



Waste Composition Analysis
(W. Harley, Milton Street and Britannia Buildings)

26 June 2018

GCU 2018 Waste Composition Analysis

Executive Summary

The University's commitments to safeguarding the environment include producing less waste through waste minimisation, re-use and recycling opportunities. To achieve this, the University has a Waste Minimisation and Recycling Plan that identifies waste composition analysis (WCA) as a mechanism for helping develop a deeper understanding of its waste.

This report presents the findings from the second WCA, carried out on 23rd March 2018 for waste from the Britannia, Milton Street and William Harley buildings. The WCA was carried out by students from the School of Engineering and Built Environment's Environmental Assessment module and followed the methodology used for the 2017 WCA.

The overall composition of the waste sorted for the three buildings by containment type is presented below and includes 30% printed paper, 20% food items, 15% cardboard and 12% food packaging (inc. paper cups).

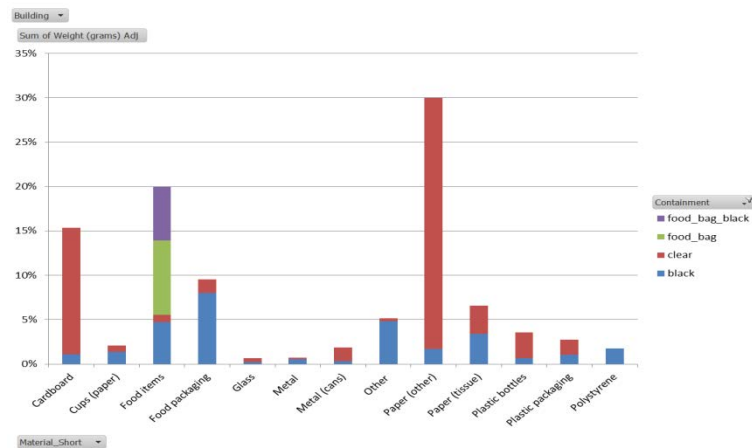


Figure 1 – Combined waste composition (%) for the three buildings analysed.

The most common materials presented for recycling (in clear bags) were paper (51%), cardboard (25%), plastic bottles (7%), paper – tissues (6%) and plastic bottles (5%). Whilst for general waste (presented in black bags), the most common materials were food items (30%), food packaging (22%), other (unsegregated) items (14%), paper tissue (9%) and polystyrene.

On a per capita basis staff at the University generate around 293 grams of waste per day (on the day prior to the WCA). With the exception is paper from the Britannia Building and cardboard and polystyrene from the William Harley, per capita waste arisings are comparable amongst the three buildings.

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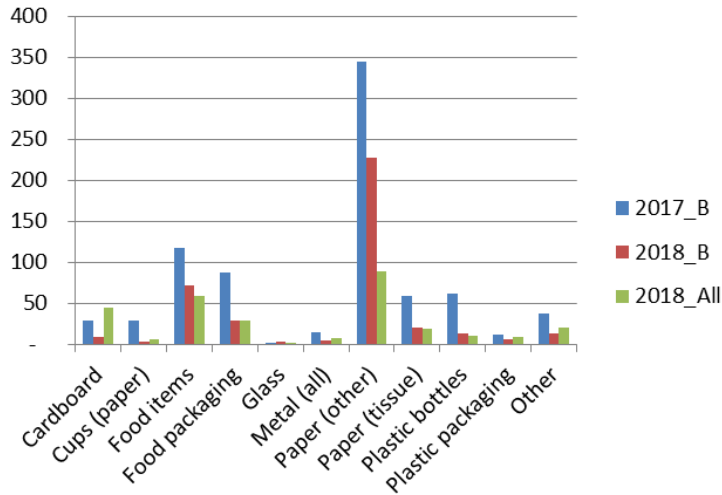


Figure 2 – Waste arisings (grams) on a per capita basis.

The WCA highlighted similarities in the composition of waste collected from staff areas across the three buildings and that whilst existing collection arrangements are effective, there are opportunities for enhancing recycling through better segregation of waste food items.

Comparing data from the 2017 and 2018 WCA suggested that arising might be falling, but due to the snap-shot nature of the analysis, corroboration with other data (e.g. waste contractor monthly returns) is warranted.

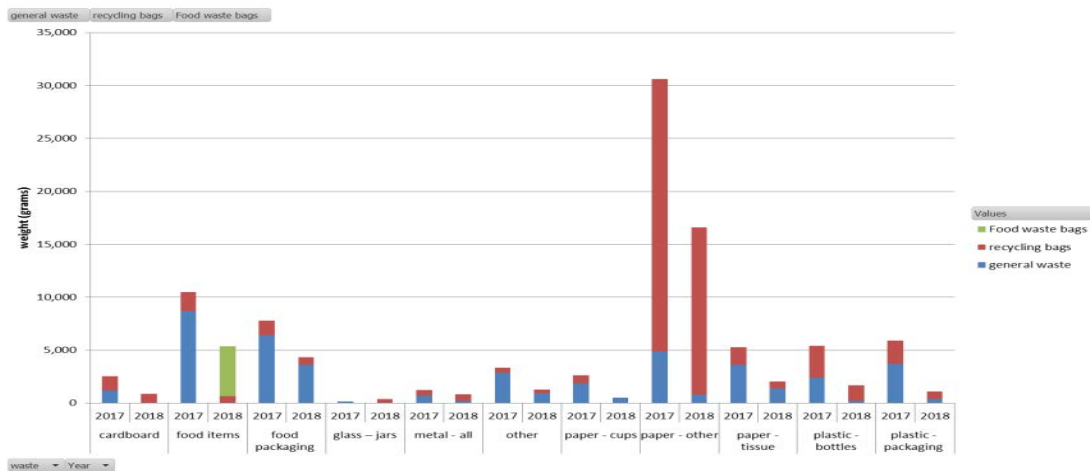


Figure 3 – Comparison of total arisings (grams) for the Britannia Building in 2017 and 2018.

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Introduction

The University's commitments to safeguarding the environment, detailed in the [Environmental Policy](#), include producing less waste through waste minimisation, re-use and recycling opportunities.

The University's Waste Minimisation and Recycling Plan¹ highlights waste composition analysis (WCA) as an important exercise to help understand the effectiveness of existing recycling systems and arrangements and potentially identify further opportunities for waste minimisation, re-use and recycling.

Through the 2017 WCA the University was able to evaluate the effectiveness of its recycling arrangements and establish an initial baseline to assess the impact of (a) food waste collections from departmental kitchens and (b) moving towards exclusively using communal bins.

This report presents the findings from Glasgow Caledonian University's (GCU) second WCA, carried out on 23rd March 2018, and assesses the impact of the changes highlighted above.

Aims & Objectives

The aim of the 2018 WCA was to help GCU deliver on its commitment to pursuing waste minimisation, re-use and recycling opportunities by:

- Building on its understanding of the composition of waste produced at the University.
- Understanding the effectiveness of current waste minimisation, re-use and recycling initiatives.
- Determining whether there are any building-specific patterns or trends.
- Identify additional opportunities for waste minimisation, re-use and recycling.

Methodology

With the exception of the following changes, the methodology for the WCA was the same as that for the first WCA²:

- It was carried out indoors.
- Fewer waste categories were used (without detriment to comparability).
- Focused was on three buildings: Britannia, William Harley and Milton Street.
- Related arisings to building occupancy levels.

Table 1 details the waste categories used in the 2018 WCA, internal collection arrangements within the University and whether specific materials are recycled (by the University's waste contractor).

¹ Available on request from sustainability@gcu.ac.uk

² [Waste Composition Analysis \(Britannia\) Report – April 2017](#)

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Category	Description	Readily Recyclable?	Containment
Cardboard	Mainly corrugated cardboard for the delivery/transportation of goods. May include lighter card.	Yes	Recycling bins or presented loose.
food items	Un-eaten food and food items, such as fruit peels, sandwiches, tea bags and coffee grinds.	Separately	Food waste bins.
Food packaging	An amalgamation of the following categories: paper, plastic, polystyrene, other.	No	General waste bins.
Glass – jars	Glass jars and bottles.	Separately	Placed next to recycling bins.
Metal – cans	Drinks cans or food tins.	Yes	Recycling bins.
Metal – other	Any other metal items.	Yes	Recycling bins.
Paper - cups	Disposable paper cups.	No	General waste or cup bins.
Paper - other	Printed paper, whole or shredded. Includes leaflets. Excl. paper with visible traces of food (e.g. packaging)	Yes	Recycling bins.
Paper - tissue	Tissue paper/serviettes from bathroom waste bins and catering.	Yes	Recycling bins.
Plastic - bottles	Plastic bottles.	Yes	Recycling bins.
Plastic – packaging	Any other plastic items, excluding those used as food packaging. Waste/recycling bags were excluded.	No	General waste bins.
Polystyrene	Any polystyrene items, excluding those used as food packaging.	No	General waste bins.
Other	Any item not accurately described by the other categories.	No	General waste bins.

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

Results

During the waste sorting session, approximately 99 kg (in an estimated 48 bags³) of general, recycling and food waste from the Britannia, Milton Street and William Harley buildings were separated and weighted (Table 2). The raw WCA data is available from the [data section of GCU's sustainability pages](#).

³ Due to an oversight, the number of bags analysed was not counted and had to be estimated using the average bag weight from the 2017 WCA.

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Building	General waste kg (% of total)	Recycling bags kg (% of total)	Food waste bags kg (% of total)	Totals kg (% of total)
William Harley	25 (25.26%)	32 (31.94%)	4 (4.04%)	61 (61.24%)
Milton Street	6 (6.27%)	6 (5.91%)	0 (0%)	12 (12%)
Britannia	4 (4.17%)	18 (18.02%)	4 (4.38%)	26 (26.58%)
Totals	35 (35.71%)	55 (55.88%)	8 (8.42%)	99 (100%)

Table 2 – Weight (kg) and percentage breakdown by containment for waste sorted for each building.

Overall Waste Composition

Figure 1 and Table 3 show the overall composition of the waste sorted by containment type, which included approximately 30% printed paper items, 20% food items, 15% cardboard and 12% food packaging (inc. paper cups).

The most common materials presented for recycling (in clear bags) were paper (51%), cardboard (25%), plastic bottles (7%), paper – tissues (6%) and plastic bottles (5%). Whilst for general waste (presented in black bags), the most common materials were food items (30%), food packaging (22%), other (unsegregated) items (14%), paper tissue (9%) and polystyrene.

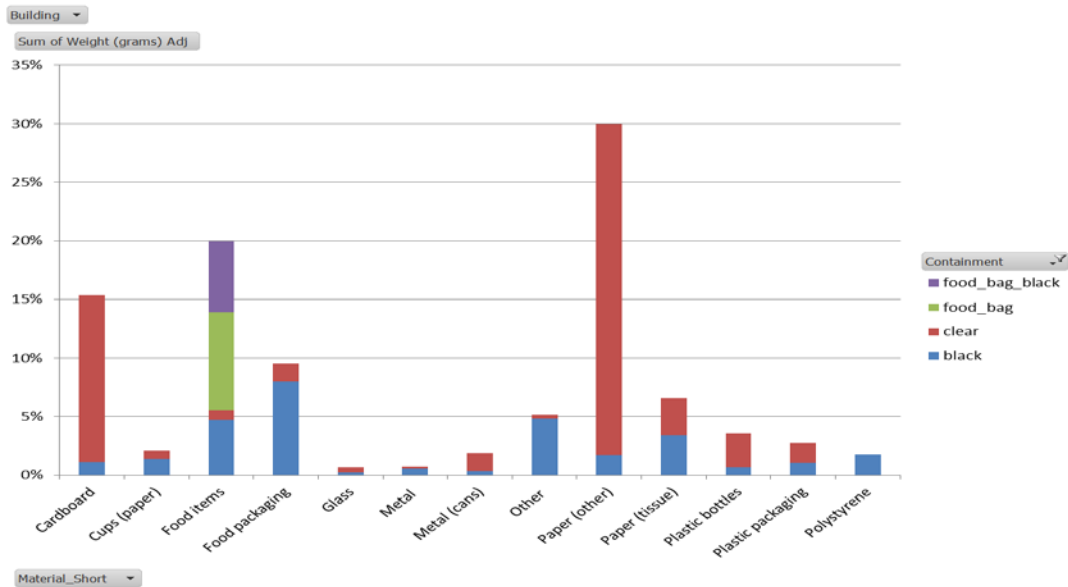


Figure 4 - Percentage composition by containment type (black, clear and food waste bags).

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Waste stream	Black bag	Clear bag	Food bag	Combined
Cardboard	3.77%	25.44%	0.00%	15.33%
Cups (paper)	4.62%	1.32%	0.00%	2.11%
Food items	15.86%	1.46%	100.00%	19.98%
Food packaging	27.05%	2.73%	0.00%	9.55%
Glass	0.83%	0.74%	0.00%	0.66%
Metal	1.80%	0.34%	0.00%	0.72%
Metal (cans)	1.04%	2.80%	0.00%	1.87%
Paper (other)	5.67%	50.65%	0.00%	29.98%
Paper (tissue)	11.38%	5.74%	0.00%	6.58%
Plastic bottles	2.14%	5.27%	0.00%	3.58%
Plastic packaging	3.56%	2.98%	0.00%	2.72%
Polystyrene	5.96%	0.00%	0.00%	1.77%
Other	16.34%	0.54%	0.00%	5.15%
Total	100%	100%	100%	100%

Table 3 - Waste composition (%) by containment type (black, clear and food waste bags).

Waste Composition – William Harley

The William Harley building accommodates several large support departments in a series of open-plan offices with the quantity of waste sampled reflecting that (61kg, 61.24%). Figure 2 shows the composition and associated containment of waste materials from the William Harley building.

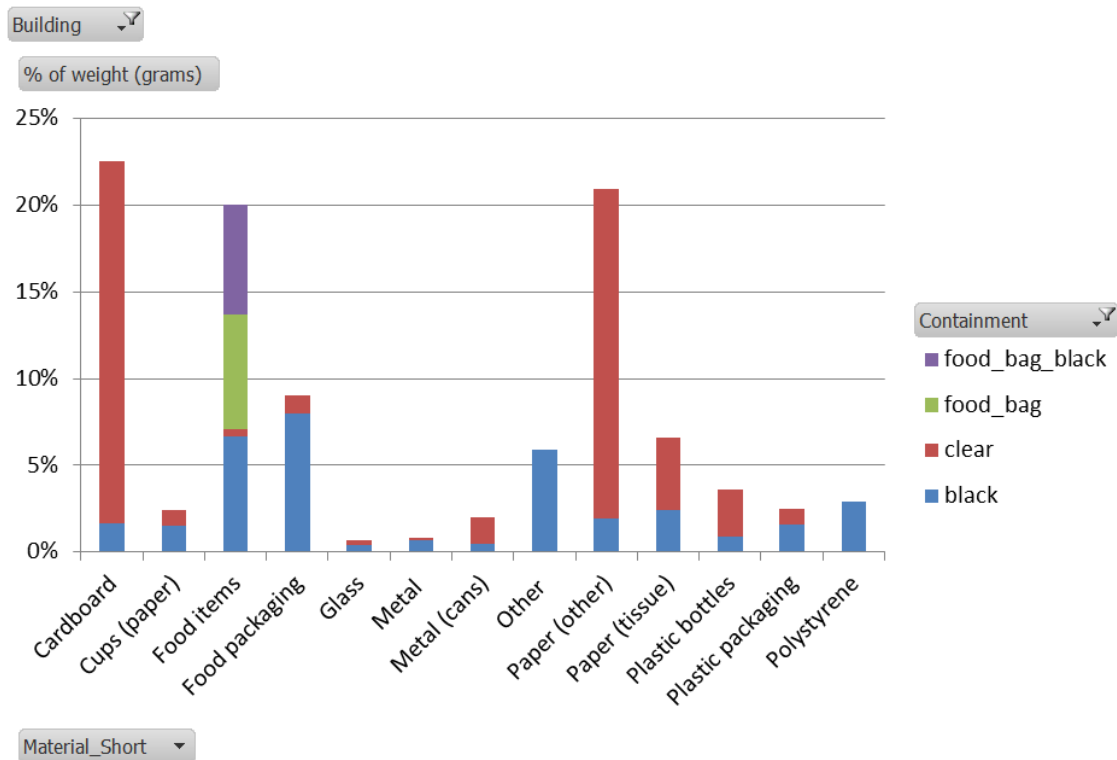


Figure 5 –Waste composition (%) for the William Harley (March 2018)

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Three materials make up the majority waste from the William Harley: cardboard (23%), paper (21%) and food items (20%). Whilst the majority of materials are being placed in the right containers, about a third of food waste is not being placed in the designated food bins and another third appears to have been placed for collection in black general waste bags after being collected in the designated food waste containers.

Waste Composition – Milton Street

Milton Street is the smallest of the three buildings sampled and accommodates a number of small academic teams and GCU’s Estates Dept. and generated 12% (12.18kg) of the waste sampled. Figure 3 shows the composition and associated containment of waste materials from the Milton Street building.

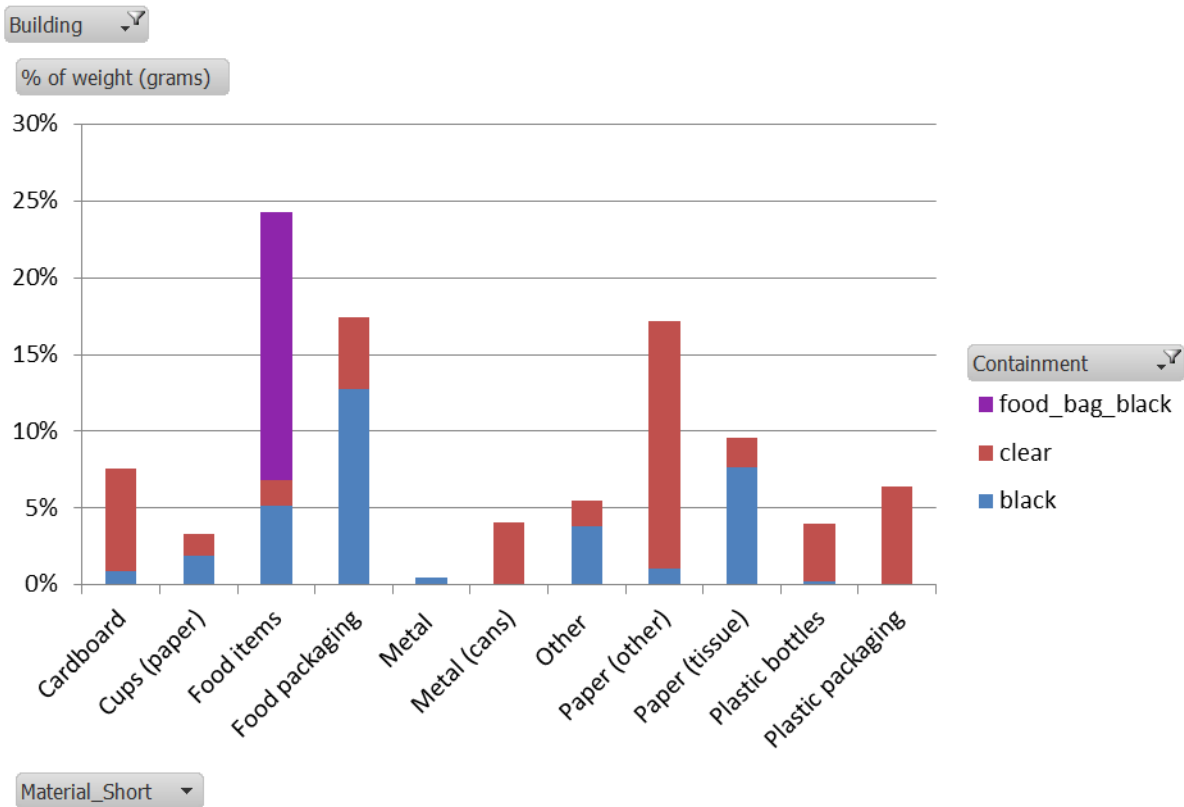


Figure 6 – Waste composition (%) for the Milton Street building (March 2018)

Food items (24%), food packaging (17.44%) and paper (17.20%) represent the majority of the waste produced in Milton Street building. As with the William Harley, food waste bags were found in the general waste (black) bags. The trend for other materials was similar to that observed in the William Harley building.

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Waste Composition – Britannia

26 kg (26.58%) of the waste sorted was from the Britannia Building. Figure 4 details its composition and containment.

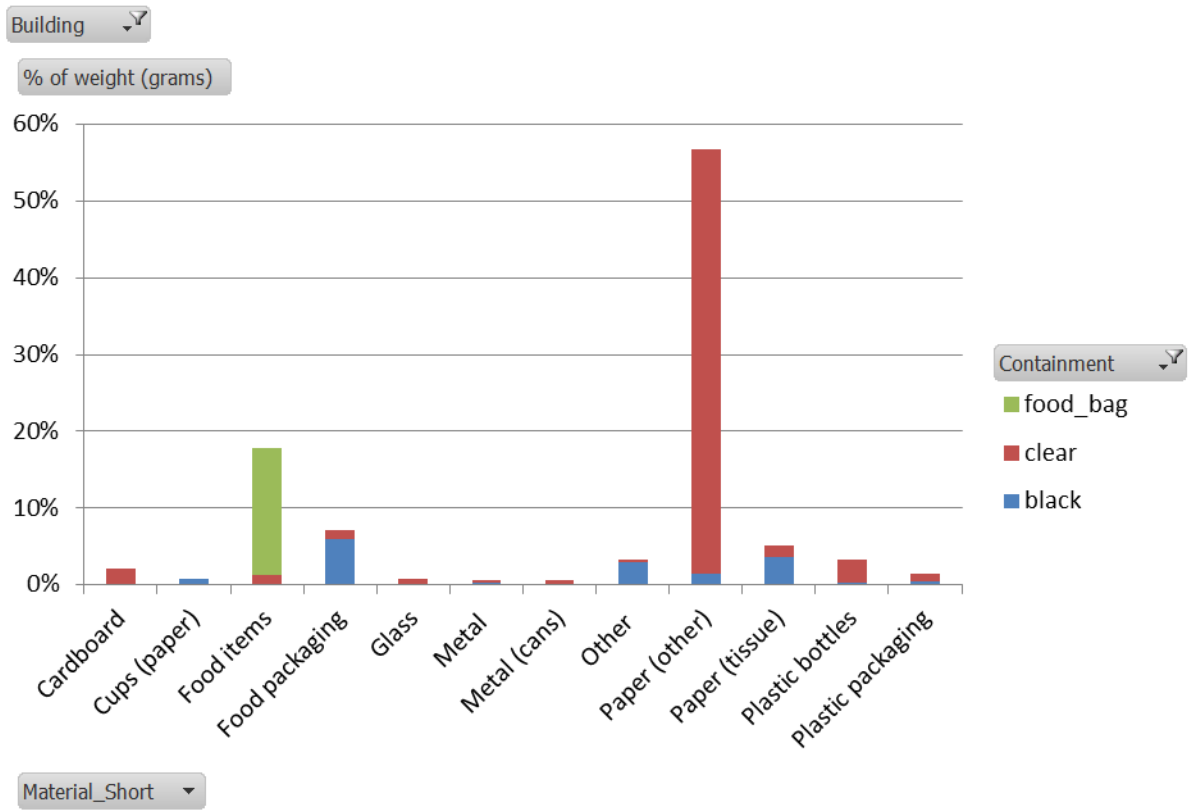


Figure 7 – Waste composition (%) for the Britannia Building (March 2018)

Paper (57%), food items (16%) and food packaging (7%) accounted for over 80% of the waste sorted from the Britannia Building. Generally waste analysed from the Britannia showed a higher degree of segregation than observed in the other two buildings.

Per Capita Waste Arisings

On a per capita basis, waste arisings for occupants in the three buildings surveyed is equivalent to approximately 290g per person for the day prior to the WCA. The breakdown by building and constituent level is detailed in Table 4 and Figure 5 (respectively).

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Building	Waste (grams)	No. Occupants	Grams per person
William Harley	60,742	225	270
Milton Street	12,085	47	257
Britannia	26,360	66	399
Combined average	99,186	338	293

Table 4 – Per capita waste arisings (grams) for the day prior to the WCA.

The William Harley Building generated 270g per person of waste, including the largest quantity of cardboard and polystyrene⁴, which was close to the combined average for the University of 293 g per person.

The amount of waste generated per person in Milton Street (257g) was lower than in the other buildings sampled, but not far off the combined average for the University (293 g per person).

The amount of waste generated per person in the Britannia Building (399g) was significantly higher than the other two buildings, with nearly 50% more waste being generated than the other two buildings. The difference was attributed to paper (the Britannia Building disposed of 4-5 times as much paper as the other two buildings), as the other waste categories were comparable (Figure 5).

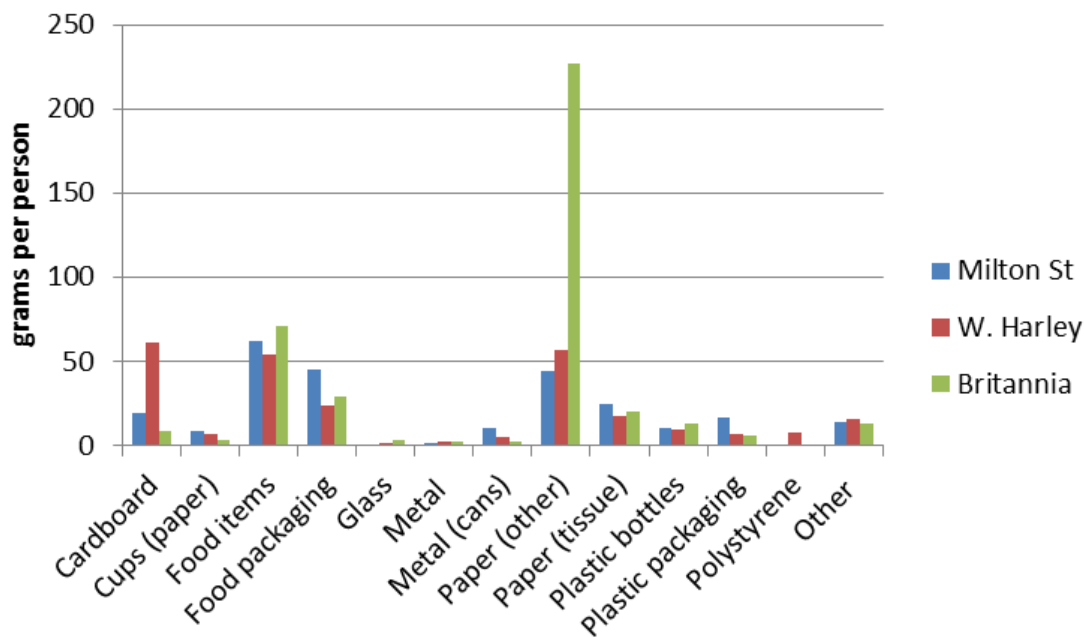


Figure 8 – Per capita waste arisings (grams) by constituent level in for the three buildings surveyed.

Figure 5 show that with the exception of paper from the Britannia Building and cardboard and polystyrene from the William Harley, per capita waste arisings are comparable amongst the three buildings. As noted, the exceptions are attributed to the functions carried out in these buildings.

⁴ Commensurate with the activities carried out in the building: i.e. the preparation of ITC equipment for deployment.

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Discussion

This section considers the results of the 2018 WCA and, where appropriate, those of the 2017 WCA to evaluate whether:

1. Waste from the Britannia Building is representative of that produced in other buildings.
2. Composition of waste differs between buildings.
3. Composition of the University's waste changed between 2017 and 2018.
4. Current waste and recycling collection arrangements are effective.
5. Additional recycling and waste minimisation opportunities are available.

Waste Composition, Representativeness & Trends

Whilst there are differences between the composition (and per capita arisings) of waste generated in the Britannia in 2017 and 2018, the composition and arising in the Britannia Building in 2018 are, with two exceptions, comparable to those of the other buildings surveyed (Figure 6 and Figure 7). The two exceptions are significantly more paper waste and less cardboard (Figure 5).

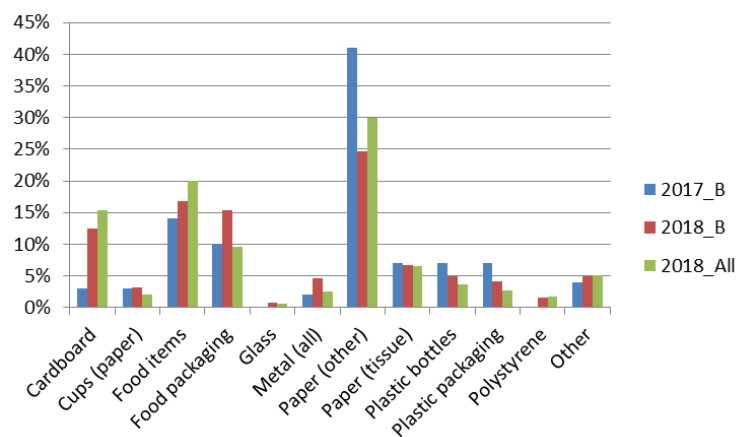


Figure 9 – Aggregated waste composition in 2018 and from the Britannia Building in 2017 and 2018.

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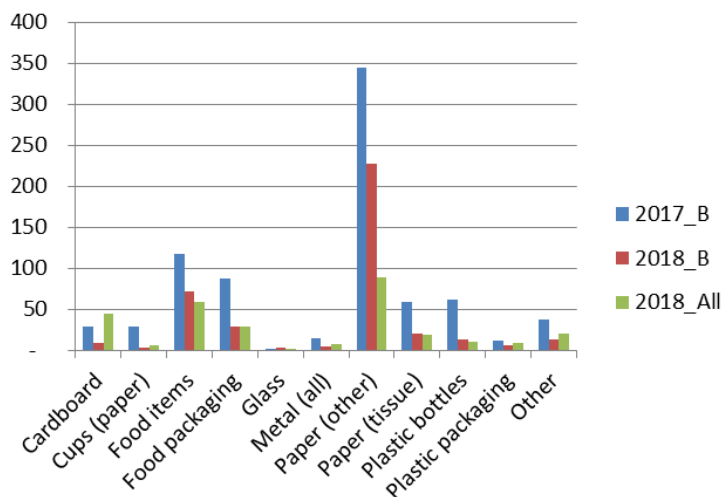


Figure 10 – Comparison of per capita waste airings (grams) for by material (for the Britannia Building in 2017 and 2018 and aggregated for the three buildings surveys in 2018).

Changes in Waste Composition

Based on the premise that waste from the Britannia Building is representative of waste generated from staff offices across the University, the WCA highlights a number of changes in the composition of the University's waste between 2017 and 2018.

At a high level, the proportion of cardboard and food waste was higher in 2018 than 2017; whilst conversely the proportion of paper was lower (Figure 6). On a per capita basis (with the exception of cardboard) there seems to be a downward trend in amount of waste generated at the University (Figure 7)⁵. However, a cursory analysis of the University's waste contractor's monthly returns, which will be reported separately, does not support this trend.

Considering these observations from a containment point of view, data for 2017 and 2018 for the Britannia Building (Figure 8), highlights that:

- The dedicated food waste collections have become the primary route for disposing of food waste.
- Paper cups are absent from recycling bags.
- Cardboard is absent from general waste bags.
- A reduction in the proportion of plastic bottles in general waste bags.

⁵ However, it is noted that these trends could be influenced by a wide range of factors, such as month, day of the week, number of building occupants and business cycle (amongst others).

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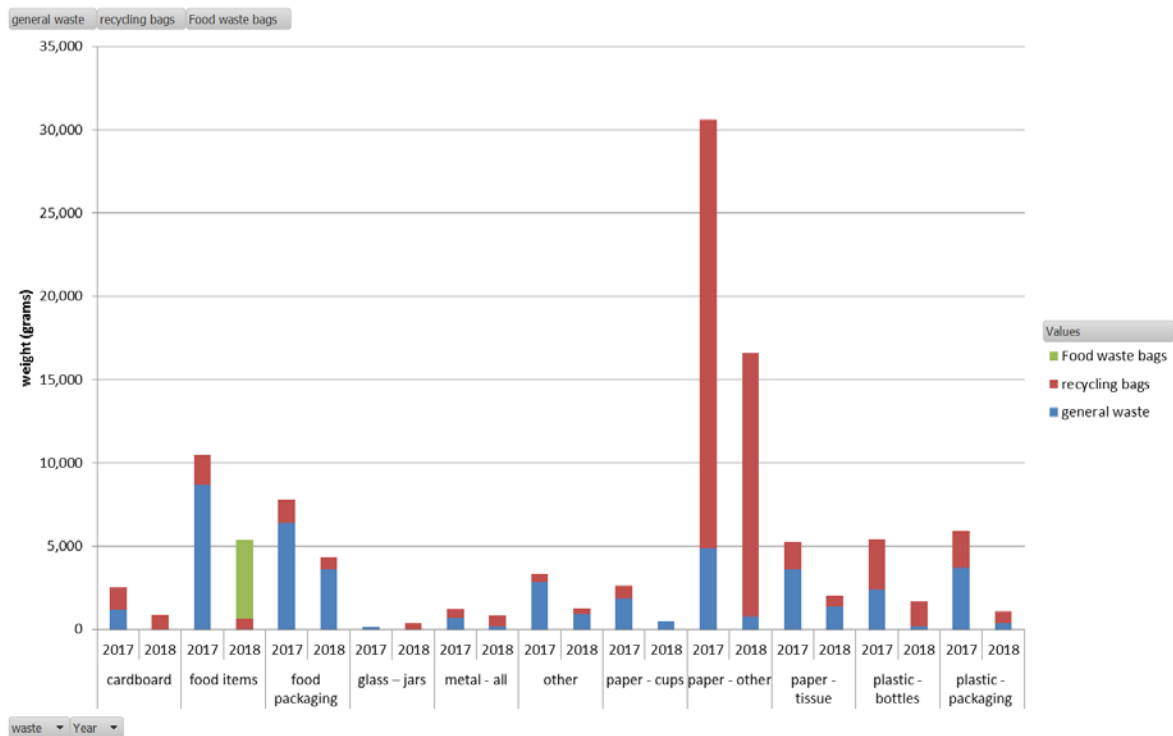


Figure 11 – Arings (grams) and containment of waste presented for analysis from the Britannia Building in 2017 and 2018.

These changes are likely to be a result of how waste is collected in the University, specifically:

- The introduction of a dedicated food waste collection from departmental kitchens.
- A move to shared split communal bins for general waste and mixed recycling
- Improved signage.

Collection Arrangements

The WCA provided an insight into the effectiveness of the University's waste collection arrangements and whether the recent changes, had any impact on the quality of material separated for recycling.

The effectiveness of existing collection arrangements can be gauged by the degree of segregation of specific items into the appropriate collection options (detailed in Table 1). High degrees of segregation indicate that users understand which materials can and cannot be recycled and with the exception of small quantities of food waste, it could be said this is the case at GCU (Figure 1).

The WCA indicated that the proportion of non-recyclable items in recycling (clear) bags was 8% (down from 17% in 2017) and for general waste (black) bags, the proportion of recyclable items was 42% (up from 36% in 2017), with the data (Figure 1) indicating significant amounts of food items in the general waste bins that could potentially be recycled (representing 5% of total arisings or a quarter of all food waste). However, where the composition analysis suggests an increase in the

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percentage of food waste in black bags, the per capita analysis indicates a reduction in the quantity generated (Figure 7 and Figure 8).

The WCA also revealed that in a couple of buildings, bagged food waste (from food waste bins) had been placed in general waste bags (Figure 2 and Figure 3), suggesting that whilst users are familiar with the appropriate segregation procedures, there may be a misunderstanding amongst the Domestic Assistants team about the correct procedures for this waste stream. Refresher training for this group should help rectify this issue and divert an additional 5% of the University's waste into recycling treatment options.

Overall, the 2018 WCA suggests that existing waste collection arrangements are effective and that food waste collections had a positive impact on the quality of materials separated for recycling. Data from the Britannia Building shows that between 2017 and 2018 the proportion (weight) of food items 4% to 2% in recycling bags and from 14% to 0% in general waste bags. This data is corroborated by data from the University's waste contractor.

The WCA data also suggests that the move towards communal bins did not have an impact on the quality of material separated for recycling, but data from the University's waste contractor suggests that this may have been to the detriment of the quantity of materials collected for recycling.

Waste Minimisation & Recycling Opportunities

The WCA highlighted that whilst a significant proportion of GCU's waste is recycled, there are materials for which there are no [cost-effective] recycling options. Amongst these are food packaging and paper cups, which combined represented the fourth largest category of waste produced at the University. The University should explore options for reducing the impact food packaging (and paper cups) has on its overall waste arisings and ability to recycle.

The WCA also highlighted that in the Britannia Building per capita use of paper was significantly higher than in the other buildings (Figure 5). It is therefore suggested this is investigated to identify and explore opportunities for bringing it in line with the other buildings.

The WCA further highlighted that whilst overall waste collection arrangements are effective, there are a number of opportunities for increasing recycling by:

- Encouraging greater diversion of food waste into the dedicated food waste collections.
- Training relevant staff to ensure that waste separated for recycling is recycled.

Conclusions

The insights provided by this WCA will help the University achieve its environmental commitments through a better understanding of:

- The type and quantity of wastes produced by staff.
- Where gaps in its current arrangements exist.

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Whilst some findings were in-line with expectations, such as the similarities in the composition of waste collected from staff areas across the University, the insights from the normalisation of arising on a per capita basis was particularly useful, as it will help identify opportunities masked by the original proportional analysis (e.g. high paper use in the Britannia Building).

The WCA also highlighted that whilst existing collection arrangements are effective, there are a number of opportunities for enhancing the University's recycling rates through better segregation of food items (through staff training and engagement).

The WCA identified food packaging (and paper cups) as a problem waste stream which the University should explore waste minimisation options because of the difficulty finding suitable [cost-effective] recycling options.

Finally, whilst the WCA highlighted some positive trends in waste arisings, the snap-shot nature of the analysis warrants corroboration with other data (e.g. waste contractor monthly returns).

Acknowledgements

The 2018 WCA was carried out with assistance from students from the School of Engineering and Built Environment's (SEBE) Environmental Assessment module and their contribution is gratefully acknowledged.

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