



# Waste Management in Small and Medium Enterprises (SMEs): Compliance with Duty of Care and implications for the Circular Economy

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## ABSTRACT

It is estimated 30.8 million tonnes of waste is generated by Small and Medium Enterprises (SMEs) in England, more than is generated by households. Despite this there is surprisingly limited research nationally and internationally on the management of waste from SMEs. In England businesses have a Duty of Care to ensure that their waste is managed in a responsible way and it is illegal for them to household waste services. This paper presents the results from semi-structured interviews and site visits with 100 SMEs to assess levels of compliance with Duty of Care. It also presents the results of analysing 3.8 tonnes of household waste to identify levels of waste from SMEs illegally entering the household stream. The author believes this is the first study which attempts to estimate levels of business waste abuse of household services through undertaking waste composition analysis. With policy makers increasingly focusing on the Circular Economy the research is the first to estimate levels of resource leakage of recyclable and biowaste from SMEs into the household waste stream. 25% of SMEs interviewed were found to be illegally using household services for their waste, and 38% for their recycling. Waste composition analysis of household waste found that 6% of the waste sampled was from SMEs and that 77% of this waste was biowaste or dry recyclable materials that could have been diverted from disposal through recycling programmes. The paper considers the implications of these findings and presents recommendations to improve the management of the SME waste stream.

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## 1. Introduction

Whilst there is a significant body of research into the management of household waste there is surprisingly limited research into the management of commercial and industrial waste (hereafter referred to as C&I or business waste) both in England and worldwide. The definition of C&I waste in England is set out in section 75 of the Environmental Protection Act 1990 (Great Britain, 1990) and is all waste generated by commerce and industry. Table 1 provides a summary of the C&I waste definition and a breakdown of waste arisings. Whilst England has the Waste Data Flow system which requires local authorities to return data to government on the quantities and management of household waste, no such system exists for C&I waste leading to uncertainties in arisings and data gaps. Improving the quality of C&I data has been identified a priority by the government (Department for Environment, Food and

Rural Affairs, 2018). The latest government estimate is that 37.9 million tonnes of C&I was waste generated in 2017 far exceeding the 22.4 million tonnes produced from households (Department for Environment, 2019).

Whilst establishing effective systems for managing C&I waste is pivotal in our attempts to meet the principles of a Circular Economy, the waste stream has historically been overlooked in both national and European waste policy. This was acknowledged in the government's 2011 Review of Waste Policy where the government stated it would be taking steps to improve the waste and recycling services to businesses, especially Small and Medium Enterprises (hereafter referred to as SMEs) (Department for Environment, Food and Rural Affairs, 2011a). This commitment to support SMEs was reinforced in the government's most recent strategy 'Our Waste, Our Resources' published in 2018 (Department for Environment, Food and Rural Affairs, 2018).

The European Commission defines SMEs as businesses with less than 250 employees or have a turnover of less than €50 million (see Table 2). Globally SMEs represent 90% of businesses and more than

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**Table 1**  
**Definition, arisings and management of Commercial and Industrial Waste in England.** (Adapted from [Department for Environment, Food and Rural Affairs & Government Statistical Service, 2019a](#); [Great Britain, 1990](#)).

Waste stream	Definition	Tonnes generated 2017 (million tonnes)
Commercial	Waste from: premises (including agriculture) used wholly or mainly for the purposes of a trade or business or the purposes of sport, recreation or entertainment excluding household waste or industrial waste.	27.1
Industrial	Waste from: - any factory; - any premises used for the purposes of, or in connection with, the provision to the public of transport services by land, water or air; - any premises used for the purposes of, or in connection with, the supply to the public of gas, water or electricity or the provision of sewerage services; - any premises used for the purposes of, or in connection with, the provision to the public of postal or telecommunications services; or any mine or quarry.>	10.8

**Table 2**  
**Definition and waste generation by businesses in England.** (Adapted from [Department for Business, Energy & Industrial Strategy and Office for National Statistics, 2018](#); [Department for Environment, Food and Rural Affairs and Government Statistical Service, 2011](#); [ECORYS, 2012](#) and [European Commission, 2005](#)).

Category	Number of employees	Turnover	% of enterprises in EU	% of enterprises in England	Weight of waste (million tonnes)	% of Total C&I waste
Micro	1 to 9	≤€2 million	92.2	95.7	5.9	12.3
Small	10 to 49	≤€10 million or balance sheet total ≤€10 million	6.5	3.6	10.7	22.4
Medium	50 to 249	≤€50 million or balance sheet total ≤€43million	1.1	0.6	14.2	29.6
Large	Over 250		0.2	0.2	17.1	35.7

50% of employment ([World Bank, 2020](#)). Across the [Organisation for Economic Co-operation and Development \(OECD\) \(2019\)](#) almost one person out of three is employed in a micro firm with less than 10 employees, and two out of three in an SME. In many countries SMEs contribute more than 50% of GDP ([International Labour Organization, 2020](#)). At the start of 2018 SMEs accounted for 99.9% of all private sector businesses, 59.2% of private sector employment and 51.0% of private sector turnover in England ([Department for Business, Energy & Industrial Strategy and Office for National Statistics \(2018\)](#)). As such SMEs have a vital role to play in the economy, employment, environmental protection and resource flows.

The most recent data providing a breakdown on the levels of C&I waste based on businesses size was published in 2011 ([Department for Environment, Food and Rural Affairs and Government Statistical Service, 2011](#)) – subsequent government studies do not show this detail. Data shows that 64.3% of the total C&I waste generated in England originated from SMEs with 12.3% generated by businesses with less than 10 employees (see [Table 2](#)).

Historically there has been a focus on the environmental impact of large business but due to economic, social and legislative drivers, larger businesses, in general, have well established waste management systems. For many SMEs this is not the case.

In England Duty of Care legislation sets out the responsibility of businesses towards managing the waste they generate. The legislation aims to ensure that the waste generated does not cause harm to the environment and human health. Under Duty of Care businesses must ensure the waste they produce is managed in a responsible way and it is illegal for businesses to place waste they generate in services for household waste. In other countries similar legislation exists. For example in the USA and Australia it is common for conditions on the use of bins and storage of waste to be set out in ordinances – see [City and County of Denver, Colorado \(2016\) Code of Ordinances Chapter 48 Waste Management](#), and the [City of Sydney \(2013\) Waste Policy Local Approvals Policy For Managing Waste In Public Places](#). Despite the levels of waste generated from

businesses there are surprisingly few journal papers on the management of C&I waste and compliance with Duty of Care regulations or similar regulations in other jurisdictions.

## 2. Aim and contribution to knowledge

This paper presents the results of research conducted in Brighton and Hove City on the south coast of England focusing on the management of waste in SMEs and compliance with Duty of Care regulations. The aims were to (i) build on existing literature to understand how SMEs are currently managing their waste (ii) to understand levels of compliance with the Duty of Care regulations (iii) through waste composition analysis estimate levels of C&I waste illegally entering the household waste stream (iv) consider the implications of current practice and make recommendations.

The research contributes to the limited knowledge of how businesses are currently managing their waste and levels of compliance with Duty of Care regulations. In addition to collating data from 100 SMEs through semi-structured interviews, it is the first study that the author is aware of which attempts to estimate levels of business waste abuse of household services through undertaking waste composition analysis. With global policy makers increasingly focusing on the Circular Economy the research is the first study to estimate levels of resource leakage of recyclable and biowaste from SMEs entering the residual household stream that should be managed more appropriately. The study presents indicators to identify C&I waste entering the household waste stream which could assist researchers undertaking similar research and highlights a range of implications associated with non-compliance with Duty of Care. Given the levels of waste generated, improved resource recovery in SMEs could have a significant environmental, economic and social benefits.

The legal framework and system for managing C&I waste in England is presented followed by a review of literature on compliance with Duty of Care. The methods adopted are presented followed by the results, discussion and conclusion.

### 3. Management of the C&I waste stream in England

#### 3.1. Duty of Care legislation

The C&I waste stream is diverse and complex with many variables. The waste ranges from specialist chemicals through to materials similar in composition to the household stream. The waste is generated from single employee enterprises through to multinational businesses. Section 34 of the Environmental Protection Act 1990 places a Duty of Care on all businesses to ensure that any controlled waste produced as part of their business or within their workplace is handled safely and within the law (Great Britain, 1990). The regulations require businesses not to leave waste or recycling out on the street without arrangements for its collection. The waste must be contained properly so it does not spill onto the pavement or attacked by vermin. Businesses are responsible for their waste until it has been collected and they must ensure that their service provider is a licensed waste carrier registered with the Environment Agency, the regulatory body for waste in England. A Waste Carriers License means the service provider is legally allowed to collect and transport waste.

Throughout the management of waste there is a system of Waste Transfer Notes that records the transfer of waste from one party to another therefore providing an audit stream. Fig. 1 provides an overview of the information required on the Waste Transfer Note. Businesses are legally required to keep copies of Waste Transfer Notes for 2 years as proof of compliance with Duty of Care. Transfer notes are issued every time waste is collected however where collection arrangements are consistent, for example the same types and quantities of waste are collected each week, a single transfer note might be issued to cover the year. It is estimated that 23 million Waste Transfer Notes are produced annually and some 50 million are in storage at one time (Lee, 2013). To reduce the level of paperwork and to develop a system where the information on these notes could be utilised to improve data on the levels and management of C&I waste, an electronic version called EDOC was launched in 2014. The system is voluntary and could be used by local authorities, private companies or waste producers, and by the beginning of 2017 there were over 5000 active users (Edoconline, 2017).

In order to meet Duty of Care businesses have two main options. They could pay the local authority to collect their waste. In England local authorities have a legal obligation to manage household waste but they also have a duty to arrange for the collection of waste from businesses if requested (Great Britain, 1990). This system dates to the Public Health Act of 1936 where local authorities were empowered, but not obliged to collect waste from businesses and the local authority could make a reasonable charge for collection (Great Britain, 1936). At present 68% of local authorities provide a business residual waste collection service and 49% provide a business recycling collection however the range of materials collected for recycling varies: whereas 97% of these authorities collect cardboard, only 39% collect plastic bottles and 9% food waste (Waste Resources Action Programme, 2013).

Alternatively, businesses could enter contracts with private waste suppliers ranging from small independent businesses through to multi-national companies. GHK (2010) investigated the management of waste from 1517 SMEs and only 29% of the largest SMEs used local authorities for recycling services compared to 68% for sole traders. This is likely to be due to the private contractors being able to offer a more comprehensive and flexible service than local authorities (GHK, 2010). According to the Federation of Small Businesses (2010) 35% of small businesses are dependent on private waste management contractors as the local authority in their area does not offer a service (cited by 45%), private companies meet their needs more efficiently (cited by 27%) or that private companies offer a cheaper service (cited by 23%). The private sector playing an important role in the management of C&I waste is not new. Data from 1991 shows that of the 15.3 million tonnes of C&I being generated in England, 80% was collected by the private sector (Department of Energy, 1991). Globally the approach towards management of C&I waste varies and in some countries businesses are reliant on private waste companies for collection and local authorities have never offered a collection and stopped their services. For example: the City of Copenhagen, Denmark no longer collects waste and recycling from businesses (City of Copenhagen, 2018); in the 1950s New York City's Department of Sanitation stopped collecting C&I waste and transferred responsibility to the private sector (New York City Department of Sanitation, 2012).

Non-compliance with Duty of Care could have a range of

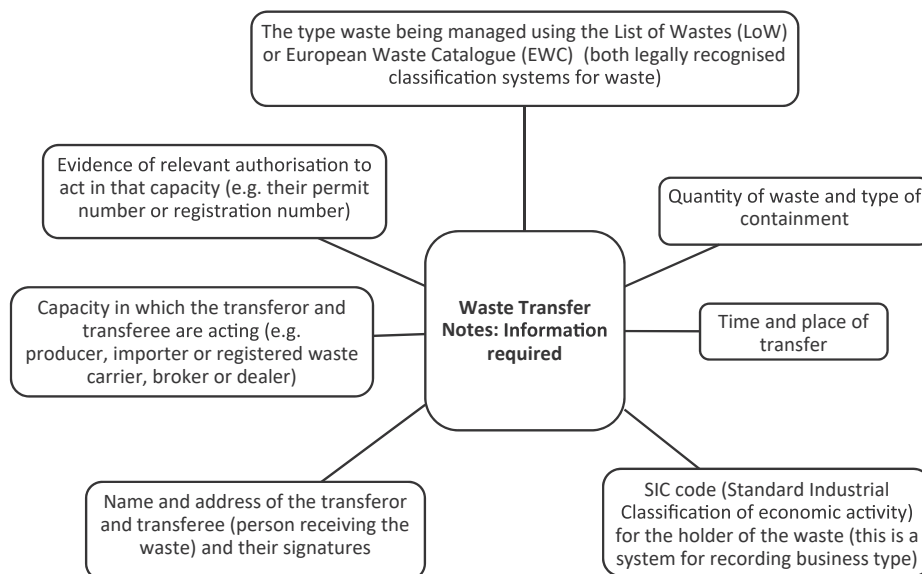


Fig. 1. Information required on a Waste Transfer Note. (Department for Environment, Food and Rural Affairs, 2016).

implications. Firstly, there is no evidence that a business is managing its waste responsibly and they could be using the household waste services at the expense of taxpayers. In England households pay Council Tax and some of that revenue contributes towards covering the cost of waste services but only for household waste - it is illegal for businesses to use household services to manage their waste or recycling, even for micro businesses or businesses based at home. Under section 34 A (2) of the Environmental Protection Act 1990 (Great Britain, 1990) businesses can be issued with a Fixed Penalty Notice of £300 if they fail to produce a Waste Transfer Note.

A business that is not having waste collected could illegally be dumping the waste, this is known as fly tipping. The business could either dump the waste themselves or pay to have their waste collected by an unlicensed contractor who then dumps the waste in public spaces or on private land. Fly tipping is a significant problem in England with approximately 1 million reported incidents annually costing local authorities £57.7 million to clear up (Department for Environment, 2017). In 2018/19 70,000 of these incidents involved C&I waste, a 3% increase on the previous year (Department for Environment, Food and Rural Affairs and Government Statistical Service, 2019b). Fly tipping involving C&I waste is not a new problem; research from the early 1980s by the London Wide Initiative On Fly Tipping (1984) estimated between 600,000 and 1 million tonnes of waste was being fly tipped annually with C&I identified as being a key contributor.

### 3.2. Review of literature on Duty of Care compliance

Few previous journal papers have researched compliance with Duty of Care regulations in England or compliance with similar regulations in other countries. Wilson led on the two most in-depth peer reviewed studies to date assessing compliance with a range of environmental regulations, including Duty of Care, within SMEs. Whilst both studies had small sample sizes a detailed evaluation of compliance was conducted through visiting premises and interviewing SMEs. In the first study a three-stage assessment was undertaken with 36 SMEs including analysing the detail of information recorded on Waste Transfer Notes. Only 28.0% were found to be completely compliant with the Duty of Care regulations (Wilson et al., 2007). Further assessment was undertaken at 44 additional SMEs and 35.5% were compliant (Wilson et al., 2015). Radwan et al. (2010) similarly undertook face to face interviews with nine small hotels to understand level of compliance with Duty of Care. They found that most hotel owners were unaware of their legal requirements for disposing of waste with some illegally using the household services. However, the study was narrow in scope only looking at hotels and again had a limited sample size of 9.

All other studies to date have been commissioned by the waste management industry as they have a vested interest in understanding how businesses manage their waste as historically there has been a problem with businesses using household waste services. SMEs have been motivated by short term gains and many small businesses took their waste home and disposed of it through the domestic route thereby avoiding charges (House of Lords Science and Technology Committee, 2008). This view has been supported in studies commissioned to estimate levels of C&I waste arisings and management. A common method has been to survey a representative sample of businesses based on sector and number of employees and then extrapolate the results. Studies including Jacobs (2011) and Urban Mines (2011) have omitted surveying businesses with less than 5 employees as the assumption was that much of this waste would be entering the household waste stream.

In the GHK (2010) study telephone surveys were conducted with 1517 businesses of which 31% claimed they had not heard of Duty of Care and a third stated that they did not have their waste or

recycling collected. There was a correlation between the number of employees and illegal use of household services: 40% of SMEs with less than four employees were using household services, compared to 5% with over 20 employees, and none for SMEs with over 100 employees.

The Right Waste, Right Place campaign was launched in 2016 which is managed by the Environmental Services Association and supported by the Environment Agency, Chartered Institution of Wastes Management and the Environmental Services Association Environment Trust. The campaign aims to increase awareness of Duty of Care amongst businesses and contains lots of useful resources and clear guidance on the requirements of businesses to comply with regulations (Right Waste, Right Place, 2017). In 2016 the campaign published data showing there continues to be high levels of non-compliance with 46% of businesses not knowing what happens to their waste once it leaves site and a third not sure whether they completed or kept Waste Transfer Notes (Right Waste, Right Place, 2017).

Table 3 presents results of local authority commissioned studies evaluating compliance with Duty of Care Regulations within SMEs. In each between 5% and 35% of businesses stated they were illegally using household services to manage their waste. A limitation is that these studies pre-date 2010 and the period of austerity in the UK. Prior to austerity the government had several initiatives to support local authorities conduct research into waste including the Waste Implementation Programme (WIP) and Business Resource Efficiency & Waste Centre for Local Authorities (BREW). Post austerity similar programmes have not been established funding more recent research.

A range of methods were deployed in these studies. Derbyshire County Council (2007), Lancaster City Council (2006) and YouGov (UK) used self-completion questionnaires. Studies also deployed online (YouGov, 2007) or telephone surveys (Entec, 2008) without visiting businesses in person. As explored in the methodology these approaches have limitations.

Household services where C&I waste could illegally be deposited include public litter bins, bring sites (central places located typically in car parks or shopping areas where people can take materials for recycling), kerbside collections and Household Waste Recycling Sites.

Household Waste Recycling Sites are centralised facilities to where the public can take waste that would not be collected as part of the normal collection service – for example bulky waste, garden waste, or quantities of waste over the limit the local authority would collect from the kerbside. Historically there has been a problem with businesses illegally using these facilities. Cameron-Beaumont and Bridgwater (2002) undertook the most detailed nationwide study to date to evaluate business waste abuse at Household Waste Recycling Sites. The study involved observing waste entering 10 Household Waste Recycling Sites in the Bristol area of England for a week. All vehicles entering the sites were observed and through a combination of vehicle type, type of waste being delivered, bins used, presence of objects indicating a trader (such as tools/invoices), and the subjective view of the surveyor, an assessment was made on if the waste originated from a trader. The surveyor also made an estimate of the volume of waste being deposited. However, the research did not conduct detailed analysis to understand the weights and composition of waste entering the sites to corroborate the observations. It was estimated 13% of waste entering the sites was delivered by businesses - at that time if the figure was extrapolated across England and Wales it would equate to 830,000 tonnes of waste illegally entering sites per annum. In 1995 the government announced the Landfill Tax which placed a levy on each tonne of waste sent to landfill thereby making it more expensive with the aim of promoting alternatives higher up the

**Table 3**  
Results from a review of studies evaluating compliance with Duty of Care Regulations within SMEs.

Study	Location	Method	Number of businesses surveyed	Findings on compliance with Duty of Care
Derbyshire County Council (2007)	Derbyshire	Self-completion survey	507	15% managed their own waste – with many using household services.
Entec (2008)	Rutland	Telephone survey	418	5% were using household waste services.
Knowles (2008)	Cambridgeshire	Cold calling questionnaire	194	17% had compliance issues with many using household services.
Lancaster City Council (2006)	Lancaster	Mailed questionnaire	150	76% of businesses did not recycle. In addition, 18% stated that they used household services to recycle.
Urban Mines (2007)	Chester, Oldham and Bolton	Cold calling questionnaire	55	Around 25% of businesses admitted to using household services – this included taking waste home or using Household Waste Recycling Sites and Bring banks.
YouGov (2007)	UK	Online questionnaire	610	47% of SMEs did not have a contractor for collecting recycling. 34% of SMEs took their waste home to use the household services.

waste hierarchy (Landfill Tax HC Deb November 28, 1995 vol 267 cc1063–4). In turn this cost was passed onto the generators of waste with the cost of collection increasing. Cameron-Beaumont and Bridgwater (2002) estimated that business waste illegally entering Household Waste Recycling Sites doubled following the introduction of the Landfill Tax. As it became more expensive to have waste collected, businesses looked at alternative ways of disposing of their waste. In 2009 Hampshire County Council estimated that 18% of all waste delivered to Household Waste Recycling Sites in the county originated from C&I sources, costing over £1 million per year to dispose of (Maynard and Cherrett, 2009).

In recent years local authorities have implemented strategies to cut down on business use of Household Waste Recycling Sites including height barriers preventing vans from accessing sites, vehicle recognition software to monitor any vehicles frequently using sites, and security guards. These restrictions combined with other factors such as the recession, materials being diverted to kerbside collections, and better segregation of waste at sites has seen an overall reduction in residual waste entering Household Waste Recycling Sites from 4.2 million tonnes in 2000/01 to 1.7 million tonnes in 2016/17, a 84.8% reduction (Department for Environment Food and Rural Affairs, 2017). Monitoring and enforcing business waste abuse at Household Waste Recycling Sites is somewhat easier than preventing the illegal use of services for household waste at the kerbside or public spaces by businesses. No studies to date have attempted to identify and quantify levels of C&I waste being illegally deposited through kerbside collection or household waste services in public spaces.

## 4. Methodology

### 4.1. Phase 1: Interviews with businesses

Semi structured interviews were conducted with 100 SMEs in Brighton & Hove City. All participants were recruited by invites submitted through business networks or cold calling. On

recruitment an interview was arranged at a time convenient with the business. Semi-structured interviews were conducted face-to-face and on average lasted 40 min. Most studies conducted to date have involved either self-completion, online or telephone surveys. This research builds on the approach adopted by Wilson and Radwan through integrating visits to business premises and conducting interviews in person. Interviews have certain advantages over self-completion questionnaire – for example the interviewer can explain questions that the respondent has not understood, can ask for further elaboration of replies (Phellas et al., 2011) and the researcher can check they correctly understand the response which is not always possible with written replies (Denscombe, 2014). Phellas et al. (2011) suggest being asked questions by a sympathetic listener is experienced as more rewarding by research participants than being requested to complete a form for an anonymous researcher. Conducting interviews in person also means you are likely to get fuller responses compared to on-line surveys where participants may drop out and in general elicit lower response rates (Waste and Resources Action Programme, 2010). Through conducting face-to-face interviews and visiting the premises the researcher can also validate the responses (Phellas et al., 2011; Waste and Resources Action Programme, 2010), in particular for this research check the waste collection arrangements through observing the collection containers present and waste levels.

Businesses were chosen to broadly reflect business types in the City with 58% of participants from retail, 19% hospitality (including restaurants, hotels and takeaways), 6% legal services and the remainder from a range of business types. 88% of SMEs interviewed had less than 10 employees, therefore classified by the EU as micro businesses, with 61% having less than 4 employees.

To ensure data was collected to provide a true indication of how the businesses were managing their waste, there was no discussion in regards Duty of Care and their regulatory obligations. Businesses were questioned on waste management practice, contractual arrangements, and on the quantities of waste and recycling they

**Table 4**  
Headline results on how the SMEs interviewed managed residual waste and recycling (n = 100).

	Residual waste	Recycling
% of businesses with contract in place for collection	70	50
% of businesses taking materials to business waste depot	1	4
Total % using household waste service	25	38
% using HWRS/public bins	15	24
% taking waste home to put out in household collections	12	24
No answer/don't know	5	–

generated. 95% of businesses were able to supply data on the containers they used to store their waste and how full they were when collected this was corroborated by observations – allowing profiles to be generated on the levels of waste generated. Questions also covered barriers to recycling. Closed questions were analysed through categorisation and tallying of answers to identify the total number of participants who selected a certain response highlighting common patterns of behaviour. Thematic analysis was conducted of the open-ended questions using coding, creating categories for frequent and common phrases or words. All data was collected in confidence and analysed anonymously with researchers complying with Data Protection Act guidelines.

#### 4.2. Phase 2: Waste composition analysis

Brighton and Hove City is home to 275,800 people and located on the south coast of England. The city has a population density of 33.1 persons per hectare placing it in the 15% most densely populated local authority areas in England (Office of National Statistics, 2013). 50.2% of the housing stock is flats (a mixture of purpose-built flats, converted or shared houses or apartments in commercial buildings) compared to 22.1% for England (Brighton & Hove City Council, 2014). Historically in England local authorities have collected waste directly from households either weekly or increasingly fortnightly. The population density and high level of flats has led to historical waste management problems with residents not having space to store waste, or not wanting to keep it in their homes, therefore putting waste out on non-collection days. As a popular tourist destination and home to two Universities the problem is exasperated by a high transient population and residents not knowing how the waste collection system works or their collection day. Being located on the coast, Brighton & Hove has problems with gulls ripping open bags and thereby littering the streets. In response in 2004 the City Council trialled communal containers for waste collection where residents deposit waste at their convenience with the council emptying bins at regular intervals. The system has operated in parts of continental Europe for many years and has now been extended in the city with additional communal bins introduced for recycling in 2011. There are now around 300 × 3200 L residual bins on the streets of the city to cater for approximately 30% of households. This communal approach has been adopted by the other UK authorities including Bristol (Bristol City Council, 2016), Edinburgh (City of Edinburgh Council, 2010) and Newcastle (Newcastle City Council, 2015).

The research aimed to understand how much C&I waste was being deposited into these containers – again the containers were for household waste only and it is illegal for businesses to use them. Based on guidance from the local authority, samples of waste were taken from 4 areas – two from the city centre and two from residential areas. A sample from each area was taken on a Monday and a Wednesday. It was expected that the levels of C&I waste present would be higher in the city centre due to the proximity of businesses and on the Monday as this would be following the weekend when businesses would have had much of their weekly trade (i.e. waste from Saturday and Sunday would be in the collection for Monday).

Bin loads were collected as per normal and delivered to a depot for sorting. The sample was sorted into big bags, small bags, and other waste such as loose bulky waste, and then weighed. All bags were then checked for evidence of C&I waste – this included checking for letter heads, commercial type packaging, receipts, invoices and bags clearly of different composition to household waste. C&I waste was then isolated, sorted into categories and weighed.

All staff working on the project complied with the Data

Protection Act – the focus of the research was to understand the levels and composition of C&I waste rather than identifying individual businesses for follow up.

At the time of study Brighton and Hove City Council did not offer a waste or recycling collection to businesses and therefore companies had to use non-public sector providers or take materials to dedicated business waste drop off facilities in order to comply with Duty of Care regulations.

## 5. Results

### 5.1. Phase 1 – Interviews with businesses

Table 4 summarises the key results from interviews with the SMEs. Despite the Duty of Care regulations 25% openly stated that they used household services to manage their residual waste with 15% using Household Waste Recycling Sites or public bins, and 12% taking waste home to be put out in household collections (2% were doing both).

Similarly, 38% recycled used household waste services with 24% using public bins or Household Waste Recycling Sites, and 24% taking recycling home to place in kerbside collections (10% were doing both). 10% of businesses had service providers for collecting recycling but used household services to manage certain materials including plastic bottles, cardboard and metals which they did not generate in significant enough quantities to warrant a separate collection.

Only 70% of businesses interviewed said they had contracts in place for managing residual waste and 50% for recycling. In total 27 different contractors were named for handling waste, recycling or specialist waste streams such as cooking oil – this excludes those with internal systems or who did not want to name their contractor.

Businesses were given the opportunity to set out barriers to recycling – unsurprisingly cost (34%), lack of suitable services (25%) and lack of space (20%) were cited as the main barriers (see Fig. 2). Interestingly only 3% of businesses stated that they did not produce enough recyclables to warrant a collection.

Based on the information supplied by participating businesses it was possible to make an estimate of weekly waste and recycling generated for 95% of businesses sampled (see Table 5). Only 6% of businesses generated less than 60 L of waste per week – the size of a typical business waste sack. 72% would need a container more than 240 L to contain a weeks' waste and recycling.

### 5.2. Phase 2 – Waste composition analysis

3862 kg of waste was collected for analysis with samples varying from 726 kg to 1210 kg (see Table 6 - note Sample 3 of 1210 kg is not included due to no C&I waste being identified in the sample). Most of the waste collected was household waste as expected however 6.2% was found to be from businesses. Levels of business waste varied from 11.6% from the City Centre on a Wednesday through to 0% in the residential area on the Monday.

The C&I waste stream is heterogeneous - Table 6 contains details on the 10 most common materials and items present. Detailed data was collected on all materials but for brevity these have been combined into the 'Other' category representing 11% of the total C&I waste identified. This includes hessian sacks, hair, candles, various types of dense plastic items and packaging, polystyrene and foil.

Based upon materials which are commonly included in dry recyclable materials collections in England 30.6% of the material could have been recycled. The main dry recyclables were cardboard (15.1%), recyclable paper (7.3%) and glass (3.8%). By far the biggest

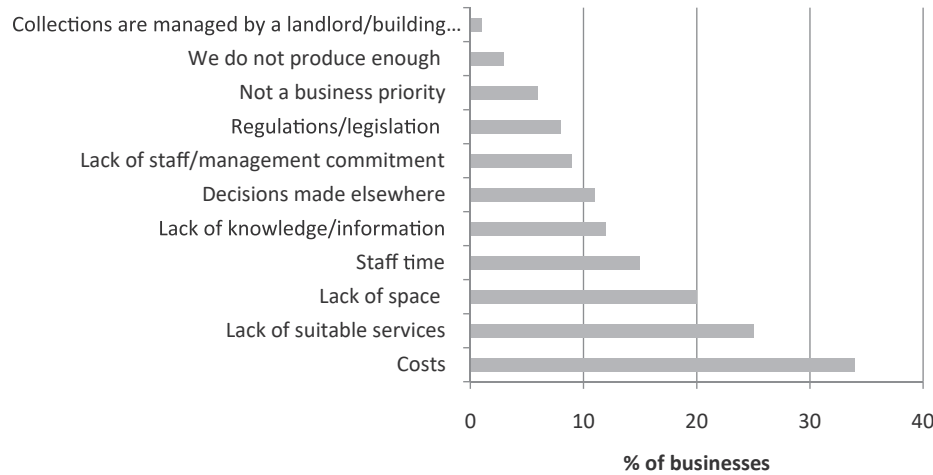


Fig. 2. Barriers to increased recycling (n = 100).

Table 5

Estimated total waste and recycling generated on a typical week by businesses interviewed (n = 100).

Quantity of waste produced per typical week	% of businesses
Less than a business waste sack 60 L	6
1 or 2 business waste sacks	10
Wheeled bin 140–239 L	12
Wheeled bin 240 L to 359 L	7
Wheeled bin 360 L to 1099 L	27
1100 L to 2199 L	22
Over 2200 L	11
Unknown	5

category was food waste representing 46.5% of all business waste present.

From the composition analysis a range of indicators were developed to identify C&I waste that might be useful for other researchers looking to undertake similar studies (see Table 7). Across the four samples there were 36 incidents of business waste abuse of household services involving 33 businesses (three businesses were found to be using the bins on two occasions). In addition, there was business waste from other sources but there was a lack of evidence of where it was from. For example, several cardboard boxes had their delivery address labels removed – seemingly on purpose to avoid detection. 72% of incidents involved businesses from the

hospitality industry including cafes, takeaways, restaurants and bed and breakfasts and this is reflected in the large quantity of food waste present.

## 6. Discussion

The results of the interviews and composition analysis support findings from previous research that a significant number of businesses are still failing to meet their legal Duty of Care requirements and that there is widespread use of household services. Only 70% of businesses had a contractor in place for residual waste and 50% a contractor for recycling. 27% of businesses openly stated that they used household services for residual waste and 38% for recycling. 6.2% of the waste sampled from the household stream was found to be from businesses. The implications of these findings are reflected on below.

### 6.1. Financial implications to the taxpayer

Businesses using household services are having their waste collection costs subsidised by taxpayers. In 2016/17 an estimated £835 million was spent by local authorities on waste collection and a further £2.0 billion on waste disposal (Department for Communities and Local Government and National Statistics, 2016). The composition analysis showed 6.2% of the household

Table 6

Composition of C&I sampled in the household waste stream - % by weight (note Sample 3 (1210 kg) not included due to no C&I waste being identified).

Material	Sample 1: City Centre Monday	Sample 2: City Centre Wednesday	Sample 4: Residential Wednesday	Total
Sample (kg)	1130	796	726	3862
C&I (kg)	95.7	92.5	50.9	239.1
C&I (% by weight)	8.5	11.6	7	6.2
Composition of C&I	%	%	%	%
Food waste	35.3	55.8	50.9	46.5
Cardboard	13.0	13.7	21.8	15.1
Recyclable paper	14.3	3.7	0.6	7.3
Plastic bags and film	7.9	4.0	9.4	6.7
Glass bottles and jars	2.5	4.0	6.1	3.8
Cans and aerosols	3.3	2.7	3.9	3.2
Shredded paper	7.2	0.0	0.0	2.9
Wet paper/tissue	0.0	1.3	4.1	1.4
Plastic bottles	1.5	0.6	0.8	1.0
Wood	1.4	1.1	0.0	1.0
Other	13.6	13.1	2.4	11.0

**Table 7**  
Indicators used to identify C&I waste present.

Sector	Indicator
All	Labels and price tags on products Shop leaflets and flyers Till rolls Names on deliveries
Hospitality	Wrappings from portion sized packaging e.g. packs of biscuits, butter/sauce/milk portions Paper towels Orders/receipts Catering sized packaging – large tin cans, sauce containers, large egg cartons Coffee machine grounds Kebab skewers Takeaway packaging
Retail	Newspapers/magazines with the business name written on Small toiletries typically given out in hotels and guest houses Branded bags Shrink wrap from deliveries

stream consisted of waste originating from C&I sources and the interviews support the findings from other studies that many businesses openly admit to using household services. Even if business waste levels were as low as 1% of the household waste stream nationally savings of £28 million could be achieved from not collecting and disposing of this waste. The diversion of this waste from the household waste stream could generate significant financial savings to local authorities with money redirected to priority areas such as health care and education.

#### 6.2. Unfair economic advantage over competitors

Businesses that use household services have an economic advantage over their competitors who are being responsible and fulfilling their Duty of Care obligations. A claim made by some SMEs is that they do not generate enough material to warrant payment for a separate waste or recycling collection (GHK, 2010). It was possible to estimate waste and recycling arisings per week for 95% of businesses sampled. Only 6% generated less than 60 L per week – the size of a typical sack, and only 16% less than 140 L, the size of a typical wheeled bin. The average arisings for those businesses that did not have a contractor was 271 L.

When questioned regarding barriers to recycling only 3% cited not generating enough waste as being a barrier to recycling. The results would suggest that for most SMEs sampled they generate enough waste to justify, at the very least, a residual waste collection. Other barriers such as will to recycle, space, cost and access to services are more significant. Similar barriers to recycling in SMEs were identified by the Federation of Small Businesses (2011), GHK (2010), Parsons and Kriwoken (2009), Radwan et al. (2010) and the Waste Resources Action Programme (2011).

#### 6.3. Public health implications

An important issue is the potential impacts on public health of businesses using household services. 46.5% of the waste sampled was food waste and unless this is managed responsibly this could have severe impacts upon public health. During the analysis nearly 50 kg of raw chicken carcasses and bones, evidently from a quick serve restaurant, were found deposited within the household stream. In addition to illegally using household services the business was in non-compliance with the Animal Bi-Product Regulations which sets out the requirement for managing food waste (Department for Environment, Food and Rural Affairs, 2011b) and therefore putting public health at risk.

#### 6.4. Resource leakage

The research highlights the leakage of valuable resources from business waste entering the household stream. Combined food waste and dry recyclable materials totalled 77.1% which could have been managed in a more sustainable way with elements recycled, composted or processed through anaerobic digestion. Policy makers are focusing on implementing the Circular Economy however the results from this research highlight that we do not even have the basic building blocks in place to manage SME waste appropriately.

#### 6.5. Impact on progress towards recycling targets

Under the EU Waste Framework EU Directive, 2008 (EU Directive, 2008/98/EC) the UK combined has a 50% recycling target for household waste to meet for 2020. In England the household waste rate has stagnated increasing by 1.1% since 2012 reaching 45.2% in 2017 Department for Environment, Food and Rural Affairs and Government Statistical Service (2019a). 45% of local authorities have seen their recycling rate reduce over the last 2 years (Department for Environment, Food and Rural Affairs, 2017). Through businesses using household services the total residual waste level is increased which in turn impacts on the UKs ability to meet the 50% recycling target. Conversely it is noted that, to a lesser degree, levels of C&I waste are also entering the household recycling stream thereby contributing towards the target. With even higher targets announced in the Waste Framework Directive (EU Directive, 2018/851) business waste levels entering the household waste stream could pose a further challenge in achieving these targets.

#### 6.6. Impact of austerity measures on enforcement levels

In 2010 the government announced public spending cuts of £81 billion by 2014/15 and therefore resources are becoming scarcer for local authorities (HM Treasury, 2010). Research by the Chartered Institution of Waste Management (CIWM) and Ricardo-AEA (2015) assessed the impact of these austerity cuts across local authority waste, recycling and street cleansing services across the UK and the Republic of Ireland through surveying local authority officers. Of local authorities responding 24% stated they had made cuts to enforcement activities – therefore the inadequate enforcement of existing regulations is going to deteriorate further.

The survey also asked local authorities for their perception of how austerity measures had impacted on levels of business waste abuse of household services. When removing non-answers – 31%



of English local authority officers felt there had been increases in business waste abuse at Household Waste Recycling Sites with 13% citing a reduction. In terms of household collections from the doorstep 30% felt there had been an increase in abuse of household services with none stating there had been a reduction. This perceived increase could be due to local authorities having less enforcement resources plus businesses having to cut costs during the recession thereby looking for cheaper ways to get rid of their waste. Moreover, the reported levels of fly tipping from businesses increased 3% in 2017/18 compared to the previous year (Department for Environment, Food and Rural Affairs and Government Statistical Service, 2019b). Less enforcement resources could lead to the fly tipping problem getting even worse. The Local Government Association (2018) (the body representing local government) estimate there will be a £8 billion funding gap for local authorities by 2025 – as such resources for enforcement will be further stretched.

## 7. Recommendations for consideration

There are a variety of possible options to improve the management of waste from SMEs and increase compliance with Duty of Care.

### 7.1. Duty of Care register

Throughout the country enforcement of Duty of Care by local authorities varies greatly and there is no available data on the level and type of enforcement activity being applied. At present there is no universal Duty of Care register that collates information on how businesses are managing their waste and that have a contract with a Licensed Waste Carrier. Development of such a register would have several key benefits. It would provide local authorities with knowledge of which businesses are managing their waste responsibly with registered contractors. The register could be used to identify businesses that are potentially not complying with Duty of Care and who the local authority could target to offer support and guidance, and if non-compliance continues, enforcement. Several bodies are engaged with visiting businesses to ensure they are complying with environmental and public health regulations. For example: waste officers inspecting business compliance with Duty of Care; water companies inspecting for business compliance with discharge regulations - under the Water Industry Act 1991 (Great Britain, 1991) premises found to be discharging fats, oils, greases and food scraps into the sewer causing blockages or compromise the safe operation of our assets, can be prosecuted); Environmental Health Officers inspect businesses for health and safety, food hygiene and food standards. All these stakeholders have an interest in ensuring businesses are managing their waste responsibility and data gleaned from inspections could be consolidated into the Duty of Care register thereby avoiding the duplication of effort.

The Duty of Care register could also potentially act as a deterrent to business waste abuse of household services. Businesses are required to pay business rates and they could be legally required to annually include a copy of their Duty of Care certificate when returning relevant paperwork. Whilst this would require administration from the local authority the costs could be offset from: savings accrued from less waste needing to be disposed of through the household stream; less clear up costs from fly tipping; revenue generated from targeted intelligence led enforcement activity which would result in either businesses being fined for non-compliance or signing up to a collection service provided by the private or public sector.

The argument against this would be it becomes an added burden to businesses; however, the counter argument is that those

businesses being responsible are being disadvantaged by those rival businesses who are acting illegally.

Variants of this system are already operating in the USA. In New York City under the 1996 *Recycling Requirements for Licensees* private waste management companies are required to submit a list of customers on a bi-annual basis to the Business Integrity Commission who regulate the private waste sector in the City. This includes contact details of all customers, the date on which services commenced, total charge per month and where the material was taken to (New York Department of Sanitation, 2012). A similar system operates in other parts of the USA such as San Diego (City of San Diego, 2017). A variation is where businesses themselves are required to supply evidence of their waste management arrangements. For example, businesses have been legally required to recycle in Philadelphia since 1994 under the Pennsylvania Act 101 and City Ordinance 1251(A) (City of Philadelphia, 2018). Businesses are required to fill out a recycling plan on-line explaining the recycling activities of the business and details of the contractor – hence the City has records of which businesses are complying with regulations. However there have been concerns expressed regarding the effectiveness of the system with many businesses reportedly not submitting recycling plans and lack of follow up from authorities (McDaniel and Bond, 2017).

### 7.2. Increased accessibility for SMEs to services

In England there is a clear delineation between the household and C&I waste stream – however in other countries the waste streams are closer aligned. In some countries business generating less than a certain quantity of waste or located in a specific geographical area are permitted to use household services thereby supporting SMEs who want to recycle. Globally there are many models that have been implemented: in Antwerp, Belgium small businesses are allowed to use households services (pers com, 2015); in Baltimore, USA businesses located within residential communities may participate in the recycling programme free of charge (Baltimore City Department of Public Works, 2018); in Louisville, USA businesses that generate 4 or less 360 L containers of waste per week located in Urban Services District are offered the same service as households (businesses generating more waste have to contract a private hauler) (City of Louisville, 2005). Adoption of a similar system in England would increase accessibility of recycling services to SMEs thereby reducing resource leakage plus additional efficiencies. McLeod et al. (2011) researched the potential resource efficiency savings of collecting waste from 25,000 homes and 577 commercial premises together. This approach led to a 9.8% reduction in vehicle mileage equating to savings of £36,800 and carbon equivalent savings of 2688 kg. In England whilst waste and recycling are collected by different service providers depending on the origin of the waste it often ends up being taken to the same facility. The Environmental Services Association (2016) has advocated increased harmonisation to manage household and C&I waste together. Policy Exchange (2009) have supported the merger of the C&I and household waste stream placing a duty on local authorities to collect from small businesses – this approach would improve services for businesses, yield efficiency savings, and lead to better planning for C&I waste.

## 8. Conclusion

The research highlights the inadequacies of the existing approach to managing waste from SMEs in England. The results reinforce those from previous studies that a significant number of SMEs are failing to comply with Duty of Care Regulations and are using household services to dispose of their waste. 27% of

businesses stated that they used household services for residual waste and 38% for recycling. Of the residual waste sampled 6.2% of the waste sampled originated from businesses and 77.1% was dry recyclable materials or food waste – resources are being wasted.

Globally waste from SMEs is an important and often overlooked waste stream. If Circular Economy principles are to be achieved to need to set up *smarter* systems to manage waste flows from SMEs. This includes enforcement of relevant legislation, increasing awareness of waste through further supporting initiatives such as 'Right Waste, Right Place' and importantly developing a more effective holistic waste management system which places resources at the core. This paper presents some recommendations for consideration ranging from developing a Duty of Care register to opening household services to SMEs. In the 2018 Waste Strategy the government pledged to improve the management of waste from SMEs including introducing new legislation to make separation of dry recyclable materials mandatory and investigating how shared services could help to improve recycling in SMEs. Whilst encouraging similar pledges have been made in the past with limited impact. Interestingly recent governments reports show that small and micro businesses would not be required to separate materials for separate collection until 2029 and 2032 respectively – over a decade after the government announced proposals in the Waste Strategy.

Suggestions for further work are to duplicate the study in other parts of the country for comparison, and to conduct a more detailed review on systems implemented in other countries to manage waste from SMEs. Other suggestions are to model the potential resource efficiency benefits from closer integration of the household and SME waste streams, and to better understand the approaches being used by local authorities to raise awareness amongst business to their Duty of Care requirements and enforcement activity – including the adoption of EDOC. Since the completion of this research Brighton & Hove City Council have implemented a collection service for C&I waste and have a new enforcement policy – research could be conducted to evaluate what impact these new arrangements are having.

### CRedit authorship contribution statement

**Ryan Woodard:** Conceptualization, Methodology, Formal analysis, Data curation, Writing - original draft, Supervision, Project administration, Funding acquisition.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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