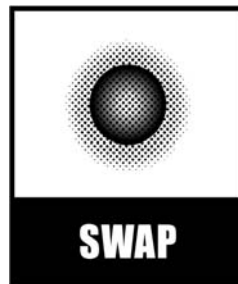


Commercial and industrial waste in the Yorkshire and Humber Region

Report prepared for Yorkshire and Humber
Regional Assembly and the Environment Agency
by SWAP

Project No: 204/23

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Contents

Executive summary	1
1. Introduction.....	4
2. Methodology.....	4
3. Compositional data by sub-sector group	7
3.1 Sector group DA–DE.....	7
3.2 Sector group DF–DH.....	15
3.3 Sector group DI.....	18
3.4 Sector group DJ.....	18
3.5 Sector group DK–DN.....	21
3.6 Sector group E–O.....	24
4. Key waste arisings.....	32
5. Summary of findings.....	36
6. Recommendations	37
6.1 Targeting waste for reduction and recycling	37
6.2 Engaging business.....	39
7. Summary of actions and potential outputs	41
Appendices.....	44

Executive summary

Limited data currently available on C&I waste arisings

The Yorkshire and Humber Regional Assembly and the Environment Agency have recognised that there is a lack of detailed information in the region on the composition of commercial and industrial (C&I) general waste arisings. The most comprehensive data currently available are contained in the Environment Agency's SWMA for Yorkshire and the Humber. The SWMA report provides general information on waste composition. However, the data are limited and less reliable when broken down by sub-region into the various C&I sub-sectors.

Research objective: to gather more accurate data

SWAP was commissioned to undertake compositional waste analyses at C&I businesses across the region to obtain more accurate information. These analyses were performed on the general/mixed waste stream being sent to landfill for each company and did not include segregated materials in the results. Audit data was supplemented by data from previous studies undertaken by SWAP. The data obtained should not be interpreted as absolute figures, but treated as estimates due to the small sample size.

Sector groups audited

Individual sectors were grouped as part of this research, follows the grouping pattern used by the Environment Agency to aggregate waste data in its SWMA.

DA-DE	Manufacturing of food, textiles, leather, wood and paper
DF-DH	Manufacture of chemicals, rubber, plastics and fuels
DJ	Manufacture of metals and metal products
DK-DN	Manufacture of electrical and transport equipment and machinery
E-O	Utilities, construction, retail, hospitality, education, transport and office-based sectors

Sector group DI (Manufacture of other non-metallic mineral products) was not audited as part of this study. All results exclude waste arising from this sector group.

Findings

An unexpected finding from this research was the large quantity of hazardous material being sent to the general waste stream.

- An estimated 33,353 tonnes of hazardous waste finds its way into the general waste stream of C&I businesses each year across the region.
- 73% is generated by sector group DK-DN.

Despite the fact that cardboard was the most frequently recycled material within the C&I sector, this was the biggest contributor to the general waste stream along with recyclable paper.

- Over 517,000 tonnes of recyclable paper and cardboard are estimated to be disposed to the general waste stream of the C&I sector each year across the region.
- The split between recyclable paper and card is almost equal.

- Sector group E–O is the primary contributor of these materials, generating 75% of all recyclable paper and 56% of all card.

Plastics recycling activity is limited within the C&I sector, with larger companies generating significant quantities being the main participants in segregation activity.

- An estimated 132,947 tonnes of plastic film are estimated to be disposed to the general waste stream of the C&I sector each year across the region.
- Rigid plastics are disposed of in lower quantities: 94,485 tonnes.
- Sector group DA–DE generates the largest quantities of plastic film (54%) and rigid plastics (48%).

Kitchen material is present within C&I general waste in significant quantities (263,395 tonnes), of which:

- 124,791 tonnes is suitable for composting
- sector group E–O generates 53% of compostable kitchen material.

Other significant materials include:

- glass – 92,131 tonnes (95% sector group E–O)
- ferrous metals – 89,910 tonnes (56% sector group DJ)
- wood – 58,761 tonnes
- WEEE – 19,553 tonnes.

Opportunities

Whilst some C&I businesses across the region are already engaging in resource efficiency activities, it is clear from these findings that there are opportunities to improve waste management within these sectors by targeting specific materials, and improving the efficiency of existing segregation systems.

By focusing on materials for which there is an established recycling infrastructure, easy gains can be made. These include card, recyclable paper, metals, plastics, glass and wood. Another priority must be to minimise the quantities of hazardous waste being generated due to limited existing regional capacity to pre-treat and landfill hazardous wastes. Where hazardous waste is generated, companies must be equipped with a clear understanding of how to manage this in compliance with the regulations.

For a company to engage in improved waste management activity, it must first of all develop a clear understanding of what is being discarded and how this waste is being generated. Having identified key materials to target, a company then faces the task of implementing improvements

Based on discussions with the audited companies about the barriers they face in improving waste management, the research identified that businesses will need the following support:

- data on the quantities and composition of the waste they generate
- a clear understanding of waste legislation, obligations and penalties
- engagement of their supply chain on waste issues (particularly packaging)

- staff training on waste issues and handling
- internal communication on waste management systems
- development of joint collections with other businesses where small quantities of recyclables are generated.

This support might take the following forms:

- development of a waste composition and arisings calculator based on audit data
- web-based guidance sheets on legislation, promoted in partnership with trade associations, particularly relating to the management of hazardous wastes
- supply chain workshops on waste minimisation issues (including hazardous waste) focussing on joint solutions
- staff training packs on waste management and legislation, supported by sector specific training events on waste issues
- development of communications resources and visual materials and training on how to design and implement in-house training campaigns within a business
- pilot studies to identify the feasibility of establishing joint facilities for reuse and recycling at different types of site.

To manage compostable material more effectively on a large scale it will require the development of new facilities within the region. Landfill Regulation targets to reduce biodegradable municipal waste over time are driving research into the feasibility of options for managing compostable materials. The Regional Assembly must ensure that compostable waste from the commercial sector is considered as part of any future feasibility studies and is included in any regional plans to manage this material more effectively.

In summary, potentially recyclable/compostable materials generated in large quantities in specific sub-regions now need to be targeted for reduction using existing and forthcoming networks of support. By focusing on materials such as card, metals, compostable waste and plastics there is the potential to achieve a much higher C&I recycling rate within the region. The reduction and correct management of hazardous waste materials also warrants special attention, given the quantities estimated to be disposed of to non-hazardous landfill.

1. Introduction

The Yorkshire and Humber Regional Assembly and the Environment Agency have identified that there is currently a lack of detailed information in the region on the composition of commercial and industrial (C&I) waste arisings intended for landfill. Headline data on the quantities of general waste arisings are available for C&I businesses, grouped by sector, through the Environment Agency's Strategic Waste Management Assessment (SWMA). However, it is not clear what types of materials compose this waste stream and what the potential for increased recycling of these wastes might be.

The Yorkshire and Humber Regional Assembly and the Environment Agency have therefore commissioned Save Waste and Prosper Ltd (SWAP) to undertake a survey of companies producing general commercial and industrial waste, to create a better understanding of the types and quantities of materials being disposed of.

2. Methodology

The most comprehensive data currently available on commercial and industrial waste arisings are available from the Environment Agency's SWMA for Yorkshire and the Humber¹. The original survey of C&I data was carried out in 1998/99. A national waste production survey identified the quantities of waste being produced by companies. The survey highlighted the quantities of general/mixed waste being sent to landfill according to grouped sector types (Table 1).

Details of each sector group and their breakdown by Standard Industrial Classification (SIC) code are provided in Appendix 1. These SWMA data are currently being updated by the Environment Agency and will be available in mid-2005. Until then, data here are the most accurate currently available on overall C&I mixed/general waste production.

The data in Table 1 do not represent the total waste generated by C&I companies within the region. The majority of the waste is segregated and managed through other methods, including reuse in other products, recycling, recovery and heat treatment. The total waste generated by sector type for the sub-regions is outlined in Appendix 2.

¹ Environment Agency, 1998/99. Strategic waste management assessment (Yorkshire and the Humber)

Commercial and industrial waste in Yorkshire and the Humber

Table 1: General/mixed waste landfilled by C&I companies in Yorkshire and Humber (1998/99)

Region	Size (employees)	Estimated waste generated by sector group (tonnes)						
		DA-DE	DF-DH	DI	DJ	DK-DN	E-O	Total
West Yorkshire	0-49	8148	3754	720	2280	2877	130,411	148,190
	50-249	133,753	6716	5685	12,256	21,647	156,069	336,126
	250+	80,379	11,443	3802	5861	62,463	149,554	313,502
	Total	222,280	21,913	10,207	20,397	86,987	436,034	797,818
South Yorkshire	0-49	3314	0	0	1989	1989	64,581	71,873
	50-249	113,831	3763	6063	37,349	4538	99,146	264,690
	250+	22,335	2279	19,138	32,098	29,307	55,659	160,816
	Total	139,480	6042	25,201	71,436	35,834	219,386	497,379
North Yorkshire	0-49	499	0	0	1308	405	20,913	23,125
	50-249	6638	0	0	2338	13,371	20,057	42,404
	250+	41,612	7300	0	1290	1633	60,313	112,148
	Total	48,749	7300	0	4936	15,409	101,283	177,677
Humberside	0-49	4093	142	0	287	956	21,145	26,623
	50-249	31,084	5869	94	266	7615	36,850	81,778
	250+	12,200	16,765	0	21,229	46,725	13,281	110,200
	Total	47,377	22,776	94	21,782	55,296	71,276	218,601
Yorkshire and the Humber	0-49	16,054	3896	720	5864	6227	237,050	269,811
	50-249	285,306	16,348	11,842	52,209	47,171	312,122	724,998
	250+	156,526	37,787	22,940	60,478	140,128	278,807	696,666
	Total	457,886	58,031	35,502	118,551	193,526	827,979	1,691,475

Source: Environment Agency 1998/99

In order to encourage waste minimisation and target increased reuse and recycling rates within the C&I sector, it is important to understand what types of mixed materials make up the general waste streams of these companies.

General information on waste composition is available through the SWMA research. However, this information is limited in detail and is less reliable when broken down by sub-region into the various C&I sub-sectors. SWAP therefore undertook a number of compositional waste analyses at various C&I businesses across the region to obtain more accurate data for each of the sector groups in Table 1. These analyses were performed on the general/mixed waste stream being sent to landfill for each company and did not include segregated materials in the results. However, information on segregation activity was noted as part of this research. Sector group DI (Manufacture of other non-metallic mineral products) was not audited as part of this study, as the group was considered beyond the scope of this particular project. All results exclude waste arising from this sector group.

Compositional waste analysis is an effective method to obtain accurate data on waste arisings for commercial and industrial businesses. This approach has four primary benefits:

1. Access to detailed, good quality data, rather than best estimates and anecdotal information.
2. Insight into operational procedures.

3. Qualitative information gained through speaking to relevant personnel (which is particularly useful when gauging information on barriers to improved waste management).
4. Data retrieval that will be of benefit to participating businesses in identifying areas for improvement.

The audits involved the physical sorting of the general/mixed waste stream of each business into 20 distinct compositional categories. These categories are listed and explained in Appendix 3. In addition, the views of the businesses were sought as to whether the waste sampled was typical for that period of production. SWAP utilised a qualitative questionnaire (Appendix 4) to gather further information on awareness of legislation, support networks, perceived waste management opportunities and barriers to improved waste management.

All data obtained from businesses through this research were summarised in individual company reports, providing recommendations and further contacts to help improve future performance.

In total, the general waste streams of 16 companies were audited as part of this project. This sample size is limited and so data was also included from previous commercial and industrial waste audits carried out by SWAP that used the same audit methodology. Table 2 indicates the data samples used for each sector group.

Table 2: Source of waste audit sample data

Sector group	Data set
DA-DE	<ul style="list-style-type: none"> • Average data from three non-food and drink company audits (on behalf of the EA/YHRA) • Average data from 30 regional food and drink audits (on behalf of Yorkshire Forward 2005)
DF-DH	<ul style="list-style-type: none"> • Average data from two audits (on behalf of the EA/YHRA)
DI	<ul style="list-style-type: none"> • No companies audited as part of this project
DJ	<ul style="list-style-type: none"> • Average data from four audits (on behalf of the EA/YHRA)
DK-DN	<ul style="list-style-type: none"> • Average data from two audits (on behalf of the EA/YHRA)
E-O	<ul style="list-style-type: none"> • Average data from five audits (on behalf of the EA/YHRA) • Average data from two regional, higher education audits (on behalf of Waste Watch) • Average data from an audit sample of 50 retailers (on behalf of City of Westminster) • Average data from audits of 8 retail stores, for two major retail chains (confidential) • Average data from an audit sample of 50 office-based organisations (on behalf of City of Westminster) • Average data from an audit sample of 50 hospitality organisations (on behalf of City of Westminster)

SWAP acknowledges permission from Waste Watch to use data collected on education institutions for their ‘Resource management in the education sector’ project. This project was funded by Biffaward under the Landfill Tax Credit Scheme (refer to www.wastewatch.org.uk for more details).¹

SWAP thanks the City of Westminster Council for permission to use data on hospitality and office-based waste compositional arisings. These data were taken from research carried out by SWAP for the council to identify waste composition and arisings from these sources.²

¹ Waste Watch, 2003. Resource management in the education sector. Waste Watch.

² SWAP, 2001. Waste analysis project. City of Westminster

SWAP also thanks Yorkshire Forward for permission to use the audit data from research carried out into food and drink waste arisings within the region.¹

This combination of audit data provides a more robust sample from which to draw conclusions on general/mixed waste compositional arisings. However, it must be noted that the results obtained through this research provide indicative figures only. There are a large variety of companies operating in the commercial and industrial sector, which vary in terms of their waste management performance. To obtain very accurate data would require a much larger number of audits across the region.

3. Compositional data by sub-sector group

A series of general waste analyses at C&I businesses were conducted across the region for this project. SWAP has also conducted general waste audits for a range of different C&I client types in the past and is working on a similar project for Yorkshire Forward investigating the composition of general waste from food and drink processing companies in the region. With the permission of the clients involved, data from a number of these waste analysis projects have been included, to provide a broader base of data on which to determine compositional arisings.

The information obtained is summarised according to the sector grouping provided in the Environment Agency's SWMA for general/mixed waste arisings (Section 2, Table 1).

3.1 Sector group DA–DE

This sector group is one of the most varied in terms of its industry make up. It includes the following SIC sub-sectors:

- DA – manufacture of food products, beverages and tobacco
- DB – manufacture of textiles and textile products
- DC – manufacture leather and leather products
- DD – manufacture of wood and wood products
- DE – pulp, paper, and paper products

By applying the average waste analysis composition for this sector group to the waste arisings total given in the SWMA, it is possible to identify the quantities of each material being generated as mixed/general waste.

In total three audits were carried out at non-food and drink manufacturing companies. Average data for the food and drink sector was taken from the 30 general waste audits carried out at food and drink companies on behalf of Yorkshire Forward during 2005.

Waste analysis composition and arisings for sector group DA-DE are detailed below in Table 3 and Figure 1. Figures discussed are highlighted in red.

The key waste streams from this sector group are:

- kitchen non-compostable (19% – 87,993 tonnes)

¹ SWAP, Scott Wilson, SLR Consulting, 2005. Food and drink waste in the Yorkshire and Humber region. Yorkshire Forward

Commercial and industrial waste in Yorkshire and the Humber

- cardboard (17% – 77,924 tonnes)
- plastic film (15% – 68,486 tonnes)
- kitchen compostable material (10% – 47,300 tonnes)
- rigid plastics (9% – 41,197 tonnes).

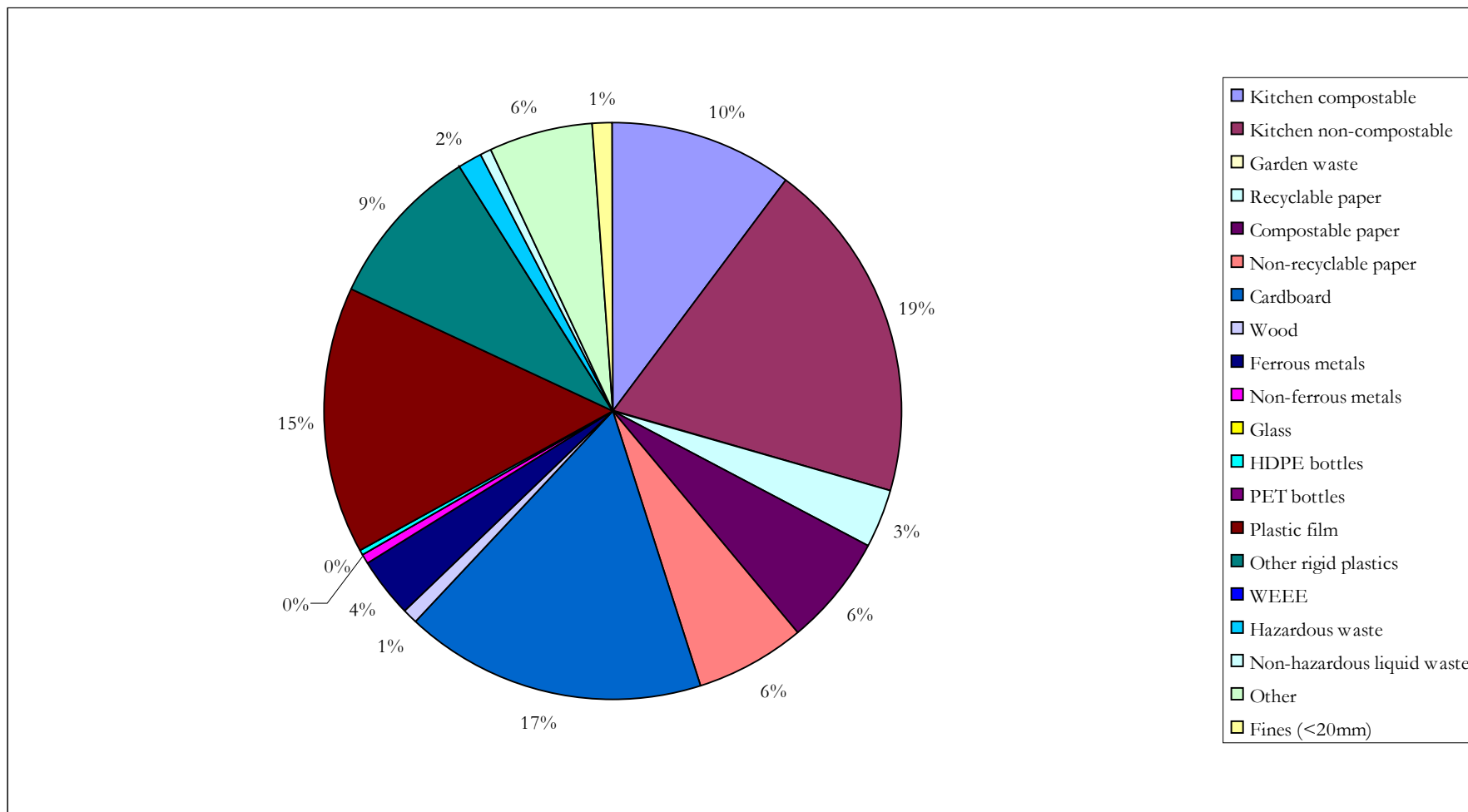
Commercial and industrial waste in Yorkshire and the Humber

Table 3: Composition and arisings of general waste landfilled for sector group DA-DE

Cat. number	Category	Percentage composition (%)	Total estimated waste (tonnes)	Estimated WY (tonnes)	Estimated SY (tonnes)	Estimated NY (tonnes)	Estimated H (tonnes)
1	Kitchen compostable	10.33	47,300	22,962	14,408	5036	4894
2	Kitchen non-compostable	19.22	87,992	42,716	26,804	9368	9104
3	Garden waste	0.00	0	0	0	0	0
4	Recyclable paper	3.29	15,076	7319	4592	1605	1560
5	Compostable paper	6.09	27,877	13,533	8492	2968	2884
6	Non-recyclable paper	6.12	28,010	13,597	8532	2982	2898
7	Cardboard	17.02	77,924	37,828	23,737	8296	8063
8	Wood	0.64	2943	1429	897	313	305
9	Ferrous metals	3.50	16,045	7789	4887	1708	1660
10	Non-ferrous metals	0.35	1621	787	494	173	168
11	Glass	0.23	1058	513	322	113	109
12	HDPE bottles	0.17	773	375	236	82	80
13	PET bottles	0.07	299	145	91	32	31
14	Plastic film	14.96	68,486	33,246	20,862	7291	7086
15	Other rigid plastics	9.00	41,197	19,999	12,549	4386	4263
16	WEEE	0.06	255	124	78	27	26
17	Hazardous waste	1.54	7072	3,433	2154	753	732
18	Non-hazardous liquid waste	0.57	2608	1266	794	278	270
19	Other	5.84	26,751	12,986	8149	2848	2768
20	Fines (<20mm)	1.00	4597	2232	1400	489	476
Total		100.00	457,886	222,280	139,480	48,749	47,377

Commercial and industrial waste in Yorkshire and the Humber

Figure 1: Composition of general waste landfilled for sector group DA-DE



A distinction can be drawn between the sectors making up this group: the food and drink processors and the other, non-food processing manufacturers. The food and drink processing companies, due to the inherent nature of their business, generate a lot more food waste than the other manufacturers. This is borne out in the findings for this sector grouping, with a high proportion of food related waste in the composition.

The food and drink sector is a highly significant business cluster in Yorkshire and the Humber. As it is distinct from the other manufacturing sectors in this grouping, in generating large quantities of food waste, its composition will be considered separately.

When the waste composition of food and drink processing businesses is considered separately, the overall composition of waste for sector DA–DE changes considerably. The composition of the non-food processing manufacturers (ie wood, leather, textile and paper manufacturers) in this sector grouping is illustrated in Figure 2.

The key waste streams from this sector group are:

- other (19%)
- non-recyclable paper (19%)
- recyclable paper (16%)
- cardboard (8%)
- ferrous metals (7%)
- hazardous waste (6%).

There is much less kitchen compostable and non-compostable waste generated from the non-food processing manufacturers in this sector group. However, these companies also generate less plastic than food and drink processors, but more metals and a greater quantity of hazardous waste. The hazardous waste results from activity in the wood and leather sectors where paper and textile materials are used to mop up glues, solvents and oils, before being disposed to the general waste stream. ‘Other waste’ is a high percentage category for these companies. It is mainly composed of product waste and by-products not captured in the other categories (eg leather off-cuts).

The non-food processing manufacturers segregate materials for recycling including scrap metals, wood, cardboard, plastics and, in the case of textiles, wool. The leather manufacturers segregate leather hide waste, but due to restrictions imposed by the Animal By-Products Regulations, this waste is treated and sent to landfill in large quantities. This material was not included in the general waste stream results, as it was not present in the general waste skip and would skew overall compositional findings. However, as an indicator, quantities of up to 700 tonnes per annum were being generated by just one company.

Non-food processing manufacturers display a good awareness of relevant waste legislation, although none of the audited companies had developed an EMS. Awareness of support organisations varies, with the Environment Agency the most recognised body, along with the trade associations. A lack of space on-site and perceived expense of implementing recycling systems proved the most commonly raised issues related to barriers to improved recycling.

Commercial and industrial waste in Yorkshire and the Humber

Figure 2: Composition of general waste landfilled for the wood, leather, textile and paper sectors

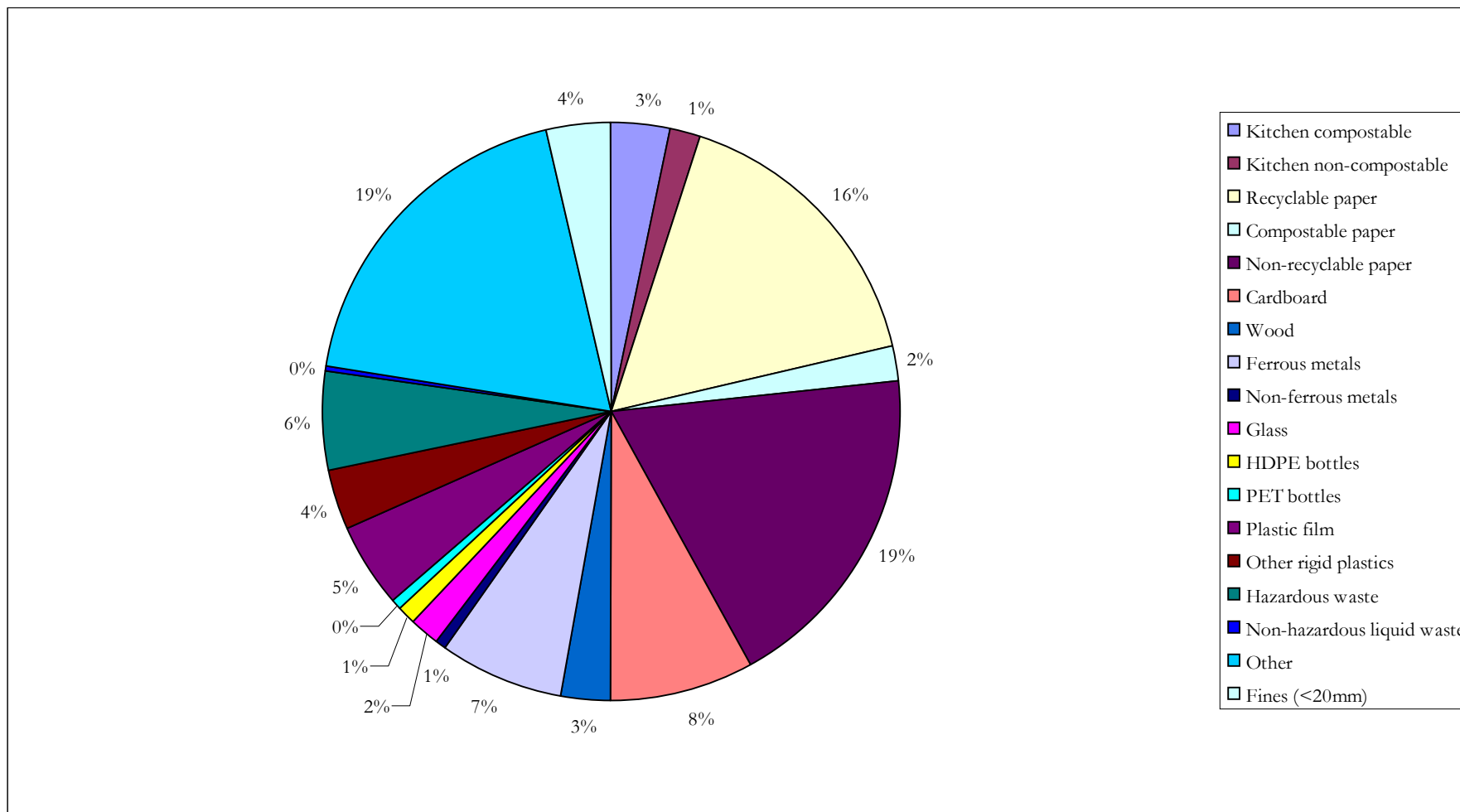


Figure 3 shows the composition of the food processors in this sector grouping. The key waste streams from this sector group are:

- kitchen non-compostable (21%)
- cardboard (19%)
- plastic film (17%)
- kitchen compostable (12%)
- other rigid plastics (10%).

As well as food-related waste, the food sector is composed of greater percentages of card and plastics. Hazardous waste in contrast to the non-food manufacturers is negligible.

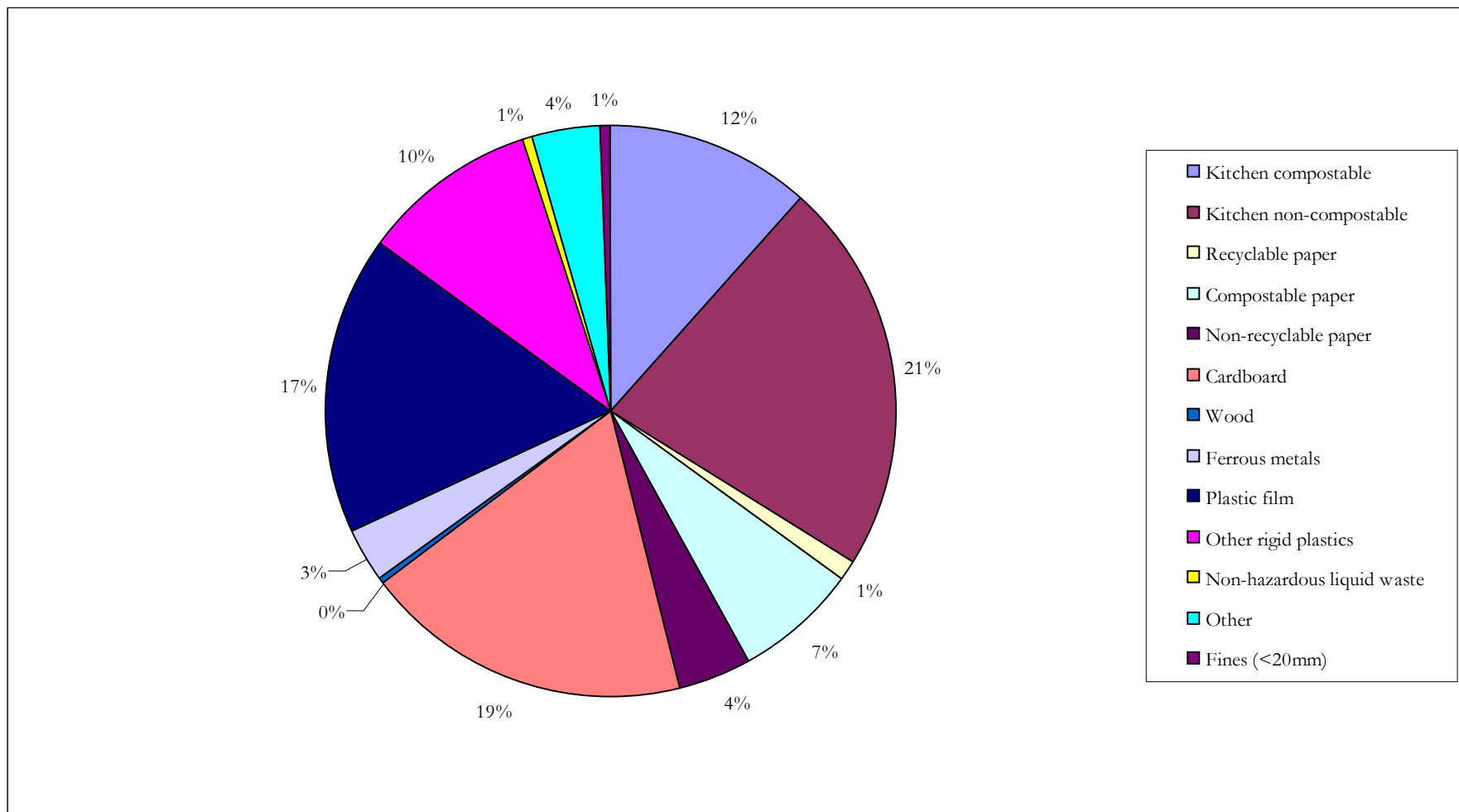
Food and drink companies concentrate recycling activities primarily on cardboard. The larger companies tend to participate in cardboard recycling more frequently than smaller businesses due to the economies of scale that can be achieved by segregating large quantities of materials. More proactive companies also target pallets and plastic waste. Despite this, these materials remain a major part of the waste stream of food and drink companies.

Larger food and drink businesses also segregate food waste. The eventual management of this waste is determined according to its content. Meat waste has to be managed in accordance with the Animal By-Products Regulations and so cannot be reprocessed for use by other industries. Low risk foods, including pastry, bread, sandwiches, fruit and vegetables are regularly segregated for animal feeds.

Food and drink companies demonstrated a good general understanding of waste-related legislation, particularly the larger businesses that in many cases had developed or were in the process of developing an Environmental Management System (EMS). However, they showed a limited awareness of regional and national environmental support organisations that could potentially help them to improve their waste management. Instead, they relied heavily on information provided via their trade associations. The main barriers to improving waste management performance were identified as a lack of space for segregation on-site and a lack of staff time available to carry this out.

Commercial and industrial waste in Yorkshire and the Humber

Figure 3: Composition of general waste landfilled for the food and drink sector



3.2 Sector group DF–DH

This group includes the following SIC sub-sectors:

DF – manufacture of coke, refined petroleum products and nuclear fuels

DG – manufacture of chemicals and chemical products

DH – manufacture of rubber and plastic products

Average data were obtained from general waste audits of two companies for this sub-sector group. Waste analysis composition and arisings for sector group DF–DH is detailed below in Table 4 and Figure 4. Figures discussed are highlighted in red.

The focus of the audits from this sector were on chemical manufacturers, and the overall composition of waste provided may not reflect some of the specific wastes arising from sector DF in particular. However, the presence of DF sector businesses within the region is lower than that of chemical, rubber and plastic manufacturers.

A large quantity of paper waste (31%) is generated by sector group DF–DH, as a result of the office elements of the businesses and the strict hygiene and cleaning processes in place for those involved in the production of products. Office paper was targeted for recycling by companies, but the presence in the general waste stream of this material suggests efficiencies could be improved, perhaps by widening collections to include lower-grade materials.

Plastic packaging comprised a substantial part of the waste stream (18%), with hazardous waste surprisingly low (1%) for a sector group handling chemical materials. This is perhaps a result of the high levels of awareness of legislation exhibited by companies within this sector, including that of hazardous waste management. The tight regulation of health and safety activities on chemical production sites was seen as a key driver influencing the development of waste awareness and waste minimisation on site.

The category ‘other materials’ was made up largely of cleaning rags, plus other miscellaneous materials such as rubber gloves used as part of a strict hygiene system.

Other than paper and card, materials targeted for recycling included chemicals, metals, plastics and metal drums for reconditioning. Pallets, card and intermediate bulk containers (IBCs) were regularly reused by businesses.

The main barriers to improving recycling included staff shortages due to cut-backs, lack of drive from management, limited space and recyclers being unwilling to collect small quantities of recyclable materials.

Awareness of support organisations varied between good and poor, with all companies aware of the role of the Environment Agency.

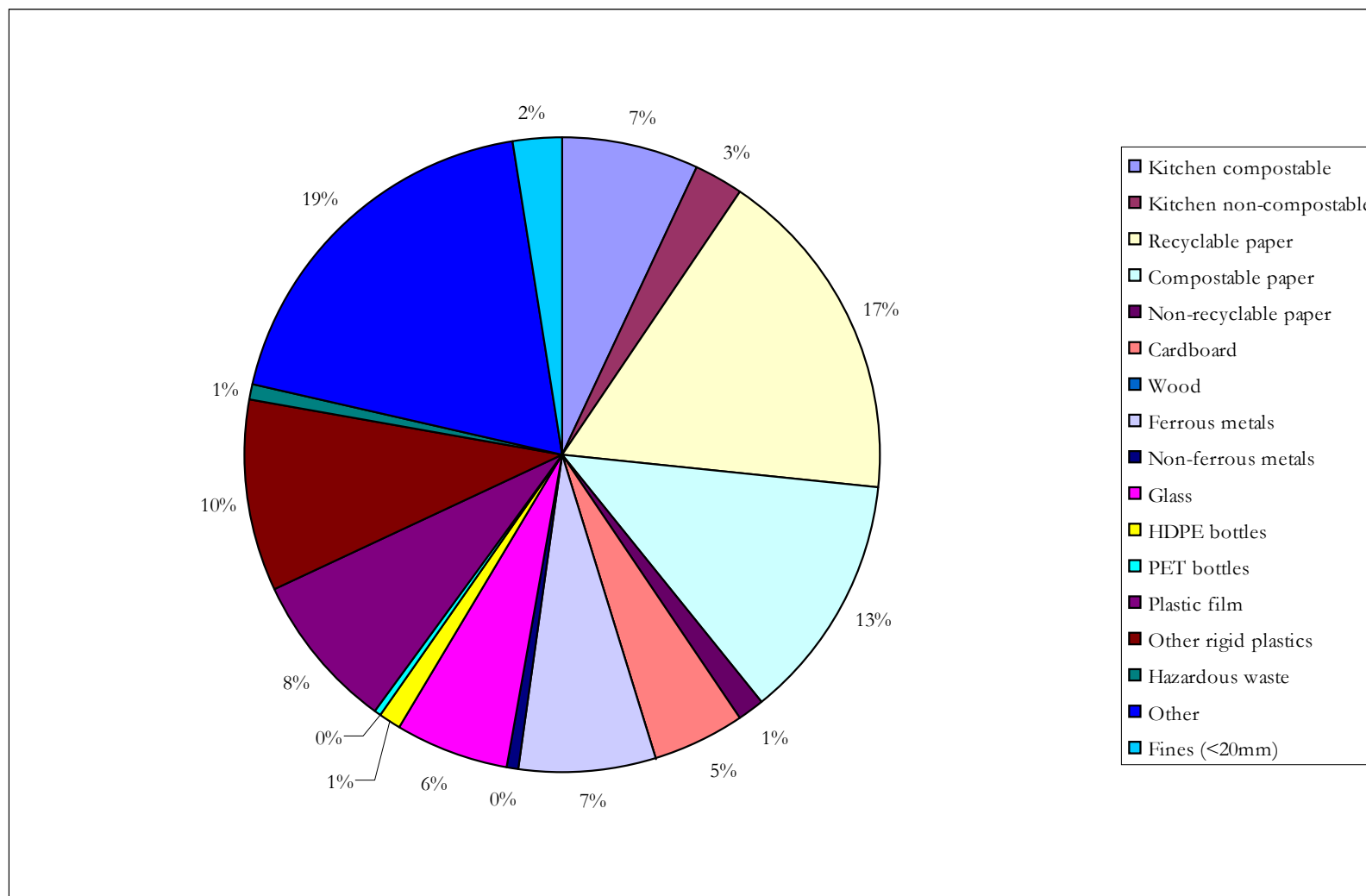
Commercial and industrial waste in Yorkshire and the Humber

Table 4: Composition and arisings of general waste landfilled for sector group DF-DH

Cat. Number	Category	Percentage composition (%)	Total estimated waste (tonnes)	Estimated WY (tonnes)	Estimated SY (tonnes)	Estimated NY (tonnes)	Estimated H (tonnes)
1	Kitchen compostable	6.95	4035	1524	420	508	1584
2	Kitchen non-compostable	2.53	1467	554	153	185	576
3	Garden waste	0.00	0	0	0	0	0
4	Recyclable paper	17.07	9904	3740	1031	1246	3887
5	Compostable paper	12.55	7281	2750	758	916	2858
6	Non-recyclable paper	1.45	844	319	88	106	331
7	Cardboard	4.61	2678	1011	279	337	1051
8	Wood	0.03	18	7	2	2	7
9	Ferrous metals	7.14	4145	1565	432	521	1627
10	Non-ferrous metals	0.35	202	76	21	25	79
11	Glass	5.97	3466	1309	361	436	1361
12	HDPE bottles	1.04	605	229	63	76	238
13	PET bottles	0.35	202	76	21	25	79
14	Plastic film	8.00	4640	1752	483	584	1821
15	Other rigid plastics	9.73	5649	2133	588	711	2217
16	WEEE	0.00	0	0	0	0	0
17	Hazardous waste	0.76	440	166	46	55	173
18	Non-hazardous liquid waste	0.00	0	0	0	0	0
19	Other	19.06	11,060	4176	1151	1391	4341
20	Fines (<20mm)	2.40	1394	526	145	175	547
TOTAL		100.00	58,031	21,913	6042	7,300	22,776

Commercial and industrial waste in Yorkshire and the Humber

Figure 4: Composition of general waste landfilled for sector group DF-DH



3.3 Sector group DI

DI – manufacture of other non-metallic mineral products

This sector group was considered to be outside the scope of this project and was not included in the analysis.

3.4 Sector group DJ

This group is focused on one key SIC sector:

DJ – manufacture of basic metals and fabricated metal products

Data were obtained through general waste audits at four companies from this sector group. Waste analysis composition and arisings for sector group DJ are detailed below in Table 5 and Figure 5. Figures discussed are highlighted in red.

The main waste generated by this sector is metals (42%). This is despite the fact that all of the companies audited were making efforts to segregate metal materials from their general waste stream. This suggests that segregation systems within these organisations are not operating effectively. Wood (8%), recyclable paper (9%) and plastic film (7%) also represent areas in which further recycling and waste minimisation inroads could be made. Wood waste is generated primarily through the presence of damaged pallets on-site. Reuse of pallets, along with cable drums (returned to suppliers) was common to all companies audited, but in most cases the damaged pallets were thrown in the general waste.

Companies that did segregate materials other than metal for recycling tended to concentrate on cardboard, which may explain the low percentage of card within the general waste. This is also related to the fact that some metal manufacturers received deliveries on shrink-wrapped pallets rather than in cardboard boxes. The most ambitious metal manufacturers also segregate plastics for recycling, although this is more of an opportunity for larger companies generating the material in bulk, with access to a compactor. Hazardous waste was present within the waste stream of this sector, mainly in the form of oil-contaminated waste disposed into the general skip.

Awareness of waste related legislation in this sector was relatively poor, despite a proportion of the companies either possessing an EMS or developing one. The main barriers to improved waste management within this sector were perceived expense associated with recycling, a lack of time and support from management as well as insufficient space on-site and limited knowledge of the issues. Awareness of the support organisations was poor, with the more proactive companies being aware of Environment Agency and Business in the Community activities.

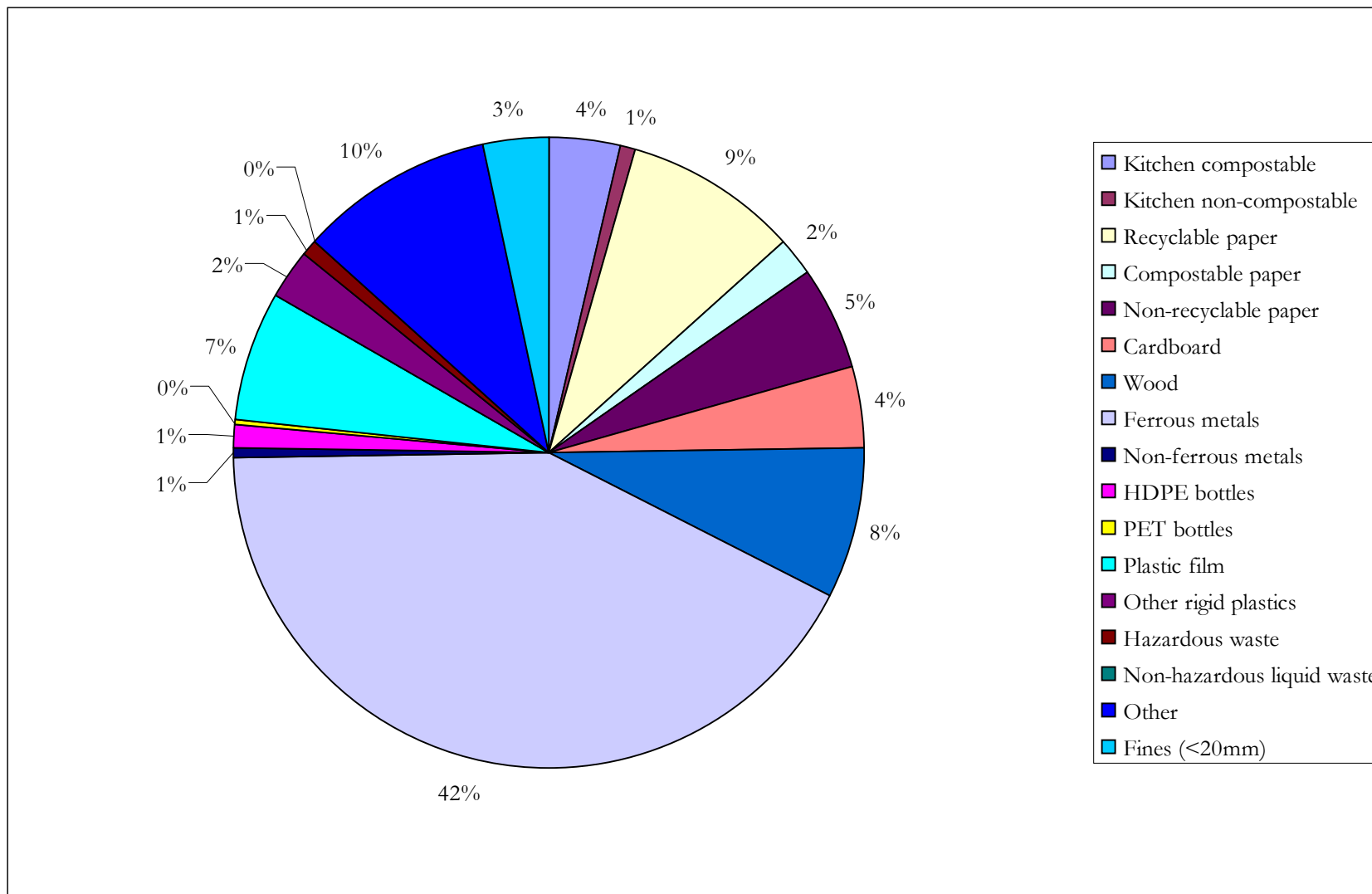
Commercial and industrial waste in Yorkshire and the Humber

Table 5: Composition and arisings of general waste landfilled for sector group DJ

Cat. Number	Category	Percentage composition (%)	Total estimated waste (tonnes)	Estimated WY (tonnes)	Estimated SY (tonnes)	Estimated NY (tonnes)	Estimated H (tonnes)
1	Kitchen compostable	3.74	4434	763	2672	185	815
2	Kitchen non-compostable	0.60	711	122	428	30	131
3	Garden waste	0.00	0	0	0	0	0
4	Recyclable paper	8.90	10,552	1815	6358	439	1939
5	Compostable paper	1.96	2318	399	1397	97	426
6	Non-recyclable paper	5.25	6229	1072	3753	259	1144
7	Cardboard	4.28	5078	874	3060	211	933
8	Wood	7.77	9215	1585	5553	384	1693
9	Ferrous metals	42.31	50,164	8631	30,228	2089	9217
10	Non-ferrous metals	0.52	614	106	370	26	113
11	Glass	0.00	3	0	2	0	0
12	HDPE bottles	1.14	1354	233	816	56	249
13	PET bottles	0.29	339	58	204	14	62
14	Plastic film	6.55	7769	1337	4681	323	1427
15	Other rigid plastics	2.47	2923	503	1761	122	537
16	WEEE	0.01	18	3	11	1	3
17	Hazardous waste	0.84	990	170	597	41	182
18	Non-hazardous liquid waste	0.00	0	0	0	0	0
19	Other	10.17	12,052	2074	7262	502	2214
20	Fines (<20mm)	3.20	3790	652	2284	158	696
Total		100	118,551	20,397	71,436	4936	21,782

Commercial and industrial waste in Yorkshire and the Humber

Figure 5: Composition of general waste landfilled for sector group DJ



3.5 Sector group DK–DN

The DK–DN group includes the following SIC sub-sectors:

DK – manufacture of machinery and equipment not elsewhere classified

DL – manufacture of electrical and optical equipment

DM – manufacture of transport equipment

DN – manufacturing not elsewhere specified.

Data were obtained from general waste audits at two companies within this sector group. Waste analysis composition and arisings for this group are detailed below in Table 6 and Figure 6. Figures discussed are highlighted in red.

A key characteristic of this sector's waste is the relatively high percentage of waste electrical and electronic equipment (WEEE) present within the waste stream (10%). Companies within this group generate electronic waste through their production process, primarily where faulty product is identified and cannot be disassembled and reused. Faulty circuit boards and batteries are also common elements of this waste stream.

Hazardous waste also makes up a significant element of the waste stream at 13%. This includes containers with glue, solvent and mineral oil residues, as well as gloves, packaging and cleaning materials contaminated with these substances, as well as mineral oils. Aerosols were also present in the waste.

Recyclable paper (15%) and card (11%) have a high presence within the waste stream, despite card recycling at some of the companies audited. Metals tend to be segregated where generated in high quantities, but still make up 8% of the waste stream and wood present (9%) was mainly the result of damaged pallets being disposed to the general waste.

All companies audited in this sector group recovered precious metals from their production process for reuse or sale. Solder containing tin and lead, copper, and gold plating all have very high inherent values, a fact recognised by business from this sector group. Segregation and recycling was undertaken where steel and scrap ferrous metal were generated in high quantities.

More proactive companies targeted their packaging waste through the segregation of cardboard and the reuse of pallets.

Awareness of waste related legislation in this sector was mixed, with some companies having a better understanding of their Duty of Care and obligations under the Special Waste Regulations and Landfill Regulations than others. Confusion about what constitutes hazardous waste was also an issue for some companies.

There was no consistent pattern in the use made of regional support organisations. Some companies preferred to use their trade association, universities and green business clubs, whilst others worked with Business in the Environment and Business Links. There was no evidence of formal environmental management systems or policies at the companies audited, with environmental procedures tending to be linked with health and safety assessments and procedures.

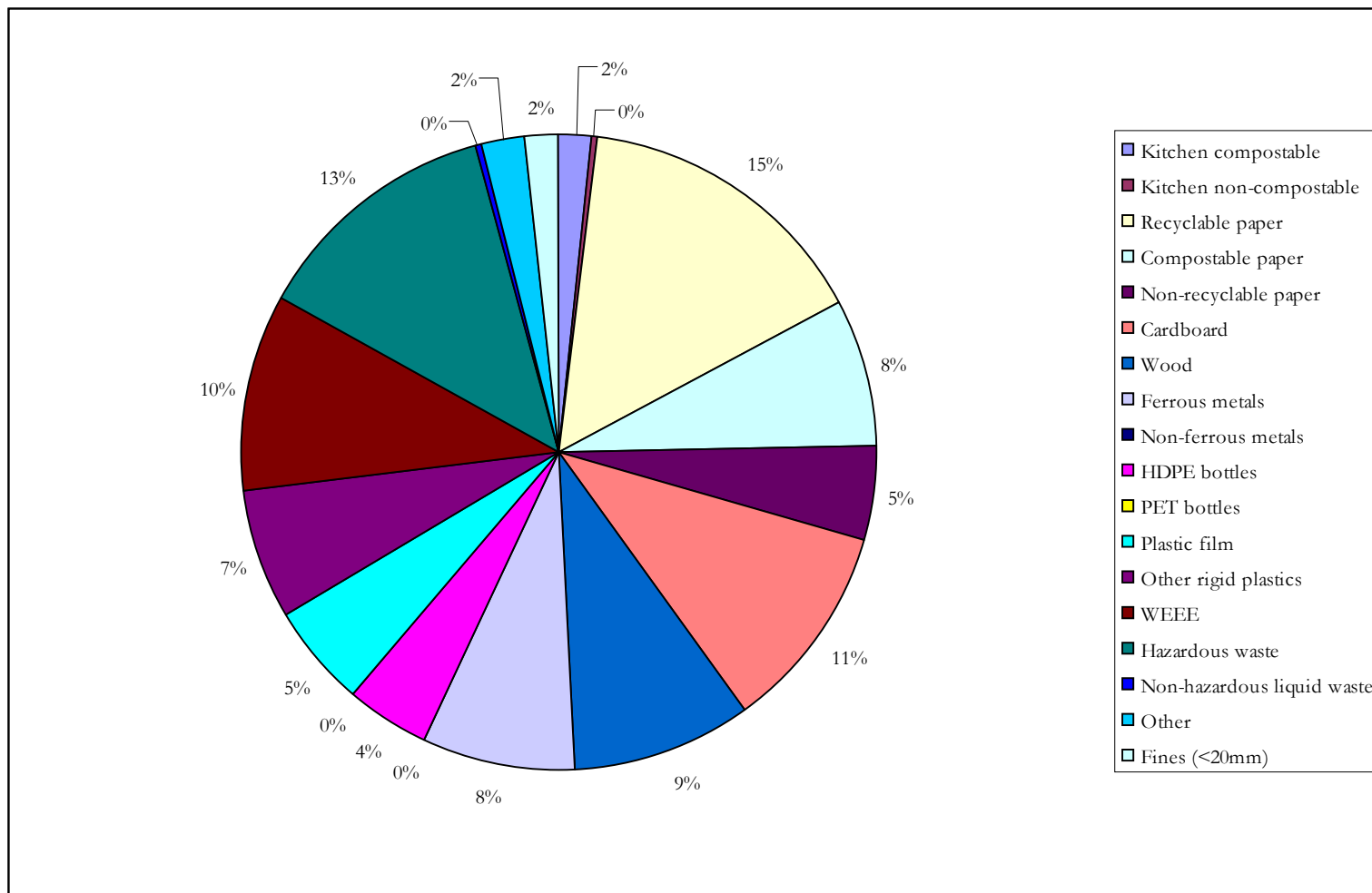
Commercial and industrial waste in Yorkshire and the Humber

Table 6: Composition and arisings of general waste landfilled for sector group DK-DN

Cat. Number	Category	Percentage composition (%)	Total estimated waste (tonnes)	Estimated WY (tonnes)	Estimated SY (tonnes)	Estimated NY (tonnes)	Estimated H (tonnes)
1	Kitchen compostable	1.71	3305	1486	612	263	944
2	Kitchen non-compostable	0.36	698	314	129	56	199
3	Garden waste	0.00	0	0	0	0	0
4	Recyclable paper	15.22	29,461	13,242	5455	2346	8418
5	Compostable paper	7.50	14,520	6526	2689	1156	4149
6	Non-recyclable paper	4.58	8870	3987	1642	706	2534
7	Cardboard	10.58	20,481	9206	3792	1631	5852
8	Wood	9.12	17,650	7934	3268	1405	5043
9	Ferrous metals	7.72	14,947	6719	2768	1190	4271
10	Non-ferrous metals	0.26	504	227	93	40	144
11	Glass	0.03	56	25	10	4	16
12	HDPE bottles	4.07	7880	3542	1459	627	2252
13	PET bottles	0.01	21	9	4	2	6
14	Plastic film	5.09	9842	4424	1822	784	2812
15	Other rigid plastics	6.89	13,325	5989	2467	1061	3807
16	WEEE	9.95	19,253	8654	3565	1533	5501
17	Hazardous waste	12.65	24,482	11,004	4533	1949	6995
18	Non-hazardous liquid waste	0.23	450	202	83	36	129
19	Other	2.23	4321	1942	800	344	1235
20	Fines (<20mm)	1.79	3460	1555	641	275	989
Total		100.00	193,526	86,987	35,834	15,409	55,296

Commercial and industrial waste in Yorkshire and the Humber

Figure 6: Composition of general waste landfilled for sector group DK-DN



3.6 Sector group E–O

This sector group is made up of a large range of different categories of company. However, many of these are office-based organisations that have a very similar waste composition. The group includes the following SIC sub-sectors:

E – electricity, gas and water supply

F – construction

G – wholesale and retail; repair of motor vehicles, motorcycles and personal household goods

H – hotels and restaurants

I – transport, storage and communication

J – financial intermediation

K – Real estate, renting and business activities

L – Public administration

M – Education

N – Health and social work

O – Other community, social and personal service activities.

Data for this sector group were obtained from a range of different sources. Audits were carried out at five companies, with supplementary data taken from previous projects that used a similar methodology and waste categories. These include average data from:

- two regional, higher education institution audits (on behalf of Waste Watch)
- audits of 8 retail stores, for 2 major retail chains (confidential)
- an audit sample of 50 retailers (on behalf of the City of Westminster council)
- an audit sample of 50 office-based organisations (on behalf of City of Westminster council)
- an audit sample of 50 hospitality organisations (on behalf of City of Westminster council)

Audits were carried out at a range of companies, including those from sectors E, G and I. Information from previous waste audits carried out by SWAP at retail sites has been included in the findings of this report, with the kind permission of the retailers involved.

Table 7 and Figure 7 below outline the key waste arisings for this sector grouping by composition. Figures discussed are highlighted in red.

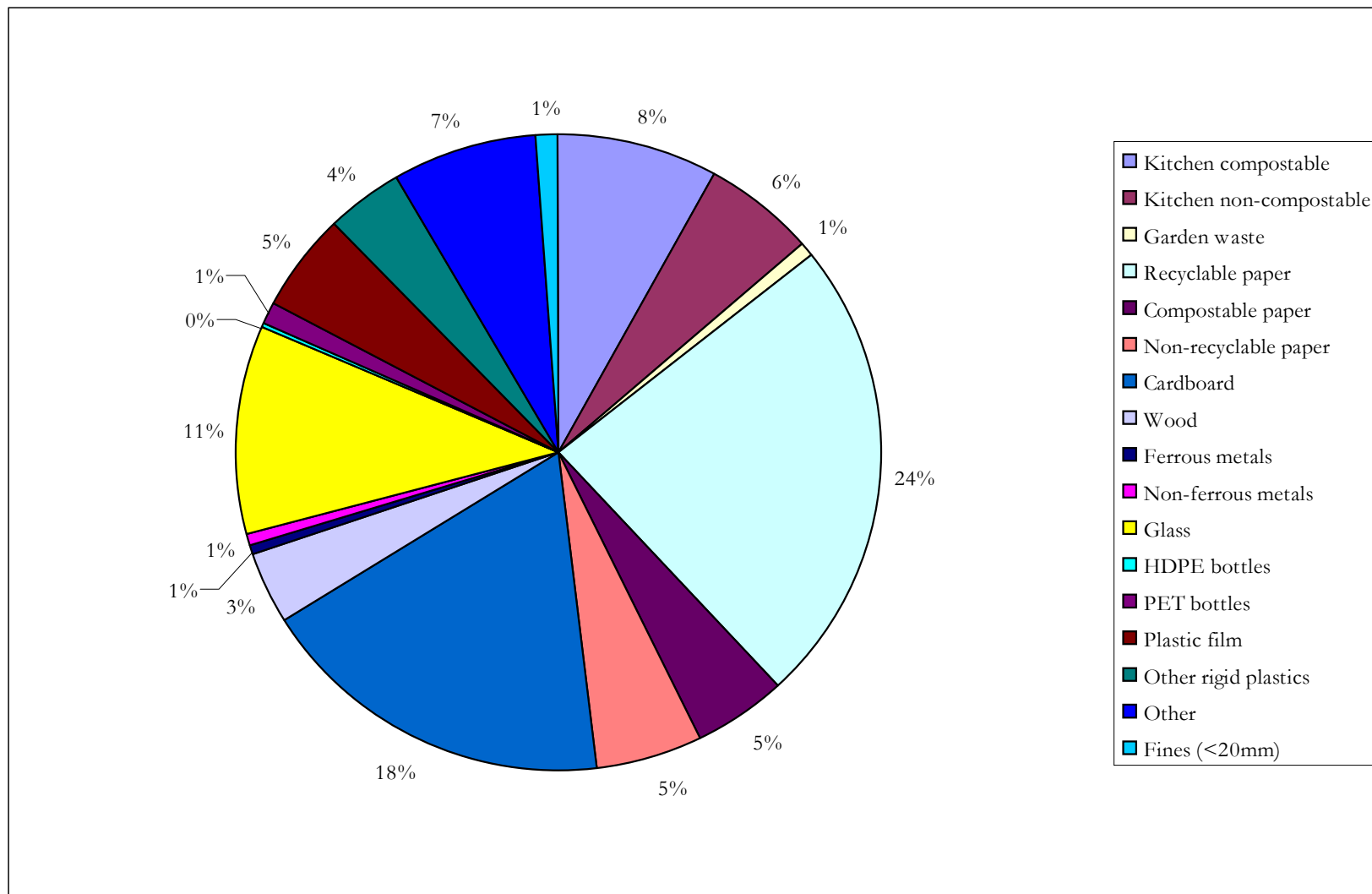
Commercial and industrial waste in Yorkshire and the Humber

Table 7: Composition and arisings of general waste landfilled for sector group E-O

Cat. Number	Category	Percentage composition (%)	Total estimated waste (tonnes)	Estimated WY (tonnes)	Estimated SY (tonnes)	Estimated NY (tonnes)	Estimated H (tonnes)
1	Kitchen compostable	7.94	65,717	34,608	17,413	8,039	5,657
2	Kitchen non-compostable	5.77	47,736	25,139	12,648	5,839	4,109
3	Garden waste	0.77	6,372	3,356	1,688	779	549
4	Recyclable paper	23.69	196,114	103,278	51,963	23,990	16,882
5	Compostable paper	4.59	37,997	20,010	10,068	4,648	3,271
6	Non-recyclable paper	5.26	43,587	22,954	11,549	5,332	3,752
7	Cardboard	18.13	150,138	79,066	39,781	18,366	12,925
8	Wood	3.49	28,935	15,238	7,667	3,539	2,491
9	Ferrous metals	0.56	4,609	2,427	1,221	564	397
10	Non-ferrous metals	0.61	5,036	2,652	1,334	616	434
11	Glass	10.57	87,548	46,105	23,197	10,709	7,537
12	HDPE bottles	0.22	1,832	965	485	224	158
13	PET bottles	1.13	9,388	4,944	2,488	1,148	808
14	Plastic film	5.10	42,210	22,229	11,184	5,163	3,634
15	Other rigid plastics	3.79	31,391	16,531	8,317	3,840	2,702
16	WEEE	0.00	27	14	7	3	2
17	Hazardous waste	0.04	369	194	98	45	32
18	Non-hazardous liquid waste	0.00	0	0	0	0	0
19	Other	7.24	59,975	31,584	15,891	7,336	5,163
20	Fines (<20mm)	1.09	8,998	4,739	2,384	1,101	775
TOTAL		100.00	827,979	436,034	219,386	101,283	71,276

Commercial and industrial waste in Yorkshire and the Humber

Figure 7: Composition of general waste landfilled for sector group E-O

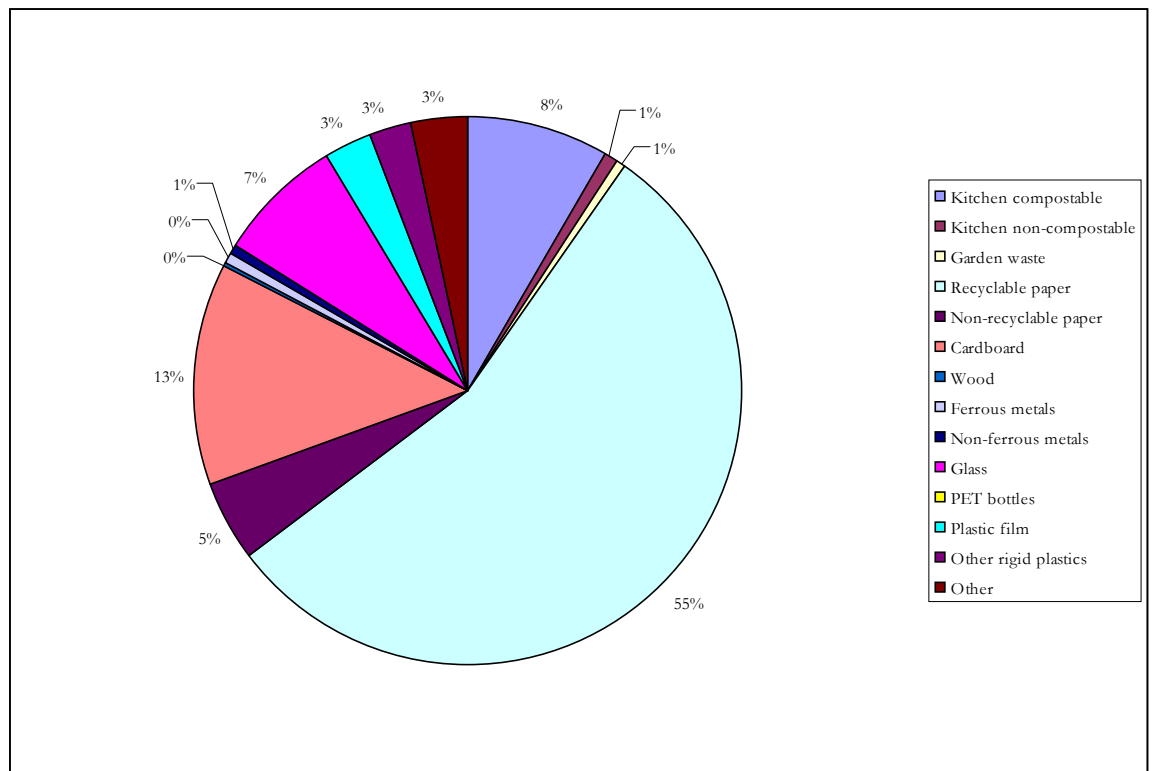


In terms of composition, the main material present in the waste stream is paper (33%) of which approximately 70% is of a recyclable quality. Cardboard (18%) is also significant, making these waste streams an obvious starting point for increased recycling within this sector grouping. Glass (11%), primarily through the hospitality and hotel sectors, represents another key waste stream, despite the fact that a proportion of these businesses are already segregating the material for recycling.

The hospitality, education and supermarket retail sectors contribute significantly to the presence of foodstuffs (compostable and non-compostable) in this sector group’s waste stream (14%). Around 57% of this is suitable for composting, with the remainder being cooked foods. Plastic is most significant in the retail sector, but averages at 9% for the sector group, split almost equally by weight between film and rigid plastics.

A breakdown of the waste composition for individual sectors is provided in the figures below.

Figure 8: Composition of general waste landfilled for office-based sectors (J, K, L, O)



Office-based sectors include:

J – financial intermediation

K – real estate, renting and business activities

L – public administration

O – other community, social and personal service activities

Figure 8 illustrates that waste from these businesses is dominated by paper (60%) and cardboard (13%), with smaller amounts of waste from canteens/kitchen generating food and glass. Recycling of paper and printer cartridges is generally quite common for office-based organisations, with more pro-active (usually larger businesses) also segregating cardboard, plastic cups and aluminium cans. One of the main barriers for smaller, office-based businesses is a lack of space for segregation and the fact that contractors are less willing to collect small

Commercial and industrial waste in Yorkshire and the Humber

amounts of materials. This makes extending office-based recycling to glass and plastics very difficult via commercial waste recycling routes.

Other sectors audited in this group, also tended to have a large element of office-based activity included in their operations. Sectors E – electricity, gas and water supply, and I – transport, storage and communication are two such examples.

Figure 9: Composition of general waste landfilled for the electricity, gas and water supply sector (E)

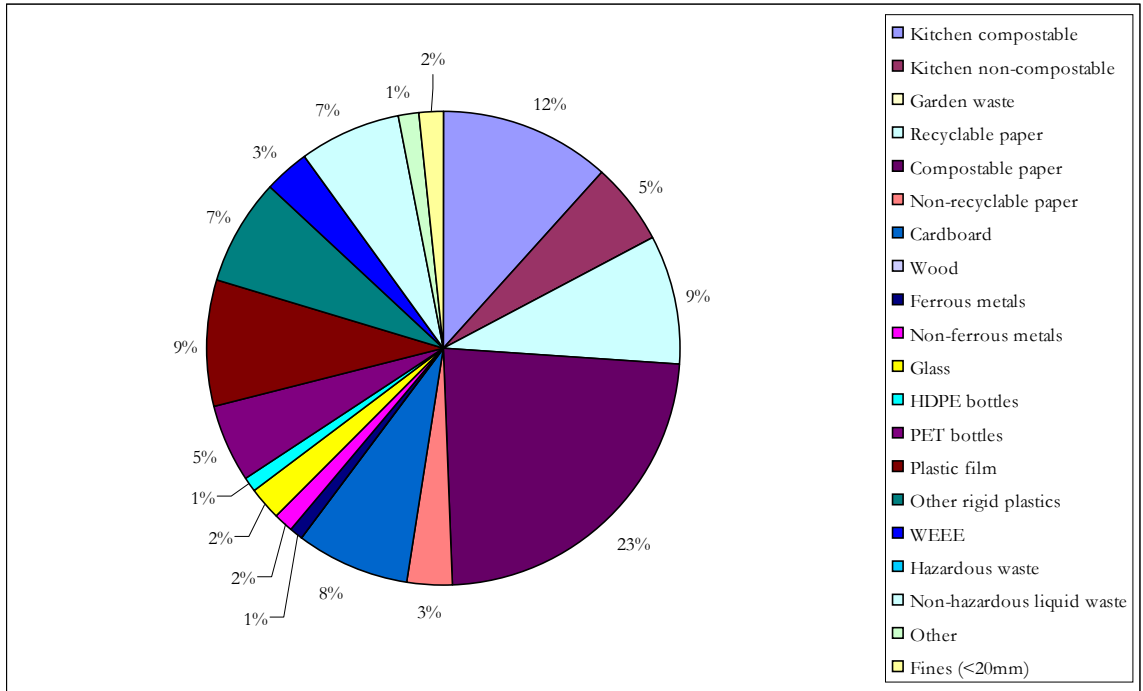
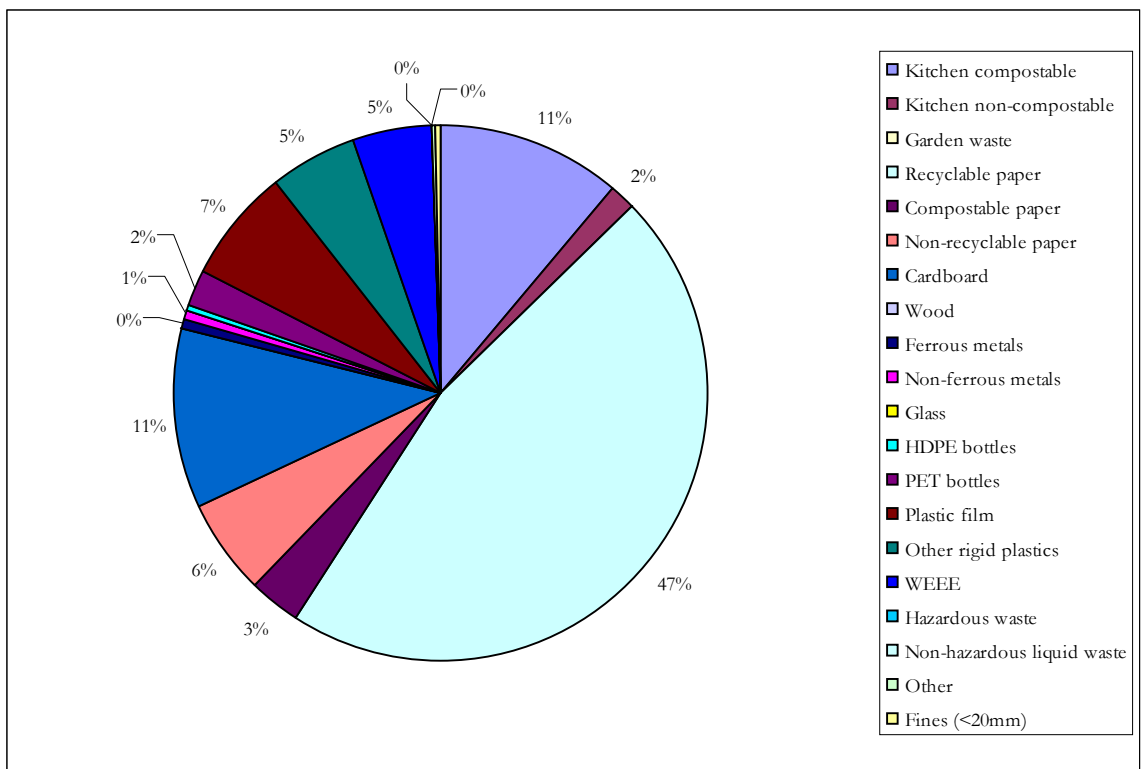


Figure 10: Composition of general waste landfilled for transport, storage & communication sector (I)



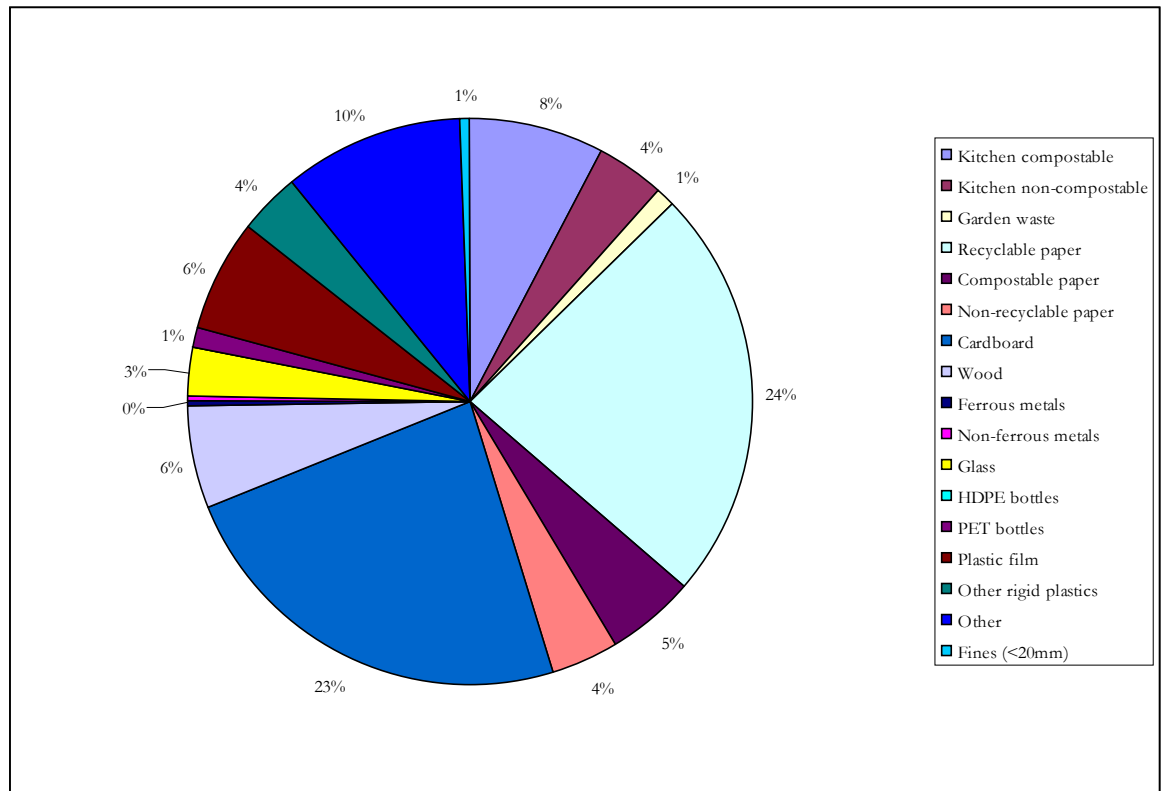
The waste composition for the ‘transport, storage and communications sector’ is very similar to that for other office-based organisations, with recyclable paper dominating the waste stream. Limited space for storage of segregated materials was considered a major barrier to increased levels of recycling.

Recyclable paper was not present in the same proportions for the ‘electricity, gas and water supply sector’ primarily due to the high level of recycling activity being carried out by companies audited from this sector.

Both of these sectors had a strong awareness of relevant waste legislation impacting upon their businesses and relied upon organisations such as the Environment Agency, Envirowise, Business in the Community and environmental consultancies for support.

Waste from the wholesale and retail sector contained a high percentage of paper and card (24% and 23% respectively), but also plastic packaging (10%) and wood waste (6%), mainly from damaged pallets. The ‘other’ category comprised elements of damaged and returned products from retailers and wholesalers.

Figure 11: Composition of general waste landfilled for the wholesale and retail sector (G)



Supermarket retailers generate the majority of food present in this sectors’ waste stream. Meat waste is generally segregated for treatment and disposal in line with the Animal By-Products Regulations. Many retailers and wholesalers segregate card, despite its presence within the waste stream, with larger retailers baling plastic film for recycling. Pallets and card boxes are also reused where possible. Large retailers with the most advanced waste management strategies have, or are in the process of implementing, reusable packaging for aspects of their production. This is a response to the Packaging Regulations, limited storage space and rising waste costs. Reusable plastic tote boxes are used in some cases, implemented in negotiation with suppliers and customers. These reduce the need for cardboard packaging, help reduce damaged product and reduce the requirement for plastic infill packaging. Reusable plastic lids

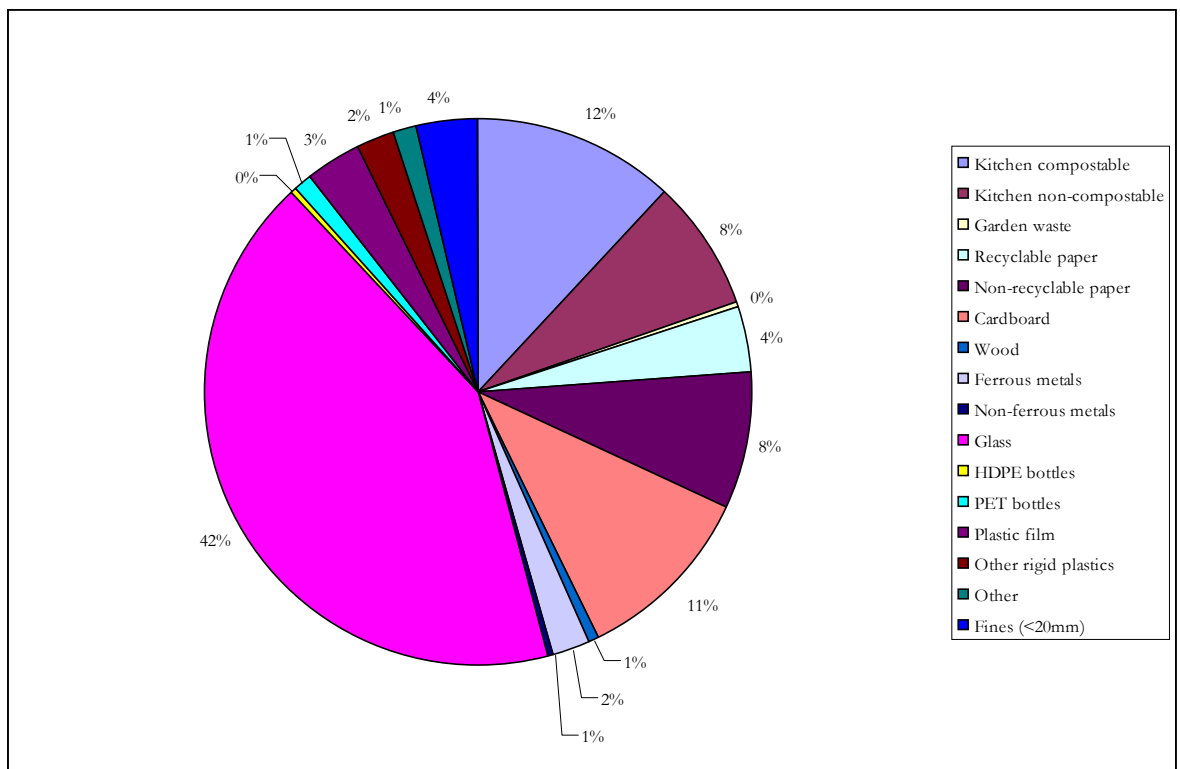
used to secure pallet loads are also being investigated by larger retailers as a viable alternative to shrink wrap.

The cost of investment is a barrier to implementation of reusable packaging systems, as well as limited space for storage of boxes etc. Space is also a restriction for further segregation of recyclables, particularly in retail outlets, where shop-floor space has to be maximised.

Awareness of legislation and support organisations was limited at retail store level, as these issues tend to be dealt with at the head office along with EMS implementation. At this level, awareness is very high, with support obtained largely from the trade associations.

Waste from hotels and restaurants (Figure 12) is dominated by glass (42%), followed by food waste (20%) and cardboard (11%).

Figure 12: Composition of general waste landfilled for the hotels and restaurants sector (H)

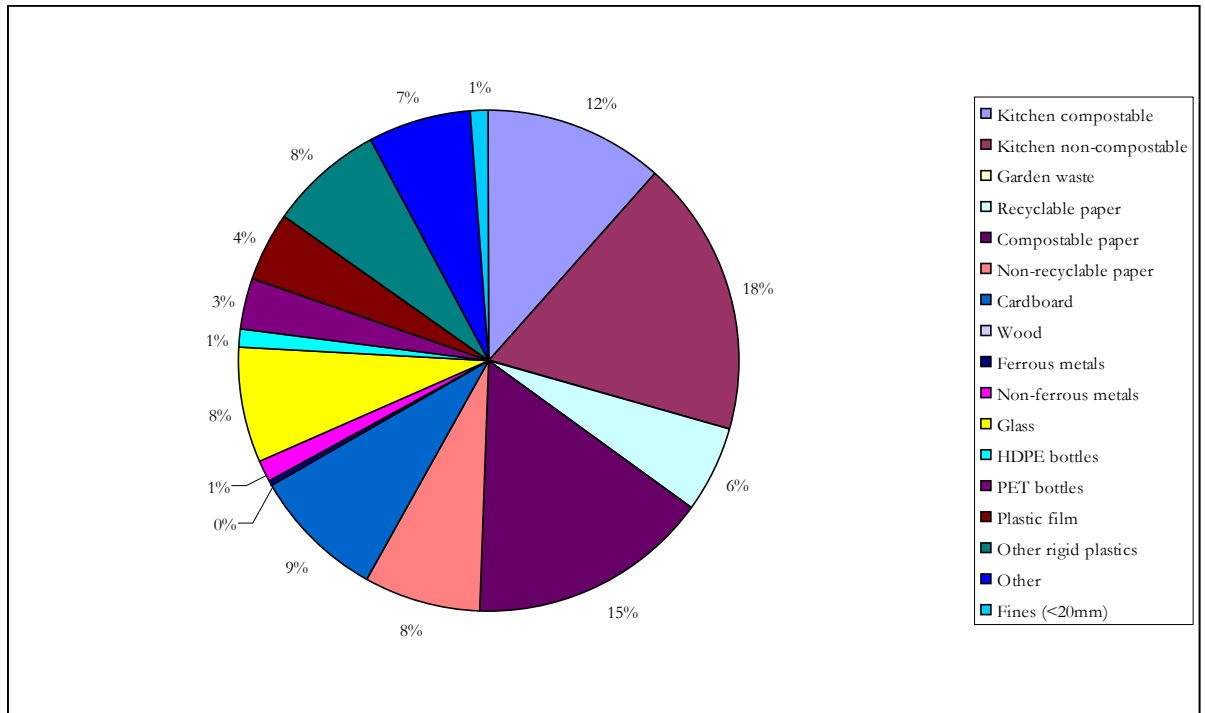


Bars, restaurants (and in some cases hotels) commonly segregate glass for recycling. However, there is still potential to increase the levels of recycling of this material, particularly as colours do not necessarily need to be segregated anymore, unless they are to be used for high value end products.

Awareness of legislation and the development of an EMS are most common within the hotel sector due to the greater environmental impacts associated with their activities. The development of recycling systems in restaurants is sometimes restricted by the perceived health and safety implications of having extra bins on-site (particularly in kitchens) and the lack of space anywhere else for storage.

The education sector includes waste from large institutions such as universities and colleges, for which a combination of different sites exist. Waste will vary from site to site depending upon its function (eg accommodation, lecture halls, refectories, science labs etc). This would explain the variability in the waste from this sector.

Figure 13: Composition of general waste landfilled for the education sector (M)



Food waste is a core element of the waste from this sector, due to the presence of canteens and refectories on education-based sites. Recyclable card and paper is present but not in large quantities (9% and 6% respectively) as many institutions already target these wastes for recycling. Universities in particular frequently segregate materials for recycling due to the large amounts of waste being generated.

Encouraging recycling amongst students/pupils is one of the biggest challenges facing education institutions. Awareness of waste related legislation in higher education institutions is generally good.

4. Key waste arisings

Key waste arisings are those materials being disposed to a company's general waste that could be managed more effectively, either through reduction, reuse or recycling. Table 8 provides a comparison of the general waste composition of the five sectors considered in this report. Table 9 summarises estimated general waste generation across the four sub-regions for the combined sector groups audited. Figures discussed are coloured red. Sector group DI (Manufacture of other non-metallic mineral products) was not audited as part of this study. All results exclude waste arising from this sector group.

A large quantity of compostable material is present in general waste containers across the region that could be targeted for improved management. Sector DA–DE contains a large percentage (10%) of potentially compostable material, due to the presence of the food manufacturing sector within this group. The majority of this material is generated within West and South Yorkshire (22,962 tonnes and 14,408 tonnes respectively) as is compostable waste from group E–O hospitality and retail sectors (39,108 tonnes and 19,677 tonnes respectively of the total 74,262 tonnes generated across the region by this group). This tonnage increases significantly if paper suitable for composting is included. A total of 65,442 tonnes of compostable paper is generated regionally by these two sectors alone. The following quantities of compostable (kitchen and paper) waste are estimated to be deposited in general waste skips across the sub-regions by the sector groups audited:

- West Yorkshire – 104,561 tonnes
- South Yorkshire – 58,929 tonnes
- North Yorkshire – 23,816 tonnes
- Humberside – 27,482 tonnes.

Cardboard is still present within the C&I general waste stream, despite this being the most favoured material for recycling in the region. Sector group DF–DH disposes the smallest quantity of cardboard to its general waste. Companies in West and South Yorkshire are the principal generators of this material, with total cardboard in general waste containers across the sector groups estimated as follows:

- West Yorkshire – 127,985 tonnes
- South Yorkshire – 70,649 tonnes
- North Yorkshire – 28,841 tonnes
- Humberside – 28,824 tonnes.

Paper recycling by the commercial and industrial sector is not as prevalent as cardboard recycling, with the exception of office-based organisations. Group E–O is responsible for the largest quantity of recyclable paper arising in the general waste stream at just over 194,000 tonnes. However, significant improvements can be made by all sector groups, as there is an element of office-based activity within every C&I businesses. The following quantities of recyclable paper are estimated to be disposed to the general waste across the sector groups:

- West Yorkshire – 129,394 tonnes
- South Yorkshire – 69,399 tonnes
- North Yorkshire – 29,626 tonnes
- Humberside – 32,686 tonnes

Commercial and industrial waste in Yorkshire and the Humber

Table 8: Composition of general waste landfilled for all sector groups audited

Cat. Number	Category	DA-DE composition		DF-DH composition		DJ composition		DK-DN composition		E-O composition	
		(%)	Est. tonnes	(%)	Est. tonnes	(%)	Est. tonnes	(%)	Est. tonnes	(%)	Est. tonnes
1	Kitchen compostable	10.33	47,300	6.95	4035	3.74	4434	1.71	3305	8.97	65,717
2	Kitchen non-compostable	19.22	87,992	2.53	1467	0.60	711	0.36	698	5.70	47,736
3	Garden waste	0.00	0	0.00	0	0.00	0	0.00	0	0.76	6,372
4	Recyclable paper	3.29	15,076	17.07	9904	8.90	10,552	15.22	29,461	23.43	196,114
5	Compostable paper	6.09	27,877	12.55	7281	1.96	2318	7.50	14,520	4.54	37,997
6	Non-recyclable paper	6.12	28,010	1.45	844	5.25	6229	4.58	8870	5.21	43,587
7	Cardboard	17.02	77,924	4.61	2678	4.28	5078	10.58	20,481	17.93	150,138
8	Wood	0.64	2943	0.03	18	7.77	9215	9.12	17,650	3.45	28,935
9	Ferrous metals	3.50	16,045	7.14	4145	42.31	50,164	7.72	14,947	0.55	4,609
10	Non-ferrous metals	0.35	1621	0.35	202	0.52	614	0.26	504	0.60	5,036
11	Glass	0.23	1058	5.97	3466	0.00	3	0.03	56	10.45	87,548
12	HDPE bottles	0.17	773	1.04	605	1.14	1354	4.07	7880	0.22	1,832
13	PET bottles	0.07	299	0.35	202	0.29	339	0.01	21	1.12	9,388
14	Plastic film	14.96	68,486	8.00	4640	6.55	7769	5.09	9842	5.04	42,210
15	Other rigid plastics	9.00	41,197	9.73	5649	2.47	2923	6.89	13,325	3.75	31,391
16	WEEE	0.06	255	0.00	0	0.01	18	9.95	19,253	0.01	27
17	Hazardous waste	1.54	7072	0.76	440	0.84	990	12.65	24,482	0.04	369
18	Non-hazardous liquid waste	0.57	2608	0.00	0	0.00	0	0.23	450	0.00	0
19	Other	5.84	26,751	19.06	11,060	10.17	12,052	2.23	4321	7.16	59,975
20	Fines (<20mm)	1.00	4597	2.40	1394	3.20	3790	1.79	3460	1.07	8,998
Total		100.00	457,886	100.00	58,031	100.00	118,551	100.00	193,526	100.00	827,979

Tables may not add up to whole numbers due to rounding

Commercial and industrial waste in Yorkshire and the Humber

Table 9: Estimated general waste for the combined sector groups audited (by sub-region)

Cat. Number	Category	Estimated WY (tonnes)	Estimated SY (tonnes)	Estimated NY (tonnes)	Estimated H (tonnes)
1	Kitchen compostable	61,343	35,525	14,031	13,894
2	Kitchen non-compostable	68,845	40,162	15,478	14,119
3	Garden waste	3,356	1,688	779	549
4	Recyclable paper	129,394	69,399	29,626	32,686
5	Compostable paper	43,218	23,404	9,785	13,588
6	Non-recyclable paper	41,929	25,564	9,385	10,659
7	Cardboard	127,985	70,649	28,841	28,824
8	Wood	26,193	17,387	5,643	9,539
9	Ferrous metals	27,131	39,536	6,072	17,172
10	Non-ferrous metals	3,848	2,312	880	938
11	Glass	47,952	23,892	11,262	9,023
12	HDPE bottles	5,344	3,059	1,065	2,977
13	PET bottles	5,232	2,808	1,221	986
14	Plastic film	62,988	39,032	14,145	16,780
15	Other rigid plastics	45,155	25,682	10,120	13,526
16	WEEE	8,795	3,661	1,564	5,532
17	Hazardous waste	14,967	7,428	2,843	8,114
18	Non-hazardous liquid waste	1,468	877	314	399
19	Other	52,762	33,253	12,421	15,721
20	Fines (<20mm)	9,704	6,854	2,198	3,483
Total		787,611	472,178	177,677	218,507

Notes: Tables may not add up to whole numbers due to rounding

Not every sector generates large quantities of metals, with its presence concentrated in the waste of sector groups containing manufacturing companies. Sector DJ, comprising metals and metal product manufacturers is an obvious starting point for targeting such material. The majority of waste ferrous metal material is already being segregated by companies from this sector. However, this still makes up a high proportion of their waste streams due inefficient segregation and the disposal of some lower-grade material. The largest quantity within group DJ emanates from south Yorkshire (39,228 tonnes), followed by Humberside (9217 tonnes). Between them, sectors DA–DE and DK–DN generate an additional 30,992 tonnes of ferrous metals across the region. Across the sector groups, the estimated quantities of ferrous metals present in general waste containers are:

- West Yorkshire – 27,131 tonnes
- South Yorkshire – 39,536 tonnes
- North Yorkshire – 6072 tonnes
- Humberside – 17,172 tonnes

Glass waste has limited presence within the waste streams of the majority of these sector groups. Group E–O is the exception as a result of the inclusion of the hospitality sector. Companies in west Yorkshire generate 45,568 tonnes of the total 86,528 produced across the region.

As a percentage of general waste, wood is most significant in sector groups DJ and DK–DN. These sectors generate 9215 tonnes and 17,650 tonnes respectively across the region. The majority of this wood is generated in West Yorkshire, South Yorkshire and Humberside. As a percentage, wood waste does not make up as much of the waste stream for group E–O. However, it contributes 28,597 tonnes to C&I general waste across the region. The wood and wood products manufacturing sector does not contribute large quantities of wood for disposal, because it has a good understanding of the markets for recycling off-cuts and unwanted timber.

Plastics are a substantial part of most C&I company's waste streams. The majority of this waste is plastic film and rigid plastic packaging/components as opposed to plastic bottles. Rigid plastic and plastic film is generated in relatively equal quantities for most of the sector groups. However, plastic film makes up around 70% of the plastic waste generated in group DJ. The contribution of plastics to waste costs for C&I companies is underestimated if considered by weight alone. By volume, plastics make up a much greater proportion of the waste stream. A number of companies with limited storage space, therefore, use a baler to compact plastic material, whether this is for recycling or disposal. In such instances, cardboard and paper bags are also baled to save on the number of general waste uplifts required each week. Total rigid plastic and plastic film present in the general waste of all the sector groups audited is estimated as follows:

- West Yorkshire – 108,143 tonnes
- South Yorkshire – 64,714 tonnes
- North Yorkshire – 24,265 tonnes
- Humberside – 30,306 tonnes

Hazardous waste is evident in the general waste stream of all sector groups, but is significant in the waste of group DK–DN. This sector group contributes 24,482 tonnes of hazardous waste to the general waste stream each year, with 11,004 tonnes from West Yorkshire and 6995 tonnes from Humberside. Sector DA–DE also contributes an additional 7072 tonnes across the region, the majority from West and South Yorkshire. Much of this material is made up of glue and solvent residue, which is often attached to cleaning and packaging materials. Sector DF–DH has the second lowest percentage hazardous waste content of the five sector groups, despite being the group handling most chemical materials. This can be attributed to knowledge within the company of how to dispose appropriately of hazardous materials, in comparison with other sectors. Overall, these sector groups are estimated to dispose of the following quantities of hazardous waste to their general waste stream:

- West Yorkshire – 14,967 tonnes
- South Yorkshire – 7428 tonnes
- North Yorkshire – 2843 tonnes
- Humberside – 8114 tonnes

5. Summary of findings

The main general waste components from each sector group are summarised in Table 10:

Table 10: Description of sector groups and their main estimated general waste components

Sector group DA-DE	
<i>Detail of sub-sectors</i>	<i>Main general waste components</i>
DA – manufacture of food products, beverages and tobacco DB – manufacture of textiles and textile products DC – manufacture leather and leather products DD – manufacture of wood and wood products DE – pulp, paper, and paper products	<ul style="list-style-type: none"> • kitchen non-compostable (19% – 87,992 tonnes) • cardboard (17% – 77,924 tonnes) • plastic film (15% – 68,486 tonnes) • kitchen compostable (10% – 47,300 tonnes) • rigid plastics (9% – 41,197 tonnes) • other (6% – 26,751 tonnes)
Sector group DF-DH	
<i>Detail of sub-sectors</i>	<i>Main general waste components</i>
DF – manufacture of coke, refined petroleum products and nuclear fuels DG – manufacture of chemicals and chemical products DH – manufacture of rubber and plastic products	<ul style="list-style-type: none"> • other (19% – 11,060 tonnes) • recyclable paper (17% – 9904 tonnes) • compostable paper (13% – 7281 tonnes) • rigid plastics (10% – 5649 tonnes) • plastic film (8% – 4640) • ferrous metals (6% – 4145 tonnes)
Sector group DJ	
<i>Detail of sub-sectors</i>	<i>Main general waste components</i>
DJ – manufacture of basic metals and fabricated metal products	<ul style="list-style-type: none"> • ferrous metals (42% – 50,164 tonnes) • other (10% – 12,052 tonnes) • recyclable paper (9% – 10,552 tonnes) • wood (8% – 9215 tonnes) • plastic film (7% – 7769 tonnes) • non-recyclable paper (5% – 6229 tonnes)
Sector group DK-DN	
<i>Detail of sub-sectors</i>	<i>Main general waste components</i>
DK – manufacture of machinery and equipment not elsewhere classified DL – manufacture of electrical and optical equipment DM – manufacture of transport equipment DN – manufacturing not elsewhere specified.	<ul style="list-style-type: none"> • recyclable paper (15% – 29,461 tonnes) • hazardous waste (12% – 24,482 tonnes) • cardboard (11% – 20,481 tonnes) • WEEE (10% – 19,253 tonnes) • wood (9% – 17,650 tonnes) • ferrous metals (8% – 14,947 tonnes)
Sector group E-O	
<i>Detail of sub-sectors</i>	<i>Main general waste components</i>
E – electricity, gas and water supply F – construction G – wholesale and retail; repair of motor vehicles, motorcycles and personal household goods H – hotels and restaurants I – transport, storage and communication J – financial intermediation K – real estate, renting and business activities L – public administration M – education N – health and social work O – other community, social and personal service activities.	<ul style="list-style-type: none"> • recyclable paper (23% – 196,114 tonnes) • cardboard (18% – 150,138 tonnes) • glass (10% – 87,548 tonnes) • kitchen compostable (9% – 65,717 tonnes) • other (7% – 59,975 tonnes) • plastic film (5% – 42,210 tonnes)

Cumulatively within the C&I sector, the key materials being generated that could be targeted for improved management are:

- Recyclable paper – 261,107 tonnes
- Cardboard – 256,299 tonnes
- Kitchen non-compostable – 138,604 tonnes
- Plastic film – 132,947 tonnes
- kitchen compostable – 124,791 tonnes
- Other rigid plastics – 94,485 tonnes
- Glass – 92,131 tonnes
- Ferrous metals – 89,910 tonnes
- Wood – 58,761 tonnes
- Hazardous waste – 33,353 tonnes
- WEEE – 19,553 tonnes

All results exclude waste arising from sector group DI, which was not audited as part of this project.

6. Recommendations

6.1 Targeting waste for reduction and recycling

Materials should initially be targeted for improved management where large quantities are being generated and for which there is already an established recycling infrastructure within the region. C&I businesses would benefit from a regularly updated list of contacts, by sub-region, detailing the reuse/recycling/disposal services available.

Based on the estimates generated through this research, card and recyclable paper are materials that are being generated in significant quantities by all of the sectors groups. It is estimated that these materials account for over 500,000 tonnes of general waste arisings within the commercial and industrial sector. The majority of recyclable paper sent to the general waste arises in sector group E–O (75%), due to the high presence of office based-activities. Some businesses have already started to segregate paper, mainly office-based organisations. The efficiency of these systems could be significantly improved through staff training and better communication regarding the recycling systems on-site. Support on how best to do this is needed by the companies. For the remaining businesses, paper (particularly white office grade paper) represents an excellent starting point for reducing, reusing and recycling their general waste materials. Recycling collections are low or no cost for this material (depending upon quantities presented for collection). It is an easily identifiable waste stream for companies new to recycling and can be combined with office management systems for reducing and reusing paper on-site.

Segregating cardboard is another obvious starting point for companies looking to improve their waste management. Cardboard has a significant presence in the general waste stream of all the sector groups, although the largest quantities are generated by sectors E–O and DA–DE

which account for 56% and 30% of waste cardboard respectively. There is potential to substitute cardboard boxes for systems of reusable plastic tote boxes within some sectors, where deliveries take place on regular basis. To achieve this will require co-operation between customers and suppliers. Encouraging cardboard box reuse on site for storage and distribution is a simple and effective recommendation, followed by recycling where this is not suitable.

The potential for recycling plastics from the commercial and industrial sector has not yet been fully realised. Rigid plastics and plastic film make up an estimated 227,000 tonnes of general waste in the region. Sector group DA–DE generates 52% of plastic film and 44% of rigid plastics. Reduction of rigid plastics will only result through improved packaging design to minimise the quantities of plastics used to protect product in transit. Again, reusable packaging is an option in some instances, with reusable plastic tote boxes requiring less infill packaging than cardboard boxes to protect deliveries of product. New packaging innovations should be publicised to the sector to encourage a reduction in plastic film wrap. A company called Loadhog has developed a reusable plastic lid to secure pallets, which eliminates the need for plastic wrapping and strapping. The Yorkshire and Humber region has a large range of reprocessors for different grades of plastic material. Companies generating plastics in large quantities must be encouraged to segregate these materials for recycling. In most cases a baler will be required to minimise the space taken up by this material in storage. The biggest barrier to recycling plastics is faced by companies generating relatively small amounts of plastics, where this still represents a significant part of their waste stream. Reprocessors are less willing to collect material where it is generated in smaller quantities.

It is estimated that around 95% of the 92,131 tonnes of glass waste arising in the general waste stream is generated by sector group E–O. This is explained by the presence of the hospitality sector within this sector group. By working directly with the hospitality sector to promote glass segregation, it will be possible to significantly increase the supply of glass feed-stock to the reprocessing sector.

Ferrous metals make up an estimated 89,910 tonnes of the general waste within the region. Around 56% is generated by sector group DJ which involves in the manufacturing of metals and metal products. The majority of the metal waste from this sector group is segregated for recycling, but inefficient systems still account for 50,164 tonnes of ferrous metal within the general waste stream. The benefits of staff training and communication of formalised recycling systems therefore needs to be encouraged within this sector group and others, such as group DK–DN, which also generate large quantities of metals.

The management of hazardous waste is an issue affecting nearly all C&I businesses, although it is a more critical issue for those involved in the manufacturing sectors that regularly use potentially hazardous substances as part of their process. It is these businesses that generate quantities sufficient to require them to register as hazardous waste producers when the Hazardous Waste Regulations commence in summer 2005. Sector group DK–DN should be targeted specifically as this group is estimated to be responsible for around 73% of hazardous waste in the general waste stream. A lack of clarity about what constitutes hazardous waste was a common theme for companies, with many also unaware of how this waste should be managed. As a result, hazardous waste is still being co-disposed with general waste where this is not obvious to the waste contractor.

There are two pressing requirements for managing hazardous waste. The first is to ensure it is managed within the scope of the regulatory framework of the Hazardous Waste Regulations (which will soon replace the Special Waste Regulations 1996) and the Landfill Regulations 2002. Dissemination of the changing legislation relating to hazardous waste needs to continue, specifying exactly what types of waste are classed as hazardous. The interviews with

businesses demonstrated that trade associations were an important source of support on legislative issues. Developing links with the C&I trade associations to communicate consistent, sector-specific information related to hazardous waste legislation and management will help significantly improve the understanding of the regulations and responsibilities.

The second requirement is to reduce the quantities of hazardous waste being generated in the first place, due to limited existing regional capacity to pre-treat and landfill hazardous wastes. This will require training for specific sectors on the benefits of good house keeping and material handling to minimise process/storage waste of hazardous products. It will also require technical support on the substitution of hazardous materials with non-hazardous alternatives. There may be scope to work with Envirowise to increase company visits advising on hazardous waste issues.

Over 124,000 tonnes of kitchen compostable material is estimated to be disposed to the general waste of the commercial and industrial sector annually. Around 53% of this emanates from sector group E–O, with another 38% from group DA–DE. These groups would provide the primary focus for any segregation strategy for this material type, with the food and drink processing, food retail and hospitality sectors the obvious starting points. The food and drink processing sector is the most advanced in terms of managing its compostable waste stream, with instances of companies using outlets such as the animal food industry as a market for this material. However, to manage this material more effectively on a large scale is likely to require the development of new facilities within the region. Landfill Regulation targets to reduce biodegradable municipal waste over time are driving research into the feasibility of options for managing compostable materials. The Regional Assembly must ensure that compostable waste from the commercial sector is considered as part of any future feasibility studies and is included in any regional plans to manage this material more effectively.

6.2 Engaging business

For a company to engage in improved waste management activity, it must first of all develop a clear understanding of what is being discarded and how this waste is being generated. A large amount of waste audit activity is being carried out within the region, with various support organisations and consultancies delivering visual and physical compositional waste audits for companies. This was evident when recruiting businesses to participate in this project. Many businesses have received such audits or have been approached about receiving this type of service. As well as through private consultancies providing specific support, C&I companies have received waste-related audits through Envirowise, Business in the Environment, waste management companies and via the sub-regional Business Links. It is possible that a large proportion of C&I companies in the region will, at some point over the last three years, have been offered the opportunity to receive some form of support to identify their waste arisings. A significant proportion of these companies will have opted not to receive this support and may be unwilling to do so in the future.

One potential way to overcome this resistance would be to provide a more generic form of support that can be accessed easily at the company's convenience. For example, waste compositional information from this and other research could be used to develop a waste calculation tool for specific business sector types. This might take the form of a downloadable spreadsheet that companies can use to input basic information on turnover and employment to generate an anticipated breakdown of their waste stream. Based on this information a company could then target specific materials and benchmark their future performance.

Having identified key materials to target for reduction, reuse and recycling a company then faces the task of implementing improvements. Free support is available regionally through a variety of organisations including: Envirowise, Business in the Environment, Business Links, the National Industrial Symbiosis Programme, Green Business Network, and the Mini Waste Faraday Partnership. Envirowise in particular offers free telephone advice on specific waste-related issues as well as good practice guides, site audits and supply chain workshops for specific sectors. This support will continue until April 2006, with the possibility of continued funding thereafter.

It is crucial that companies are made aware of the free support that is on offer and that they take the opportunity to utilise this. A regional advisor is currently being recruited by Envirowise to work with Yorkshire Forward and other regional networks to engage as many C&I companies as possible in this support. At a sub-regional level, Business Links also offers free telephone advice for businesses on environment issues, assigning them to the most appropriate form of support. These initiatives should help to reach more companies within the region and ensure that support projects are not being duplicated.

Based on interviews with the companies audited, it is apparent that for small businesses, contractors are often unwilling to collect the small amounts of potentially recyclable material they generate. In many cases, businesses resort to recycling their materials at civic amenity sites intended for household waste. They have the potential to breach their Duty of Care for managing waste as a result. Efforts need to be increased in the sub-regions to identify clusters of small business that can receive joint collections of recyclables from contractors and benefit from the resulting economies of scale. Potential exists for this to take place on industrial estates, business parks and in shared buildings. This may involve pilot studies to monitor the feasibility of developing joint collections at strategic sites.

Where recycling does take place, even at the most proactive companies systems are often inefficient, with staff either unaware or dismissive of segregation systems. The most successful systems are those where waste management responsibilities have been allocated at both strategic management and operational levels. Companies with an EMS operate in this way, with documented procedures and responsibilities for such processes. Those responsible for waste management at a strategic level allocate recycling responsibilities to specific members of staff at an operational level.

The most successful companies regularly brief all staff on the systems in place through their available communication channels. These might include the intranet, use of posters and signage in relevant areas, briefings at staff meetings and in newsletters. Regular turnover of staff at C&I companies should not inhibit waste management systems and this is where communication and training for new staff plays a key role in maintaining good waste management practices in the long-term. C&I companies require external support to develop training systems and improve communication of waste messages within their businesses.

In summary, potentially recyclable/compostable materials generated in large quantities in specific sub-regions now need to be targeted for reduction using existing and forthcoming networks of support. By focusing on materials such as card, metals, compostable waste and plastics there is the potential to achieve a much higher C&I recycling rate within the region. The reduction and correct management of hazardous waste materials also warrants special attention, given the quantities estimated to be disposed of to non-hazardous landfill.

7. Summary of actions and potential outputs

As discussed above, C&I businesses will require support in order to improve their waste management performance within the region. The general support required is summarised below in no particular order in Table 11.

Table 11: Generic requirements and actions for improved C&I management

Support requirement	Potential action
1. Identification of waste composition and arisings	<ul style="list-style-type: none"> • Development of a waste composition and arisings calculator based on information from this report and other research
2. Staff waste training	<ul style="list-style-type: none"> • Development of staff training packs • Delivery of training sessions for relevant personnel • Potential to link in supply chain workshops with this training for specific sector groups
3. Internal communication	<ul style="list-style-type: none"> • Development of communications packs, linking in with good practice from the national Recycle Now campaign, to be used internally • Development of generic visual materials (signage, posters etc) that can be accessed by businesses for use internally
4. Supply chain engagement	<ul style="list-style-type: none"> • Facilitation of supply chain engagement to encourage joint waste minimisation projects • Focus on innovation in packaging reduction/substitution and reduction in hazardous content in products
5. Joint collections for small businesses generating small quantities of recyclables	<ul style="list-style-type: none"> • Pilot studies to identify the feasibility of establishing joint facilities for reuse and recycling at different sites • Engagement of waste management companies infeasibility research
6. Dissemination of legislation	<ul style="list-style-type: none"> • Clear, unambiguous dissemination of waste legislation • Partner trade associations to communicate obligations

Table 12 provides a summary of the support required to improve the management of specific materials being sent to the general waste stream. These materials have been prioritised, taking into account the following:

- potential tonnage available
- ease of segregation and storage at the host company's site
- availability of infrastructure for collecting and recycling/composting this waste
- potential negative impact upon the environment

Commercial and industrial waste in Yorkshire and the Humber

Table 12: Summary of actions and potential gains for specific general waste materials

Priority	Material	Support required	Potential (tonnes)	Key sector groups
1	Hazardous waste	<ul style="list-style-type: none"> • Increase dissemination of related regulations • Emphasise penalties for non-conformance • Partner trade associations to communicate obligations • Encourage suppliers to design out hazardous content 	33,353	DK-DN (73%)
2	Recyclable Paper	<ul style="list-style-type: none"> • Promote paper reduction and reuse systems • Promote recycled content in procurement • Encourage segregation for recycling • Highlight contacts providing these services • Support training and communication in companies • Pilot joint collection schemes for small businesses 	261,107	E-O (75%)
3	Cardboard	<ul style="list-style-type: none"> • Engage customers and suppliers to use plastic totes • Promote purchasing of reused card boxes • Promote reuse and recycling best practice • Identify contacts providing recycling services • Support training and communication in companies • Pilot joint collection schemes for small businesses 	256,229	E-O (56%) DA-DE (30%)
4	Glass	<ul style="list-style-type: none"> • Engage customers and suppliers to promote returns • Promote recycling (mixed or by colour) • Identify contacts providing these services • Support training and communication in companies • Pilot joint collection schemes for small businesses 	92,131	E-O (95%)
5	Plastic film	<ul style="list-style-type: none"> • Engage customers and suppliers to use Load hog lids • Promote recycling best practice • Provide advice on baler requirements and costs • Identify contacts providing recycling services • Support training and communication in companies • Pilot joint collection schemes for small businesses 	132,947	DA-DE (52%) E-O (32%)
6	Ferrous metals	<ul style="list-style-type: none"> • Promote recycling best practice • Identify contacts providing these services • Support training and communication in companies 	89,910	DJ (56%) DK-DN (17%)
7	Wood	<ul style="list-style-type: none"> • Encourage reuse systems • Promote purchasing of reused pallets • Promote recycling best practice • Identify contacts providing these services • Support training and communication in companies 	58,761	DK-DN (30%) DJ (15%)
8	Rigid plastics	<ul style="list-style-type: none"> • Engage customers and suppliers to minimise packaging • Promote recycling best practice • Identify contacts providing these services • Support training and communication in companies • Pilot joint collection schemes for small businesses 	94,485	DA-DE (44%)
9	Kitchen compostable	<ul style="list-style-type: none"> • Research options for managing compostable material • Investigate potential to link with municipal infrastructure • Engage customers and suppliers to minimise food waste 	138,604	E-O (53%) DA-DE (38%)
10	Kitchen non-compostable	<ul style="list-style-type: none"> • Increase dissemination of ABP regulations • Research options for managing remaining material • Investigate potential to link with municipal infrastructure • Engage customers and suppliers to minimise food waste 	124,791	DA-DE (63%)

Appendices

Appendix 1: Sector group and SIC breakdown

Appendix 2: Total waste generation per sector

Appendix 3: Waste categories explained

Appendix 4: Questionnaire

Appendix 1: Sector group and SIC breakdown

Category group	Sector
DA–DE	<ul style="list-style-type: none"> • DA – manufacture of food products, beverages and tobacco • DB – manufacture of textiles and textile products • DC – manufacture leather and leather products • DD – manufacture of wood and wood products • DE – pulp, paper, and paper products
DF–DH	<ul style="list-style-type: none"> • DF – manufacture of coke, refined petroleum products and nuclear fuels • DG – manufacture of chemicals and chemical products • DH – manufacture of rubber and plastic products
DI	<ul style="list-style-type: none"> • DI – manufacture of other non-metallic mineral products
DJ	<ul style="list-style-type: none"> • DJ – manufacture of basic metals and fabricated metal products
DK–DN	<ul style="list-style-type: none"> • DK – manufacture of machinery and equipment not elsewhere classified • DL – manufacture of electrical and optical equipment • DM – manufacture of transport equipment • DN – manufacturing not elsewhere specified.
E–O	<ul style="list-style-type: none"> • E – electricity, gas and water supply • F – construction • G – wholesale and retail; repair of motor vehicles, motorcycles and personal household goods • H – hotels and restaurants • I – transport, storage and communication • J – financial intermediation • K – real estate, renting and business activities • L – public administration • M – education • N – health and social work • O – other community, social and personal service activities

Appendix 2: Total waste generation per sector

Table 10: Total waste (including segregated materials) produced by C&I companies in Yorkshire and Humber (1998/99)

Region	Sector group						Total
	DA-DE	DF-DH	DI	DJ	DK-DN	E-O	
West Yorkshire	783,567	852,115	61,797	126,041	381,350	857,994	3,062,863
South Yorkshire	201,243	9,305	431,690	1,871,702	131,458	343,131	2,988,529
North Yorkshire	512,243	19,410	0	36,069	282,307	203,362	1,053,390
Humberside	149,793	615,957	7551	4,161,056	152,645	161,812	5,278,948
Yorkshire and the Humber	1,646,845	1,497,051	501,037	6,194,867	947,760	1,596,169	12,383,729

Appendix 3: Waste categories explained

CAT No.	CATEGORY	DETAIL AND EXAMPLES
1	Kitchen compostable	Uncooked kitchen food waste (fruit and vegetables, tea bags)
2	Kitchen non-compostable	Cooked kitchen food waste
3	Garden waste	Plants, soil, cuttings from site maintenance
4	Recyclable paper	Office paper, envelopes, newspapers, magazines etc
5	Compostable paper	Tissue paper, paper towels, contaminated paper
6	Non-recyclable paper	Waxy paper, windowed envelopes
7	Cardboard	Flat and corrugated card
8	Wood	Treated and untreated wood, including shavings
9	Ferrous metals	
10	Non-ferrous metals	
11	Glass	Clear and coloured
12	HDPE bottles	Natural and coloured bottles
13	PET bottles	Clear bottles
14	Plastic film	Shrink-wrap, bagging etc
15	Other rigid plastics	Any plastics maintaining their form
16	WEEE	Waste electrical and electronic equipment
17	Hazardous waste	Materials exhibiting hazardous properties or contaminated with such substances
18	Non-hazardous liquid waste	
19	Other	Anything not falling into the categories above. This general category is necessary due to the range of businesses being audited.
20	Fines (<20mm)	Small particulate

Appendix 4: Questionnaire

Contact details and company information

Company name	
Company contact	
Telephone	
Email	
Address	
Business activity	
No. of FT employees	
Company turnover	
No. days operate per week	

Waste information

What type/size of container is used for general waste disposal? (eg skip, euro bin, compactor)	
How often is the container collected and by whom?	
What is the cost per uplift?	
Is the container full on collection?	
Is the general waste sample presented (on the day), a fair representation of the waste throughout the year?	
Are any materials segregated for recycling? For each material obtain details on: <ul style="list-style-type: none"> • Company collecting • Quantity collected. 	
Do you reuse any materials?	
What materials could potentially be minimised, reused or recycled that are not already?	
Are there any barriers that prevent improved waste management? <ul style="list-style-type: none"> • any change is perceived as being too expensive • there is no backing from management for improvements • there are no staff with the time to focus on this • limited space is available on-site for segregation of materials • staff are not willing to participate in reuse/recycling • recyclers are unwilling to collect material generated in small quantities • insufficient knowledge to enable changes to be made • other reason (please state)._____ 	Yes/No
Do you generate any hazardous or difficult wastes?	
How are these dealt with?	
Do you have any of the following? <ul style="list-style-type: none"> • EMS (standard) • Environmental policy • Environment manager • IPPC permit (or applying for). 	

Commercial and industrial waste in Yorkshire and the Humber

<p>Are you aware of your responsibilities regarding any of the following pieces of legislation?</p> <ul style="list-style-type: none"> • Environmental Protection (Duty of Care) Regulations 1991 • Producer Responsibility Obligations (Packaging Waste) (Amendment) Regulations 2000 • Packaging (Essential Requirements) Regulations 2003 • Landfill (England and Wales) Regulations 2002 • Animal By-Products Regulation 2003 • Special Waste (Amendment) Regulations 1996 • Waste Management Licensing Regulations 1998 • Pollution Prevention and Control Regulations 2000 • Waste Electronic and Electrical Equipment Directive 2003. 	<p align="center">Yes/No/Not affected</p>
<p>Do you receive support from any of the following regional networks/organisations?</p> <ul style="list-style-type: none"> • Business in the Community/Business in the Environment • Business Link • Envirowise • Environment Agency • Environmental Business Network • Environmental Consultancies • Food and Drink Processing Faraday • Green Business Clubs • Green Business Network • Green Business Support Organisation Network (GBSO) • Groundwork • National Industrial Symbiosis Programme • The Carbon Trust • Trade associations • Universities • Waste exchanges. 	<p align="center">Yes/No/Aware of</p>