were not readily apparent from the results of this WCA, either because of the categories used, building selected or day sampled.

Recommendations

Whilst the WCA provided valuable insights to drive the University's environmental performance, the experience will also help streamline future WCA and it is suggested that the following changes be implemented:

- Future audits should be take place indoors, perhaps in laboratory or workshop spaces. This'll shelter participants from inclement weather and facilitate preparations by allowing the setup to be done in advance.
- Given the time constrains, future WCA should focus on one building at the time. The benefit of this is that it'll simplify the pre-audit arrangements.
- More detailed waste categories should be used to help develop deeper insights into waste minimisation opportunities (an example would be a detailed description of food packaging found).

In addition to the lessons, the WCA and the opportunity to work with students may bring additional opportunities for the curriculum (however, such discussions are outwith the scope of this report).

Closing Remarks

The WCA provided the first quantitative assessment of the University's waste composition and effectiveness of existing waste and recycling arrangements. As a result, a number of waste minimisation and recycling opportunities were identified and if implemented, will have a positive impact on the University's recycling performance.

Unfortunately due to time constraints, it was not possible to obtain complete waste composition data for the other buildings surveys, but it is hoped that future waste composition sessions, which will benefit from the experience gained, will hopefully fill this gap.

Finally, the data and insights from this WCA will provide a baseline to compare future WCA and benchmark the performance of the University's waste minimisation initiatives and recycling systems.

Appendix 1 – Methodology & Briefing Note for Students

Below is the methodology and briefing note circulated to students helping with the WCA in advance of the session.

Introduction

The University's <u>Environmental Policy</u> outlines a commitment to reducing environmental impacts by exploring waste minimisation, re-use and recycling opportunities and to achieve this, the University developed a Waste Minimisation and Recycling Plan⁴ (WMRP).

The WMRP highlights a requirement for a waste composition analysis (WCA) to better understand waste arisings at the University and the effectiveness of existing waste management arrangements. This document, which should be read in conjunction with the accompanying Risk Assessment, details how the WCA is to be carried out.

Aims & Objectives

The waste composition analysis will help GCU purse waste minimisation, re-use and recycling opportunities by:

- Quantifying the composition of waste produced at the University.
- Identifying which wastes are and aren't being recycled
- Determining whether there any building-specific patterns or trends.
- Benchmarking the effectiveness of current waste minimisation, re-use and recycling initiatives.

Methodology

The WCA will take place at the rear of the Hamish Wood building (see the map below) from 09:00 to approximately 15:00 hrs.

⁴ Available from: <u>sustainability@gcu.ac.uk</u> .



The WCA will be carried out by following the steps described below:

GCU Central Stores/Catering Contractors

- 1. Dedicated 1100L bins will be used to collect waste from individual bins/locations by Central Stores (CS) and catering contractor (as usual).
- 2. General waste (black bags) and recycling (clear bags) transferred to holding containers/areas for each building.

Students

Students will be assigned to one of two sessions (starting 09:00 and 12:00 hrs).

- 3. Students assigned sub-groups (focusing on opening bags or record keeping).
- 4. Focusing on a building at a time, students will open either black or clear bags on tables
- 5. Students separate the contents into 5L tubs according to predetermined categories.
- 6. Tubs weighed and emptied (see 8.) when full *or* before changing from either general waste/recycling bags *or* before changing to waste from a different building.
- 7. Weight of tub contents, plus some other descriptive information recorded on a laptop using a specifically formatted spreadsheet with the form below.

fuliding name (dropdown):	Waste n	naterial (dropdown):	Weight (in grams) - numbers only:
- How were the waste ma	terials contained? -	$\ensuremath{\mathbb{C}}$ Loose or boxed	C Other (add to notes)
lotes			

8. Contents of 5L tubs emptied into cardboard bins lined with either clear bags (for recyclable waste or food waste) or black bags (for general waste). 5L tubs returned to use.

GCU Sustainability Officer

- 9. Bottles with liquids will be put aside (after the initial weighing) for additional processing.
- 10. Contents of cardboard bins emptied into either compactor or marked 1100L bins for uplift by waste contractor.
- 11. On completion, place PPE in designated containers.

PPE & Equipment

The following PPE will be issued:

- Heavy-duty gloves (please let the supervisor know if you have any allergies with gloves e.g. latex)
- Disposable plastic aprons
- Disposable plastic overshoes
- Dust masks

The following equipment will be used to assist with the WCA:

- Gazeebo
- 2x1m tables + table protectors (blue cling-film)
- laptops
- [outdoor] extension cable
- Scales <5 kg
- Scale <25kg
- Cardboard bins
- Clear and black plastic bags
- Hand sanitising gel

Important

Your supervisors for the WCA will be:

- Dr. Karin Helwig Lecturer
- Paulo Cruz GCU Sustainability Officer

Please note the following information:

- You will be working outside, so please wear warm clothes and suitable shoes that you do not mind getting dirty (although gloves, aprons and overshoes will be provided there may still be a chance of getting dirty).
- No eating, drinking or smoking (unless you've moved away from work station and have washed hands see below)
- You may find sharp/wet items in the bags you're opening. Please take due care and watchout for sharp or wet items (e.g. glass or containers with drinks).
- Do not read any material you come across (e.g. personal correspondence).
- If in doubt, leave it aside and call the supervisor.
- Sanitise hands after removing gloves
- Wash hands on completion of task
- On completion, place used PPE in designated bin.

What Next?

- The data collected will be shared on the sustainability pages on GCU's website ()
- A brief report of GCU's WCA will be produced.
- Please speak to GCU's Sustainability Officer if you would be interested in helping with future WCA

Appendix 2 - Waste Categories - Original & Final

To simplify the data analysis, the categories of waste used were adjusted from the ones originally used, as detailed below.

Original	Final	Rational for Adjustment
fines	other	Very small quantity of fines. Merged with "other".
food packaging - foil/plastic film	food packaging - film	Clearer category name.
food packaging - rigid/paper	food packaging - rigid	Clearer category name.
food packing - general	food packaging - other	Clearer category name.
glass - jars	glass jars	
paper	paper - other	"Other" added to differentiate from other materials included in the paper classification.
plastic bottle - empty	plastic - bottles	Originally plastic bottles were weighed separately and then re-weighed after being emptied (to determine whether the weight of the fluids was significant). As it wasn't, bottles were simply recorded as bottles.
plastic film - not bin liners	plastic - film	Clearer category name. See not for "plastic film – bin liners".
plastic film - bin liners		The weight of black and clear bags used to collect waste was originally recorded, but as the
		bags were not in themselves waste, they were excluded from the WCA analysis.
rigid plastic - not bottles	plastic - other	Clearer category name.
sanitary waste	other	No significant quantities found waste sampled to justify own category.
textiles	other	No significant quantities found waste sampled to justify own category.
cardboard	cardboard	
Food	food items	Clearer category name.
metal	metal - all	Clearer category name.
paper - cups	paper - cups	
paper - tissue	paper - tissue	
other	other	

Appendix 3 – Waste Stream Breakdown by Weight

Weigh of streams sampled

Waste Stream	Black Bag (grams)	Clear Bag (grams)	Loose (grams)	Total (grams)
cardboard	1,180	1,342	4,494	7,016
food items	8,694	1,772		10,466
food packaging - film	241	117		357
food packaging - other	5,903	496		6,399
food packaging - rigid	249	764		1,013
glass jars	135			135
metal - all	685	547		1,232
other	2,855	503	60	3,418
paper - cups	1,849	758		2,607
paper - other	4,873	25,738		30,612
plastic - bottles	2,385	3,026		5,411
plastic - film	373	708		1,080
plastic - other	3,313	1,486		4,798
paper - tissue	3,631	1,648		5,279
Total	36,364	38,905	4,554	79,823





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www.gcu.ac.uk/sustainability

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