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Case study report:
London Borough of Haringey
An analysis of the manufacturing industry

Cities of Making Report

Case study: Old Oak and Park Royal (OPDC)

Sustainable Urban Manufacturing report

Cities of Making (CoM) explores the future of urban based manufacturing in European cities in terms of technology, resources, place, and application. CoM uses a combination of strategic and action research resulting in concrete projects. Our ambition is to identify what works in supporting a resilient and innovative industrial base and to test those solutions in a real-world setting.

The team: The project brings together a dynamic, multidisciplinary team from Brussels (BECI, Latitude, ULB and the VUB), London (UCL and the RSA) and Rotterdam (TU Delft) – which gather a breadth of competencies in resource and technology, industrial ecology, circular economy, urban planning, governance, strategy, social dynamics and more.

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Executive Summary

Outsourcing manufacturing activities out of European cities has given rise to issues such as the displacement of technical skills and innovation, the externalisation of environmental impacts, and a reduction of value creation in the European economy. Cities of Making, a collaborative project based in Brussels, London and Rotterdam, aims to explore the present and future urban-based manufacturing in Europe. This report presents an analysis of the manufacturing industry in London, taking the Borough of Haringey as a case study.

The mixed research methods include documentary research, 19 interviews to relevant stakeholders and observations through site visits to four industrial focus areas. The examination of primary and secondary data was conducted using a series of specialised tools such as network, qualitative, and material flow analyses, among other.

Key findings include the categorisation and statistic review of manufacturing activities in the borough, an in-depth spatial characterisation of industrial focus areas, as well as the identification of spatial conflicts, and a descriptive breakdown of the interviewed companies in terms of building typology, market reach, employee profile, technology, resources, transport, networking, and specific challenges. Lastly, the overall main conflicts and challenges were identified and practical as well as policy recommendations are provided.

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Glossary of abbreviations

Avg	Average
BG	Bounds Green
C&D	Construction and Demolition
CD&E	Construction, Demolition and Excavation
C&I	Commercial and Industrial
CAT	Computer-Assisted Translation
CMT	Cut, Make, Trim
CNC	Computer Numerical Control
DEA	Defined Employment Area
DEFRA	Department for Environment, Food and Rural Affairs
DMC	Domestic Material Consumption
EfW	Energy from Waste
EU	European Union
ha	hectare
HGV	Heavy Goods Vehicle
km	kilometre
m	metre
MDF	Medium-Density Fibreboard
MFA	Material Flow Analysis
MIG	Metal Inert Gas
MRF	Material Recovery Facility
MRHCC	Markfield Road and the High Cross Centre
N/A	Not Applicable
N/M	Not Mentioned
NACE	Nomenclature of Economic Activities
n.e.c.	Not elsewhere classified
NMUH	North Middlesex University Hospital
PMMA	Polymethyl Methacrylate
PV	Photovoltaic
PVC	Polyvinyl Chloride
RDF	Refused-Derived Fuel
RE	Renewable Energy
SD	Standard Deviation
SIC	Standard Industrial Classification
SME	Small and Medium Enterprise
TIG	Tungsten Inert Gas

UK	United Kingdom
USA	United States of America
VAT	Value Added Tax
WG	Wood Green

Glossary of terms

Delocalisation	The displacement of something from its local or original place
(Industrial) focus area	Industry-intensive zone under analysis
(Industrial) trade	Category that includes similar industrial activities
Industrial activity	Specific industrial operation carried out by a company
Inner London	The London area encircled within the A205 (South Circular Road), the A406 (North Circular Road) and the A1020

1. Introduction

The delocalisation of manufacturing activities out of European cities has led to technical, environmental and socio-economic problems. It has pushed manual jobs, technical knowledge and industrial innovation capacity out of Europe, externalising environmental issues while contributing to emissions from transportation. Even after outsourcing much of the UK's manufacturing base, it contributes four times more to the gross added value than its financial core (Lawlor et al., 2009). However, modern economies reward activities that extract value rather than create it (Mazzucato, 2018) and the economic composition has been moving away from manufacturing and towards finance and services, creating a gap in the middle-income layer of the economy (Hills et al., 2009).

As a response to these challenges, political discourse has called for an 'Industrial Renaissance' (European Commission, 2014) and endorsed re-industrialisation initiatives such as the Circular Economy Package and Industry 4.0. This may offer a raft of potential benefits, including jobs for sociodemographic groups most affected by unemployment, innovation, more efficient use of materials and urban resilience. Urban centres play an important role in nurturing new forms of green urban manufacturing, based on a clean, knowledge- and labour-intensive manufacturing sector.

Re-industrialisation is a complex challenge in terms of adaptation of urban areas and the public services that can support it. This project aims to close this critical knowledge gap by combining complementary research including a) physical environments for urban making, b) resource flows, c) relevant new smart technologies, and c) how public services and other relevant stakeholders can engage in transition strategies. This will be achieved through applied research and case studies in Brussels, London and Rotterdam. This report specifically focuses on the London Borough of Haringey, which was chosen as one of the case studies due to its high industrial activity, relative to other boroughs within inner London.

The project uses a mixed method approach, which includes the analysis of primary and secondary data using a number of specialised tools such as spatial analysis and material flow analysis. Primary data was obtained through interviews and shorter questionnaires with key relevant stakeholders including companies, policy makers, and other local actors shaping urban manufacturing.

The outcome provides practical guidelines and resources for public service professionals, aiming to position public services at the centre of re-industrialisation, grounded in academic research and best practices, while equipping them with pragmatic and cost-effective tools that can be deployed to revitalise their industrial bases. Such results will be as relevant to private actors that are taking a collaborative, cross-disciplinary and/or place-based approach.

The report is divided into nine chapters. After the introduction, Chapter 2 provides detail on the research methodology. Chapter 3 presents an overview of the Borough of Haringey in terms of history, location, census statistics, and economic profile, followed by presenting the industrial zones, trades and activities in the borough. Chapter 4 provides a descriptive breakdown of the four focus areas in terms of land use, building typology and spatial context. Chapter 5 presents a breakdown of diverse aspects per industrial trade, including industrial activities, building typology, market reach, supply chain, employee profile, technology, energy and water, material flows, transport, networking, and specific challenges. Chapter 6 illustrates material flow analyses (MFAs) for the interviewed companies, along with the corresponding waste treatment pathways. Chapter 7 includes a SWOT analysis touching on the overall strengths, weaknesses, opportunities, and threats of the manufacturing industry in the borough. Chapter 8 summarises the main conflicts and challenges identified during this study. Chapter 9 summarises key findings and provides policy and practical recommendations to support the manufacturing industry in this context. Lastly, supplementary data is given in the Appendix.

2. Research methodology

This project used a mixed-method approach to obtain primary data and to analyse both primary and secondary data. Primary data was obtained through questionnaires to key relevant stakeholders, i.e. companies' owners, directors or staff. Secondary data was obtained from literature review, online databases, site visits to industrial focus areas, and aerial imaging. The analysis of primary and secondary data was conducted through a number of specialised tools such as spatial analysis, qualitative analysis, material flow analysis (MFA), and strengths-weaknesses-opportunities-threats (SWOT) analysis. The methodological steps followed for this study are detailed next.

2.1 Creating a company database:

1. A FAME database (FAME, 2019) search was conducted. At a first approach, 993 relevant companies were identified in the Borough of Haringey. Two parameters were used as input for this database search: 1) Postcodes – all postcodes within Haringey were obtained through a combination of online mapping tools (Mapit, 2019; Freemaptools, 2019). 2) NACE codes – the database search used thirty-three NACE codes, including economic activities such as manufacturing, mining/quarrying, repair and installation of machinery, water and waste collection, warehousing and transportation, and leasing of machinery and equipment. The full list of the considered NACE codes and the corresponding economic activities is presented in section 10.1 in the Appendix. NACE codes (European Commission, 2019) were used over SIC codes (UK Government, 2019b) in order to use a standard within the European Economic Community.

2. The 993 companies identified in the previous step were mapped using Latitude and Longitude coordinates. Most of the companies' coordinates were also found in the FAME database, however, some of the companies lacked their corresponding coordinates and these had to be acquired using Google Maps (2019).

3. The first site visit was conducted within the N15 postcode. It was then discovered that a significant share of the companies identified on FAME database did not actually exist. For instance, several buildings identified as companies were residential buildings with no business trade. On the other hand, several other companies were recognized, although these were not found originally found in the database search. This discrepancy may be due to the fact that some of these companies have a different registered trade address or their trade description in FAME was unavailable or incorrect.

4. Given the discrepancies encountered in the previous step, the research was narrowed down to eight focus areas within the Borough of Haringey. The focus areas selected were the zones in the map (created in step 2) which showed a higher density of manufacturing companies.

5. Out of the eight recognised focus areas, four were selected as case studies for this research. The selection criteria aimed for a mixture of industrial trades and activities which were representative of the whole borough.

6. A new FAME database search was carried out where only the four selected focus areas were considered (using the respective postcodes as parameters). This time, 577 companies were identified. From these, only the companies in the database that provided either a phone number, email, or website were considered – around 69 companies were selected in this step.

7. Site visits within the focus areas and aerial imaging helped identify other companies that could not be found in the database search. Thus, 61 further companies were identified and considered.

8. From steps 6 and 7, a total of 126 relevant companies were finally selected for this study and categorised into industrial trades and industrial activities (as detailed in section 3.6). A database was then created to contain all the selected manufacturing companies, along with the respective trade, activity, postcode, address, phone number, email, and website. A list of the selected manufacturing companies is presented in section 10.3 in the Appendix.

2.2 Contacting the companies:

9. Three rounds of emails were sent to all companies included in the database created in step 8. Only three companies replied positively to these emails. A template of the email sent can be seen in section 10.2 in the Appendix.

10. After sending emails, phone calls were conducted to all companies which provided a phone number. Two further companies agreed to interview through this approach.

11. During site visits to industrial focus areas, the identified companies were visited without appointment. This proved to be the best way to find participants as fourteen companies agreed to participate in the project when they were directly approached.

12. In total, 19 relevant companies were interviewed using the questionnaire included in section 10.3 in the Appendix. Interviews lasted from 10 minutes to two hours depending on the interviewees' availability.

2.3 Analysis of primary and secondary data:

13. Collated primary and secondary data was analysed using specialised tools. Firstly, a spatial analysis was conducted in order to identify the land uses within the industrial focus areas. For this purpose, maps were created using the online tool Google My Maps (2019).

14. Plotting a network diagram helped recognize the connections among industrial trades and industrial activities in the analysed companies.

15. A qualitative analysis was conducted to elucidate key issues under an umbrella of aspects such as market reach, supply chain, employment, technology, resources and transport.

16. A material flow analysis (MFA) was used to assess the material flows per industrial trade and activity. This analysis was first carried out for each interviewed company based on primary information provided, and a subsequent MFA was conducted for the Borough of Haringey based on secondary data. Sankey diagrams were created for some of the MFAs using the online tool SankeyMATIC (2019).

17. A strengths-weaknesses-opportunities-threats (SWOT) analysis was implemented considering all the obtained information in order to identify practical and policy recommendations.

18. Finally, practical and policy recommendations were drawn based on the analysis of the documentary research, interviews, and site visits.

3. Borough of Haringey

Haringey is one of the 32 London boroughs or local authority districts that constitute Greater London. The London boroughs were created at the same time by combining groups of former local government units through the London Government Act 1963 (UK Government, 1963). The next sections briefly describe Haringey's history, as well as its location, census statistics, and economic profile based on a documentary research. Next, the identified industrial zones and activities are described based on primary and secondary data.

3.1 Haringey's history

What is known as Haringey today was made up of two large manors, Hornsey and Tottenham. These became parishes with firm boundaries in 1300. In the Middle Ages, Tottenham's population consisted of 59 serfs, four slaves, two freemen and a priest. Wood Green, originally part of Tottenham Parish, became a separate district in 1888 (Haringey Council, 2018a).

Many streets in Haringey now bear the names of aristocrats from centuries long gone: the Barons Coleraine, the Comptons, and Waltheof, Lord of Tottenham Manor and son of the Earl of Northumberland. Other local names, such as Wood Green, testify to the area's past as woodland and countryside, some of which still survives in Haringey's parks. As commerce developed, railways were built, linking the separate townships. Gradually, a once rural area merged into the city of London (Haringey Council, 2011a). The name of Haringey was assigned in 1964 (Haringey Council, 2019a) – it is worth noting that Harringay is a district within the Borough of Haringey, which might be confusing as both names are similar.

3.2 Location

The Borough of Haringey covers an area of more than 2,850 hectares (ha) and is located just 10.5 km north of the City of London (UK's financial core). It shares borders with six other London councils; clockwise from the north, they are: Enfield, Waltham Forest, Hackney, Islington, Camden, and Barnet (Haringey Council, 2018b). Figure 0.1 shows the Borough of Haringey (highlighted in red) within Greater London.

Haringey is well located relative to the city centre – just 10 mins from Kings Cross and less than 30 mins from the City or West End. Haringey is also well linked in terms of public transport – there are over 40 bus routes serving Haringey as well as three underground lines, namely Piccadilly, Victoria and Overground lines. The Crossrail 2 project, due for completion in 2030, will run through the borough (Haringey Council, 2018b).

3.3 Census statistics

Under the last census held in 2011, Haringey reports a total population of 254,900, which related to a greater population growth (17.7%) from 2001 to 2011 than the London average (14.0%). Over-occupancy is up significantly in the borough, with 16.3% of households being over-occupied by at least one bedroom, which is much higher than the London rate of 11.6% (Haringey Council, 2013).

Out of the population, 49.5% are male and 50.5% are female (Haringey Council, 2011), and the population profile is relatively young and ethnically diverse. The population aged between 0 and 19 accounts for 24.9%, which is proportionately higher than both for London (24.5%) and the UK (24.0%); 66.3% of the population are between 20-64, while 8.8% are 65 or older

– this is proportionately lower than both for London (11.1%) and the UK (16.4%) (Haringey Council, 2011).

Haringey's population is mostly made up of non-white British ethnic groups (65.3%). This is higher than both for London (55.1%) and the UK (19.5%). The top three of these ethnic groups are: other white (23.0%), black African (9.0%) and black Caribbean (7.1%) (Haringey Council, 2011).

Figure 0.1: Borough of Haringey (highlighted in red) within Greater London (source: Haringey in Greater London, by TUBS, licensed under CC BY-SA 3.0, https://bit.ly/2GbliYW).

Nearly half (45%) of the residents were born outside the UK, which is above the London average. Haringey has the highest proportion of Europeans (20.6%), excluding British, of any local authority in the UK, as well as the highest percentage of residents born in countries that joined the EU after April 2011 of any London Borough. The main non-British-born nationalities are Polish (4.3%), Turkish (4.0%), Jamaican (2.0%), Irish (1.9%), Ghanaian (1.3%) and Somalian (1.3%) (Haringey Council 2013).

A high proportion (40%) of residents over 16 years old have a Level 4 qualification or above, which is superior than the London rate (37.7%). However, there are more people in Haringey who have never worked or are long-term unemployed (10.4%) than the London average (8.3%) (Haringey Council, 2013). Around 27% of the working population work in the borough, whereas many commute further into inner London to their workplace (Haringey Council, 2011).

3.4 Economic profile

Haringey is historically based around medium-scale manufacturing industry which, although in decline (as shown in Table 0.1), still remains strong in the area. Accordingly, Haringey retains a strong skilled manufacturing base, relative to other London boroughs. The Public Sector (public administration, education and health) is the largest employer in the borough. Distribution, hotels and restaurants also play an important role, while emerging sectors include real estate, banking, finance and insurance activities (Haringey Council 2008; 2018b).

Table 0.1 presents Haringey's economic profile in terms of number of jobs for 1995 and 2006, as well as the percentage variation between these figures. Figure 0.2 shows the share per each type of economic activity for 2006, also based on number of jobs.

Haringey's economy is dominated by small businesses with 93.1% of businesses employing less than 10 people. The average gross weekly pay in Haringey in 2015 was £584, while London's weekly average was £659 and the UK's was £529 (Haringey Council, 2018b).

Table 0.1: Haringey's economic profile in terms of number of jobs for 1995 and 2006. The number of units is rounded to the nearest hundred (Haringey Council, 2008).

Industry type	No. of jobs 1995	No. of jobs 2006	Variation [%]
Public administration, education and health	12,700	17,000	33.9
Distribution, hotels and restaurants	14,300	15,900	11.2
Banking, finance and insurance	8,400	10,800	28.6
Other services	5,000	6,000	20.0
Manufacturing	7,200	4,600	-36.1
Transport and communications	4,200	4,400	4.8
Construction	2,800	2,200	-21.4
TOTAL	54,700	61,000	
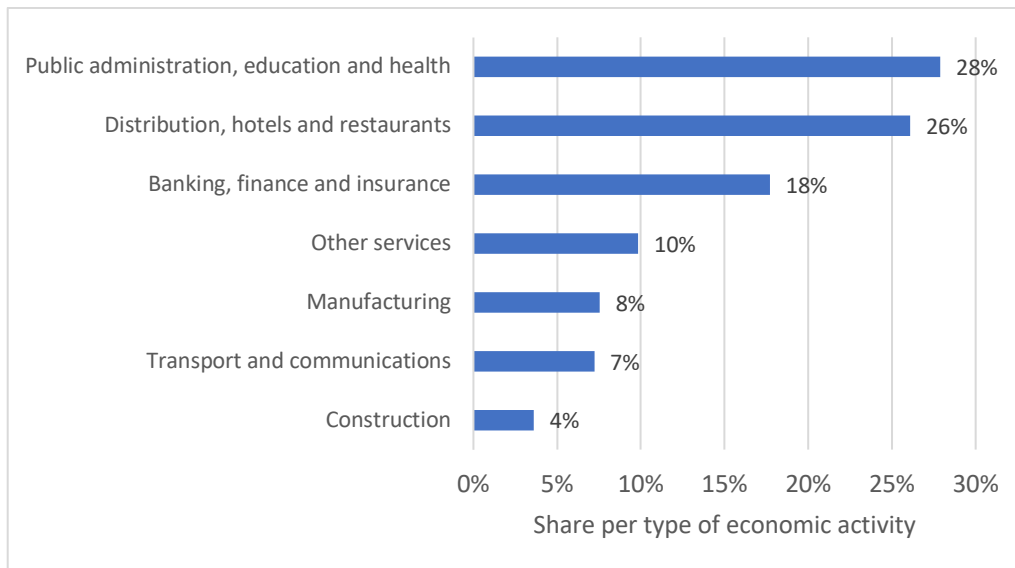
Figure 0.2: Share (or percentage) per type of economic activity in Haringey for 2006 (Haringey Council, 2008).

3.5 Industrial zones

Several industrial areas have been identified in the Borough of Haringey. At a first approach, every identified industrial zone was considered and analysed. Subsequently, four industrial focus areas were selected (see chapter 2 for selection criteria) and analysed in more detail. The breakdown per industrial zones presented in chapter 4 is based on the four industrial focus areas.

3.5.1 Industrial zones in the Local Plan

According to Haringey's Local Plan, there are 26 defined employment areas (DEAs) in the borough (Haringey Council, 2017); a detailed list is included in section 10.5 in the Appendix. The DEAs include strategic industrial locations, locally significant industrial sites, local employment areas, and local employment areas under or planned for urban regeneration. The four types of DEAs contain industrial and commercial activities, among other land uses. Figure 0.3 shows the respective DEAs within the Borough of Haringey, where also the Ward boundaries are delimited in the map. A coloured polygon marked, for instance, as a strategic industrial location may contain several DEAs within.

Strategic industrial location		Locally significant industrial site		Local employment area		Local employment area: regeneration area	

Figure 0.3: Borough of Haringey showing industrial locations and employment areas as stated in the council Local Plan (Haringey Council, 2019b).

3.5.2 Industrial focus areas

Four industrial areas have been selected as focus areas; the rationale and criteria behind this selection are specified in chapter 2. These focus areas are representative of the current situation of Haringey, in terms of land use, and economic activities. The analysed industrial focus areas are: Bounds Green (BG), Markfield Rd and the High Cross Centre (MRHCC), North Middlesex University Hospital (NMUH), and Wood Green (WG). According to Haringey's Local Plan (Haringey Council, 2017), BG is defined as a local employment area, while MRHCC and WG are defined as a local employment area planned for urban regeneration. Most of NMUH crosses Haringey's north boundary and technically belongs to the Borough of Enfield, however, the area is included in this study since it is an important industrial zone and provides an adequate case study.

Figure 0.4 shows a map of the Borough of Haringey, delimiting its boundary with a black line. The four focus areas are marked with their respective acronym (i.e. BG, MRHCC, NMUH, and WG). It can be appreciated that each of the focus areas contains coloured polygons, which represent the variety of buildings encountered in the study area. The colour-coding relates to the different types of land use, as described in section 4.1.

Table 0.2 presents a summary of the analysed 'focus areas', their respective 'postcode', the 'occupied area' (in hectares) that was surveyed in this study, and the number of 'interviewed companies' within each focus area. The occupied area was demarked following site-visit observations and calculated using a mapping tool (as mentioned in chapter 2). The next subsections provide information on the history, main characteristics, and location of the four industrial focus areas.
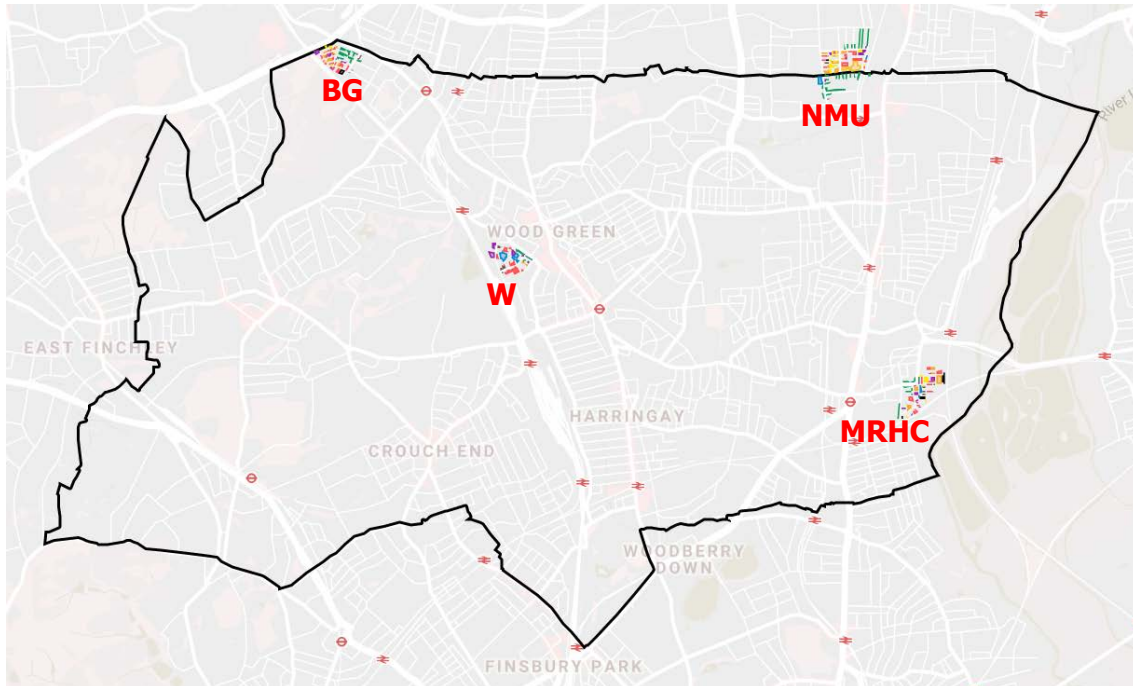
Figure 0.4: Focus areas within the Borough of Haringey, where BG: Bounds Green, MRHCC: Markfield Rd and the High Cross Centre, NMUH: North Middlesex University Hospital, and WG: Wood Green.

Table 0.2: Summary of analysed industrial focus areas.

Focus area	Postcode	Occupied area [ha]	Interviewed companies
Bounds Green (BG)	N11	7.8	3
Markfield Rd and the High Cross Centre (MRHCC)	N15	12	5
North Middlesex University Hospital (NMUH)	N18	10.5	8
Wood Green (WG)	N22	6.7	3

3.5.2.1 Bounds Green (BG)

The Bounds Green Industrial Estate is located at the north-west boundary of Haringey. It provides 52 units ranging from 55 m^2 to 650 m^2, offering a wide variety of space suitable for light industrial and trade counter use (Capital Industrial, 2019). Its name was first recorded as *Le Boundes* and may derive from a family that lived here in the 13th century. Bounds Green remained a small farming hamlet until the late 19th century, while suburban houses began to

appear with the outward spread of Wood Green. The suburban build-up was completed following the opening of Bounds Green station on the London Electric Railway (now the Piccadilly line) in 1932. Factories were established in this area in the years before and after the Second World War, at first individually and later on an industrial estate (Hidden London, 2019a). The site benefits from direct access to the North Circular Road (A406) and is located 850 m from Bounds Green Tube Station.

3.5.2.2 Markfield Rd and the High Cross Centre (MRHCC)

Markfield Road and the High Cross Centre are located in Tottenham, at the South-East of Haringey. The High Cross Centre is a secure, gated industrial estate providing a mixture of warehouse, office and industrial units, which takes its name from the nearby Tottenham High Cross monument which marked the centre of the former Tottenham village in the 17th Century (Tottenham, 2019). Markfield Road provides a mix of private and public freeholds and leaseholds and is currently a Designated Employment Area, which reflects the Haringey Council (2015) aspiration to increase the number of jobs in the area, including creative employment (e.g. artists and artisans), and creating a mix of land uses. Therefore, warehouse living is allowed in this area. The nearest station to MRHCC is Tottenham Hale Railway Station, about 530 m to the North-East, and South Tottenham Overground Station, 660 m to the South-West.

3.5.2.3 North Middlesex University Hospital (NMUH)

This industrial focus area is located just under the North Middlesex University Hospital, hence, this focus area is named after the hospital. There is not a defined or protected industrial space, but this area comprises a mix of private and public freeholds and leaseholds (Haringey Council, 2015). The NMUH focus area is located at the north-east border of Haringey, crossing over the intersection between Haringey and Enfield. Main roads in this area include Shaftesbury Rd, Pretoria Road and Commercial Rd. The re-development of the Tottenham Hotspur Stadium located about 750 m away to the South-East has driven a recent development around this zone, and Haringey Council is targeting an increase of residential land uses in the area (Haringey Council, 2015). Closest public transport includes Silver Street (690 m) and White Hart Lane (530 m) Railway stations.

3.5.2.4 Wood Green (WG)

Wood Green is a suburban district located at the heart of Haringey. Originally known as Woodleigh, it became part of both Haringey and Greater London in 1965. Wood Green contains a number of late 19th century and early 20th century housing estates as well as post-war and more recent developments (Horsney Historical, 2019). By the mid-1960s, this district had become the north London's most important shopping destination. Wood Green is currently well known as a lively shopping centre and the council is keen to encourage more outward-

facing arts enterprises, which may result in developments such as Hackney Wick and Fish Island, though at a smaller scale (Hidden London, 2019b).

3.6 Industrial trades and activities

The totality of the companies analysed in the Borough of Haringey (including but not limited to the companies within the focus areas) can be categorised into different industrial trades and industrial activities. For this study, thirteen industrial trades have been considered. The following subsections provide detail on the company categorisation into industrial trades and activities. Firstly, the totality of the selected manufacturing companies (126) is presented, followed by the categorisation of the interviewed companies (19). Chapter 5 presents a breakdown for relevant aspects per industrial trade, mainly based on the 19 interviewed companies. However, the network diagram presented in that chapter considers the totality of the selected manufacturing companies.

3.6.1 Selected manufacturing companies (126):

Table 0.3 presents the corresponding industrial trades and activities, along with the corresponding NACE codes, for the 126 selected manufacturing companies (see chapter 2 for the selection criteria). The 'industrial trade' specifies the type of industry (e.g. clothing or food) while the 'industrial activity' represents the specific manufactured product or service provided. The 'NACE code' relates to each of the industrial activities. A full list of the selected manufacturing companies is included in section 10.3 in the Appendix. The number within the parenthesis represents the number of identified companies under that trade or activity, respectively. For example, there are two companies in the 'audio' trade; out of these, one company manufactures 'amplifiers' and the other one produces 'music studio furniture'. Some activities belong to more than one trade, such as 'music studio furniture' which belongs to both the 'audio' and the 'furniture' trades. Both industrial trades and activities are arranged by alphabetical order.

Table 0.3: Industrial trade, activity and NACE code for the 126 selected manufacturing companies. The number in parenthesis represents the number of identified companies under that trade or activity, respectively.

Industrial trade	Industrial activity	NACE code
Audio (2)	amplifiers (1)	2640
	music studio furniture[1] (1)	3109
Building (14)	architectural structures[2] (3)	2511
	blinds (1)	3299
	curtain poles[3] (1)	2599
	glazing and rooflights[2] (1)	2599
	joinery[3] (2)	1623

Industrial trade	Industrial activity	NACE code
	lighting equipment (1)	2740
	surface coverings (4)	4676
	water fittings (1)	2599
Clothing (28)	bride dresses (1)	1413
	costumes/uniforms (1)	1413
	CMT (cut, make, trim) (1)	1330
	handbags (1)	1512
	leather clothing (1)	1411
	men clothing (2)	1410
	men/women clothing (1)	1410
	military/casual clothing (2)	1410
	pattern grading[4] (4)	1330
	garment sampling (1)	1330
	shoes (2)	1520
	women clothing (11)	1410
Food (26)	Asian food (1)	1073
	beer (2)	1105
	bread (9)	1071
	cheese (1)	1051
	coffee roasting (1)	1083
	juice (1)	1032
	meat (2)	1011
	meat/poultry (1)	1013
	oil (2)	1041
	organic (2)	1089
	other (1)	1089
	sausages (1)	1013
	take-away food (2)	1089
Furniture (10)	joinery (1)	3109
	kitchens (3)	3102
	mirrors (1)	2312
	music studio furniture[1] (1)	3109
	office (1)	3101
	seating (1)	3109
	furniture upholstery (1)	3299
	various (1)	3109
Metal (9)	architectural structures[2] (3)	2511

Industrial trade	Industrial activity	NACE code
	glazing and rooflights[2] (1)	2599
	metal-forming machinery (1)	2841
	other (3)	2599
	ventilation products (1)	2599
Other (14)	beauty care products (2)	2120
	chemical products (1)	2059
	dental supplies (1)	3250
	display systems (2)	3299
	educational products (1)	1729
	jewellery (3)	3212
	mouse tramps (1)	3299
	photo studio leasing (1)	3299
	tablet accessories (1)	3299
	treasury tags (1)	3299
Printing (10)	banners (1)	7410
	engraving (1)	7410
	photos (1)	7420
	publishing (1)	5819
	signage (3)	7410
	various (3)	1812
Textile (11)	embroidery (1)	1330
	fabric manufacture (1)	1391
	household textiles (2)	1392
	leather upholstery (2)	1511
	pattern grading[4] (4)	1330
	pleating (1)	1330
Video (2)	software and hardware (1)	2640
	film studio (1)	3299
Waste (2)	commercial waste collection (1)	3811
	C&D waste collection (1)	3811
Wood (7)	curtain poles[3] (1)	2599
	wood finishing products (1)	2030
	joinery[3] (2)	1623
	sawmilling (2)	1610
	tableware (1)	1629

Industrial trade	Industrial activity	NACE code

[1] Belongs to both Audio and Furniture trades.

[2] Belongs to both Building and Metal trades.

[3] Belongs to both Building and Wood trades.

[4] Belongs to both Clothing and Textile trades.

Figure 0.5 presents a bar chart of the corresponding shares of each industrial trade (based on the 126 selected manufacturing companies). As can be seen, the clothing (21%) and food (19%) trades account for the largest shares. The building trade and miscellaneous activities categorised into 'other' trade show an important share (10% respectively), followed by the textile trade (8%), furniture, printing, metal (7% respectively), and wood (5%), while video and waste comprise the smallest shares (below 2% respectively).
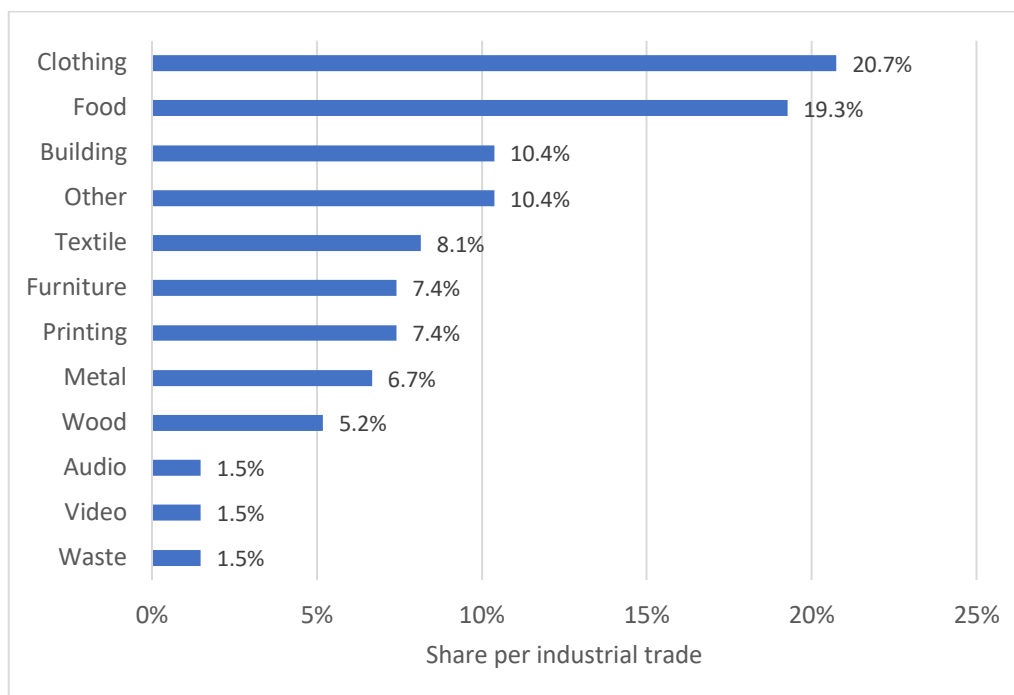
Figure 0.5: Share (or percentage) of each industrial trade, including the 126 selected manufacturing companies.

Figure 0.6 shows the location of the 126 selected manufacturing companies with in the Borough of Haringey (delimiting its boundary with a black line). In this map, only the most common industrial trades are colour-coded. The rest of the companies, in this case, are included into the 'other' category.

Figure 0.7 provides a network diagram, including the 126 selected manufacturing companies – two of these companies correspond to non-hazardous waste collection. The companies in this diagram where selected according to the criteria presented in chapter 2. As can be seen,

there is negligible networking or industrial symbiosis among companies and among industrial trades. One exception corresponds to the link between the clothing and the textile sectors, where mainly material inputs and auxiliary services are exchanged – a fabric manufacturer is a supplier for the clothing trade and the pattern-grading service is also a link between the clothing and the textile trades.

It is worth highlighting that the activity of pattern grading is classified within the textile trade under the NACE classification. Code group 13 covers textile-manufacturing activities while group 14 relates to clothing-manufacturing activities. Pattern grading is done entirely using paper and cardboard whereas no textile is used in the process. Therefore, NACE code 1330 for "finishing of textiles" is wrongly associated to pattern-grading companies, whereas this activity should be included within the code group 14.

● Clothing   ● Food   ● Furniture   ● Printing   ● Textile   ● Other
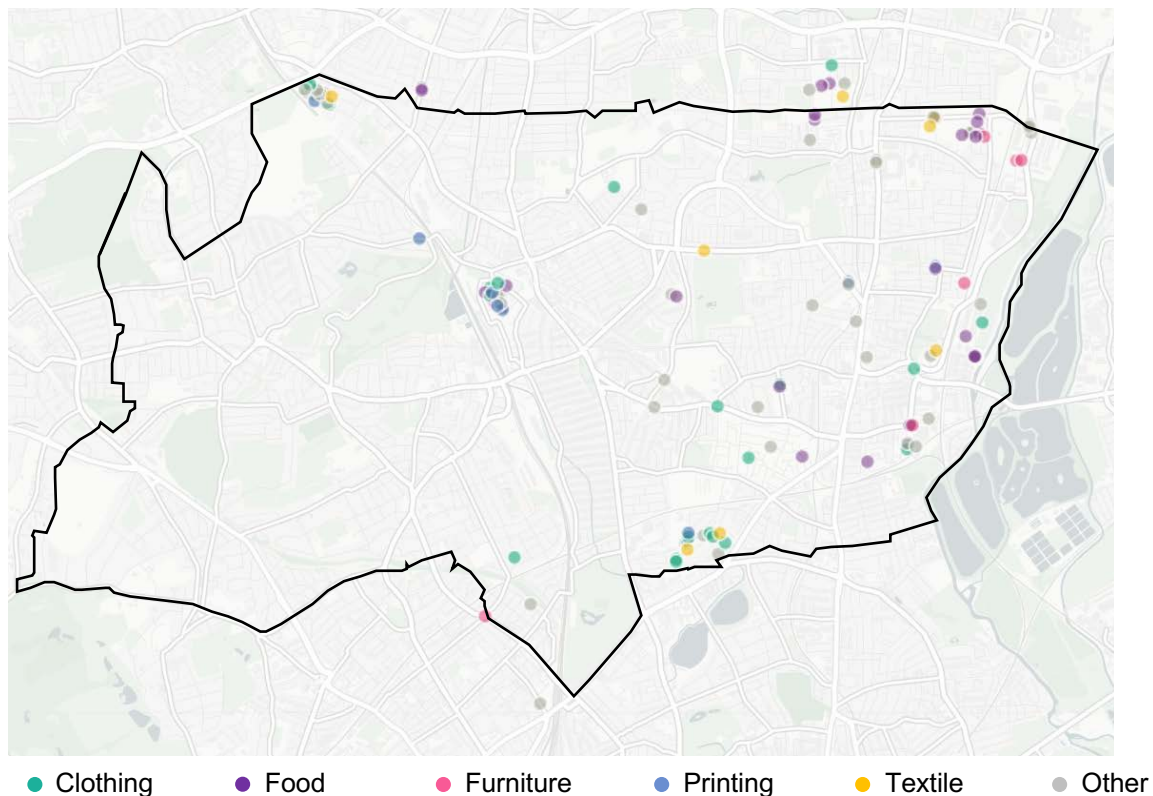
Figure 0.6: Selected manufacturing companies (126) within the Borough of Haringey. Each coloured dot indicates a company and the colour represents the type of industrial trade.

Based on the networking diagram, it can be appreciated that some companies belong to more than one industrial trade, although this does not imply a networking link. Namely: furniture for music studio belongs in both the audio and furniture trades. Glazing and rooflights, structural steel work, and ventilation products fit in the building and metal trades. Curtain poles are part of the building and wood trades. Kitchen and bathrooms belong in the building and furniture trades. Lastly, joinery is part of the building, furniture, metal and wood trades.
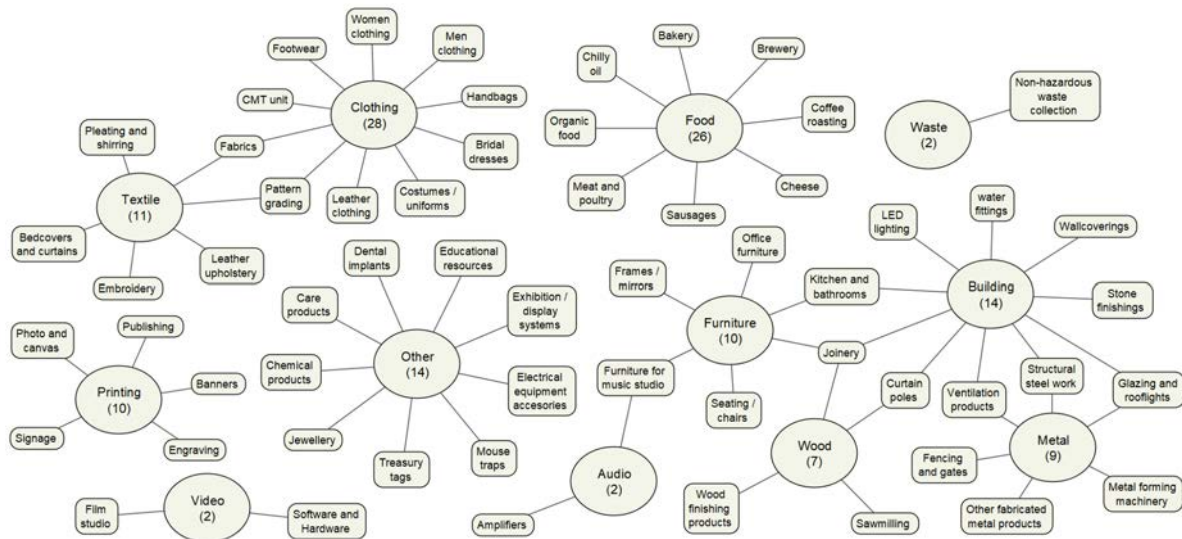
Figure 0.7: Network diagram considering a total of 126 selected manufacturing companies.

3.6.2 Interviewed companies (19):

Out of the 126 selected manufacturing companies, 16 manufacturing companies agreed to participate and were interviewed. Additionally, one Waste Contractor and two wholesale companies were interviewed, totalling 19 interviewed companies. Table 0.4 indicates the 'number of interviewed companies' per 'industrial trade'. This study aimed at interviewing at least one stakeholder per each of the industrial trades mentioned above. The textile trade is represented by one of the companies or activities (pattern grading) included in the clothing sector, while the building sector is covered to some extent by a company in the furniture trade (kitchens and cabinets) and a company in the metal trade (architectural structures). Two wholesale companies were also interviewed in order to enquiry why these companies chose to import their products instead of manufacturing or sourcing them in the UK.

Table 0.4: Number of interviewed companies per industrial trade.

Industrial trade	No. of interviewed companies
Building / Wood	1
Clothing / Textile	6
Food	4
Furniture / Building	1
Metal / Building	1
Printing	1
Waste	1
Wood / Building	2
Wholesale	2
TOTAL	**19**

4. Breakdown per focus areas

4.1 Land use and building typology

This section provides an overview of the types of land use and building typology at each of the analysed focus areas. In total, a combined floor area of 13.19 hectares [ha] was analysed, including the four focus areas. The types of land use considered include manufacturing, wholesale trade, business clusters (containing several businesses in one building or space), car-related services, other companies (conducting business activities other than manufacturing, wholesale or car services), residential buildings, other land uses (such as educational or religious institutions), and unused (or abandoned) premises. The spatial analysis was conducted using a mapping tool, as mentioned in chapter 2. Identified premises within the focus areas were demarked by coloured polygons and categorised according to the land uses mentioned above. The surface areas of all polygons were used to calculate the corresponding percentages of land uses, relative to both the analysed surface at each focus area and to the total combined floor area considering the four focus areas. The colour-coding used to represent each type of land use is given below in Table 0.5. Polygons are diagonally sectioned to indicate different companies or land uses take place within (different floors of) a building. A detailed list of the buildings analysed (or coloured polygons) is given in section 10.6 in the Appendix, including either the concept, company or institution name, the activity description, and the occupied floor area.

Table 0.5: Colour-coding for land use types.

Land use type	Polygon colour
Manufacturing	
Wholesale	
Business clusters	
Other companies	
Residential	
Other land use	
Unused	

4.1.1 Bounds Green (BG)

Figure 0.8 shows a close-up map of Bounds Green industrial focus area (BG) within the Borough of Haringey. The analysed area (represented by coloured polygons) comprise 2.67 ha of which 0.75 ha belong to manufacturing, 0.44 ha to wholesale, 0.11 ha to car services, 0.41 ha to other companies, 0.76 ha to residential buildings, 0.05 ha to other land use, and 0.15 ha to unused premises, while there are no business clusters.
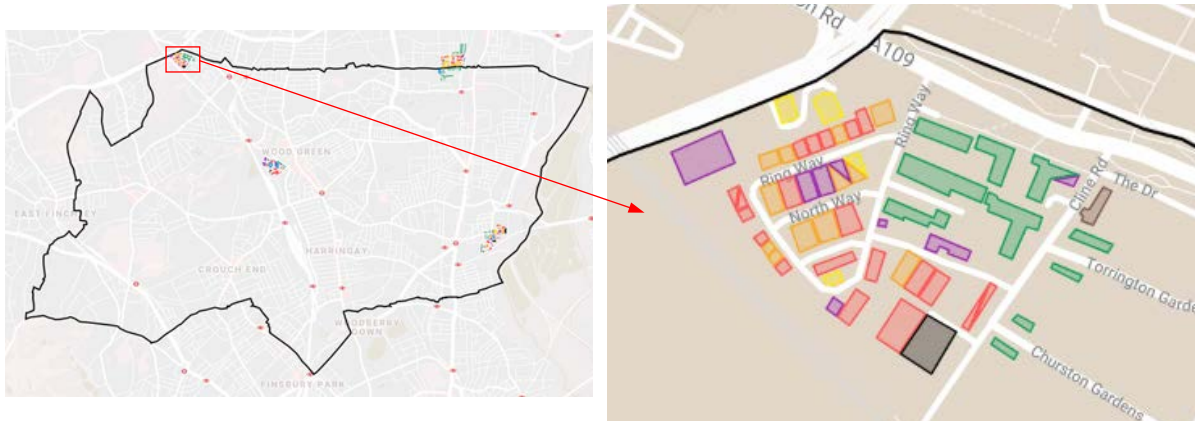
Figure 0.8: Map of bounds Green industrial focus area (BG) within Haringey.

Manufacturing and residential land uses account for the largest shares (28% respectively) relative to the analysed floor area within BG, while these represent 6%, respectively, based on the total combined floor area (considering the four focus areas). BG presents the lowest share of other land uses from the four focus areas (0.3%), based on the total combined floor area, and it is the only focus area with no business clusters.

Common manufacturing activities include design and installation of kitchen and interiors, processing of marble and stone surfaces, CMT units, and provision of pattern-grading and printing services. Common wholesale activities mainly comprise distribution and supply of surfaces for building purposes. A detailed list of the analysed buildings (or coloured polygons) is given in section 10.6.

BG shows the most homogeneous building typology out of the four focus areas, mainly comprised by two-story warehouses with gable roof. This focus area has an efficiently organised building configuration and its road design facilitates good vehicle mobility. Roads and sidewalks are evenly sized and parking is planned efficiently as vehicles can park in parallel at some points. The average floor area occupied by manufacturing companies in BG is 374 m^2, which is the smallest average from the four focus areas.

Figure 0.9 shows pictures of BG taken during site visits. Ringway (pictures a-c) is the main road in the area, which circumvents both Northway (picture d) and Southway. The relative homogenous building typology can be appreciated in the pictures.
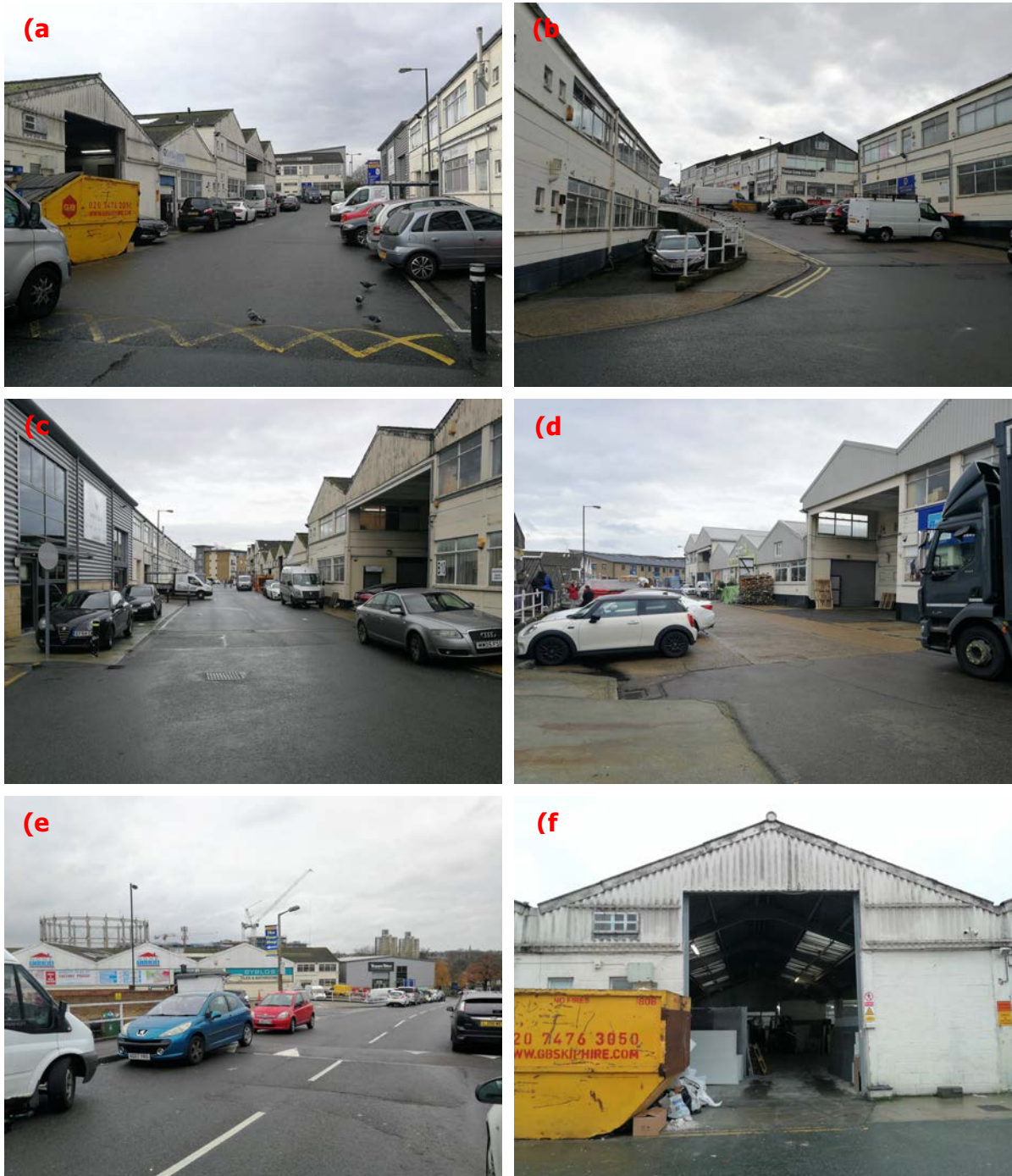
Figure 0.9: Pictures of Bounds Green industrial focus area (BG): (a-c) Ringway; (d) Northway; (e) Ringway and Northway intersection; and (f) gable-roofed warehouse.

4.1.2 Markfield Rd and the High Cross Centre (MRHCC)

Figure 0.8 shows a close-up map of Markfield Rd and the High Cross Centre industrial focus area (MRHCC) within the Borough of Haringey. The analysed area (represented by coloured polygons) comprise 3.14 ha of which 0.55 ha belong to manufacturing, 0.79 ha to wholesale, 0.34 ha to business clusters, 0.18 ha to car services, 0.38 ha to other companies, 0.54 ha to residential buildings, 0.07 ha to other land use, and 0.30 ha to unused premises.

Wholesale accounts for the largest share of land use (25%) relative to the analysed floor area within MRHCC, followed by manufacturing and residential land uses (17% respectively). Based on the total combined floor area (considering the four focus areas), wholesale also represents the largest share of land use (6%), likewise followed by manufacturing and residential land uses (4% respectively). MRHCC shows the highest share of unused premises from the four focus areas, which equals 10% of its analysed floor area, and 2% of the total combined floor area.

Furniture manufacture is the most common manufacturing activity in MRHCC, which includes the manufacture of chairs, general-purpose furniture, joinery and design and installation of kitchen and cabinets. Provision of workspace for artists and artisans is currently increasing in the area. All of the buildings categorised under other land uses in MRHCC relate to religious practices. An apparently abandoned building was found in the area, comprising six stories and 1,830 m^2 (Figure 0.13). A detailed list of the analysed buildings (or coloured polygons) is given in section 10.6.

MRHCC generally shows a diverse building typology, except for the High Cross Centre in which flat-roofed two-story warehouses are predominant, as well as an area on Fountayne Road, which provides gable-roofed warehouses with a distinctive uniform typology, extending 100 metres on this road (Figure 0.12e). This focus area shows the most disorganised building configuration out of the four analysed areas, however, is the only one which provides a cycling lane (Figure 0.12d). The average floor area occupied by manufacturing companies in MRHCC is 498 m^2, which is the second smallest average (after BG) from the four focus areas.
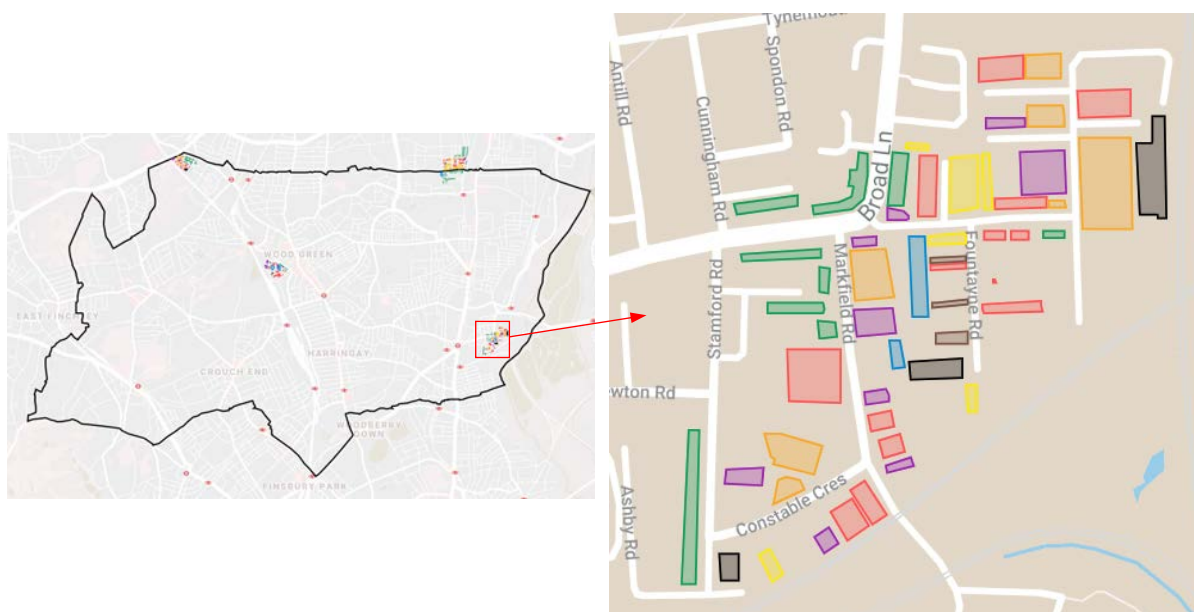
Figure 0.10: Map of Markfield Rd and the High Cross Centre industrial focus area (MRHCC) within Haringey.

The diverse building typology can be appreciated in Figure 0.11, which shows pictures of MRHCC taken during site visits. Figure 0.12 presents the High Cross Centre within MRHCC, while Figure 0.13 shows the abandoned massive building in the area.
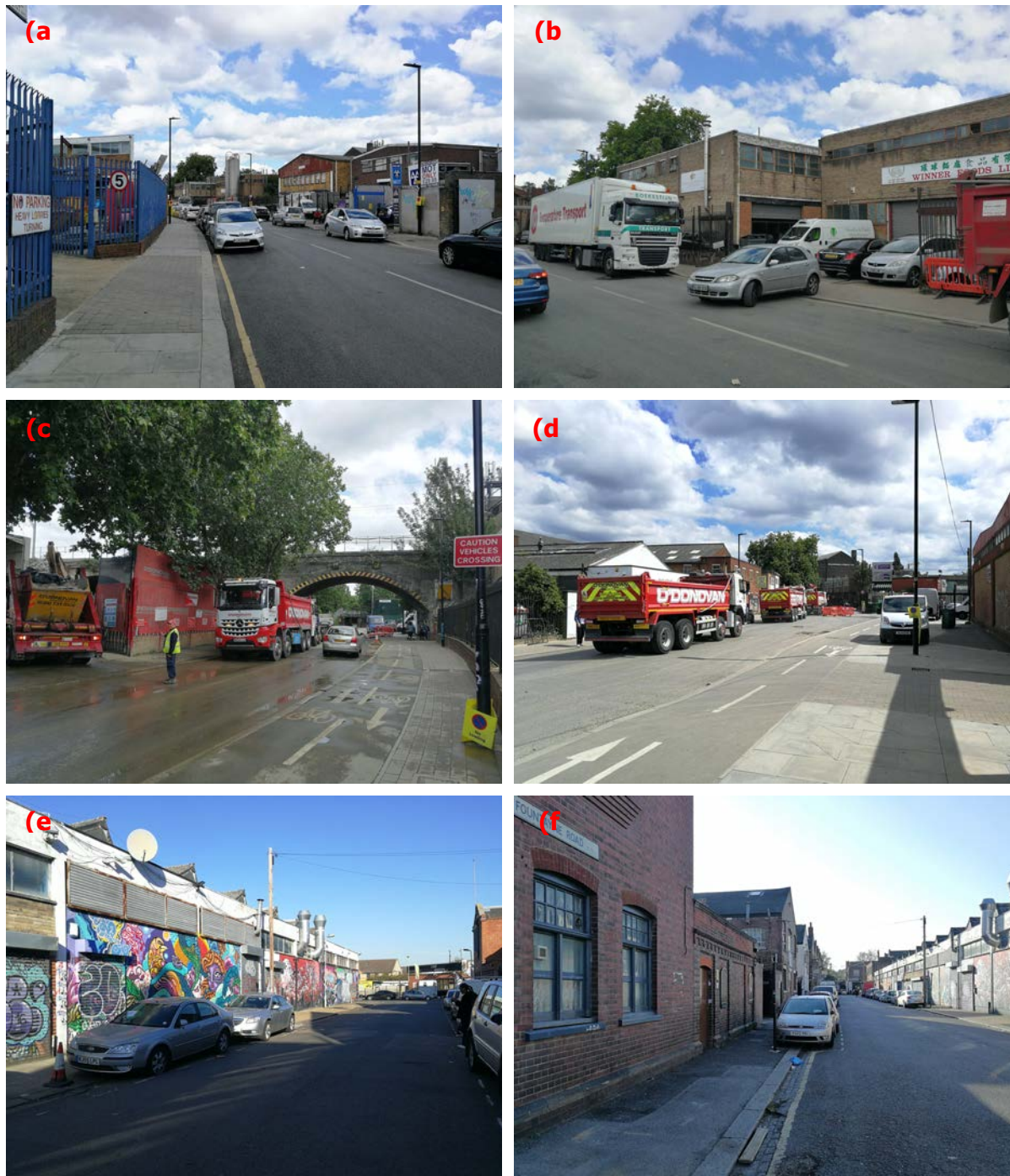
Figure 0.11: Pictures of Markfield Rd and the High Cross Centre industrial focus area (MRHCC): (a, b) Constable Cres; (c) Markfield Rd; (d) cycling lane on Markfield Rd; and (e, f) Fountayne Rd.

Figure 0.12: Pictures of the High Cross Centre within MRHCC: (a) the High Cross Centre entrance; (d) inside one of the warehouses; and (c, d) warehouses on unnamed streets.

Figure 0.13: Unused or abandoned 1,830-square-metre, 6-story building in MRHCC.

4.1.3 North Middlesex University Hospital (NMUH)

Figure 0.14 shows a close-up map of North Middlesex University Hospital industrial focus area (NMUH) within the Borough of Haringey. The analysed area (represented by coloured polygons) comprise 4.63 ha of which 0.93 ha belong to manufacturing, 1.53 ha to wholesale, 0.34 ha to business clusters, 0.40 ha to car services, 0.19 ha to other companies, 1.16 ha to residential buildings, 0.06 ha to other land use, and 0.02 ha to unused premises.

Wholesale accounts for the major share of land use (33%) relative to the analysed floor area within NMUH, followed by residential land use (25%). NMUH shows the largest share of wholesale (12%), residential (9%) and car service (3%) land uses out of the four focus areas, based on the total combined floor area. NMUH also accounts for the highest share of manufacturing land use (7%), along with WG, based as well on the total combined floor area. NMUH presents a low percentage of unused premises, constituting 0.5% of its floor area.

Production of clothing is the most common manufacturing activities in NMUH, followed by food processing and wood works such as joinery, curtain poles, picture frames, and wood-turning services. The most common wholesale activity comprises the distribution of food and drinks. The most largely available car-related companies relate to the provision of car-repair services. A detailed list of the analysed buildings (or coloured polygons) is given in section 10.6.

NMUH shows a mixed building typology, although one-story gable-roofed warehouses are the predominant building type. This focus area shows a relatively organised building configuration, however, some of its roads are in a bad state and re-paving them would improve the image of the zone. The average floor area occupied by manufacturing companies in NMUH is 579 m^2, which is the second largest average (after WG) from the four focus areas.
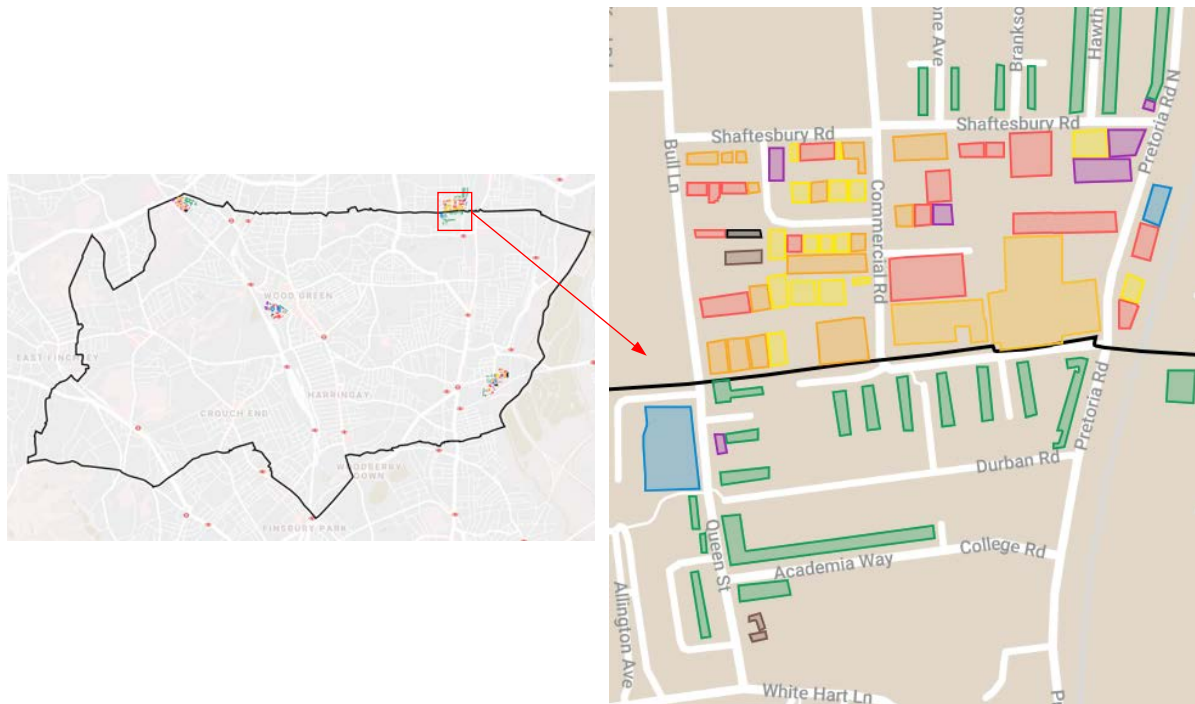

Figure 0.14: Map of North Middlesex University Hospital industrial focus area (NMUH) within Haringey.

A 20-story apartment building (shown in Figure 0.15) was found in NMUH, occupying an area of 0.07 ha, while the neighbouring duplex two-story house (with its backyard) occupies an area of 0.02 ha. This could be a potential solution against the sprawl of residential land use. The NMUH industrial area can be appreciated in Figure 0.16**.** The predominant one-story gable-roofed warehouses can be seen below, although the area shows a diverse typology. Bull Lane is one of the main roads connecting this area to the North Middlesex University Hospital and White Hart Lane.

Figure 0.15: A 20-story residential building in NMUH.

Figure 0.16: Pictures of North Middlesex University Hospital industrial focus area (NMUH): (a-d) warehouses between Bull Ln and Commercial Rd; (e, f) Commercial Rd; (g) Shaftesbury Rd; and (h) Pretoria Rd..

4.1.4 Wood Green (WG)

Figure 0.17 shows a close-up map of Wood Green industrial focus area (WG) within the Borough of Haringey. The analysed area (represented by coloured polygons) comprise 2.75 ha of which 0.88 ha belong to manufacturing, 0.09 ha to wholesale, 0.78 ha to business clusters, 0.58 ha to other companies, 0.21 ha to residential buildings, and 0.20 ha to other land use, while there are no car services or unused premises.

Figure 0.17: Map of Wood Green industrial focus area (WG) within Haringey.

Manufacturing accounts for the main share of land use (32%) relative to the analysed floor area within WG, closely followed by business clusters (28%). WG shows the largest share of manufacturing land use (7%), along with NMUH, out of the four focus areas, based on the total combined floor area. Likewise, WG represents the highest shares of business clusters (6%), other companies (4%), and other land uses (2%). Conversely, WG accounts for the smallest share of wholesale (1%) and residential (2%) land uses from the four focus areas, while it is the only area with no car-service companies or unused premises.

Manufacturing activities in WG are relatively diverse, including among other the production of bread, clothing, art, and signage as well as the provision of printing and publishing services. Business clusters are a common scheme in WG, in which several businesses (including artisans and small manufacturers) share a common building, facilitating logistic and economic benefits. Business clusters in this area include Cypress House, Parma House and The Cholate Factory 1 and 2. A detailed list of the analysed buildings (or coloured polygons) is given in section 10.6.

WG shows a diverse building typology featuring larger buildings (in average) than the other focus areas. There is a mix of large warehouses and buildings, which share the commonality of having flat roofs. The roads and sidewalks in the area are generally in a good state. A large proportion of the blocks and buildings are owned by a company called Workspace (2019). The average floor area occupied by manufacturing companies in WG is 1,100 m^2, which is the largest average out of the four focus areas.

Figure 0.18 presents pictures of WG, including some of its business clusters. It can be seen this area features larger buildings in average that other focus areas. Western Road surrounds the area on the west side, linking it with Mayes Road and Turnpike Lane.

Figure 0.18: Pictures of Wood Green industrial focus area (WG): (a) Western Rd; (b-d) one of the blocks owned by Workspace; (f) The Chocolate Factory 1; (f, g) Olympia Trading Estate; and (f) The Chocolate Factory 2.

4.2 Land use statistics

This section analyses the number of companies and occupied floor area for each type of land use, per each focus area, based on the site visit maps presented in the previous section. The considered occupied floor area disregards the number of floors in each case.

Figure 0.19 illustrates the number of companies for each type of land use, broken down into the corresponding focus areas. Considering the four focus areas, there are 55 manufacturing companies, 47 residential buildings, 36 wholesale businesses, 27 companies relating to other activities, 21 car-service companies, 11 buildings under other land uses, nine business clusters, and five unused premises.

Under manufacturing land use, there are 20 companies in BG, 11 in MRHCC, 16 in NMUH, and eight in WG. Under residential land use, there are 10 buildings (or building clusters) in BG, nine in MRHCC, 22 in NMUH, and six in WG. There are 12 wholesale businesses in BG, eight in MRHCC, 14 in NMUH, and two in WG. There are eight companies relating to other activities in BG, eight in MRHCC, five in NMUH, and six in WG. There are four car-service companies in BG, four in MRHCC, 13 in NMUH and none in WG. Under other land use, there is one in BG, three in MRHCC, three in NMUH, and four in WG. Finally, there is none business cluster in BG, three in MRHCC, two in NMUH, and four in WG.

Figure 0.20 presents the share (or percentage) of occupied floor area for each type of land use, out of the combined total land use (considering the four focus areas), broken down into the corresponding focus areas. The tendency is slightly different to the one found in the previous graph (Figure 0.19), where the number of companies is analysed. Considering the four focus areas, manufacturing accounts for 24% of the floor area, followed by wholesale (22%), residential (20%), other companies (12%), business clusters (11%), car-related services (5%), unused premises (4%), and other land use (3%).

Under manufacturing land use, 6% of the total floor area corresponds to BG, 4% to MRHCC, 7% to NMUH, and 7% to WG. Under wholesale, 3% corresponds to BG, 6% to MRHCC, 12% to NMUH, and 1% to WG. Residential buildings account for 6% of the floor area in BG, 4% in MRHCC, 9% in NMUH, and 2% in WG. Companies related to other activities comprise 3% in BG, 3% in MRHCC, 1% in NMUH, and 4% in WG. There are no business clusters in BG, while these account for 3% in MRHCC, 3% in NMUH, and 6% in WG. Unused premises represent 1% in BG, 2% in MRHCC, 0.2% in NMUH, whereas there are no unused premises in WG. Car-service companies make up for 1% in BG, 1% in MRHCC, 3% in NMUH, while there is none in WG. Buildings or spaces under other land use account for 0.3% in BG, 1% in MRHCC, 0.4% in NMUH, and 2% in WG.
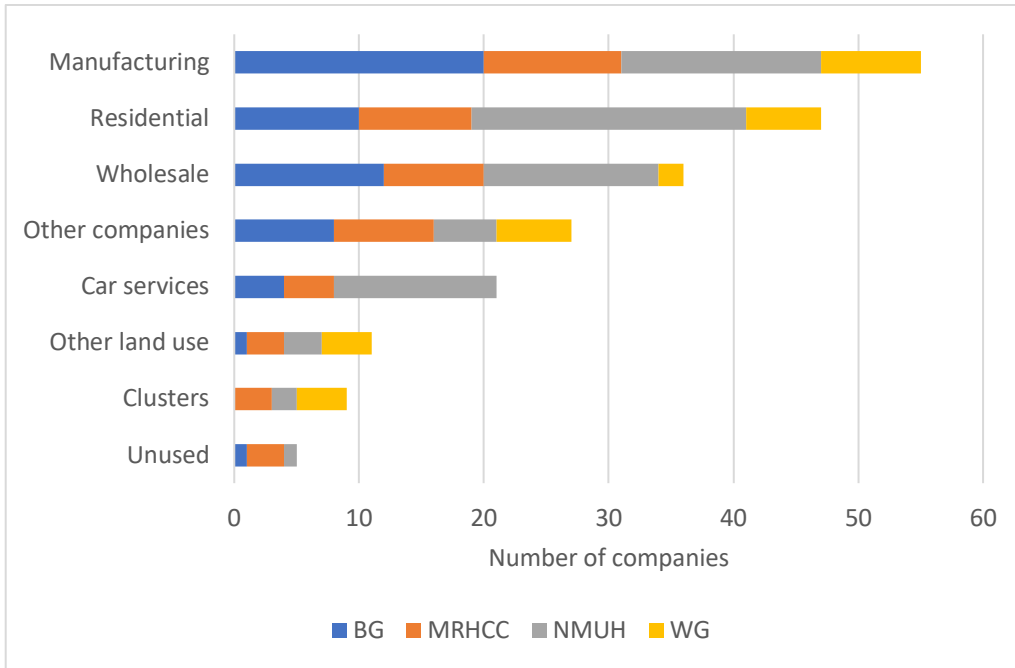
Figure 0.19: Number of companies for each type of land use, per focus area.
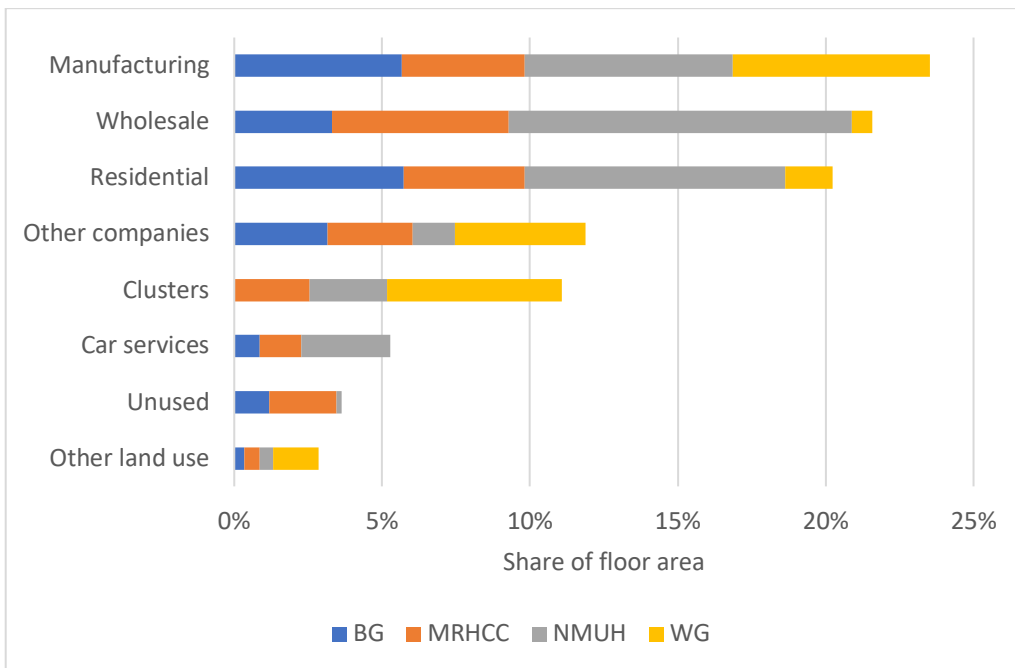
Figure 0.20: Share of occupied floor area for each type of land use, per focus area, out of the combined total floor area.

Figure 0.21 illustrates the shares (or percentages) of occupied floor area per type of land use, for each focus area, out of the total analysed floor area in each focus area. In BG, 28% of its total analysed floor area falls under manufacturing, 16% under wholesale, 4% for car services, 16% for other companies, 28% under residential land use, 6% for unused premises, while there are no business clusters. In MRHCC, 17% of its analysed floor area belongs to manufacturing, 25% to wholesale, 11% to business clusters, 6% to car services, 12% to other

companies, 17% to residential buildings, 2% to other land uses, and 10% to unused premises. In NMUH, 20% of its floor area falls under manufacturing, 33% under wholesale, 7% under business clusters, 9% under car services, 4% under other companies, 25% under residential buildings, 1% under other land uses, whereas there are no unused premises. In WG, 32% of its analysed floor area belongs to manufacturing, 3% to wholesale, 28% to business clusters, 21% to other companies, 8% to residential buildings, 7% to other land uses, while there are no car-service companies or unused premises.
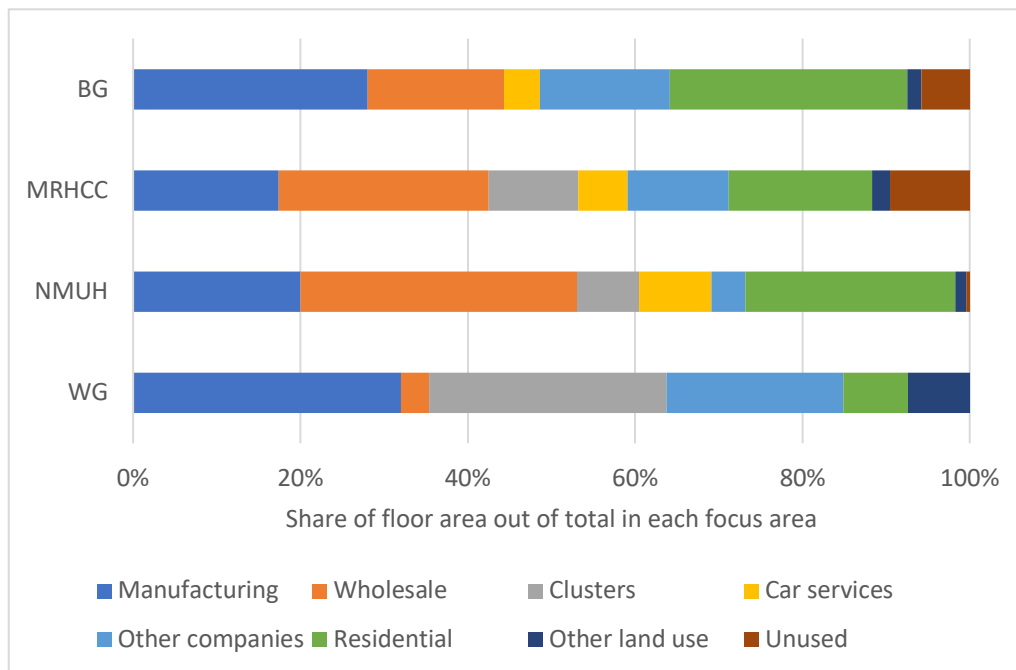
Figure 0.21: Share of occupied floor area per type of land use, out of the total in each focus area.

4.3 Spatial context

BG is a defined industrial area under relatively less spatial pressures amid urban regeneration. Two out of three interviewees claimed they do not face pressures to be relocated, whereas one of them said the Cross Rail 2 project (CrossRail 2, 2019) may pose some spatial pressures. One of the interviewees mentioned their company was sold and relocated from Lower Park Road (210 m away), to accommodate residential land use.

MRHCC used to be a completely industrial area 30 years ago (C&D Waste Contractor), while it currently provides a mixture of commercial/industrial and residential land uses. There is an increasing share of artists and artisans who place their studios or workshops in this area. Interviewees mentioned that MRHCC is becoming a trendier location since six to seven years ago, where people want to live in and socialise. It was also mentioned that landlords are turning industrial land use into residential spaces in order to charge higher rents, although living workspaces are also a common trend. These factors, among other, underpin the increment of residential land use, pressuring current industrial spaces to move out. One

interviewee claimed the area is relatively insecure, which discouraged them from installing PV panels on the roof, although this was not a factor pressuring them to relocate.

Interviewees at NMUH coincide with the fact that the area might turn into nursing homes due to its proximity to the North Middlesex University Hospital. Moreover, the ongoing construction of the Tottenham Hotspur Stadium (THS, 2019) will complicate manufacturing in the area. Accordingly, NMUH might be defined as a Low Emission Zone, where HGVs coming in would be fined. Some of the industrial spaces have become living workspaces to accommodate work and living in the same place. One interviewee mentioned the location shows some areas in bad condition, while another one pointed out there is too many people in the area for manufacturing business to carry out their operation efficiently. Conversely, two interviewees claimed they feel no current pressures to relocate and one of them even purchased a new warehouse in the area to expand their business.

WG industrial area was generally occupied by artists and small manufacturers in the past, where only peppercorn (low) rent was due in order to help small creative industries (Tableware Manufacturer). That particular deal stopped and now Workspace (2019) owns a major share of the land and the buildings in the area, incurring in higher rents. St James developer (Berkeley Group, 2019) is another major landlord in WG, who owns the Olympia Trading Estate. Interviewees claimed they feel potential pressures to relocate their companies as both landlords plan to build residential buildings in the area.

One interview took place within the Compass West Estate, which is not part of the focus areas. The interviewee claimed they face no spatial pressures since the area is defined as a protected industrial zone by the local government council.

Table 0.6 summarises the rationale for location and pressures to relocate for each focus area, including different industrial trades.

Table 0.6: Rationale for location and pressures to relocate for each focus area and different industrial trades.

Industrial trade	Rationale for location	Pressures to relocate
Bounds Green (BG)		
Clothing CMT unit 2	Affordable rent 5-6 years ago	No pressures to relocate, just invested £16k in the building although space is rented
Clothing pattern grading	Proximity to owners; provision of suitable industrial space in inner London	Increasing rents (in inner London); urban regeneration due to the CrossRail 2 project (CrossRail 2, 2019) – the area is being safeguarded so that might push out the businesses in the area

Wholesale tiles and flooring	N/M	No current pressures to relocate, although already relocated from across the road as a housing development was built there

Markfield Rd and the High Cross Centre (MRHCC)

Clothing garment sampling	N/M	There are talks about redevelopment due to the Crossrail coming there from Tottenham Hale. On the other hand, the Haringey Council said they want to keep the area as commercial
Clothing military/casual clothing	N/M	Increasing rents/change of land use – the landlord plans to turn the space into flats as they get more money this way
Furniture kitchens and cabinets	Proximity to owners; proximity to high-end clientele (which tends to be in Central London)	Increasing rents as the area is becoming trendier (turning into a kind of live-work place)
Waste C&D waste collection	Public transport accessibility, proximity to high-end clientele	Increasing rents/change of land use – landlords can charge higher rents for residential properties or living workspaces. Incompatibility of land uses – people and the local council complain about the noise, dust, and vehicle movement.

North Middlesex University Hospital (NMUH)

Building curtain poles	Proximity to owners	Urban regeneration/impaired vehicle mobility – the construction of the Hotspur stadium may complicate manufacturing in the area, which might become Low Emission Zone
Clothing CMT unit 1	Proximity to high-end clientele; parking space; public transport accessibility; proximity to staff; cleanliness and road structure	No pressures to relocate
Clothing men/women clothing	Proximity to high-end clientele	Uncertain about future development – they feel that the council will leave the good places in and regenerate the worse parts
Food Caribbean bread	Access to the North Circular Rd; being able to own space	Urban regeneration – the area might turn into a nursing home as a hospital is located nearby
Metal architectural structures	Access to the North Circular Rd	No pressures to relocate and have already bought a warehouse next door

Wood Green (WG)

Food artisan bread	N/M	Change of land use – the landlord (Workspace) plans to build apartments
Printing signage	Proximity to high-end clientele	Urban regeneration; change of land use –the landlord is planning to build housing and workshops

Wood tableware	Proximity to owners	Urban regeneration – the block (owned by Workspace) will be turned into flats
Other: Compass West Estate		
Food beer	Provision of suitable industrial space in inner London; affordable rent; good transport network (easy access to and from estate to facilitate deliveries); proximity to high-end clientele	No pressures to relocate – the area is defined as a protected industrial zone by the local council

4.3.1 Rationale for location in Haringey

Six interviewees stated high-end clientele tends to be in Central London and they rely on this client base. This generally means less commuting time and easy access for clients and supply-chain actors. Some high-end clothing designers prefer to have their production local to be able oversee it. Four of the interviewees said they have their companies in Haringey as they live nearby and would not want to commute long distances to work. Four interviewees mentioned the area is well located in terms of public transport, including trains such as Piccadilly and Victoria lines and the Overground. Two people highlighted the area has access to the North Circular Road which allows relatively fast transportation everywhere in London. Two interviewees mentioned the availability of industrial spaces in inner London as a criterium for their location – as there are not many of these spaces left in London.
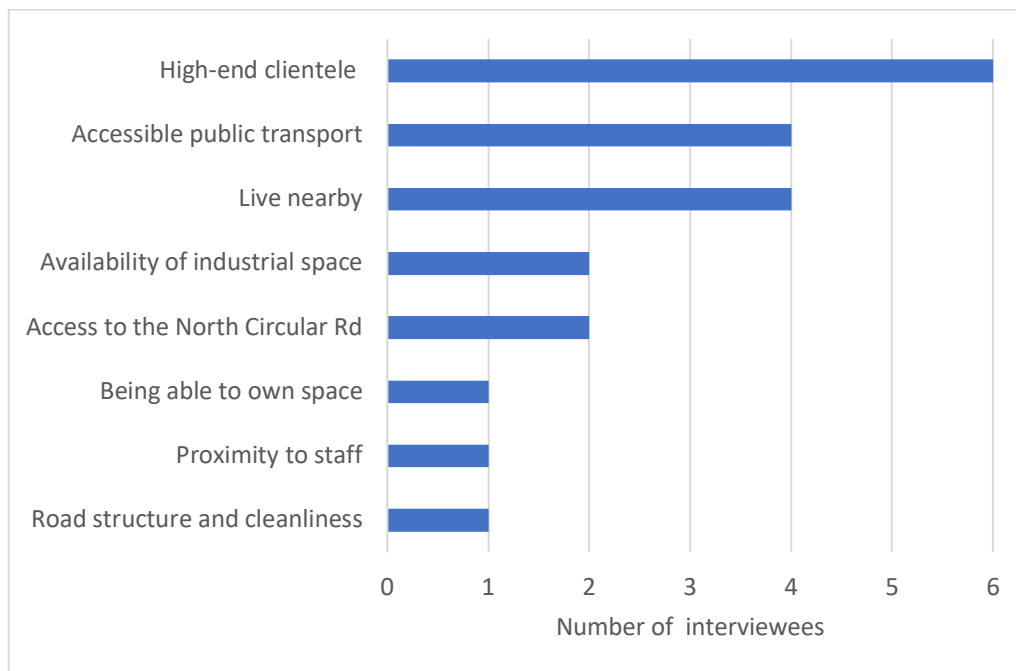
Figure 0.22: Frequency of criteria mentioned for location selection (out of 18 interviews).

Less common reasons (which were mentioned once) include: road structure and cleanliness of the area and being able to own the property. One interviewee mentioned they chose the area to be close to staff; conversely, another interviewee claimed that they can find staff

anywhere, and another one said staff would relocate in order to be near their workplace. Figure 0.22**Error! Reference source not found.** illustrates the frequency of the criteria mentioned for the location selection.

4.3.2 Pressures to relocate
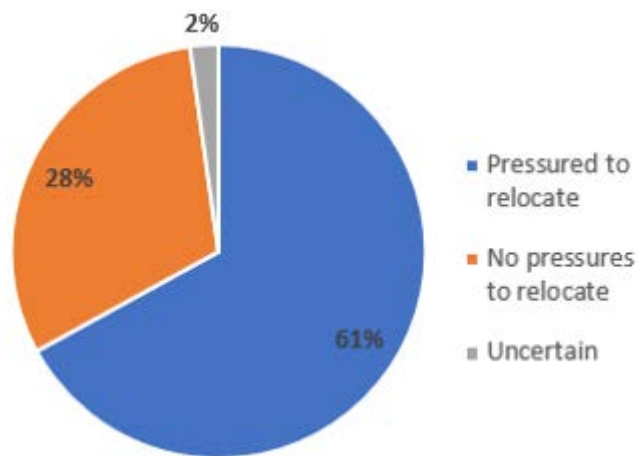
Figure 4.15: Percentage or perceived pressures to relocate (out of 18 interviews).

Out of 18 interviewed companies, 11 (61%) stated they feel pressures to relocate due to urban regeneration, five of them (28%) said they do not face any pressures to relocate, while two interviewees (11%) mentioned they are uncertain of whether urban regeneration would affect them (as shown in Figure 4.15**Error! Reference source not found.**).

The increasing rents in inner London and urban regeneration are the main pressures forcing businesses to relocate. There is a general tendency of changing commercial/industrial land use into residential properties, incurring in gentrification. One interviewee claimed landlords now can change the land use easily, which was not the case in the past, so they are turning commercial/industrial properties into residential or living workspaces and charging higher rents. Living workspaces are becoming trendy because in this way people maintain their work and living in space.

One of the interviewed companies was already relocated as a housing development was built in their previous location. Several tile and flooring distributors were located at that place and the landlord offered them a significant amount of money to relocate. All of these companies (except for one) took the money; some of them relocated and some were liquidated. Currently, three massive 9-story apartment buildings are under construction at that place (as seen in Figure 0.23).
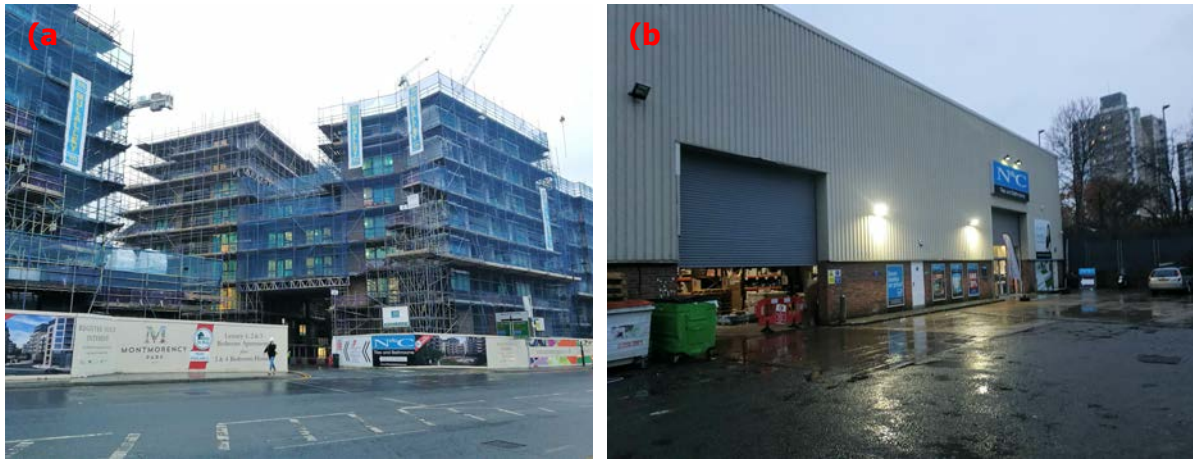
Figure 0.23: Urban regeneration in BG: (a) massive 9-story residential buildings under construction; (b) the only tile company left in place after refusing the offered purchase.

4.3.2.1 Incompatibility of land uses

As more residential land uses are being developed and planned in Haringey, there is the rising issue of land use incompatibility. Some of the interviewed companies said people and the local council complain about the noise, dust, and vehicle movement. As well, people might be concerned about children and they do not want fumes or off-gassing of materials such as MDF. On the contrary, companies such as the Artisan Bread Manufacturer said none of their neighbours have complained as their production implies negligible noise and dust and the manufacture of food produces pleasant smells.

There are conflicting perspectives on land use compatibility. One interviewee claimed "the problem is that all manufacturing is being pushed out of London because everybody needs houses, but people also need jobs" (Signage Manufacturer). Another interviewee said "industries are getting pushed out of London, but similarly you don't want big industrial areas right in the heart of residential areas. Industries produce dust and noise. I think it's inevitable that business like ours get pushed out of London, because the population is increasing, we need more homes. An industrial unit of this size could produce hundreds of homes. If my children were growing up next to a place like this, I wouldn't like it, I want green space for my kids, clean air" (Furniture Manufacturer).

4.3.2.2 Costs of relocating

Companies facing pressures to relocate claim that landlords and politicians do not seem to consider the disadvantages of moving. "People start businesses, create something, stablish themselves and then to be moved is a very upsetting thing, it affects the whole chain", said the Caribbean Bread Manufacturer. The Pattern-Grading Provider claimed the cost of moving the machinery would incur in a £50k expense. Contrarily, one interviewee said that being located in inner London is "not a necessity as suppliers would go anywhere and you could potentially find good employees elsewhere" (Furniture Manufacturer).

4.3.2.3 Lack of communication towards the community

There is a general perception of lack of communication from local councils towards property tenants and owners: "they keep you in this limbo land, we have no idea when they are going to take the land or if they are going to take it at all" (Pattern-Grading Provider). When asked if they were given any official notice about potential urban regeneration, one interviewee mentioned: "no, the council starts visiting a lot and want to see what you do, but it's all really uncertain, I don't think anybody is really sure. I don't think how long this can go for, I'm hoping 10 years" (Signage Manufacturer).

One interviewee said that there would be compulsory purchase if relocated, however, there has not been any official notice and procedural information is negligible. When asked how they found out about the potential urban regeneration, the interviewee said "a friend tried to sell his units and he saw the paperwork and land registry and he realised there would be a compulsory purchase. The council will send a letter out in the year 2021" (Specialised Footwear Distributor). One interviewee believes that if they get relocated, the council should offer another suitable place.

4.3.2.4 Potential relocation site

Interviewees were asked where they would relocate their companies if they required so. All of them said they would prefer to remain in London. In line with this, 38% of the interviewees said they wish they could relocate nearby, the same ratio (38%) mentioned they would move outside the North Circular Road, in the direction of Enfield, and 25% said they were willing to move outside the M25, which is 8.20 km away in a straight line from the northernmost point of the North Circular Road. One interviewee pointed out that several manufacturing companies formerly located in inner London are moving to Essex.

5. Breakdown per industrial trades

This chapter provides a breakdown per industrial trade of different aspects relevant to the study, namely: building typology, market reach, supply chain, employee profile, technology, energy and water, material flows, transport, networking, and challenges. As mentioned in subsection 3.6.2, the analysis in this chapter is based on the 19 interviewed companies. Two wholesale companies were also interviewed in order to enquiry why these companies chose to import their products instead of manufacturing or sourcing them in the UK.

5.1 Industrial activities

Table 0.7 presents the corresponding industrial trades and activities for the 19 interviewed companies (see chapter 2 for the selection procedure). The table follows the same format as Table 0.3 presented earlier. The 'industrial trade' specifies the type of industry (e.g. clothing

or food) while the 'industrial activity' represents the specific manufactured product or service provided. The number within the parenthesis represents the number of interviewed companies under that trade or activity, respectively. For example, there is one company in the 'building' trade whose industrial activity is 'curtain pole' manufacture. Some activities represent more than one trade, such as 'curtain pole' manufacture which belongs to the 'building' trade and to some extent represents the 'wood' trade as well. Both industrial trades and activities are arranged by alphabetical order.

Table 0.7: Industrial trade, activity and NACE code for the 19 interviewed companies. The number in parenthesis represents the number of interviewed companies under that trade or activity, respectively.

Industrial trade	Industrial activity	NACE code
Building (1)	curtain poles[1] (1)	2599
Clothing (6)	CMT (cut, make, trim) (2)	1330
	men/women clothing (1)	1410
	military/casual clothing (1)	1410
	pattern grading[2] (1)	1330
	garment sampling (1)	1330
Food (4)	beer (1)	1105
	bread (2)	1071
	meat/poultry (1)	1013
Furniture (1)	kitchens and cabinets[3] (1)	3102
Metal (1)	architectural structures[3] (1)	2511
Printing (1)	signage (1)	7410
Waste (1)	C&D waste collection (1)	3811
Wood (2)	joinery[3] (1)	1623
	tableware (1)	1629
Wholesale (2)	specialised footwear (1)	4772
	tiles and flooring (1)	4778

[1] Curtain poles partly represents the Wood trade.

[2] Pattern grading partly represents the Textile trade.

[3] Kitchens and cabinets / architectural structures / joinery partly represent the Building trade.

5.2 Building typology

Table 0.8 summarises the building typology for the interviewed companies. The table includes the 'land use area', 'number of stories', whether the company 'owns or rents' the property, the 'location' in terms of focus areas and 'other' characteristics, such as whether the building has been adapted or it was built for purpose.

The land use area represents the land area occupied by a property regardless of the type of construction (i.e. warehouse, yard) and the building's height. The land use area for the interviewed companies ranged from 200m^2 to 1,100m^2, with an average of 525m^2 and a standard deviation of 280m^2.

All of the interviewed companies said their building was adapted rather than built for purpose. Three interviewees claimed to suffer spatial constrains and are planning to move to a larger building. In total, 53% of the buildings are owned by the companies, while 47% are rented from private landlords. In terms of focus areas: there is one owned and two rented buildings at BG; there are three owned and one rented at MRHCC; five owned and three rented at NMUH; while there are no owned buildings and three rented ones at WG. Accordingly, MRHCC showed the highest proportion of owned properties (75%) and WG had the highest rate of rented properties (100%), based on the number of interviewed companies per focus area. It is worth mentioning that Workspace (2019) owns the majority of properties in the analysed focus area of WG, and thus these properties are only available for leasing rather than buying.

Table 0.8: Building typology per industrial trade.

Industrial trade	Land use area [m^2]	No. of stories	Owns or rents	Location	Other
Building (1) curtain poles	270	2	Owns	NMUH	Adapted, plan to have a purpose-built building in the future
Clothing (1) CMT unit 1	330	2	Rents	NMUH	Adapted, fits the needs, no spatial conflicts
Clothing (1) CMT unit 2	220	2	Rents	BG	Adapted, accessible enough. Rent is around £40k a year
Clothing (1) men/women clothing	770	2	Owns	NMUH	Adapted
Clothing (1) military/casual clothing	600	2	Rents	MRHCC	Adapted
Clothing (1) pattern grading	500	1.5[1]	Owns	BG	Purchased as empty shell and adapted
Clothing (1) garment sampling	820	1	Owns	MRHCC	Adapted
Food (1) artisan bread	630	2	Rents	WG	Need a bigger building because they are growing – clients demand more products than they can supply

Food (1) Caribbean bread	220	1	Owns	NMUH	Purchased as empty shell and adapted
Food (1) Beer	480	2	Owns	Other	Adapted
Food (1) meat/poultry	180	1	Owns	NMUH	Adapted
Furniture (1) kitchens and cabinets	740	1.5[1]	Owns	MRHCC	There are spatial constrains and could easily benefit from a space twice as big
Metal (1) architectural structures	200	2	Owns	NMUH	Adapted. Includes both an open and closed spaces
Printing (1) signage	1,020	1	Rents	WG	Adapted, big warehouse, they are satisfied with the place
Waste (1) C&D waste collection	1,100	2	Owns	MRHCC	Two-story (180 m^2) building with a big warehouse and a large yard (where waste is piled up)
Wood (1) joinery	200	1	Rents	WG	Adapted
Wood (1) tableware	150	1	Rents	NMUH	Adapted. Rent is around £800 a month
Wholesale (1) specialised footwear	610	1	Rents	NMUH	Adapted warehouse with storage space
Wholesale (1) tiles and flooring	560	1	Rents	BG	Adapted warehouse with storage space

[1] Number of stories indicated with a decimal (e.g. 1.5) means the building has a mezzanine.

5.3 Market reach

The market for most of the industrial trades considered is mainly comprised by high-end clients, including: building, clothing, food (artisan bread and beer), furniture, printing, wood (tableware), and waste. Thereby, 68% of the interviewed companies serve a high-end clientele, whereas 32% are based on a more diverse market. In terms of exports, 47% of the interviewed companies export some of their products, while 53% of them deliver products of services merely within London or the UK. London is the main market for 42% of the companies and the UK in general is the main market for 58% of them. The Tableware Manufacturer is the company exporting the largest share of their products (50%) whose marketing approach is based on Instagram (2019). Table 0.9 provides detail for the market reach of the analysed industrial trades.

Table 0.9: Market reach per industrial trade.

Industrial trade	Main market	London share of market
Building (1) curtain poles	The UK – 20% of their products are exported to Arab countries, Russia, and USA, among other	Not the main market
Clothing (6)	The UK - mainly retail stores, British designers and manufacturers with a few clients abroad (e.g. Dubai, Belgium, France, Germany)	70-100%
Food (1) artisan bread	London – retailers and food-service companies	N/M
Food (1) Caribbean bread	London – with few exports going to Europe or USA for example	90%
Food (1) beer	London – pubs within the M25	95%
Food (1) meat/poultry	London – restaurants	N/M
Furniture (1) kitchens and cabinets	London	95%
Metal (1) architectural structures	The UK	70-80%
Printing (1) signage	London – with a few exports going to the Netherlands, Scandinavia, France and USA	70-80%
Waste (1) C&D waste collection	London	98%
Wood (1) joinery	London	95%
Wood (1) tableware	50% of products are sold in the UK while 50% are exported everywhere (e.g. Germany, USA)	Not the main market
Wholesale (2)	The UK	Not the main market

5.4 Supply chain

Table 0.10 summarises the upstream and downstream suppliers for the analysed industrial trades. Common supply-chain actors for all of the companies include a material or input supplier on the upstream side and a Waste Contractor as downstream service supplier.

The clothing trade showed to be the most ubiquitous industry in Haringey (as shown in Figure 0.5), involving a complex supply chain. Within the clothing trade, different supply-chain actors were contacted, including activities such as: clothing design and manufacturing, pattern

grading, sampling, and CMT (cut, make, trim). Generally, the supply chain starts with the clothing designers or with the retail stores (which specify their requirements to designers). The analysed garment supply chain in London followed two schemes:

1. Designing in London, manufacturing abroad: Usually entails large production scales (i.e. several copies of one item). In this scheme, London-based designers design the clothing item and then send a pattern (on paper or on a digital file) or a garment sample to be manufactured abroad. As well as the labour, the material inputs are sourced abroad. When designers send a garment sample (instead of a pattern) to manufacturers, this is commonly produced by a CMT or a sampling unit. Clothing manufacturers abroad include countries such as: Bulgaria, Morocco, Poland, Portugal, Rumania, and Sri Lanka.

2. Designing and manufacturing in London: Usually entails smaller production scales. This scheme is commonly used by high-end clients who want to have more control over their production. Here designers first send a pattern (on paper or on a digital file) to CMT units. The latter produce a sample and send it back to designers for approval, then designers send the approved (or modified) pattern to the CMT unit, commonly along with the material inputs (e.g. fabric). The CMT unit produces the requirement, basically by cutting the fabric and sewing it together.

The patterns that designers provide to manufacturers or to the CMT unit may be graded into different sizes in order to produce different sizes of a garment model. The sizing of the patterns is called pattern grading and is a service provided by another supply-chain actor – the pattern grader. Designers generally send over a paper or digital pattern to the pattern graders. The latter scan the pattern and grade it into different sizes using computer software. Finally, the graded patterns are sent back to the designer.

Table 0.10: Upstream and downstream supply chain per industrial trade.

Industrial trade	Upstream supply chain	Downstream supply chain
Building (1) curtain poles	Material suppliers	High-end retail stores
Clothing (6)	Textile manufacturers and suppliers; high-end designers	Clothing manufacturers abroad, high-end retail stores
Food (4)	Input suppliers	Distributors, retailers, food-service companies, restaurants, pubs
Furniture (1) kitchens and cabinets	Material suppliers	End-clients; construction industry
Metal (1) architectural structures	Material suppliers	Private companies, construction industry

Printing (1) signage	Material suppliers	Various companies, construction industry
Waste (1) C&D waste collection	Construction and demolition industry	Material recovery facilities (MRFs), incineration plants, construction industry, used for covering landfill cells)
Wood (2)	Wood manufacturers and suppliers	High-end retail stores and restaurants, construction industry
Wholesale (2)	Manufacturers abroad	Suppliers and end-clients

5.5 Networking

Networking in this context includes sharing knowledge, products, services, material resources, facilities, storage, and/or machinery. Based on interviews, it was concluded that little networking takes place within the analysed companies. Only four (21%) of the interviewed companies mentioned some kind of networking. The Pattern-Grading Provider said they sometimes provide their services for a clothing manufacturer in the area. The Caribbean Bread Manufacturer shared storage space with the company next door. The Beer Manufacturer is a founding member of London Brewers Alliance (LBA, 2019), which includes most of the breweries in London and is a regular forum for sharing ideas. The C&D Waste Contractor claimed to share knowledge with companies in the same trade: "I'm a firm believer in sharing the knowledge, I don't understand why our industry doesn't do it more – each of us are doing the same thing, although you might be doing it a little bit different. When I speak at events I share statistics, how we look after the environment, how we cut our emissions, and how we reduce accidents".

5.6 Employee profile

Based on the interviewed companies, the number of employees ranges from one employee in the wood and wholesale trades to 160 employees in the Artisan Bread Manufacturer (food trade). The average number of employees is 36.6, while the standard deviation is 42.2.

The majority of workers in the production lines were skilled or semi-skilled when hired, yet all of them were further trained in the company. Nearly all the production staff were not educated, while most of the staff conducting administrative tasks were tertiary educated. Jobs that required physical strength were generally done by male employees, while women were commonly doing tasks that demanded detail (such as finishing products or machinist in the clothing trade). Administrative staff were gender mixed. Most of the employees, both in production and administration, were immigrants and Eastern Europeans accounted for the majority of the staff. One interviewee stated that "British-born people do not want low-skilled, low-paid jobs. These types of jobs are mostly taken by Eastern European" (C&D Waste Contractor). Similar concerns were raised by other interviewees: "There are no good

employees in the market, the very good ones retired now. English ones don't have enough training (CMT Unit 2). "There are so many less skilled people in the UK than there were 20 years ago. Those people got old and retired, younger people aren't coming into the [manufacturing] industry" (Garment Sampling Manufacturer). "[In the manufacturing industry] skilled workers are not British. Now with Brexit, skilled workers are leaving" (Tiles and Flooring Distributor).

In terms of difficulty of hiring, 69% of the interviewees stated it is difficult to find skilled employees and 31% said it is not difficult to do so, based on 13 interviewees who provided a response in this regard. Employee recommendation was mentioned as the most common and effective mechanism for hiring employees. The Curtain Pole Manufacturer mentioned: "When we advertise in the local job centre we do get people but they tend to be unskilled or don't want to do the job. It's easier to get friends of friends. You get one from somewhere, like Lithuania or Rumania, and then there return more". Similar statements were made by other interviewees: "There's lots of [job] agencies that would charge us; two times I've used them but staff left (Signage Manufacturer). "Hiring through the job centre has been good but employing from within [through employees' recommendation] is much better because you can find similar personality and work ethics" (Caribbean Bread Manufacturer).

Thus, employment through friends' recommendation relates to higher retention rates, as compared to hiring through job centres. Additionally, an interviewed company claimed to have a relatively high retention rate (79%) due to inclusive training programmes provided to their employees: "So far it's been welcomed, it creates a team effort, it makes everybody be more responsible and feel more responsible for their own. Overall it makes us safer, more sustainable, and more profitable. I don't understand why other people don't do it – I see it as an investment they see it as an expense […] I think education and training is the key to successful businesses" (C&D Waste Contractor).

Table 0.11 summarises the employee profile per industrial trade, including the number of employees, skills level, ethnicity, difficulty for finding adequate workers, and hiring mechanism.

Table 0.11: Employee profile per industrial trade.

Industrial trade	No. of employees	Level of skills	Ethnicity	Hiring
Building (1) curtain poles	48 – 55 30% Admin staff	Admin staff: most have tertiary education. Production workers: most of them are skilled and/or trained *insitu*.	Different nationalities, mostly Eastern European	Difficult to find skilled workers. Hired through employees' recommendation

Clothing (6)	12 - 85 Avg: 42.4 SD: 31.2	Generally, not tertiary educated. Mostly skilled. Further trained *insitu*	Non-British	Difficult to find skilled workers. Hired mostly through employees' recommendation
Food (4)	6 – 80 Avg: 27.8 SD: 30.3	Not tertiary educated. Semi-skilled and further trained *insitu*	Non-British	Not difficult to find workers as no high-level skills are needed. Hired through employees' recommendation or Indeed.co.uk
Furniture (1) kitchens and cabinets	3 employees (including the 2 owners)	All of them have tertiary education	British	Difficult to find skilled workers
Metal (1) architectural structures	20 - 30 60% admin staff	Admin staff: some have tertiary education. Production workers: not tertiary-educated, trained *insitu*	30% British, the rest mostly Eastern European	Not difficult to find workers. Hired mostly through Indeed.co.uk
Printing (1) Signage	20 35% admin staff	Admin staff: some have tertiary education in unaffiliated fields, e.g. two teachers, one economist and a nurse (the owner). The rest were already skilled or trained *insitu*	N/M	Fairly difficult to find employees. Done through a sign magazine, Gumtree.co.uk or Indeed.co.uk
Waste (1) C&D waste Collection	160	Some of the admin staff have tertiary educated. Lorry drivers go through qualification. Pickers[1] are low skilled	Lorry drivers and pickers are mostly Eastern European	Not difficult to find workers, their reputation brings employees in, who email CVs or walk in and ask
Wood (2)	1-2 (including the owner)	Not tertiary educated	British	Not currently required
Wholesale (2)	1-2	Not tertiary educated	British	Not currently required

[1] Pickers are the people who manually pick up recyclables from a conveyor belt in order to segregate them.

Figure 0.24 shows pictures taken during site visits of employees performing diverse activities within different trades, such as curtain-pole manufacturing (building trade), signage manufacturing (printing trade), CMT Unit 1 and pattern grading (clothing trade), kitchens and cabinets manufacturing (furniture trade), and architectural structures manufacturing (metal trade).
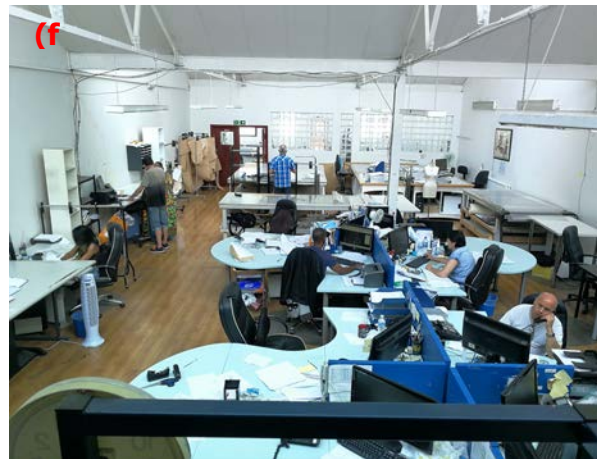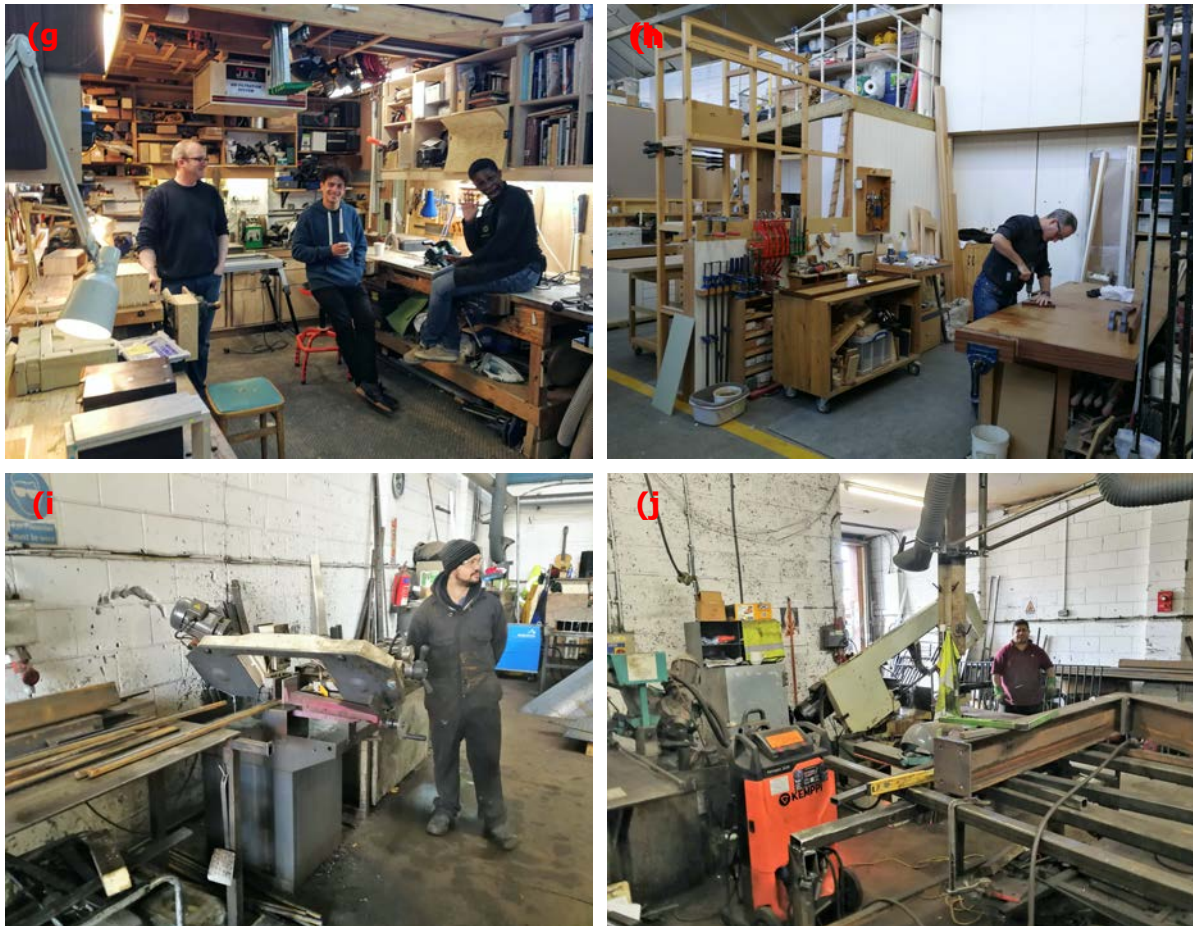
Figure 0.24: Pictures of employees working at different trades: (a) wood turner at the building trade; (b) women hand-finishing curtain finials; (c) sprayer coating curtain poles; (d) staff producing signage at the printing trade ; (e) machinists at the clothing trade; (f) pattern-grading employees ; (g, h) workers in the furniture trade; (i, j) employees in the metal trade.

5.7 Technology

All of the industrial trades (except for wholesale) currently require manual labour, where the trades that demand most intense manual labour are the clothing and food trades, based on the interviewed companies. This constitutes a challenge due to the labour cost in London, which reflects on the high living costs in the city. Even the waste collection process currently needs manual labour, specially at the picking station where waste is hand-picked in order to be segregated. The interviewed C&D Waste Contractor mentioned they are working on a project on infrared-sensing robotics for the picking station, which would improve accuracy in the segregating process and would cut down on costs, injuries, and downtime; although this implementation might negatively affect employment.

A CNC machine was deemed to potentially support the building, furniture, metal and wood trades. Lack of space and cost-benefit were mentioned as the main barriers to own this type of machine in the corresponding interviewed companies. Sharing workspace could be a potential option to overcome these barriers, as is the case of Building Bloqs (2019), which

rents out equipped workspace on a daily or weekly basis for small manufacturers. However, two interviewees claimed they require their own space in order to store the specific tools and materials they use.

Table 0.12 covers the current technology used per industrial trade, as well as the respective technology that could play an important role in the future.

Table 0.12: Current and future technology per industrial trade.

Industrial trade	Technologies used	Future technology
Building (1) curtain poles	Fret cutters, programmable cutting machines, sprayers, hand tools	N/A
Clothing (5)	5-thread/4-thread/3-thread, baby-locking machine, button-hole machine, button sewer machine, flap machine (sewing machine), fusing machine, Gerber machine (automated cutting machine), overlocking machines, pryers, sewing machines, scissors	3D printers (to create templates for costumers to see); laser cutting machines
Clothing (1) pattern grading	Computer CAT systems, plotting machines, scanners, specialised software	N/M
Food (2) artisan bread; Caribbean bread	Dough cutters (hand cutting tools), ovens, mixers, bread is hand-moulded	Want to keep the bread hand-crafted as this defines the product
Food (1) beer	Steam powered jacketed kettle, hot water tank, heat exchanger, natural fermentation process	Any ability to reclaim CO_2 from the fermentation process[1]
Furniture (1) kitchens and cabinets	Drills, hand tools, spray boot, table saws	CNC work is outsourced to a company nearby
Metal (1) architectural structures	Band saw, MIG welding (arc welding), grinder (to polish welded parts), drills, spray and powder-coating boot coupled with pressurized air	A CNC machine would support this type of industry, but they do not own one due to spatial constrains
Printing (1) signage	CNC machine, TIG and MIG welding, saws, spray room, routers, a printer, an HD printer, various hand tools, vacuum systems (for the CNC machine and spray room)	N/M
Waste (1) C&D waste collection	Crusher, dual crusher, screener, flip-flop screener (to separate soils and stone), trommel (rotary screen), shredder (to make waste smaller and transport it more efficiently), conveyor belt (the segregation of recyclables is done manually off the conveyor), HGVs	Infrared-sensing robotics in the picking station – there already exists a system called ZenRobotics (2019) but a massive site is required to place it. Interviewee believes electric HGVs will not be commercially available soon

	and telematic systems in the vehicles (measuring mileage, CO2 emissions, acceleration and braking rate)	
Wood (2)	Carving tools and other hand tools, rotary tool with different attachments (e.g. for sanding), saws	A CNC machine would support this type of industry
Wholesale (2)	No industrial process in place	N/A

[1] Breweries such as AB InBev (2019) have the ability to capture CO_2. It is expensive to establish such a unit. The reclaimed CO2 would be most likely used for purging tanks of oxygen and carbonating the beer (Beer Manufacturer).

Figure 0.25 shows pictures taken during site visits of machinery used for diverse activities within different industrial trades, such as such as curtain-pole manufacturing (building trade), CMT Unit 1 and CMT Unit 2 (clothing trade), kitchens and cabinets manufacturing (furniture trade), and architectural structures manufacturing (metal trade). Figure 0.25 (f) shows a spray and powder-coating, which is a type of equipment used by the furniture, metal, and printing (signage) trades. In the case of the Architectural Structures Manufacturer elements are shot-blasted first, then added a coat of powder, painted, and sometimes a coat of zinc is applied; elements are left for 20-45 minutes at 200°C to finish the coating process.
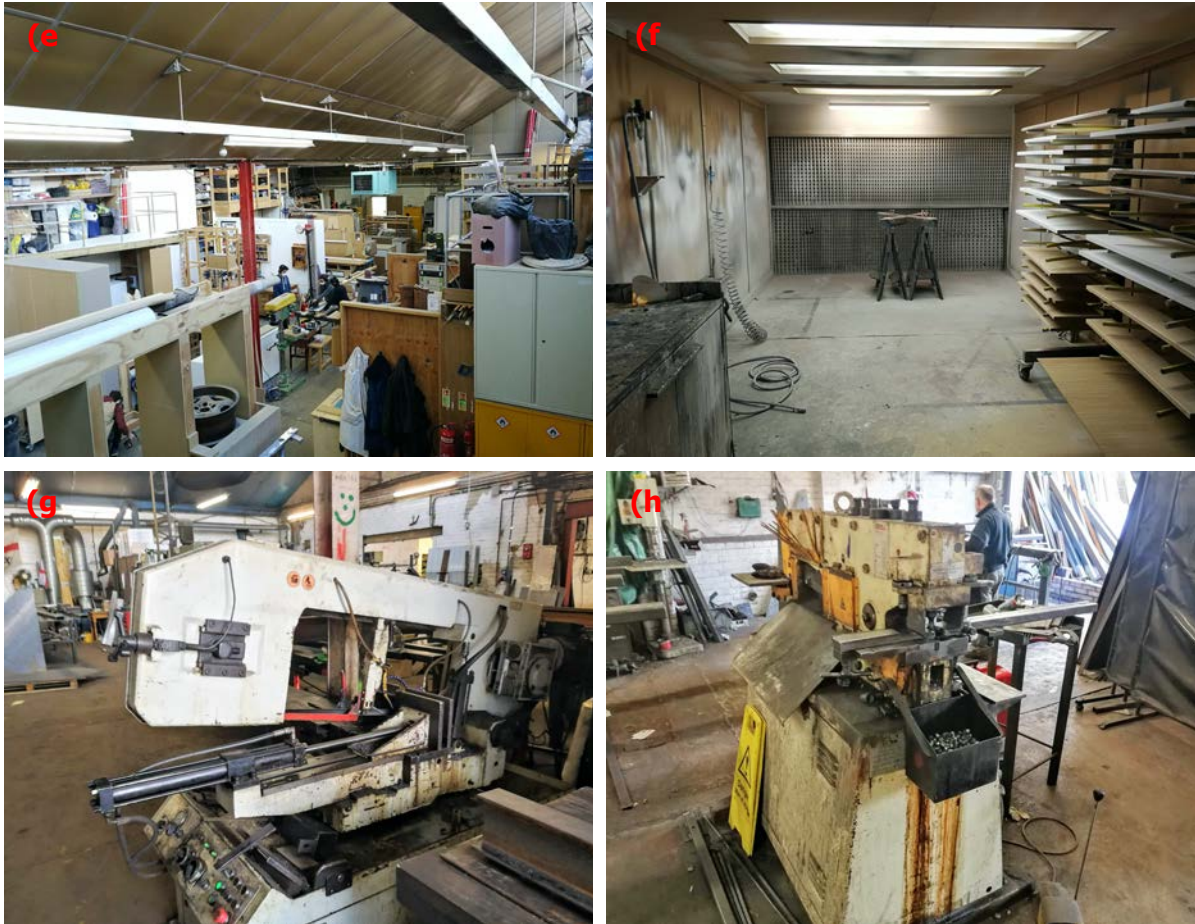
Figure 0.25: Pictures of machinery used at different trades: (a, b) machines for curtain-pole manufacturing at the building trade; (c, d) sewing machines at the clothing trade; (e, f) cutting machine and spray boot at the furniture trade; (g-h) machine tools at the metal trade.

5.8 Energy and water

Table 0.13 summarises the energy use and energy sources per industrial trade. For all cases, the main energy consumption was attributed to machinery, although all of the interviewed companies lacked energy meters and were thus unable to provide a breakdown of their energy use, i.e. how much energy each part of the production (or machinery) consumes in average. Electricity was the main energy source, and gas was mainly used for indoor heating, while diesel represented a significant energy source for powering HGVs by the C&D Waste Contractor. Only 18% of the interviewed companies use some sort of renewable energy source, although none of them fully rely on renewable energy.

Table 0.13: Energy use and energy sources per industrial trade.

Industrial trade	Energy used for	Energy sources	On-site/RE generation
Building (1) curtain poles	Machinery (mainly) and heating	Electricity (mainly), gas (for indoor heating)	11 solar panels were installed on the roof three years ago, decreasing 25% of bills cost. Energy-

			from-waste is used for heating by burning wood and cardboard waste in a boiler
Clothing (6)	Machinery (mainly) and heating	Electricity (mainly), gas (for indoor heating)	One of them was powered by renewable energy through energy suppliers such as Green Energy or Volvo
Food (2)	Mixers, ovens, freezers heating	Electricity (for the mixers) and gas (for the ovens and indoor heating)	No
Food (1) beer	92% of energy is used for the production process and steam generation to heat the brewing vessels	Electricity and gas	No
Food (1) meat/poultry	Cooling (fridges/freezers)	Electricity	Installed PV panels (recently)
Furniture (1) kitchens and cabinets	Table saws and spray boot (mainly) and other machinery	Electricity (mainly), gas (for indoor heating)	Plan to install a biomass (wood) burner in their future workshop
Metal (1) architectural structures	Welding machines, the fume extraction, band saw and drills	Electricity (mainly), gas (for indoor heating), and pressurized air	No
Printing (1) signage	Machinery, probably CNC machine consumes the most	Electricity	No
Waste (1) C&D waste collection	Transport (HGVs) consumes the most energy, followed by the heavy machinery	Electricity (for machinery), gas (for indoor heating), and diesel for the HGVs	No
Wood (2)	Machinery	Electricity (mainly), gas (for indoor heating)	No
Wholesale (2)	No manufacturing process in place	Electricity (for lighting), gas (for heating)	No

Table 0.14 covers the water use and treatment for the interviewed companies. Only 22% of the companies use water in the production process. All of these companies discharge the waste water through the municipal sewer. Only one (0.06%) company harvests rain water, which is done through syphonic drainage.

Table 0.14: Water use and treatment per industrial trade.

Industrial trade	Water used for	Water treatment
Building (1) curtain poles	No water is used in the production process	N/A

Clothing (6)	No water is used in the production process	N/A
Food (2) artisan bread/ Caribbean bread	Water is used for the production process of bread	Sewer
Food (1) beer	Water is mainly used for production (20%), cleaning (50%), and cooling[1] the wort (10%)	Sewer[2]
Furniture (1) kitchens and cabinets	No water is used in the production process	N/A
Metal (1) architectural structures	Cooling the band saw	Sewer
Printing (1) signage	No water is used in the production process	N/A
Waste (1) C&D waste collection	No water is used in the process	They harvest rain water (80,000 L per year considering their two facilities) through syphonic drainage on the roof
Wood (2)	No water is used in the production process	N/A
Wholesale (2)	No manufacturing process in place	N/A

[1] In the beer manufacturing process the wort is boiled and cooled down from 100 °C to around 18 °C. The most efficient way to do this is using a heat exchanger, where the hot wort runs along one side of the plates and chilled water runs along the other side (Beer Manufacturer).

[2] Waste water from the beer manufacturing process is not treated. Thames Water grants trade effluent discharge permissions and takes samples to determine the waste water average composition (Beer Manufacturer).

5.9 Material flows

Table 0.15 summarises the material inputs and supply as well as the waste outputs and management, for the interviewed companies. A more detailed version of this table is given in section 0 in the Appendix. When asked about their input supply origin, 50% of the interviewees provided a comprehensive answer, 28% gave a partial response, while 22% did not know or would not provide information about the origin or their inputs. In some cases, interviewees mentioned that material inputs were sourced in the UK, but originally imported from abroad.
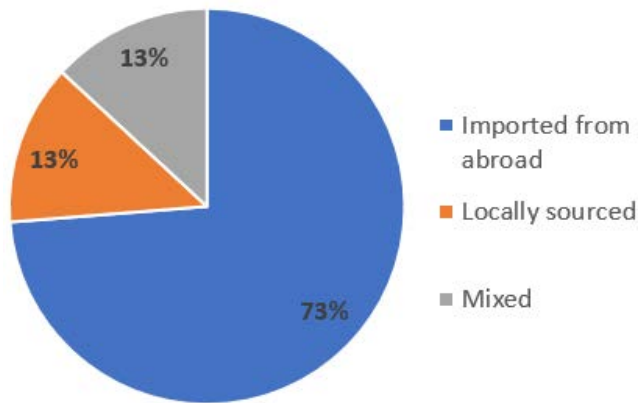
Figure 5.3: Share of material input origin

Based on the interviewees who provided information about the origin of their material inputs, it was found that 73% of the inputs were imported from abroad, 13% were sourced locally in the UK, while 13% comprised a mix of imports and locally sourced inputs (as illustrated in Figure 5.1). Material inputs were mainly imported from abroad since this generally entailed lower prices. As the Men/Women Clothing Manufacturer stated, "there are good fabric mills in the UK such as Abraham Moon & Sons or British Millerain, the problem with these is that they're more expensive [than imported inputs]".

Nonetheless, some manufacturers prefer to source their material inputs locally in the UK, as one interviewee claimed: "we've always believed that it [the product] should be UK made and sourced. [Our] raw material comes from the UK, which is a bit of a concern because of Brexit; we already had two suppliers file liquidation" (Signage Manufacturer).

For the case of the wholesale companies, the entirety of the finished products they distribute in the UK were imported from other countries, since "it's way cheaper to import this type of products than manufacturing them in the UK" (Tiles and Flooring Distributor).

In terms of waste management, all of the interviewed companies use a private Waste Contractor to collect their waste. Likewise, all of the companies said they have to pay for the waste-collection service, while they obtain no monetary benefit from their waste; except for the Artisan Bread Manufacturer which hands their food waste (in exchange for a payment) to a company called Green Feeds (2019). In rare occasions, waste was collected by other companies or individuals to be burned or used for farming, although this showed to be an informal and uncommon practice. Several companies said it is easier to have their waste collected by a Waste Contractor due to time and space constrains, instead of "having to worry about what to do with it" (CMT Unit 1).

Likewise, due lack of time and space, none of the interviewed companies properly segregated their waste, except for the case of hazardous residues. This also relates to the fact that

companies see no benefit in separating their waste, and none of the companies knew precisely how their waste is treated: "[Waste Contractor] comes to collect offcuts and they'd put the recycling in the same load, so we know that plastic and cardboard isn't necessarily recycled" (Furniture Manufacturer). Similar comments include: "Waste Contractors do not provide companies with information on what is done with the collected waste" (Curtain Pole Manufacturer). "No idea what they do with it" (CMT Unit 1). "I take my receipt and I don't care what they do with the waste" (Meat/Poultry Processor). "I can't confirm how our general waste and recycling is dealt with" (Beer Manufacturer).

Some waste types if properly segregated could be useful for some industries, although this rarely was the case due to space and time constrains, lack of recycling market and infrastructure, and the relatively small scale of individual waste generation. For instance, "wood dust could be useful for certain industries such as farming. However, this is commonly unfeasible as [wood] dust is mixed with different materials and separating them would be time consuming" (Furniture Manufacturer). The Beer Manufacturer mentioned their waste could be used for farms and bio fuel processors; the main barriers preventing this include lack of market, lack of infrastructure and their output being too small to be collected, so it would probably result in them paying a collection charge. The CMT Unit 2 said their waste fabric is not recycled by their Waste Contractor and they would have to pay for a special company to collect and recycle this type of waste. Again, the issue being their waste amount or scale, which was too small to make the collection cost-effective.

None of the interviewed companies knew about the resources consumed or waste generated by companies located nearby, nor have they considered using waste or underutilised resources from other companies as input for the manufacturing process. Likewise, none of the interviewees had heard the concept of circular economy.

Table 0.15: Material inputs and supply as well as waste outputs and management per industrial trade.

Industrial trade	Material inputs	Material supply	Waste outputs	Waste management
Building (1) curtain poles	Wood, resins, metals, paint	Italy, Poland, Spain, China, and India	Wood, resins, metals, paint, and cardboard	Waste Contractor. Wood and cardboard waste is burnt in a boiler to generate heat
Clothing (6)	Fabrics, buttons, fusing, linings, leather, lining, paperboard, plastic (to cover the dresses), ribs, thread,	China, Turkey, Korea, Japan, and Italy (fabrics), Germany (thread), UK (paper and paperboard)	Fabric offcuts, paper and plastic	Collected by Waste Contractor. Sometimes offcuts are kept for further re-use

	trimmings, waddings, zips			
Food (2) artisan bread; Caribbean bread	Flour, salt, seasonings, starter (yeast), water	France, Germany, Canada	Food waste (dough and finished products), cardboard and paper packaging	Food waste is either re-used or collected and used for animal feed. Packaging waste is collected by Waste Contractor
Food (1) beer	Water, malt, hops, yeast	UK, USA, New Zealand, Germany, Poland, Czech Republic (hops), UK (malt)	Trade effluent, spent grains, spent hops, packaging	Spent grains and hops are collected and used for animal feed and composting. Other waste is collected by Waste Contractor
Food (1) meat/poultry	Beef, lamb, chicken	New Zealand, Spain, France	Bones and packaging	Collected by Waste Contractor
Furniture (1) kitchens and cabinets	Corian, glass, lacquer, marble, MDF, melamine, metal, paint, stones, wood	USA (Corian), Italy or Greece (marble and stone), UK (melamine), Italy, USA or Africa (wood)	Various material offcuts and shavings, cardboard and plastic packaging	Collected by Waste Contractor using different vehicles for recyclables, MDF dust, and hazardous waste, respectively
Metal (1) architectural structures	Steel sheets, paint, powder coating	Interviewees did not know where their suppliers source the material inputs from	Metal offcuts and shavings, paint spray cans	Collected by Waste Contractor. Sometimes collected by metal merchants
Printing (1) signage	Acrylic glass, aluminium, steel, timber, LED lighting, neon lighting, PVC foamboard, MDF, concrete, vinyl, water-based paints	China (LED lighting[1]), Italy (wood), USA (acrylic glass[2]). The rest is sourced in the UK	Various material offcuts and shavings, cardboard and plastic packaging	Collected by Waste Contractor
Waste (1) C&D waste collection	Bricks, concrete, soils, timber, cardboard, plastics, greenery, shrubbery	Waste is collected in London	Cardboard is recycled in the UK; timber goes to energy-from-waste or is re-chipped for MDF. Concrete and bricks are turned into certified recycled aggregate and sold to the construction industry; plastic is re-melted into plastics in the UK, the residue (RDF) is bailed and shipped to either Holland, Germany, Scandinavia or Poland; fines are sold for covering landfill cells	
Wood (2)	Wood, adhesives, finishing products, nails, screws	Italy, UK (wood). Interviewers did not know the origin of the rest of material inputs	Wood offcuts and shavings, and packaging	Collected by Waste Contractor. Sometimes waste is sold to farming companies

| Wholesale (2) | Finished products | Imported from China, India, Italy, Pakistan, Spain, Taiwan, Turkey | Packaging | N/M |

[1] China dominates the market for LED lighting (Signage Manufacturer).

[2] China has a huge requirement of acrylic glass that USA suppliers rather ship to them, so UK companies struggles as their requirement is not as big (Signage Manufacturer).

5.10 Transport

Table 0.16 summarises the corresponding transport modes for material inputs, delivered products and employees per industrial trade. Transport modes for material inputs include ship, train, HGV (heavy goods vehicle) and couriers, while transport modes for delivered products mainly comprise HGVs, vans (or company vehicles) and couriers. Couriers mentioned, both for material inputs and delivered products, include DPD, Fedex, Madex, Pallet Plus, Royal Mail, Speedshift, and UPS.

There is a growing concern about HGVs movement in inner London, as this implies traffic and pollution. As one interviewee mentioned: "People want to ban lorries [HGVs] from certain parts of London or from London or for certain times, but they forget that when they go to a coffee shop, that coffee is being delivered by an HGV, and the same goes for all the supplies in the shops – 85% of all goods and supplies have been delivered by an HGV" (C&D Waste Contractor).

Transport modes for employees comprise walking, cycling, public transport and owned vehicle (car). Generally, employees were located near the company where they work or staff tend to relocate in order to be close to the company (Artisan Bread Manufacturer). One Interviewee mentioned employees' mode of transport is a culture issue: "our employees are sort of older, the largest age group would be between 40 and 50, and they rely on their cars. The younger, 30 to 40, use public transport and 20- to 30-year-old staff use bicycles" (C&D Waste Contractor).

Table 0.16: Transport modes for material inputs, delivered products, and employees per industrial trade.

Industrial trade	Inputs in	Products out	Employees
Building (1) curtain poles	Resins (from China) come by ship, then HGV; the rest of inputs arrive by train, then lorry	Courier, van	Walking, cycling, public transport, car
Clothing (1) CMT unit	N/M	N/M	Cycling or public transport (bus)
Clothing (1) CMT unit 2	Samples are sent to Morocco by UPS	Final products are sent back to the UK by train	Most of them by public transport, a few of them by car

Clothing (1) men/women clothing	various	Courier or collected by the client (designer)	N/M
Clothing (1) pattern grading	Digitally (via email), or collected in the company vehicle	Digitally, or delivered in the company vehicle – a hybrid sedan	Most of them by public transport, a few of them by car
Clothing (1) garment sampling	Finished products come by road (and then cross the English Channel)	N/M	N/M
Food (1) artisan bread	N/M	Delivery Contractor	Most of them by public transport, some of them by car
Food (1) Caribbean bread	N/M	Distribution is done by other companies that showed interest in the product	N/M
Food (1) beer	N/M	Van and truck	Walking, public transport and car
Food (1) meat/poultry	By ship and by train	N/M	N/M
Furniture (1) kitchens and cabinets	Inputs from USA come by ship, Europe-sourced inputs arrive by train	Van (owned)	Car or van
Printing (1) signage	N/M	Van when signs are installed by them. UK Mail or Royal Mail for UK deliveries. For international deliveries UPS, Fedex, or SpeedShift	Mainly public transport
Waste (1) C&D waste collection	Waste is collected by diesel-powered HGVs	Waste is transported by diesel-powered HGVs as well. RDF is shipped abroad	Cycling, public transport, car (mainly)
Wood (2)	Collected or delivered by HGVs	Courier (DPD)	Public transport
Wholesale (2)	Finished products arrive at the UK by ship	Couriers such as DPD, Madex, Pallet Plus, and Royal Mail	N/M

5.11 Challenges

Cost of making in London is generally perceived to be too high, as one interviewee stated "it's ridiculous to be in London as a manufacturer, we should be in Yorkshire or Wales, but we like it here. Other manufacturers say our business model is wrong, we should be designing here and making in China. We have this company because we like making things, not for the money

itself" (Curtain Pole Manufacturer). Figure 0.26 illustrates the frequency of issues mentioned as main challenges for manufacturing in London (out of 18 interviews), while Table 0.17 presents a breakdown per industrial trade of the main challenges mentioned by interviewees.
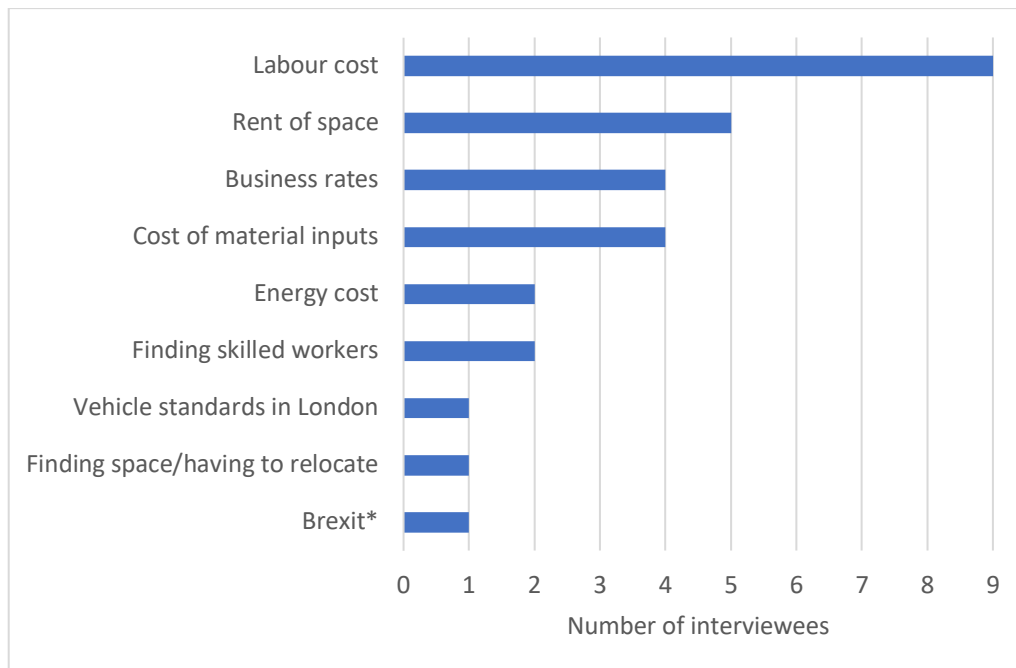
*Brexit was mainly perceived as a challenge as it would affect the labour market.

Figure 0.26: Frequency of issues mentioned as main challenges for manufacturing in London (out of 18 interviews).

Labour cost was mentioned by nine interviewers as a main challenge for manufacturers in London: "Labour [cost] is the major challenge, to live in London costs a fortune, you got to pay the people salaries they can live on" (Garment Sampling Manufacturer). Clothing, specifically, "[…] is probably one of the industries that still needs [intense] labour" (Men/Women Clothing Manufacturer). One clothing manufacturer mentioned they had factories in London but they were all closed down since it was cheaper to manufacture abroad, so they currently manufacture in Sri Lanka, Turkey and Morocco. They had to move from Rumania to Asian or African countries as the standard and cost of living is also going up in some European countries. This clothing manufacturer also claimed that "if you compare how this industry was in London in the 70s and 80s to how it is today, it's a shadow, it's gone, [although] there are still little factories in Leicester (Garment Sampling Manufacturer). Conversely, one interviewee mentioned labour costs are not a major challenge for them (CMT Unit 1).

Overheads (or fixed costs) were also perceived as a major challenge for manufacturers. Namely, rent of space was mentioned by five interviewers, followed by business rates (four mentions), and energy cost (two mentions). The Specialised Footwear Manufacturer said they used to manufacture footwear (i.e. leather shoes and work shoes) in Hackney, London. Now,

they are importing safety boots from China, Taiwan, India, Pakistan, and Italy for wholesaling in the UK. Importing goods rather than manufacturing in the UK entailed lower overheads.

In terms of business rates (or tax) specifically, one interviewee mentioned: "It'd be great if our business rates weren't so high or if we were able to see where our tax is going. It's difficult to see the benefits of our business rates" (Kitchens and Cabinets Manufacturer). A similar comment was made by the Men/Women Clothing Manufacturer: "business rates I find a bit too expensive. I don't mind paying as long as I have a good service, but if you go to the street you'll see rubbish". Contrarily, one interviewee claimed "business rates are actually not too bad" (CMT Unit 2).

Cost of material inputs was mentioned by four interviewers as a main challenge, although interviewers stated they import a significant share of material inputs, as shown in section 5.9. Finding skilled workers was mentioned twice as a major challenge, which reflects a reduction of manufacturing skills in the London population, as one interviewee mentioned: "Nothing is made in this country anymore. Manufacturing is gone, factories are closing. It doesn't benefit British workers, it's a skill that is lost, the population becomes less skilled" (Specialised Footwear Manufacturer).

Issues mentioned once as major challenges include vehicle standards in London (i.e. Direct Vision Standard and Ultra Low Emission Zone), finding adequate space and having to relocate due to urban regeneration, and Brexit (UK leaving the European Union). According to interviewees, the main concern related to Brexit would be a reduction of skilled labour for the manufacturing industry, since the majority of this kind of workers are non-British-born, as mentioned in section 5.5, while other Brexit issue might include the increase of imports costs.

Table 0.17: Main challenges per industrial trade

Industrial trade	Main challenges
Building (1) curtain poles	Labour cost
Clothing (1) CMT unit 1	Cost of material inputs
Clothing (1) CMT unit 2	Labour cost, cost of material inputs
Clothing (1) men/women clothing	Business rates
Clothing (1) military/casual clothing	Cost of material inputs; rent

Clothing (1) pattern grading	Labour cost, business rates
Clothing (1) garment sampling	Labour cost
Food (1) artisan bread	Finding skilled employees
Food (1) Caribbean bread	Labour cost
Food (1) beer	Rent; business rates; cost of material inputs[1]; labour cost
Furniture (1) kitchens and cabinets	Rent; labour cost; energy
Metal (1) architectural structures	Energy; labour cost
Printing (1) signage	Finding suitable space; having to relocate
Waste (1) C&D waste collection	Brexit; vehicle standards in London[3]
Wood (2)	Rent; labour cost; finding skilled employees
Wholesale (2)	Rent; business rates[2]

[1] For every £1 spent at the brewery, material costs equate to around £0.42.

[2] Vehicle standards in London include: a) Direct Vision Standard in which vehicles require retrofitted safety equipment and need to be below a certain height off the road – the aim being that drivers can get eye contact with any vulnerable road user. The interviewee said these vehicles cost £25k more than a normal one. b) Ultra Low Emission Zone (ULEZ) in which vehicles below Euro 6 engine cannot go into central London. Euro 6 engine only came out in 2015, so anything behind had to be replaced. The interviewed waste company estimated a cost excess of £3.2m to renew their fleet, which they cannot afford, so now they will have to contract hire the vehicles, where historically they always used to own them. This standard was said to be badly thought due to severe financial implications for SMEs – the standard should have started with Euro 5 engine and go up gradually. This standard will also immediately devalue vehicles in London.

[3] Business rates for the specialised footwear wholesaler are £6.5k a year.

6. Material flow analysis (MFA)

This chapter present material flow analyses (MFA) based on data provided by interviewees. An MFA diagram is provided for each of the interviewed companies, except for two cases in which one diagram is used to represent two or more companies. Accordingly, a diagram is included for the CMT Unit 1, CMT Unit 2 and the Garment Sampling Manufacturer, which use the same type of material inputs and generate similar waste types. Likewise, a diagram is provided for the wholesale companies, following the same criteria. In total, 16 diagrams are included below (Figure 0.27 to Figure 0.42).

The general structure for all MFA diagrams constitutes a) the material inputs, b) the manufacturing process or service provided, c) the material or waste outputs, and d) the waste collection process (except for the case of the C&D Waste Contractor). Some of these diagrams entail 'Additions to inventory', which is specified within the manufacturing process or service provided.

6.1 Building trade (curtain poles)
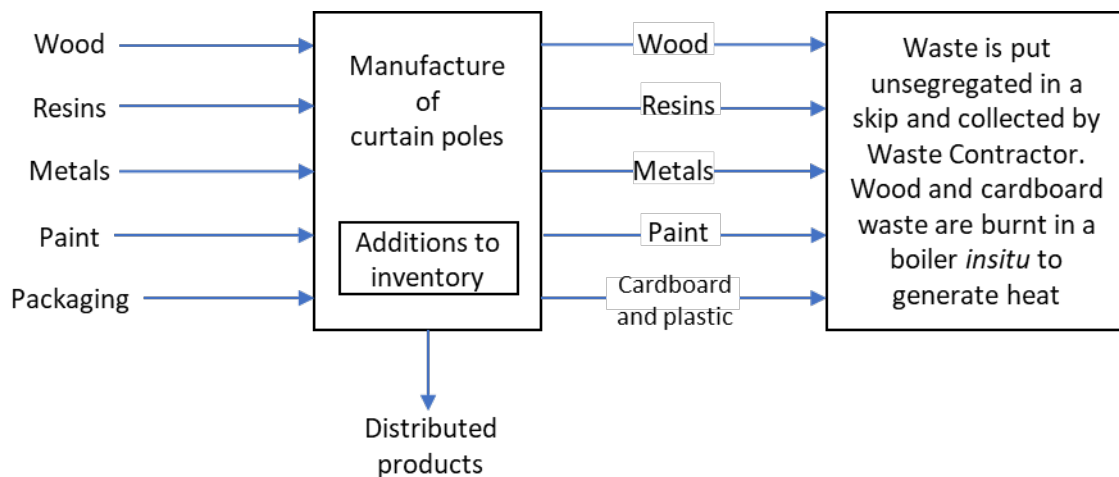
Figure 0.27: Material flows for the Building trade (Curtain Pole Manufacturer), based on the corresponding interview.

6.2 Clothing trade

6.2.1 CMT unit 1 and 2 & garment sampling
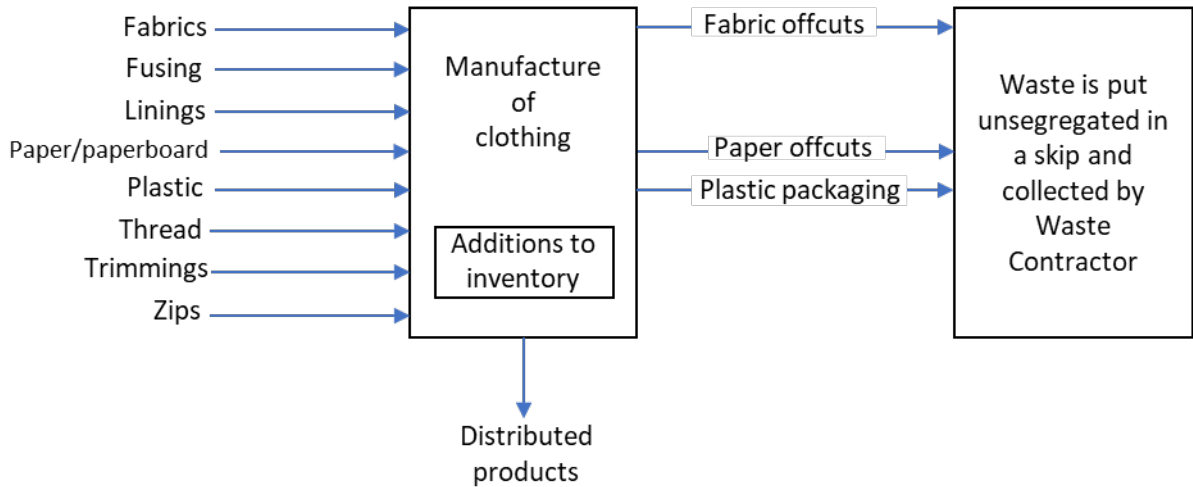
Figure 0.28: Material flows for the Clothing trade (CMT Unit 1 and 2 & Garment Sampling Manufacturer), based on the corresponding interviews.

6.2.2 Men/women clothing
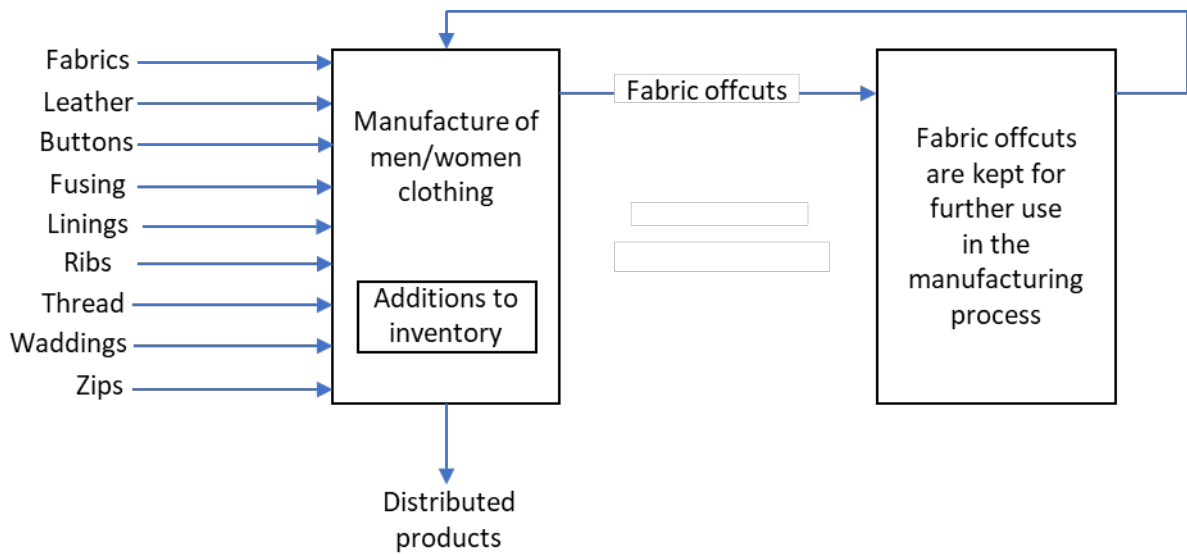
Figure 0.29: Material flows for the Clothing trade (Men/Women Clothing Manufacturer), based on the corresponding interview.

6.2.3 Military/casual clothing
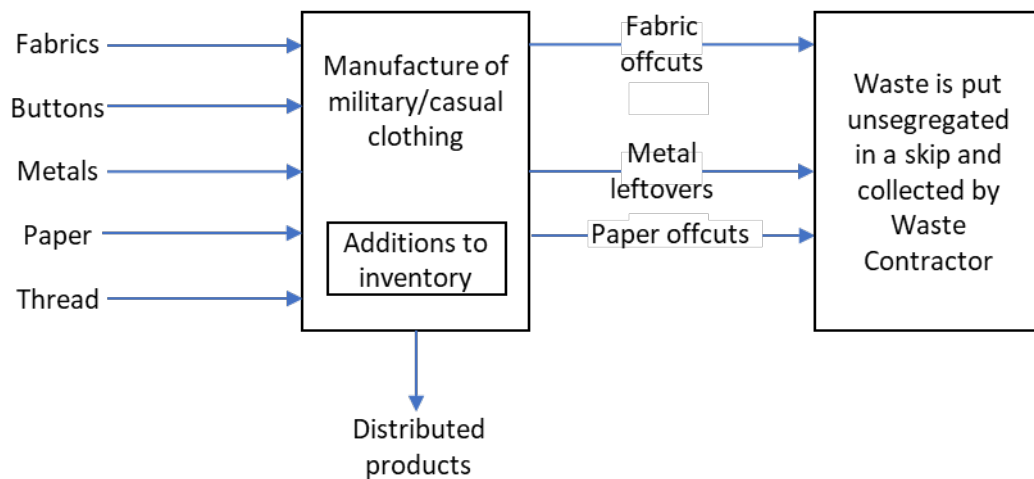
Figure 0.30: Material flows for the Clothing trade (Military/Casual Clothing Manufacturer), based on the corresponding interview.

6.2.4 Pattern grading
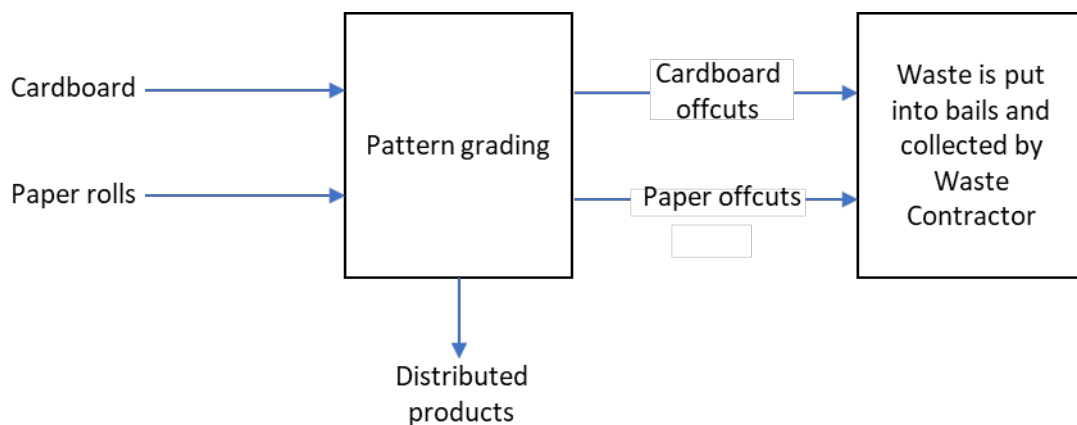
Figure 0.31: Material flows for the Clothing trade (Pattern-Grading Provider), based on the corresponding interview.

6.3 Food trade

6.3.1 Artisan bread
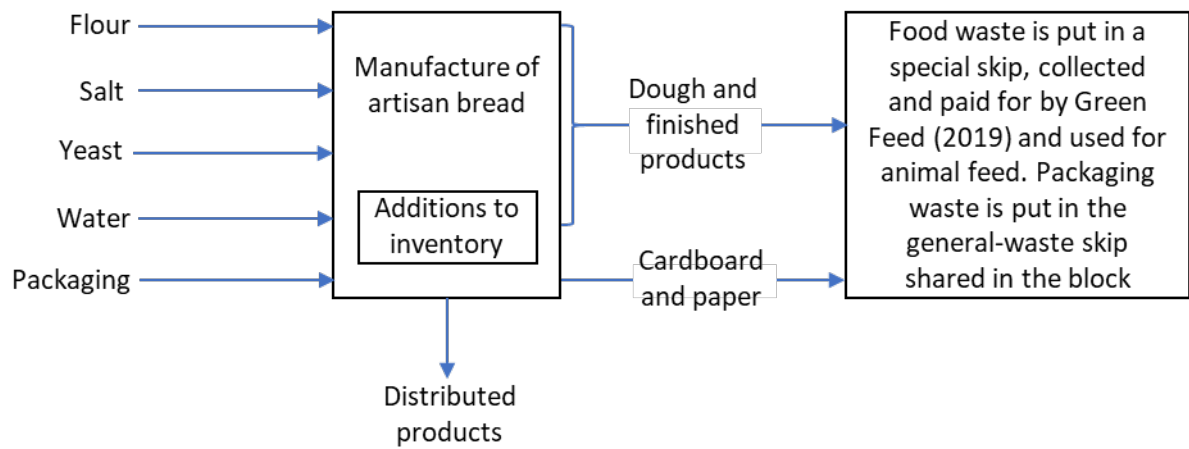
Figure 0.32: Material flows for the Food trade (Artisan Bread Manufacturer), based on the corresponding interview.

6.3.2 Caribbean bread
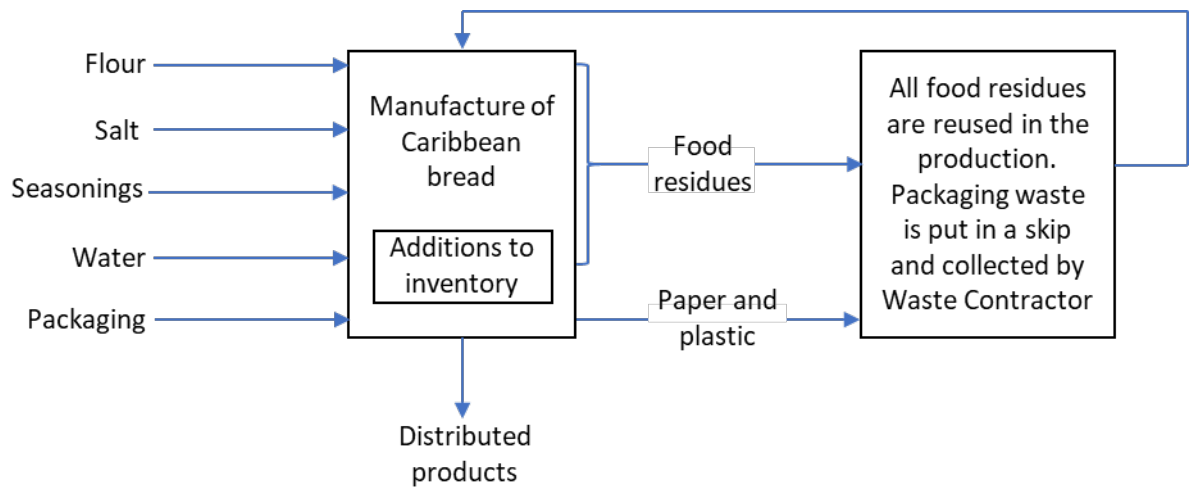
Figure 0.33: Material flows for the Food trade (Caribbean Bread Manufacturer), based on the corresponding interview.

6.3.3 Beer
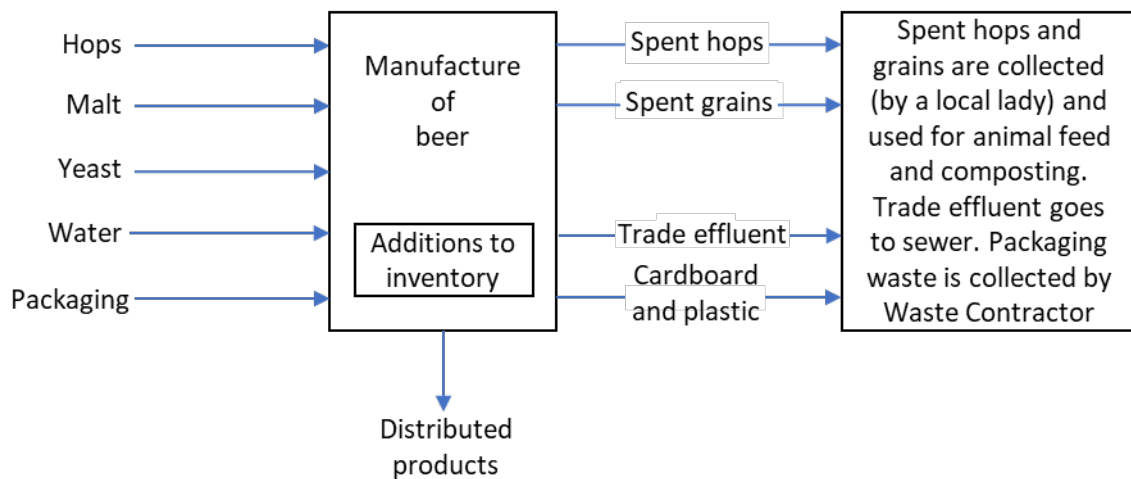
Figure 0.34: Material flows for the Food trade (Beer Manufacturer), based on the corresponding interview.

6.3.4 Meat/poultry processing
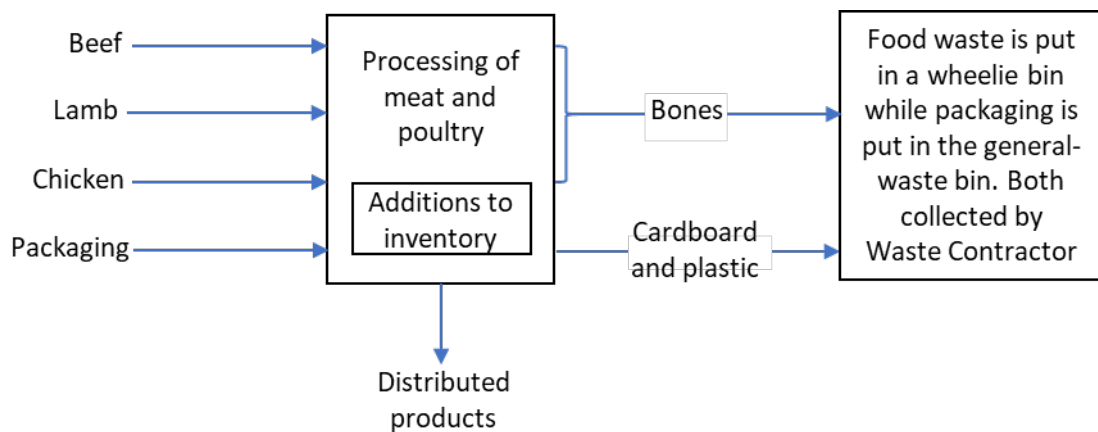
Figure 0.35: Material flows for the Food trade (Meat/Poultry Processor), based on the corresponding interview.

6.4 Furniture trade (kitchens and cabinets)
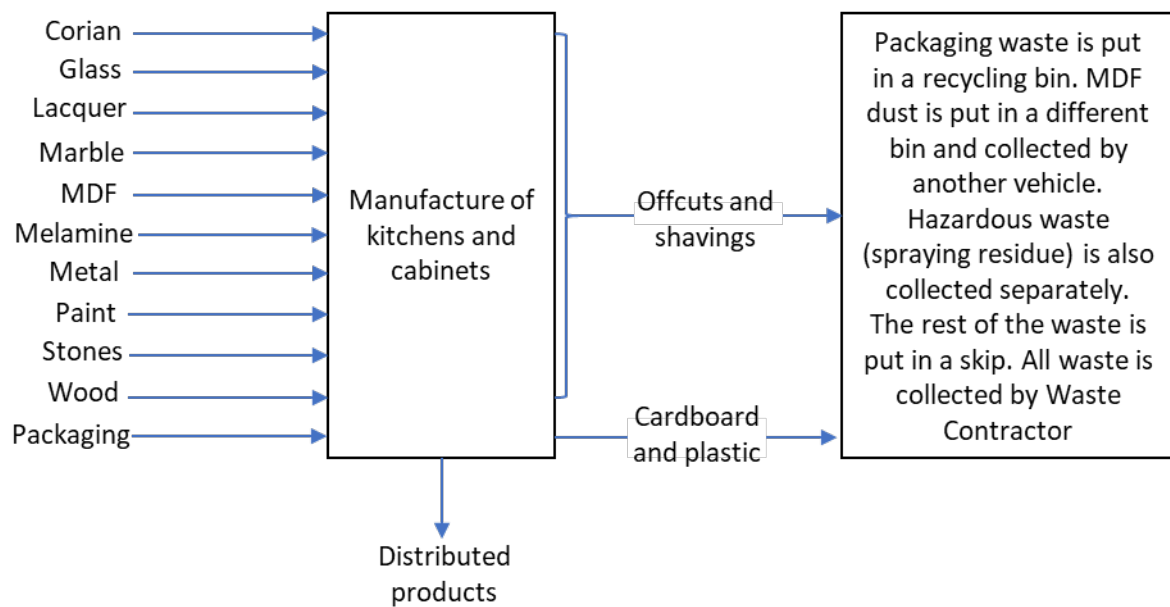
Figure 0.36: Material flows for the Furniture trade (Kitchen and Cabinets Manufacturer), based on the corresponding interview.

6.5 Metal trade (architectural structures)
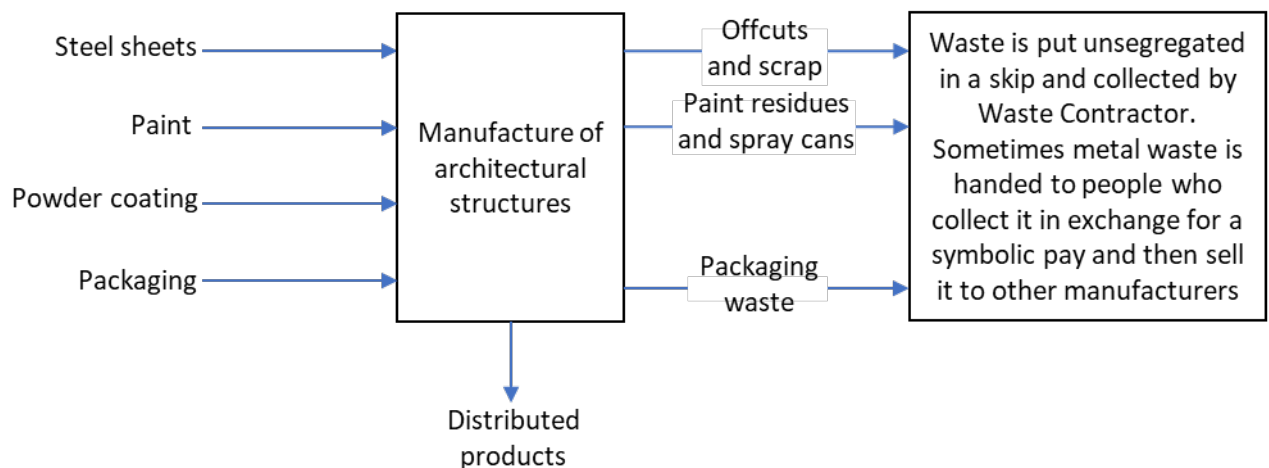
Figure 0.37: Material flows for the Metal trade (Architectural Structures Manufacturer), based on the corresponding interview.

6.6 Printing trade (signage)
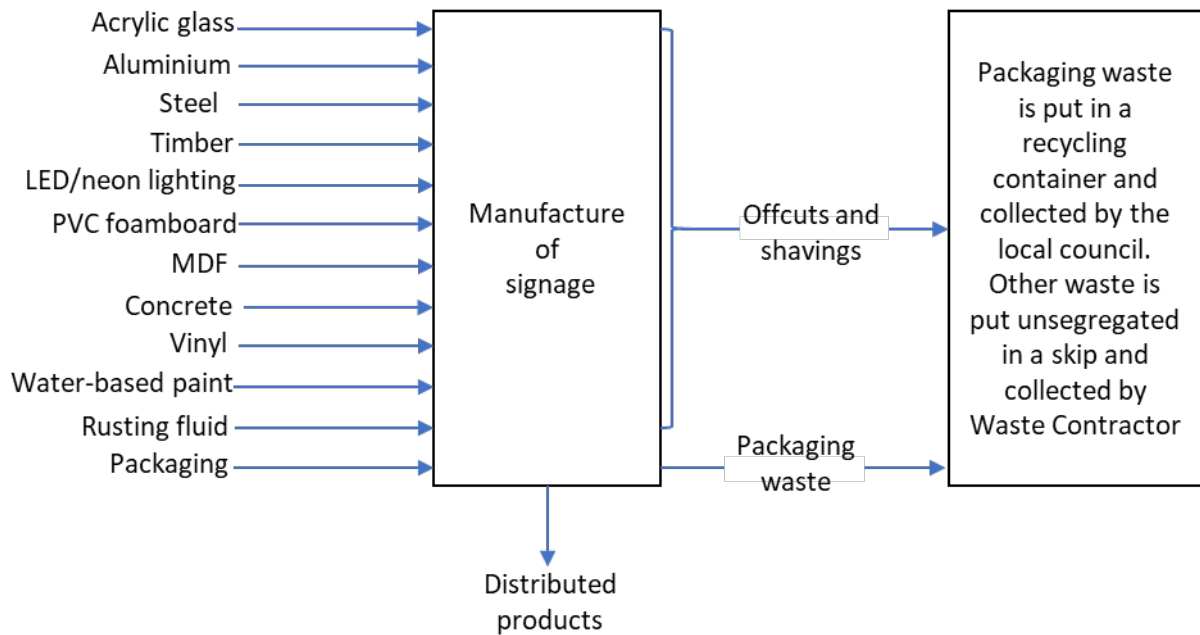
Figure 0.38: Material flows for the Printing trade (Signage Manufacturer), based on the corresponding interview.

6.7 Waste trade (C&D waste collection)
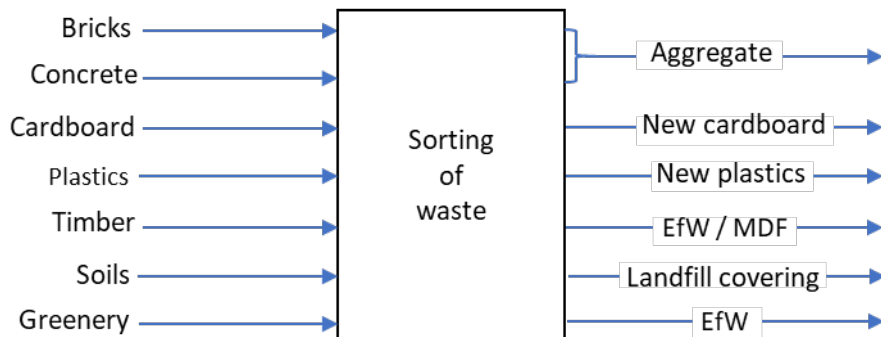
Figure 0.39: Material flows for the Waste trade (C&D Waste Contractor), based on the corresponding interview.

6.8 Wood trade

6.8.1 Joinery

Wood →
Adhesives →
Finishing products →
Nails/screws →
Packaging →

Manufacture of joinery

→ Offcuts and shavings →

→ Packaging waste →

Waste is put unsegregated in a skip and collected by Waste Contractor

↓ Distributed products
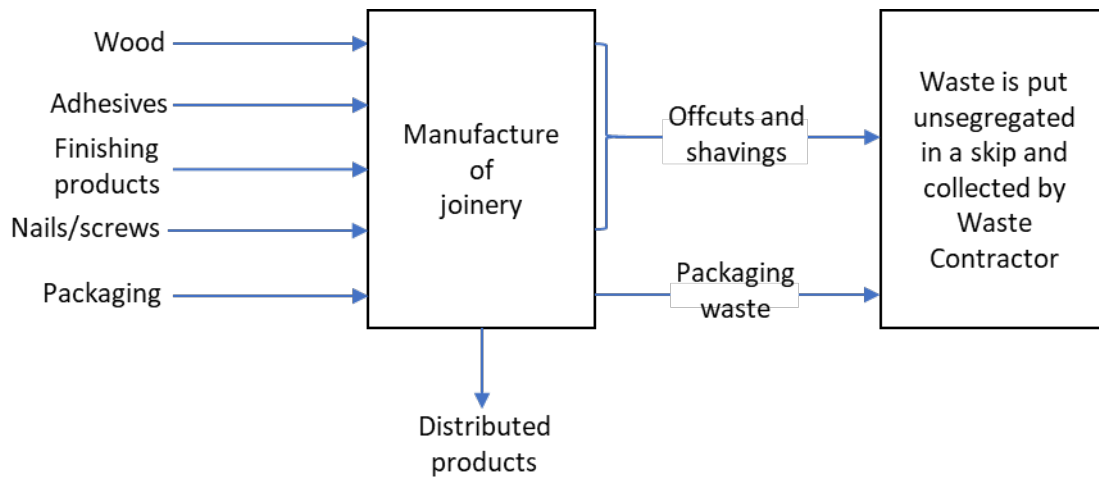
Figure 0.40: Material flows for the Wood trade (Joinery Manufacturer), based on the corresponding interview.

6.8.2 Tableware

Wood →
Sealing wax →
Packaging →

Manufacture of tableware

Additions to inventory

→ Offcuts and shavings →

→ Packaging waste →

Waste is put unsegregated in a skip and collected by Waste Contractor. Sometimes waste is sold to farming companies

↓ Distributed products
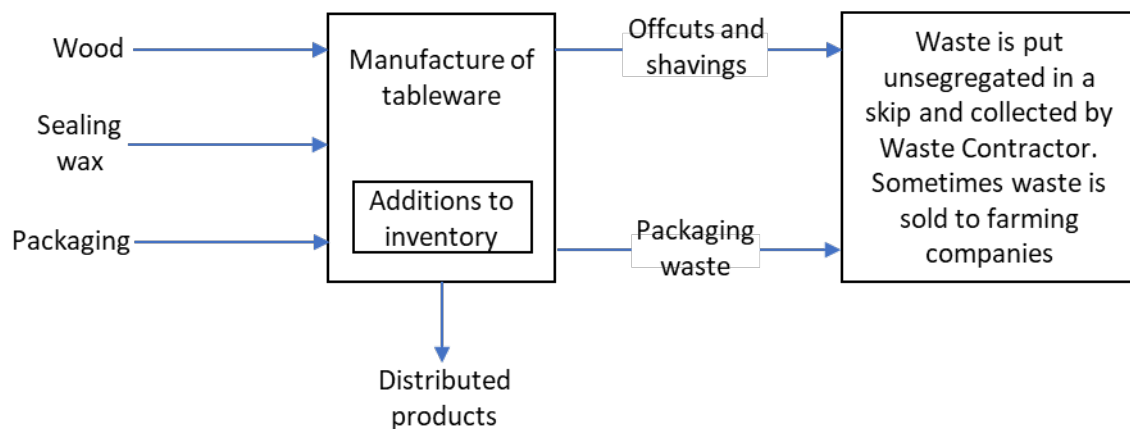
Figure 0.41: Material flows for the Wood trade (Tableware Manufacturer), based on the corresponding interview.

6.9 Wholesale trade (specialised footwear & tiles and flooring)
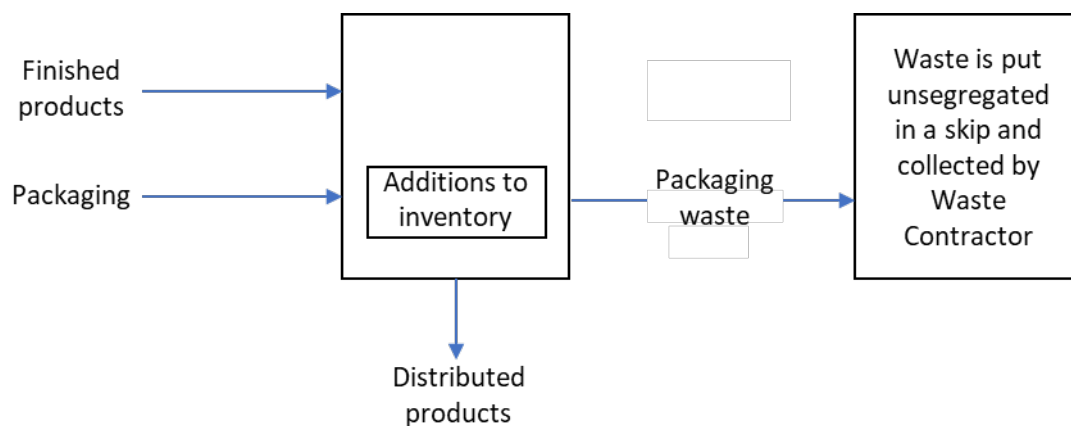
Figure 0.42: Material flows for the Wholesale trade (Specialised Footwear & Tiles and Flooring Distributors), based on the corresponding interviews.

Based on the MFA diagrams presented above, it was concluded that packaging (mainly plastic and cardboard) was a common material input and output for all interviewed companies. Offcuts was a common material output for all manufacturing companies: fabric offcuts were produced by all clothing companies, except for the Pattern-Grading Provider which produced paper and cardboard offcuts, while the rest of the manufacturers generated offcuts and shavings of diverse materials. Food waste was a common output for all food companies. Out of 16 manufacturing companies, only two (12%) claimed to reuse their material output as an input for the manufacturing process.

6.10 Haringey material consumption and waste generation

Figure 0.43 illustrates the overall material consumption and waste generation in the Borough of Haringey. Data was taken per capita for the UK for 2016 (DEFRA, 2019; Eurostat 2019a; 2019b; 2019c; 2019d) and extrapolated based on Haringey population for that year (ONS, 2018). Detailed data is included in section 0 in the Appendix. As can be seen in the Sankey diagram, material inputs towards Haringey material consumption (HMC) are divided into biomass (30%), metal ores (2%), non-metallic minerals (42%), and fossil energy carriers (26%). The HMC (2,426 kt) includes the material domestic extraction and material imports. Additions to stock comprise 51% of the HMC, while waste generation constitutes a share of 49%. Waste is divided into household waste (12%), C&I waste (19%), CD&E waste (61%), and other waste (8%). Treated waste accounts for 77%, while 23% of the waste is untreated. Finally, waste treatments are broken down into landfill (24%), incineration (3%), backfilling (8%), energy recovery (3%), recycling (49%), and other (treatments) (13%).
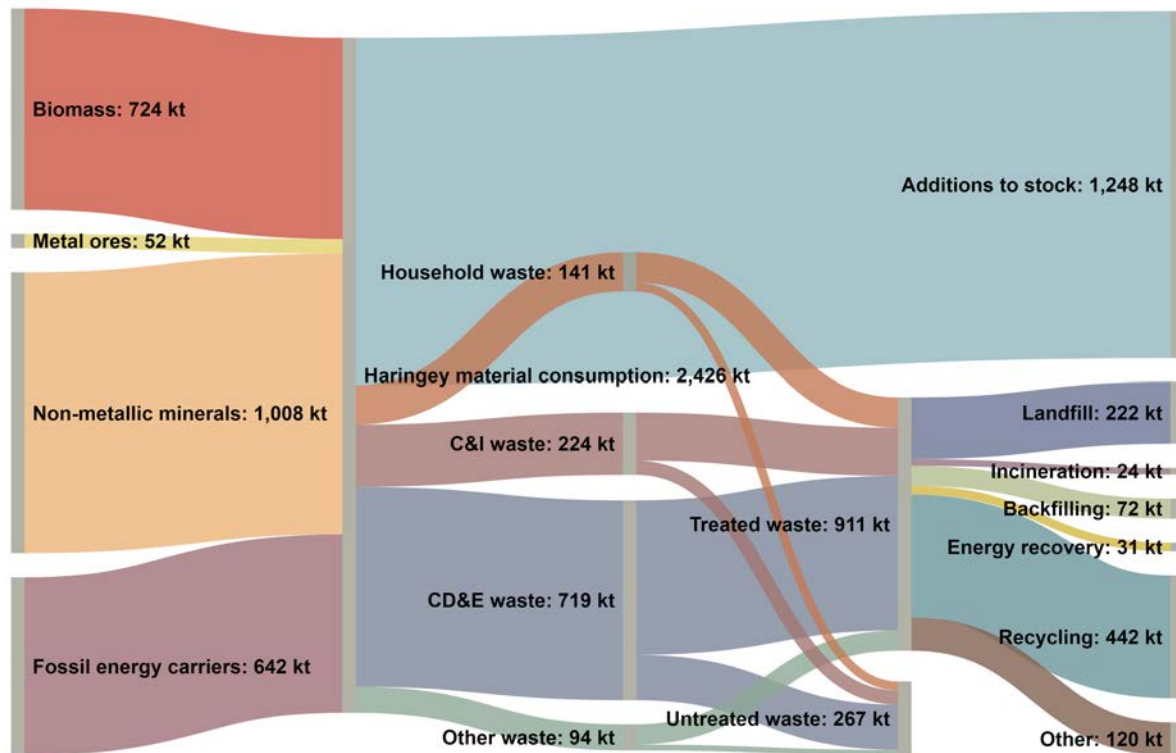
Figure 0.43: Sankey diagram for Haringey material consumption and waste generation in 2016 [kilotonnes] (DEFRA, 2019; Eurostat 2019a; 2019b; 2019c; 2019d; ONS, 2018).

6.11 Waste treatment for industrial trades

C&I waste accounts for 19% of the total waste generated in Haringey, as calculated above (in section 6.10). This section presents the waste treatment options and shares for C&I waste, which are extrapolated from literature review. Waste treatment data was given for England in 2009 (DEFRA, 2011). The comprehensive data for waste treatment is included in section 10.9 in the Appendix. The shares of types of waste treatment are obtained for different business types as follows: the building and the furniture trades are taken from the total C&I waste; the clothing, printing and wood trades are obtained from textiles, wood, paper, publishing waste; the food trade is based on food, drink, tobacco waste; the metal trade is taken from metal manufacturing waste; the waste trade is based on transport and storage waste; and the wholesale trade is taken from the retail and wholesale waste.

The different options for waste management include: landfill, land recovery, energy-recovery thermal treatment (ERTT), energy-recovery thermal treatment (NERTT), non-thermal treatment (NTT), transfer station, recycling, composting, reuse, and unknown. The definitions of each of these options are given in section 10.9 in the Appendix.

Figure 0.44 presents Sankey diagrams for waste-treatment pathways after waste collection for (a) building and furniture; (b) clothing, printing and wood; (c) food; (d) metal; (e) waste; and (f) wholesale.
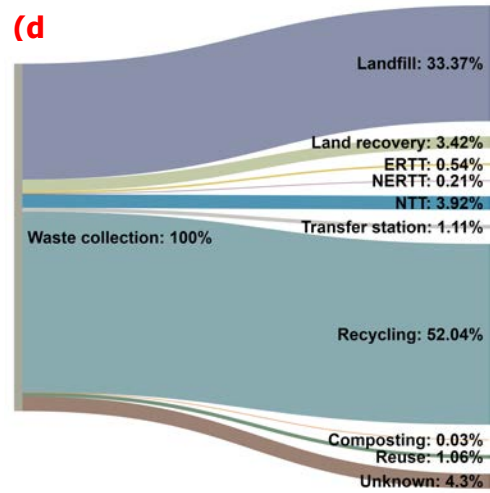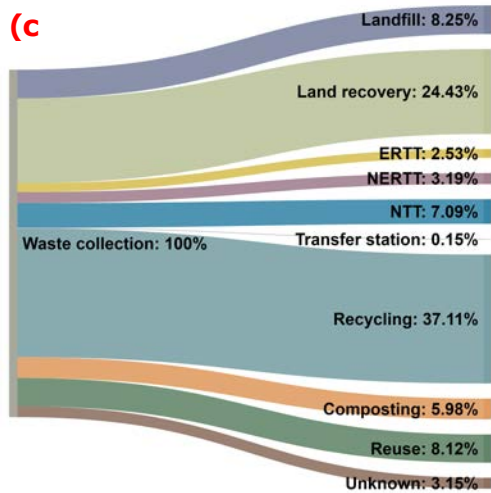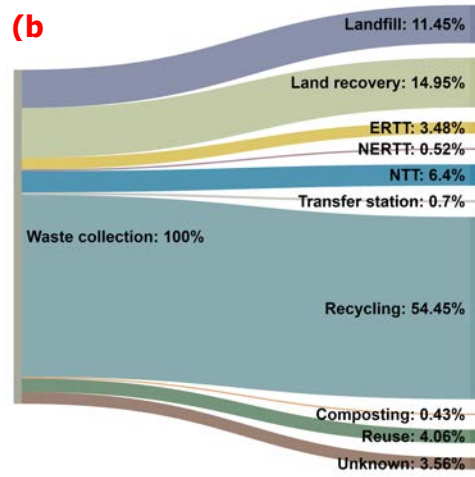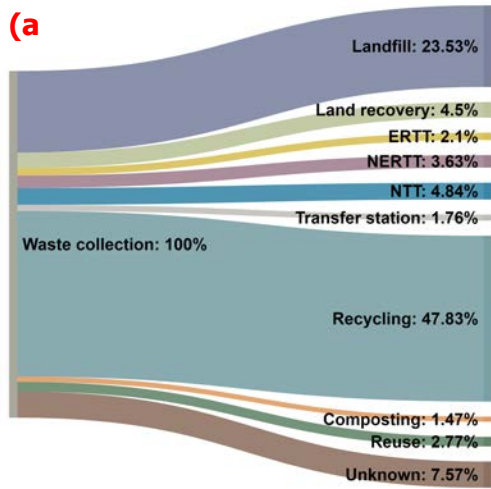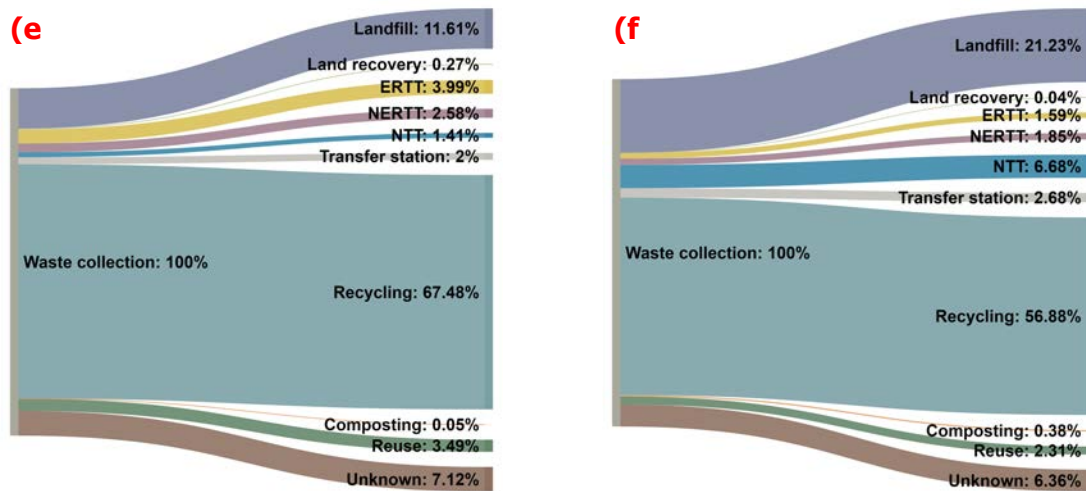
Figure 0.44: Sankey diagrams for waste treatment pathways after waste collection for (a) building and furniture; (b) clothing, printing and wood; (c) food; (d) metal; (e) waste; and (f) wholesale (DEFRA, 2011).

Based on the average for the six cases, the top three waste-treatment pathways comprise: recycling with an average share of 52.67% and a standard deviation of 9.2%, landfill (share of 18.24%, standard deviation of 8.7%) and land recovery (share of 7.94%, standard deviation of 8.9%). The subsequent waste-treatment options include unknown treatments with an average share of 5.34%, NTT (5.06%), reuse (3.64%), ERTT (2.37%), NERTT (2%), transfer station (1.40%), and composting (1.39%).

7. SWOT analysis

A strengths-weaknesses-opportunities-threats (SWOT) analysis was carried out and is presented in Table 0.18, based on literature review and the corresponding interviews and site visits.

Table 0.18: SWOT analysis.

Strengths	Weaknesses
Haringey is located just below the North Circular Road, allowing easy access across London – thus facilitating access to clients and suppliers	Generally, road structure and cleanliness can be improved in Haringey
Good location relative to the city centre – just 10 mins from Kings Cross and less than 30 mins from the City (financial district) or West End	Some manufacturing companies entail dust, noise and vehicle movement, which might be incompatible with residential land use

Haringey is also well linked in terms of public transport – there are over 40 bus routes serving Haringey as well as three underground lines, namely Piccadilly, Victoria and Overground lines	Expensive overheads, such as rent, business rates and energy consumption Costly labour force
Relative availability of suitable industrial spaces	Difficulty to find skilled employees
High-end client base – high-end clientele tends to prefer locally made products	Costly material inputs, which often must be imported
Nearly half of the Haringey residents were born outside the UK, which offers a vast work force for the manufacturing industry as this type of jobs are mainly performed by non-British-born	Unawareness of neighbouring companies' material outputs Lack of knowledge of own waste treatment pathways
Opportunities	**Threats**
The Crossrail 2 project, due for completion in 2030, will run through the borough increasing the area accessibility	The Crossrail 2 project also poses a threat due to urban regeneration
Sharing workspace could be a potential solution to overcome logistic and cost barriers	Vehicle standards in London complicate HVGs mobility
Haringey population profile is younger and more educated than the London average	Increasing rents for manufacturing spaces Declining suitable space for manufacturing
Technological advances might potentially decrease labour costs	Urban regeneration due to growing demand of residential land use
Renewable energy sources can decrease energy costs	Household over-occupancy is higher in Haringey than the London average
Enhanced waste generation and treatment knowledge would spot networking opportunities	Comparative disadvantage in relation with manufacturing in developing countries
Industrial symbiosis can reduce material input costs and waste outputs	Technological advances might affect employment
Community can be made aware of the technical, environmental, and socio-economic importance of the manufacturing industry	Brexit might further compromise the manufacturing labour market – skilled employees are generally non-British-born

8. Main conflicts and challenges

This chapter presents the main conflicts and challenges identified during this study from interviews, site-visit observations, and literature review. The conflicts and challenges are divided into space, labour force, energy and water, transport, international context, and socio-economic impacts.

8.1 Space

Road structure and cleanliness can generally be improved in Haringey. Interviewers complained about business rates not being reflected on infrastructure benefits in the area. The increasing rents and the declining suitable space for manufacturing in inner London also pose a major challenge for manufacturing businesses. These circumstances are induced by urban regeneration linked to the growing demand of residential land use. This is a general tendency in London and is particularly important in Haringey due to its household over-occupancy rate (16.3%), which is higher than the London average (11.6%). Interviewees also mentioned that landlords are recently making more money through leasing residential properties rather than commercial or industrial land use.

Amid the growing residential land use, people and the local council complain about the noise, dust, and vehicle movement, which makes some manufacturing activities incompatible with residential (and even commercial) land use. Increasing vehicle traffic, implementation of cycle lanes and recent vehicle standards in London further complicate HVGs mobility, which are the main mode of transport for material inputs and distributed products across London. Interviewees also perceived the Crossrail 2 project as a potential threat due to collateral urban regeneration.

In line with this, 61% of interviewees claimed they feel pressured to relocate. Having to relocate was mentioned as a major challenge as it affects the corresponding supply chain and incurs in high expenditures due to the cost of finding a new place and moving machinery and equipment. There is a general perception of lack of communication from local councils towards property tenants and owners. Several interviewees said they are uncertain about future urban regeneration in the area, which hinders their capability for planning ahead.

8.2 Labour force

The relatively high labour cost in London was deemed as the major challenge for manufacturing, underpinned by the high living costs in the city. One interviewee pointed out that the paperwork to hire someone and the payable pension add to the cost for small businesses until the point they become unviable as these costs cannot be reflected in the product price. Moreover, 69% of interviewees stated it is difficult to find skilled employees, as

British-born people are generally reluctant to working in the manufacturing industry. Interviewers mentioned this type of jobs are mostly taken by Eastern European, which represents a potential threat as the UK might leave the EU. In terms of hiring, interviewers generally stated that advertising through the local job centre or websites is ineffective since employees tend to be unskilled or leave the job shortly. Technological advances can potentially reduce labour costs although they might affect employment rates.

8.3 Energy and water

Energy consumption entails a significant expense for manufacturers. All of the interviewed companies lacked energy meters and were thus unable to provide a breakdown of their energy use, however they stated that machinery generally consumed the largest share of energy. Although renewable-energy sources would decrease energy costs, only 18% of the interviewed companies said they are partly sourced by renewable energy, and only one of them (0.06%) harvested rain water.

8.4 Material flows

Material inputs are relatively costly in the UK, which often drives manufacturers to import their inputs. Based on interviews, 73% of the material inputs were imported from abroad. This circumstance entails environmental concerns due to transportation and leads to economic impacts as local producers are relegated by foreign ones.

Negligible material reuse takes place within this context. None of the interviewees had heard the concept of circular economy, nor have they considered using waste or underutilised resources from other companies. There is also an overall lack of knowledge of the waste treatment pathways. Waste Contractors do not provide companies with factual information on what is done with the collected waste. Thus, no interviewee could specify the recycling output of their waste.

Likewise, none of the interviewees appropriately segregated their waste. Some waste types if properly segregated could be useful for some industries, although this rarely was the case due to space and time constrains, lack of recycling market and infrastructure, and the relatively small scale of individual waste generation. Additionally, there is lack of information about how to segregate and about whether segregating is worthwhile.

There was a clear disconnect among companies. Only 21% of the interviewed companies mentioned some kind of networking, although it merely entailed sharing storage space or providing services for few neighbouring companies. In the best-case scenario, networking comprised knowledge sharing among companies within the same trade, however, this seldom took place as companies are usually seen as competitors among each other.

8.5 Transport

As mentioned above, most of materials inputs are imported, which is done either by ship, train, HGVs or couriers, involving fossil-fuel consumption and the related environmental impacts. Manufacturers also face the growing challenge of distributing their products within London, as HGV mobility is becoming more difficult due to denser traffic and stricter vehicle standards. Moreover, relocating manufacturing companies towards outer London, increases fleet movement and carbon emissions. Although electric vehicles would reduce environmental impacts, interviewees stated that there are no electric HGVs commercially available.

8.6 International context

About 68% of the interviewed companies manufacturing in the UK serve a high-end clientele which are willing to pay higher prices. Outsourcing manufacturing activities and externalising socio-economic and environmental costs, facilitates lower product price for end-users, allowing the gross population to afford these commodities. In this context, London manufacturing confronts a comparative disadvantage relative to manufacture in lower-density UK cities and in developing countries due partly to the challenges listed above. However, the interviewed companies stated they do not receive any kind of spatial, logistic, social or financial support from the government or other organisations.

The fact that the UK is possibly leaving the UK, a circumstance known as Brexit, represents potential conflicts for the manufacturing industry, such as a compromised labour market, increased import costs and a perceived economic recession.

British-born people are reluctant to taking relatively low-skilled, low-paid jobs. Therefore, the majority of employees in the production lines are immigrants, mainly from Europe. If Brexit goes through, non-British European workers would require a work (Tier 2) visa and would generally need to be paid at least £30,000 per year (UK Government, 2019c). Consequently, the availability of skilled workers might decrease, while labour cost is likely to increase, which would further push manufacturing companies outside the UK.

Import tariffs on finished products could possibly encourage manufacturers to produce locally, however, end-clients would be the ones ultimately affected by having to pay higher prices. In line with this, the cost of imported material inputs would probably increase under Brexit, which might in turn increase production costs for manufacturers in the UK.

According to interviewees, people are trying to save money amid the Brexit situation, so costumers tend to consume less. A reduction of market demand is causing UK prices to rise.

8.7 Socio-economic impact

Pushing manufacturing away from London and the UK negatively affects Industrial Commons, which refers to the basis of knowledge and capabilities shared within industrial sectors. This ultimately reflects on reduced skill sets in the population and lower innovation rates in the manufacturing sector.

Moreover, the delocalisation of manufacturing activities creates a gap in the middle-income layer of the economy. There are more highly-paid and low-paid jobs than ever, and the earnings for those jobs are increasing at the top and decreasing at the bottom (Hills et al., 2019). This phenomenon also narrows job choices and diversity for the working population, while several interviewees highlighted the pleasure involved in manual jobs and making.

9. Conclusions and recommendations

An analysis of the manufacturing industry in the London Borough of Haringey was carried out. The mix-method research was based on documentary research, 19 interviews to companies in the borough and observations through site visits to four focus areas. Primary and secondary data was examined through specialised analyses such as spatial analysis, qualitative analysis, material flow analysis (MFA), and SWOT analysis. This chapter summarises the key findings and provides practical and policy recommendations.

9.1 Conclusions

The Borough of Haringey covers an area of more than 2,850 hectares (ha) and is located 10.5 km north of the City Centre (Haringey Council, 2018b). Haringey reports a total population of 254,900 in the last census, where nearly half (45%) of the residents were born outside the UK (Haringey Council, 2013). A high proportion (40%) of residents over 16 years old have a Level 4 qualification or above, which is superior than the London rate (37.7%), however, there are more people in Haringey who have never worked or are long-term unemployed (10.4%) than the London average (8.3%) (Haringey Council, 2011). Haringey is historically based around medium-scale manufacturing industry which, although in decline, stills remains strong in the area, relative to other London boroughs (Haringey Council, 2018b). The Public Sector (public administration, education and health) is currently the largest employer in the borough, while emerging sectors include real estate, banking, finance and insurance activities (Haringey Council 2008; 2018b).

For this study, thirteen industrial trades have been considered. Based on 126 selected manufacturing companies in the borough, the clothing (21%) and food (19%) trades account for the largest shares. The building trade and miscellaneous activities categorised into 'other'

trade show an important share (10% respectively), followed by the textile trade (8%), furniture, printing, metal (7% respectively), and wood (5%), while video and waste comprise the smallest shares (below 2% respectively).

Four industrial areas have been selected as focus areas, which are representative of the current situation of Haringey, in terms of land use, and economic activities. The analysed industrial focus areas are: Bounds Green (BG), Markfield Rd and the High Cross Centre (MRHCC), North Middlesex University Hospital (NMUH), and Wood Green (WG).

Considering the four focus areas, a combined floor area of 13.19 ha was analysed. The types of land use considered include manufacturing, wholesale trade, business clusters (containing several businesses in one building or space), car-related services, other companies (conducting business activities other than manufacturing, wholesale or car services), residential buildings, other land uses (such as educational or religious institutions), and unused (or abandoned) premises.

In total, 211 companies were encountered during site visits to focus areas. From these, there were 55 manufacturing companies, 47 residential buildings, 36 wholesale businesses, 27 companies relating to other activities, 21 car-service companies, 11 buildings under other land uses, 9 business clusters, and five unused premises. In terms of occupied floor area, manufacturing accounts for 24% of the floor area, followed by wholesale (22%), residential (20%), other companies (12%), business clusters (11%), car-related services (5%), unused premises (4%), and other land use (3%).

In the BG industrial focus area a surface of 2.67 ha was analysed. Manufacturing and residential land uses accounted for the largest shares (28% respectively) relative to the analysed floor area within BG. It presented the lowest share of other land uses from the four focus areas (0.3%), based on the total combined floor area, and it was the only focus area with no business clusters. Common manufacturing activities include design and installation of kitchen and interiors, processing of marble and stone surfaces, CMT units, and provision of pattern-grading and printing services, while common wholesale activities mainly comprised distribution and supply of surfaces for building purposes.

An area of 3.14 ha was analysed in MRHCC. Wholesale accounted for the largest share of land use (25%) relative to the analysed floor area within MRHCC, followed by manufacturing and residential land uses (17% respectively). MRHCC showed the highest share of unused premises from the four focus areas, which equals 10% of its analysed floor area, and 2% of the total combined floor area. Furniture manufacture was the most common manufacturing activity in MRHCC, which included the manufacture of chairs, general-purpose furniture,

joinery and design and installation of kitchen and cabinets. Provision of workspace for artists and artisans is currently increasing in the area.

In NMUH an area of 4.63 ha was analysed. Wholesale accounted for the major share of land use (33%) relative to the analysed floor area within NMUH, followed by residential land use (25%). NMUH shows the largest share of wholesale (12%), residential (9%), manufacturing (7%) (along with WG) and car service (3%) land uses out of the four focus areas, based on the total combined floor area. NMUH presented a low percentage of unused premises, constituting 0.5% of its floor area. Production of clothing was the most common manufacturing activities in NMUH, followed by food processing and wood works such as joinery, curtain poles, picture frames and wood-turning services. The most common wholesale activity comprised the distribution of food and drinks.

An area of 2.75 ha was analysed in WG. Manufacturing accounted for the main share of land use (32%) relative to the analysed floor area within WG, closely followed by business clusters (28%). WG showed the largest share of manufacturing land use (7%) (along with NMUH), business clusters (6%), other companies (4%), and other land uses (2%), based on the total combined floor area. Conversely, WG accounted for the smallest share of wholesale (1%) and residential (2%) land uses from the four focus areas, while it was the only area with no car-service companies or unused premises. Manufacturing activities in WG are relatively diverse, including among other the production of bread, clothing, art, and signage as well as the provision of printing and publishing services. Business clusters were a common scheme in WG, in which several businesses (including artisans and small manufacturers) share a common building, facilitating logistic and economic benefits.

According to interviewees, the rationale for being located in Haringey was diverse. The provision of a high-end clientele base in inner London was mentioned as the main reason for the location, followed by public transport accessibility, the fact that owners live nearby, availability of industrial space, access to the North Circular Road, being able to own space, proximity to staff, and road structure and cleanliness in the area.

Based on the interviewed companies, 61% stated they feel pressures to relocate due to urban regeneration, 28% said they do not face any pressures to relocate, while 11% mentioned they are uncertain of whether urban regeneration would affect them.

The increasing rents in inner London and urban regeneration were mentioned as the main pressures forcing businesses to relocate. There is a general tendency of changing industrial land use into residential properties, incurring in gentrification. As more residential land uses are being developed and planned in Haringey, there was the rising issue of land use incompatibility. Some of the interviewed companies said people and the local council complain

about the noise, dust, and vehicle movement. On the contrary, companies which generated negligible noise and dust said none of their neighbours have complained about their operation.

Interviewees showed concerned about potential relocation as this would imply moving costs and might affect the supply chain. There was a general perception of lack of communication from local councils towards property tenants and owners. If relocated, all of the interviewees said they would prefer to remain in London. Accordingly, 38% of the interviewees said they wished they could relocate nearby, the same ratio (38%) mentioned they would move outside the North Circular Road, in the direction of Enfield, and 25% said they were willing to move outside the M25.

The occupied land area by the interviewed companies ranged from 200 m^2 to 1,100 m^2, with an average of 525 m^2. All of the interviewed companies said their building was adapted rather than built for purpose, while 53% of the buildings were owned by the companies, and 47% were rented from private landlords. MRHCC showed the highest proportion of owned properties (75%) and in WG all the properties under study were rented.

In terms of market reach, 68% of the interviewed companies serve a high-end clientele, whereas 32% are based on a more diverse market. In relation to exports, 47% of the interviewed companies export some of their products, while 53% of them deliver products of services merely within London or the UK. London was the main market for 42% of the companies and the UK in general was the main market for 58% of them. Common supply-chain actors for all of the companies include a material or input supplier on the upstream side and a Waste Contractor as downstream service supplier.

The number of employees ranged from one to 160, with an average of 36.6 employees. The majority of workers in the production lines were skilled or semi-skilled when hired, yet all of them were further trained in the company. Nearly all the production staff were not educated, while most of the staff conducting administrative tasks were tertiary educated. Most of the employees, both in production and administration, were immigrants and Eastern Europeans accounted for a significant share of the staff.

In terms of difficulty of hiring, 69% of the interviewees stated it is difficult to find skilled employees and 31% said it is not difficult to do so. There was a general concern about the declining skill level in the population, and an overall perception that British-born people are reluctant to take jobs in the manufacturing industry. Employee recommendation was mentioned as the most common and effective mechanism for hiring employees, as opposed to hiring through job centres or websites.

All of the industrial trades required manual labour, where clothing and food were the trades that demanded most intense manual labour. Laser-cutting machines and 3D-printers were mentioned as technology that would support the clothing trade. A CNC machine was deemed to potentially support the building, furniture, metal and wood trades. Any ability to reclaim CO_2 from the fermentation process would be useful for beer manufacturing, and infrared-sensing would facilitate the waste segregation process in the waste industry. Lack of space and cost-benefit were deemed as the main barriers to own high-tech machinery in the corresponding interviewed companies.

For all cases, the main energy consumption was attributed to machinery, although interviewed companies lacked energy meters and were thus unable to provide a breakdown of their energy use. Electricity was the main energy source, gas was mainly used for indoor heating, while transportation was primarily powered by diesel. Only 18% of the interviewed companies use some sort of renewable energy source, although none of them fully rely on renewable energy. Just 22% of the companies use water in the production process and all of them discharge the waste water through the municipal sewer, while only one company harvested rain water.

Regarding material flows, 50% of the interviewees provided a comprehensive answer, 28% gave a partial response, while 22% did not know or would not provide information about the origin or their inputs. Based on the information provided, 73% of the inputs were imported from abroad, 13% were sourced locally in the UK, while 13% comprised a mix of imports and locally sourced inputs. Material inputs were mainly imported from abroad since this generally entailed lower prices.

All of the interviewed companies used a private Waste Contractor to collect their waste and they had to pay for the waste-collection service, while they generally obtain no monetary benefit from their waste. Waste Contractors did not provide companies with factual information on waste treatment pathways. In rare occasions, waste was collected by other companies or individuals to be burned or used for farming, although this showed to be an informal and uncommon practice. Some waste types if properly segregated could be useful for some industries, although this rarely was the case due to space and time constrains, lack of recycling market and infrastructure, and the relatively small scale of individual waste generation.

None of the interviewed companies knew about the resources consumed or waste generated by companies located nearby, nor have they considered using waste or underutilised resources from other companies as input for the manufacturing process. Likewise, none of the interviewees had heard the concept of circular economy.

Based on the material flow analysis (MFA), packaging (mainly plastic and cardboard) was a common material input and output for all interviewed companies. Offcuts was a common material output for all manufacturing companies: fabric offcuts were produced by most clothing companies, while the rest of the manufacturers generated offcuts and shavings of diverse materials. Food waste was a common output for all food companies. Out of 16 manufacturing companies, only two (12%) claimed to reuse their material output as an input for the manufacturing process.

It was concluded that negligible networking takes place within the analysed companies. Only 21% of the interviewed companies mentioned some kind of networking, although it merely entailed sharing storage space or providing services for few neighbouring companies. In the best-case scenario, networking comprised knowledge sharing among companies within the same trade, however, this seldom took place as companies are usually seen as competitors among each other.

Transport modes for material inputs included ship, train, HGV (heavy goods vehicle) and couriers, while transport modes for delivered products mainly comprised HGVs, vans (or company vehicles) and couriers. There was a growing concern about HGVs movement in inner London, as this implies traffic and pollution, although the majority of goods and supplies in London are delivered by HGVs. Transport modes for employees comprise walking, cycling, public transport and owned vehicle (car).

Interviewers were asked about the main specific challenges they faced and labour cost was deemed as the major challenge. Rent of space was also frequently mentioned, followed by business rates, cost of material inputs, energy cost, finding skilled workers, vehicle standards in London, finding suitable industrial space, having to relocate, and Brexit. The main concern related to Brexit was a potential reduction of skilled labour for the manufacturing industry.

9.2 Recommendations

Based on the main conflicts and challenges found during this study, several practical and policy recommendations are provided in terms of space, logistics, labour, resources, technology, and general issues.

9.2.1 Space and logistics

- Local councils should make the most out of the business rates payed by companies. For instance, road structure and cleanliness can generally be improved in Haringey.
- Local government councils must factually communicate tenants and property owners about future urban regeneration, so that companies are able to plan ahead in terms of space, market, supply chain, and logistics, among other.

- Government should also define protected industrial areas where manufacturing companies have a secured space and are able to prosper.
- These protected industrial areas should be planned carefully in terms of communication links such as vehicle transit and public transport, so that efficient transportation takes place without compromising other land uses.
- Living workspaces pose a viable scheme for small- and medium-scale manufacturers. In this way, manufacturers can live and work in the same place without the need of travelling, eliminating commuting times, while reducing traffic and carbon emissions.
- Sharing workspaces could be a potential solution to overcome logistic and cost barriers. For instance, a CNC machine can be shared among several manufacturers within a common space. This scheme could also serve as a hub for knowledge sharing and innovation. Occupants should be able to store all the materials and tools they need within these sharing workspaces.
- Manufacturers doing similar activities could be placed together within an industrial area (i.e. Analogue Industry Cluster), so that these manufacturers are able to share knowledge, material resources, and machinery, thus boosting quality and innovation while reducing material and technology costs. Also, transport for material inputs and delivered products can be shared to reduce vehicle movement and decrease logistic costs and carbon emissions.
- Manufacturing companies which entail relatively higher levels of dust, noise and vehicle movement should be carefully controlled and/or located away from residential and commercial land uses.
- If industrial companies must be relocated, government should provide them with new suitable space and could even assist them financially to lower moving costs.
- Household over-occupancy demands more residential land use, although this is often incompatible with industrial spaces. In this context, high-rise apartment buildings (as shown in subsection 4.1.3) represent a potential solution against the sprawl of residential land use, allowing other land uses to prosper.

9.2.2 Labour

- Payment threshold for the work (Tier 2) visa should be lowered in the manufacturing industry as its work force is currently based on immigrant labour force.
- An awareness campaign on the importance of manufacturing (as mentioned in subsection 9.2.5) would possibly make the British-born working population more eager towards manufacturing jobs.
- As well, better designed industrial spaces and buildings would increase the desirability to work in the manufacturing industry, and it would increase employment retention rates. As mentioned earlier, cleanliness and road structure can be generally improved in Haringey. Good building design can include appropriate natural or mechanical

ventilation, day-lighting, biomimicry, and connection with exterior through glazed and unglazed openings in ceilings and walls.

- Employment retention rates can also be increased through inclusive-training and skill-development programmes, so that employees feel part of a community and see their time in the company as an investment.
- Labour tax should be reduced or eliminated. This can be offset by taxing virgin-resource consumption, carbon emissions or waste generation.

9.2.3 Resources

- Renewable-energy sources can decrease energy costs for running the production lines and reduce carbon emissions.
- Energy metering and monitoring would allow companies to precisely understand how much energy each part of the production or each machinery consumes.
- Water harvesting through syphonic drainage or other mechanisms would significantly reduce water consumption.
- Tax (VAT) breaks can be granted for companies consuming locally sourced material inputs, as opposed to inputs imported from abroad. This would support local material producers, while lowering costs and carbon emissions due to transportation.
- Industrial symbiosis would greatly reduce material input costs and waste-generation rates.
- An online platform which provides an inventory of material inputs and waste outputs per each active company (i.e. an industry material input/output inventory) would potentially boost industrial symbiosis. When reclaimed waste outputs are purchased, these should not be taxed.
- Waste handlers (such as Waste Contractors, MRFs, and recycling facilities) should be made accountable for providing factual information on waste generation and treatment pathways, as well as on recycling outputs. A proper inventory on waste handling would allow further resource reuse within industrial sectors (Casas-Arredondo et al., 2017).
- Sharing workspaces and Analogue Industry Clusters (as specified in subsection 9.2.1) can make waste segregation and collection more cost-effective. For instance, fabric offcuts, food waste, or wood dust can be agglomerated and collected by a specialised Waste Contractor for optimal recycling.

9.2.4 Technology

- Technology such as 3D-printing, CNC machinery, infrared-sensing, and laser-cutting would support the manufacturing industry as it could improve quality and boost innovation, while reducing material offcuts and shavings. This type of technology could also lower labour costs.

- As mentioned in subsection 9.2.1, Analogue Industry Clusters and sharing workspaces could accommodate costly technology which could not be otherwise afforded by small and medium manufacturers.
- The development and deployment of electric vans and HVGs would significantly reduce carbon emissions from transportation.

9.2.5 General policies

- Local governments and councils ought to provide spatial, logistic, employment and networking support, as detailed for instance in subsections 9.2.1 to 9.2.3.
- In terms of networking, the concept of circular economy must be put in the minds of supply-chain stakeholders and policy makers at all levels.
- Knowledge sharing should be encouraged in order to support innovation, improve design, and reduce costs and carbon emissions.
- Government should boost the manufacturing industry by investing in technology development (Mazzucato, 2013).
- Economic activities that add value from the economy (such as manufacturing) should be taxed lower than those activities that extract value.
- An effort should be made to provide a diversity of job choices which include both manual- and intellectual-labour alternatives.
- An awareness campaign can be launched to emphasize the technological, socio-economic and environmental benefits of maintaining and re-localising manufacturing activities – such as fostering technological and design innovation in the industry, developing skills in the population, and creating value in the economy, while reducing social and environmental externalities on a wider scale.

10. Appendix

10.1 NACE codes considered in the FAME database search

Table 0.19 provides a list of all the NACE codes that were considered for the FAME database search, as stated in chapter 2. Each 'NACE code' is given on the left column while the corresponding 'economic activity' is shown on the right column.

Table 0.19: NACE codes and the corresponding economic activities, considered in the FAME database search.

NACE code	Economic activity
05	Mining of coal and lignite
07	Mining of metal ores
08	Other mining and quarrying
10	Manufacture of food products
12	Manufacture of tobacco products
13	Manufacture of textiles
14	Manufacture of wearing apparel
15	Manufacture of leather and related products
16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
17	Manufacture of paper and paper products
18	Printing and reproduction of recorded media
19	Manufacture of coke and refined petroleum products
20	Manufacture of chemicals and chemical products
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
22	Manufacture of rubber and plastic products
23	Manufacture of other non-metallic mineral products
24	Manufacture of basic metals
25	Manufacture of fabricated metal products, except machinery and equipment
26	Manufacture of computer, electronic and optical products
27	Manufacture of electrical equipment
28	Manufacture of machinery and equipment
29	Manufacture of motor vehicles, trailers and semi-trailers
30	Manufacture of other transport equipment
31	Manufacture of furniture
32	Other manufacturing
33	Repair and installation of machinery and equipment
36	Water collection, treatment and supply

37	Sewerage
38	Waste collection, treatment and disposal activities; materials recovery
39	Remediation activities and other waste management services
52	Warehousing and support activities for transportation
773	Renting and leasing of other machinery, equipment and tangible goods

10.2 Email template sent to prospect companies

Title: Research on Urban Manufacture requires your valuable input

Dear Sir or Madam,

Cities of Making (www.citiesofmaking.com) is an international research project about urban making/manufacturing, which seeks to better understand and support industries in European cities.

The Borough of Haringey has been selected as case study, so the UCL-Bartlett researchers need your indispensable feedback in order to explain the present situation, the issues, and potential development of urban industries.

Your interview would last from 30 minutes to one hour, with questions about production process, spatial conditions, material inputs, waste streams, energy, technology, policy context, and social pressures. All information will be anonymised and collated to generate policy briefs for policy makers and also to produce reports downloadable from the project's website.
Please let me know when you'd be so kind to grant me a little time for an interview. Your input is fundamental to this project.

Best wishes,
Miguel Casas

10.3 Questionnaire for relevant stakeholders

COM
cities
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Manufacturers Interview questions

1 - History of your activity

What is the history of your business?

Why is it located in Brussels/London/Rotterdam?

2 - Description of the activity

Could you pls describe what you MAKE?

Under what NACE code is your activity classified?

Do you think your company belongs to the manufacturing sector?

3 - Space

Architecture/building type:
- *Was this building custom designed or adapted?*

- *Does it fit your needs?*

- *Are there spatial/functional conflicts?*

- *How big is the building?*

Location in the city:
- *Why are you in this spot?*

- *What is your relation with the neighbourhood (clients/infrastructure)?*

- *Are there subsidiary/secondary activities in the surroundings you depend on?*

Planning:
- *Does your site fall in a strategic area? For example, a mixed zone (ZEMU) or industrial zone.*

- *Are your experiencing any conflict/threat linked to urban development?*

4 - Organization

Employees:
- **How many employees do you have?**

- **What are the worker's profiles?**
  - e.g. Unskilled, Skilled, Tertiary educated (university or technical college)

- *If employees are skilled or tertiary educated, where were they educated? Are education establishments suitable in London? If not, where is the best education available?*

- *Where are the employees located? Do they live in London?*

Business structure:
- *Could you pls specify the geography of your production? (where does the different stages of the production happen?)*

- **Do you have divisions outside UK?**

Market:
- *What is your primary market?*

- *Is London a significant market?*

Networking:
- *To what extent do you interact with companies in the neighbourhood?*

- *Do you belong to any local networking association for makers?*

- *Do you exchange knowledge/ products/ inputs with companies in the area?*
- *Do you share space/ facilities/ storage space/ machinery with companies in the area?*

5 - Materials, water and energy

Diagram flow of your activity
- ***Could you pls provide or draw a simplified diagram flow of your activity?***

- ***What are the main processes performed on site?***

- ***What is the main product produced by your company (both tangible and intangible)? Could you pls indicate approximate volume/mass per year?***

Energy

What are the main uses of energy in your activity (indicate % if possible)?
  - e.g. Heating, Lighting, Production processes, Steam generation, IT, Others

What are the main sources of energy (indicate the %)?
  - e.g. Electricity, Natural gas, Biomass, Solar PV, Wind energy, Other RE

Water

What are the main uses of water in your company? (indicate % if possible)
  - e.g. Production, Cleaning, Cooling, General water use, Other

Apart from potable water, does your company use any other types of water?
  - e.g. Grey water, Reused water, Other

How do you treat your waste water?
  - e.g. Local sewer, Water treatment plant on site, Other

Materials

Materials flows in:
- ***Could you pls list your main material inputs***?

- ***Do you know where the raw material comes from?***

- ***Could you pls specify the radius of locally sourced materials?***

Material flows out
- ***Could you pls list your main waste streams (materials)?***

- ***Could you pls mention the main activities that generate waste in your company? (production/office/packaging)***

- ***How do you manage your waste?***
  - e.g. Municipal collection, Specialist waste manager, Other

- ***Do you know what is the final destination of your waste by material category?***
  - e.g. *composting/ AD/ recycling/ reuse/ landfill/ Incineration/ gasification/ other thermal treatments*

- *Are there other businesses that could benefit/extract value from your waste?*

- *Have you look at ways to reduce or reuse your waste?*

- *Do you know the resources consumed/ waste generated by companies located nearby?*

- *Have you considered using waste/underutilised resources from other companies as input for your processes?*

Transport

What is the main mode of transport for the goods you produce as well as for the inputs you consume?
- e.g. Train, Truck/Lorry, Airplane, Ship, Barge, Car, Van, Other

What are the main modes of transport for your employees to commute to work?
- e.g. Bus, Tube, Train, Cycle, Private car, Walk, Other

6 - Technologies and innovation

Business model innovation
Have you heard of the concept of the circular economy?

Do you think any of the following business models could apply to your company:
- Supply Chain: using renewable, recyclable or biodegradable materials to reduce cost. Example: the creation of fibres as good as cotton coming from flax and hemp.
- Recovery & Recycling: everything that can be considered as waste, can be revived for other uses. Example: recover end-of-life products and reuse them
- Product Life-Extension: Maintaining and improving products through repairs, upgrades, remanufacturing or remarketing. Example: Dell Inc. takes back old equipment and resells units when possible
- Sharing Platform: rent, share, swap, or lend their idle goods to save money and do not keep things stored. Examples: Uber Inc, Airbnb Inc.
- Product as a Service: selling access to products while retaining their ownership or assets. Example: Philips NV is using lighting as a service to charge by output instead of unit sales.

Technologies:
Could you pls describe the main technologies you use for the manufacturing processes?

Do you use any of the following emerging technologies?
- e.g. Sensors, Drones, Additive manufacturing technologies (3D printing), Robotics

Is there any technology that you envision could play a key role in your sector in the near future?

7 - Context

Compatibility
- ***Is your business compatible with the metropolitan scale?***

- ***What are the main benefits associated with your location?***

- ***Would you choose London if you were to start again?***

Support:
- ***Do you feel there is public support for your business? If so, from what level of government?***

- ***Do you receive financial support/concessions of any kind? If so, from what level of government?***

Is your business under pressure?
- ***Are there pressures to relocate your business? If so, is this from public or private actors?***

- ***Are labour costs a significant restriction on your business?***

- ***Are the environmental constraints a major challenge?***

- ***Is there any friction with your neighbours or with other land uses? If so, which constraints in particular?***

10.4 List of the 126 shortlisted companies

Table 0.20 presents a list of the 126 selected manufacturing companies, including their respective 'NACE Code', 'trade, 'activity', and 'activity description'. The table is arranged in alphabetical order according to the 'trade' and then the 'activity'. The NACE codes provided below were either obtained from the FAME database or from the Companies House Beta website (UK Government, 2019). An official list of NACE codes (European Commission, 2019) was used to verified or rectified a few of them for Table 0.3 and Table 0.7, in order to provide more precise information.

Table 0.20: List of the 126 selected manufacturing companies, showing the NACE code, trade description, trade, and activity for each of the companies (European Commission, 2019; UK Government, 2019).

Industrial trade	Industrial activity	NACE Code	Activity description
Arts	photo studio	3299	Photographic studio
Audio	amplifiers	2640	Manufacture of guitar and bass amplifiers
Automotive	refinishing	3299	Production and distribution of products for the automotive refinishing industry
Building	blinds	3299	Manufacture of blinds

Building	curtain poles	4690	Manufacture of curtain poles for interior design
Building	lighting	3299	Manufacture of intelligent LED lighting
Building	surface coverings	4543	Manufacturer of natural and artificial stone (for building interiors)
Building	surface coverings	4676	Manufacture of wallpapers
Building	surface coverings	4676	Manufacture and supply of wallcoverings
Building	surface coverings	4778	Supply of building tiles
Building	water fittings	2599	Manufacture of metal water fittings
Chemicals	surface materials	2059	Manufacture of other chemical products n.e.c.
Chemist	care products	2121	Manufacture of personal care products - e.g. makeup
Chemist	care products	2120	Manufacture of personal care products - e.g. makeup
Clothing	bride dress	1413	Design and manufacture of bridal dresses
Clothing	CMT (cut, make, trim)	1419	Provision of CMT (cut, make, trim) services
Clothing	costumes	1413	Manufacture of costumes and samples
Clothing	handbags	1512	Manufacture of women handbags
Clothing	leather clothing	1410	Manufacture of leather garments
Clothing	men clothing	1413	Manufacture of men's outerwear, other than leather clothes and workwear
Clothing	men clothing	1413	Manufacture of men's outerwear, other than leather clothes and workwear
Clothing	men, women	1419	Manufacture of other wearing apparel and accessories
Clothing	military, casual	1410	Manufacture of military and casual clothing
Clothing	military, casual	4641	Manufacture of military and casual clothing
Clothing	shoes	1520	Manufacture of women shoes
Clothing	shoes	1520	Manufacture of footwear
Clothing	uniforms	1410	Manufacture of school uniforms
Clothing	women	1413	Manufacture of women's outerwear, other than leather clothes and workwear
Clothing	women	1413	Manufacture of plus-size women clothing
Clothing	women	1413	Manufacture of women apparel
Clothing	women	1413	Manufacture of women apparel

Clothing	women	4771	Manufacture of women clothing
Clothing	women	1413	Manufacture of women clothing
Clothing	women	1413	Manufacture of women's outerwear, other than leather clothes and workwear
Clothing	women	1413	Manufacture of women's outerwear, other than leather clothes and workwear
Clothing	women	4642	Manufacture of women dresses
Clothing	women	1413	Manufacture of women's outerwear, other than leather clothes and workwear
Clothing	women	1413	Manufacture of women's outerwear, other than leather clothes and workwear
Clothing	women	1413	Manufacture of women's outerwear, other than leather clothes and workwear
Food	Asian	1073	Manufacture of Asian food
Food	beer	1105	Production of beer
Food	beer	1105	Production of beer
Food	bread	1071	Manufacture of bread (e.g. sourdough and cakes)
Food	bread	1071	Manufacture of bread; manufacture of fresh pastry goods and cakes
Food	bread	1071	Manufacture of bread; manufacture of fresh pastry goods and cakes
Food	bread	1071	Manufacture of bread; manufacture of fresh pastry goods and cakes
Food	bread	1071	Manufacture of bread; manufacture of fresh pastry goods and cakes
Food	cheese	1051	Production of artisan cheese
Food	coffee	4637	Roasting of coffee
Food	juice	1032	Manufacture of fruit and vegetable juice
Food	meat	1011	Processing and preserving of meat - donner
Food	meat, poultry	1013	Production of meat and poultry meat products
Food	oil	1041	Production of cold pressed oils and steam distilled products
Food	oil	1041	Production of chilly oil
Food	organic	1089	Manufacture of organic food products
Food	organic	1089	Manufacture of organic foods
Food	other	1039	Manufacture of mezze food - e.g. hummus
Food	pitta bread	1071	Manufacture of pitta bread
Food	pitta bread	1071	Manufacture of pitta bread

Food	pitta bread	1071	Manufacture of pitta bread
Food	roti bread	1071	Production of roti bread and other Indian-food products
Food	sausages	1013	Production of sausages
Food	take away	5610	Production of take-away foods
Food	take-away	1089	Manufacture of other food products - patties
Food	meat	4632	Wholesale of meat products
Furniture	joinery	3109	Manufacture of cabinets
Furniture	kitchen	3102	Manufacture of kitchen furniture
Furniture	kitchen	3102	Manufacture of kitchen furniture
Furniture	kitchen	3102	Manufacture of kitchen furniture
Furniture	mirrors	2312	Manufacture of framed mirrors and other furniture (UK's leading)
Furniture	music studio	3109	Manufacture of studio furniture for production and edition of audio
Furniture	office	3101	Manufacture of office furniture
Furniture	seating	3109	Manufacture of chairs
Furniture	upholstery	3299	Installation of upholstery of furniture
Furniture	various	3109	Manufacture of other furniture
Jewellery	amber	3299	Manufacture of amber products
Jewellery	craftsman	3212	Manufacture of jewellery and related articles
Jewellery	craftsman	3212	Manufacture of jewellery and related articles
Leather	various	1511	Installation of leather for interior design (e.g. upholstery)
Leather	various	1511	Installation of leather for various purposes: interior design, furniture, automotive, marine
Medical	dental	3250	Manufacture of dental implants
Metal	machinery	2841	Manufacture of metal forming machinery
Metal	other	2599	Manufacture of other fabricated metal products n.e.c.
Metal	other	2599	Manufacture of other fabricated metal products n.e.c.
Metal	other	2599	Manufacture of other fabricated metal products n.e.c.
Metal	various	4399	Structural steel work, staircases and balconies
Metal	various	2599	Manufacture of glazing and rooflights

Metal	various	2599	Manufacture of metal fencing, gates, balconies, staircases, windows, etc.
Metal	various	2599	Manufacturers of stainless steel and bespoke steel products (e.g. dishwashing tabling, structural beams, etc.).
Metal	ventilation	2410	Manufacture and supply and building ventilation products
Other	display systems	3299	Manufacture and provision exhibition solutions
Other	display systems	3299	Portable display systems for exhibitions
Other	educational	1729	Manufacture of educational resources for children
Other	mouse tramps	4618	Manufacture of mouse tramps
Other	tablet accessories	3299	Manufacture of tablet accessories for business use
Packaging	jewellery	3299	Manufacture and supply of jewellery and gift packaging
Printing	banners	7410	Manufacture and installation of interior and exterior graphics for commercial and public spaces (e.g. banners)
Printing	engraving, signage	7410	Provision of engraving and signage services on various materials
Printing	photo, canvas	9609	Printing for photographic and artistic purposes
Printing	publishing	5819	Provision of publishing services
Printing	signage	1812	Printing - window display, signage, 3D visualisation
Printing	signage	7410	Manufacture of signs for commercial and interior design purposes
Printing	signage	7410	Manufacture of signs
Printing	various	1812	Printing (other than printing of newspapers and printing on labels and tags) n.e.c.
Printing	various	1812	Printing (other than printing of newspapers and printing on labels and tags) n.e.c.
Printing	various	1812	Printing (other than printing of newspapers and printing on labels and tags) n.e.c.
Stationery	treasury tags	3299	Manufacture of treasury tags - to hold large volumes of paper
Textile	carpet	1393	Manufacture of carpets and rugs (other than woven or tufted) n.e.c.

Textile	embroidery	1330	Provision of embroidery and printing services
Textile	fabrics	1391	Manufacture of knitted fabric for clothing and other industry
Textile	household	1392	Manufacture of household textiles (other than soft furnishings of 13.92/1)
Textile	household	1392	Manufacture of household textiles (like bed covers and curtains)
Textile	pattern grading	1330	Provision of garment grading services
Textile	pattern grading	1330	Provision of garment grading services
Textile	pattern grading	1330	Provision of patter grading and printing services
Textile	pleating	1330	Pleating, shirring and smocking Service for the fashion and allied industries
Video	software, hardware	2640	Design and manufacture of hardware and software for real-time manipulation of video in the AV industries
Waste	commercial	3811	Collection of commercial waste
Waste	commercial, household	3811	Business and household waste collection (this is a subsidiary)
Waste	non-hazardous	3811	Collection of non-hazardous waste
Wood	finishing products	2030	Manufacture and supply of wood finishing materials
Wood	joinery	1623	Manufacture of other builders' carpentry and joinery
Wood	joinery	1623	Manufacture of other builders' carpentry and joinery
Wood	tableware	1629	Manufacture of wooden tableware
Wood	sawmilling	1610	Sawmilling and planing of wood
Wood	sawmilling	1610	Sawmilling and planing of wood

10.5 Defined employment areas (DEAs) in Haringey

Table 0.21 includes the defined employment areas (DEAs) according to the Haringey Council (2017) Local Plan, as cross-referenced in subsection 3.5. The table includes the 'DEA' number, the 'name of site/area', the respective 'postcode', and the 'level of designation'. The latter is broken down into strategic industrial areas, locally significant industrial areas, and local employment areas.

Table 0.21: Defined employment areas (DEAs) for Haringey according to the council Local Plan (adapted from: Haringey Council, 2017).

DEA	Name of site/area	Postcode	Level of designation
DEA 1	Brantwood Rd	N17	Strategic industrial location
DEA 2	North East Tottenham	N17	Strategic industrial location
DEA 3	Marsh Lane	N17	Strategic industrial location
DEA 4	Millmead & Lockwood	N17	Strategic industrial location
DEA 5	Lindens/Roseberry Works	N/A	Locally significant industrial site
DEA 6	Vale/Tewkesbury Rd	N4	Locally significant industrial site
DEA 7	Queen St	N17	Locally significant industrial site
DEA 8	White Hart Lane	N17	Locally significant industrial site
DEA 9	Cranford Way	N8	Locally significant industrial site
DEA 10	South Tottenham	N15	Locally significant industrial site
DEA 11	Willoughby Lane	N17	Locally significant industrial site
DEA 12	Rangermoor Rd	N15	Locally significant industrial site
DEA 13	Bounds Green Industrial Estate	N11	Local employment area
DEA 14	Pinkham Way	N11	Local employment area
DEA 15	Ashley Rd	N15	Local employment area: Regeneration area
DEA 16	Hale Wharf	N15	Local employment area: Regeneration area
DEA 17	Fountayne Rd	N15	Local employment area: Regeneration area
DEA 18	Herbert Rd/Ashby Rd	N15	Local employment area: Regeneration area
DEA 19	Constable Crescent	N15	Local employment area: Regeneration area
DEA 20	Arena Design Centre	N4	Local employment area: Regeneration area
DEA 21	Crusader Industrial Estate	N4	Local employment area: Regeneration area
DEA 22	Omega Works	N4	Local employment area: Regeneration area
DEA 23	Vale/Eade Rd	N4	Local employment area: Regeneration area
DEA 24	Eade/Overbury	N22	Local employment area: Regeneration area
DEA 25	Wood Green	N22	Local employment area: Regeneration area
DEA 26	Cross Lane	N8	Local employment area: Regeneration area

10.6 Detailed charts of land use in focus areas

This section presents a breakdown per land use considering the corresponding focus areas, as analysed in chapter 4. Table 0.22 to Table 0.29 are given for each land use considered, including: manufacturing, wholesale, business clusters, car-related services, other companies, residential buildings, other land uses, and unused premises.

Table 0.22: **Manufacturing**: *company name, activity and occupied floor area [m^2].*

Company name	Activity	Area [m^2]
Bounds Green (BG)		
Dream Design Curtains	Manufacture of curtains, blinds and upholstery	220
Charli Textile House	Provision of sampling services	420
CMD Bespoke	Manufacture of metalworks	560
Unknown name	Food production	150
Grade Line	Provision of pattern-grading services	500
Katrina Fashion Marketing	Design of women clothing	420
N16 Vintage Ltd	Provision of CMT services	270
Odlar Joinery	Manufacture of joinery	210
Perfect Fit	Design and installation of kitchen and interiors	260
Planet Marble	Manufacture of granite and composite worktops	460
Praxis	Provision of printing services	510
Premium German Kitchens	Design and installation of kitchens	150
Unknown name	Provision of printing services	150
Roma Marble	Distribution of marble and stone surfaces	1190
Seltex	Manufacture of wall coverings	390
Sharewindows & Metalworks Ltd	Manufacture of metal windows and metalworks	410
The Grading Bureau	Provision of pattern-grading services	520
Thomson Brothers	Design and installation of kitchen and interiors	260
Trimway CMT London Ltd	Provision of CMT services	220
Unlimited Fashion	Manufacture of clothing samples	210
Markfield Rd and the High Cross Centre (MRHCC)		
Kashnet & Partners	Manufacture of military and casual clothing	600
Lella&Bros	Manufacture of clothing	820
Polydiam	Manufacture of rubber stamps	340
Rent Art Space	Provision of space for artists and artisans	310
Rose & Hollis	Manufacture of picture frames	150
Rosjohn Furniture	Manufacture of furniture	500
Sandler seating	Manufacture of chairs	830
Sheraton	Manufacture of window blinds	170
Smith and Brown	Manufacture of joinery	460
Williams Ridout	Manufacture of high-end kitchens and cabinets	200
Witherbys	Provision of printing services	1100

Company name	Activity	Area [m²]
North Middlesex University Hospital (NMUH)		
Blue Star Foods	Processing of meat and poultry products	440
Alexander George Ley and Sons	Manufacture of fine picture and mirror frames	700
Bluett & Company Ltd	Finishing of gift products (i.e. gift tags, wrapping paper and greeting cards)	280
Byron & Byron	Manufacture of high-end curtain poles	270
Daas Trading London	Manufacture of women and men clothing	570
Devran Donner	Processing and distributor of meat and poultry	180
Europe Pride Ltd	Manufacture of women clothing	1270
Guney Design	Manufacture of clothing	190
Horizon Foods	Manufacture of Caribbean food	220
Island Blue Ltd	Provision of pattern-grading services for clothing manufacturers	330
Kelan House	Contains the London Clothing Works - manufacturer of women clothing	1520
MQ Metal Fabrication	Manufacture of architectural metal structures	200
Nichols & Nichols	Provision of wood-turning services	210
S. Green and Sons Ltd	Manufacture of household textiles such as bed covers and curtains	2190
Strastry Joinery	Manufacture of joinery	200
Sunburst Snacks	Processing and distribution of nuts and dried fruits	490
Wood Green (WG)		
AKA Design	Manufacture of studio furniture for production and edition of audio	1460
Alandar Park Ltd (Ellis Bridals)	Manufacture of women's clothing and wedding dresses	1990
Brook Farm Sausages	Manufacture of sausages	280
Celtic Bakers	Manufacture of artisan bread	630
Goodwin & Goodwin	Manufacture of high-end signage using different materials	1330
Hope in the Woods	Manufacture of high-end wood tableware	60
Turn Around Publishing Services	Provision of printing and publishing services	2990
Unknown name	Artisan Display Makers	60

Table 0.23: Wholesale: company name, activity and occupied floor area [m²].

Company name	Activity	Area [m²]
Bounds Green (BG)		
Bed Masters	Distribution of bed and mattresses	130
Byblos	Distribution of tiles and surfaces for building purposes	420

Company name	Activity	Area [m²]
Commeris	Distribution of Mediterranean food	220
Home Tiles	Distribution and supply of tiles and surfaces for building purposes	420
I-lumos	Distribution of lighting supplies	470
London Stone	Distribution and supply of surfaces for building purposes	290
London Trophy Company	Distribution of trophies and provision of engraving services	140
P. David Interiors	Distribution and supply of porcelain, ceramics, natural stone, adhesives and grout	490
The Floor Shop	Distribution and supply of hardwood and laminate flooring	570
Tiles DIY	Distribution and supply of bathroom, kitchen, floor and wall tiles and surfaces.	560
Topp Tiles	Distribution and supply of tiles and surfaces for building purposes	450
Total Tech	Distribution of I.T spare parts	200
Markfield Rd and the High Cross Centre (MRHCC)		
Birlem Oil	Distribution of oil and lubricants	1430
Carpet City	Distribution and supply of carpets	1190
Fountayne International Suppliers	Non-specialised wholetrade sale	120
Fountayne International Suppliers	Non-specialised wholetrade sale	120
Furniture World	Distribution of furniture	600
Industrial & Marine Supplies	Distribution and supply of industrial and marine material and equipment	410
Marson Imports	Distribution of textiles	660
Q Quilting	Distribution of fabrics	3350
North Middlesex University Hospital (NMUH)		
Belles Fruit Basket	Distribution and supply of fruit	110
C&M Watermelon	Distribution and supply of watermelons	290
Cosmos Wholesale	Distribution and supply of Mediterranean food products	460
EFES Group Ltd	Distribution of Turkish and Mediterranean food products	470
Elite Bathroom and Plumbing	Supply and distribution of bathroom, plumbing and heating spare parts	430
Empee Silk Fabrics	Distribution of fabrics	1500
First development	Distribution of whisky	370
Innovation Schoolwear	Distribution of schoolwear and other clothing	2510
JD's Food Group	Distribution of food and drinks	510
Marathon Foods	Distribution of food and wine	1040
Ruya Meat	Distribution of meat	100
Select Fashion	Distribution of clothing	6170
Torrent Trackside	Distribution of machinery and equipment (e.g. chainsaws, welding equipment)	970
Whiteheat charcoal	Supply and distribution of charcoal	360
Wood Green (WG)		
Alpicino Cash & Carry	Distributors of clothing and fabrics	410
Blue Nile Clothing	Distribution of clothing and footwear	500

*Table 0.24: **Business clusters:** cluster name, description and occupied floor area [m²].*

Cluster name	Description	Area [m²]
Markfield Rd and the High Cross Centre (MRHCC)		
Fountayne House	Three-story building containing offices, a church, and a gym, among other	1050
Gaunson House	Part of the Mill Co. Project. Includes studios, a meeting room and a cafe	270
Rainbow Works	Provision of space for small businesses and manufacturers. Companies here include On Time Joinery Ltd, Manil, and Hyjo Hydroponics	2050
North Middlesex University Hospital (NMUH)		
Fontrier works	Business cluster containing Wildes Cheese (artisan cheese manufacturer), Paradise Patties (patti bread manufacturer), Fabs Fudge Cake (cake manufacturer), Yezda Meat (meat supplier), Just Fx (special effects and pyrotechnic supplier), Ceramatech (ceramic material and equipment supplier), among other	2930
Pretoria Studios	Containing nine studio spaces to let, Pretoria Studios is part of Byron&Byron holdings	520
Wood Green (WG)		
Cypress House	Four-story building containing different companies, such as The Village Factory (clothing manufacture), DGS Grading and Sampling, Petr Weigl (contemporary art created in ceramic, concrete and metal), 5E (IT training and support), Kids Adventure Playzone, and The London Wing Chun Academy (martial-arts school), among other	1570
Parma House	Belonging to a corporation called Workspace, Parma House is a four-story building containing several offices, including Green Hippo (software), Argidiaris Analogue Electronics, Ingeus (social services), Lupotex Trading (clothing supplier), among other	880
The Chocolate Factory 1	Belonging to a corporation called Workspace (which provides working space for around 70 small businesses). The Chocolate Factory 1, a five-story building, contains offices, clothing retailers, canvas printing, etc.	4570
The Chocolate Factory 2 / Collage Arts	Five-story building containing Collage Arts on the second floor. Collage Arts provides access and support to under-represented sections of the community, offering skills, experience and opportunities in creative and digital media, film, music, photography, performing arts and visual arts	770

*Table 0.25: **Car-related** services: company name, activity and occupied floor area [m²].*

Company name	Activity	Area [m²]
Bounds Green (BG)		
BP Gas Station	Supply of petrol	290

Company name	Activity	Area [m²]
M.O.T. Test Centre	M.O.T. and car mechanical repairs	200
TP Automotive parts	Distribution of automotive spare parts	420
Volkswagen Dealership	Supply of passenger vehicles	220
Markfield Rd and the High Cross Centre (MRHCC)		
IMO Car Wash	Provision of car-wash services	130
Imperial Works	Provision of car-repair services	240
RSM Motors	Provision of car-repair services	310
Tony's hand car wash	Provision of car-wash services	1170
North Middlesex University Hospital (NMUH)		
AlloyWorks	Diamond-cut wheel specialists	470
Bodyworks Accident Repair Centre	Provision of car-paint and bodywork services	460
C&M Motors	Provision of car-repair services	90
G&L Taxis	Provision of taxi rental and repair services	360
GML MotorWerks	Provision of car-repair services	420
Gurtek	Provision of car-repair services, specialised on German cars	190
M.O.T Test Centre	Provision of M.O.T. tests	670
M.O.T. Test Centre	Provision of M.O.T. tests	90
M.O.T. Test Centre	Provision of M.O.T. tests	320
Mega Crash Repairs	Provision of car bodywork services	420
MnF Motors	Provision of electrical and mechanical car repairs	110
Volante	Provision of car-repair services	200
White Repairs	Provision of car-repair services, specialised on brakes, engine and bodyworks	190

*Table 0.26: **Other companies:** company name, activity and occupied floor area [m²].*

Company name	Activity	Area [m²]
Bounds Green (BG)		
Artel Scaffolding	Provision of scaffolding services	530
Caretower	I.T. security specialists	170
Engie	Community regeneration and housing solutions	470
Local Express	Off-license (convenience store)	300
MMG Building Services	Provision of building services	60
Occam	Provision of storage space	450
Safe Storage Selfstorage	Provision of storage space for businesses and individuals	1770
SS Catering Ltd	Provision of catering services	400
Markfield Rd and the High Cross Centre (MRHCC)		
Olive TV	Christian television channel	340
Cloud & Horse	Provision of photographic and filming studio	1380
Diamond Build	Building developers	480

Company name	Activity	Area [m²]
Mannions Prince Arthur	Traditional pub	180
Nana Sussies Cafe	Cafe and restaurant	180
O'donovan	Collection of commercia waste	180
The Cove	Photographic and filming studio	270
Unknown name	Lorry yard	800
North Middlesex University Hospital (NMUH)		
Queen's Cafe	Cafe and restaurant	150
Rug Washing Express	Provision of rug washing services	390
Speedy Depot	Provision of machinery hiring services for construction, manufacturing, retail and facilities management	940
Star Market	Convenience store (off license)	100
Transportugal European	Provision of removal, packaging and shipping services	310
Wood Green (WG)		
Destiny Weddings & Events	Provision of space for events (e.g. weddings)	220
Livington Studios	Audio recording studios	230
Matizz	Bar-lounge	350
Safestore Self Storage	Provision of personal and business storage	1170
The Decorium	Provision of space for events (e.g. weddings)	1610
Western Road	Household waste recycling centre	2230

Table 0.27: **Residential buildings:** *building typology and occupied floor area [m²].*

Building typology	Area [m²]
Bounds Green (BG)	
2-story apartment building	780
2-story houses	410
2-story houses	250
2-story houses	180
2-story houses	220
3-story apartment building	1700
4-story apartment building	840
4-story apartment building	1330
4-story apartment building	880
4-story apartment building	980
Markfield Rd and the High Cross Centre (MRHCC)	
1-story house (in a warehouse)	140
2-story houses	680
2-story houses	1510
3-story apartment building	620

Building typology	Area [m²]
3-story apartment building	870
3-story apartment building	240
4-story apartment building	570
4-story apartment building	220
4-story apartment building	520
North Middlesex University Hospital (NMUH)	
2/3-story houses	470
20-story apartment building	660
2-story houses	350
2-story houses	300
2-story houses	290
2-story houses	290
2-story houses	490
2-story houses	490
2-story houses	420
2-story houses	430
2-story houses	410
2-story houses	410
2-story houses	210
2-story houses	100
2-story houses	440
3/4-story apartment building	490
3-story houses	470
3-story houses	480
3-story houses	480
3-story houses	820
4-story apartment building	610
4-story apartment buildings	2510
Wood Green (WG)	
2-story house	120
2-story house	140
2-story houses	710
3-story apartment building	200
3-story houses	770
4-story houses	170

*Table 0.28: **Other** land **uses**: institution name, activity and occupied floor area [m²].*

Institution name	Activity	Area [m²]
Bounds Green (BG)		
Ming-Al London Institute	Adult education and skill training	460
Markfield Rd and the High Cross Centre (MRHCC)		
Asambleia de Deus	Christian church	310

Institution name	Activity	Area [m²]
Maranatha Evangelistic Ministries International	Religious association	180
One In Christ Ministry	Christian church	180
North Middlesex University Hospital (NMUH)		
Britain Axlas Community Centre / Moonchild Education	Community centre and skill-development centre	360
Christian Pilgrims Church	Christian church	120
Gospel Centre	Christian church	110
Wood Green (WG)		
Alexandra Primary School	Primary school	740
Area 51 Education	Provision of education for young adults with learning disabilities	800
Faith Miracle Centre	Christian church	370
Victory International Church	Christian church	140

*Table 0.29: Unused **premises:** concept and occupied floor area [m²].*

Concept	Area [m²]
Bounds Green (BG)	
Unused building	1550
Markfield Rd and the High Cross Centre (MRHCC)	
Unused 6-story building	1830
Unused building	770
Unused building	420
North Middlesex University Hospital (NMUH)	
Unused warehouse	220

10.7 Material flows per industrial trade and activity

Table 0.30 covers the material inputs and supply as well as waste outputs and management per industrial trade and activity, as analysed in section 5.9.

Table 0.30: Material inputs and supply as well as waste outputs and management per industrial trade and activity.

Industrial trade	Material inputs	Material supply	Waste outputs	Waste management
Building (1) curtain poles	Wood (75-80% of material input), resins, metals, paint	Wood comes from Italy (mostly), Poland, Spain, and China (recently). Resins comes from	Wood, resins, metals, paint, and cardboard	Put in the skip unsegregated and collected by Waste Contractor every six weeks to two

Industrial trade	Material inputs	Material supply	Waste outputs	Waste management
		China. Metals come from China and India. Paint comes from Italy.		months. Wood and cardboard waste is burnt in a boiler to generate heat
Clothing (1) CMT unit	Fabrics, fusing, linings, paper, plastic (to cover the dresses), thread, trimmings, zips	Thread comes from Germany but supplied in the UK. The rest of inputs are also supplied in the UK, however the interviewee did not know where inputs are originally sourced from	Fabric offcuts (mainly), paper and plastic	Put in a skip unsegregated, and collected by Waste Contractor
Clothing (1) CMT unit 2	Fabric, paper, paperboard	Paper and paperboard are sourced and produced in the UK. Fabric comes from Turkey, Italy, China, and Korea	Fabric and paper offcuts	Put in a skip unsegregated, and collected by Waste Contractor
Clothing (1) garment sampling	Fabric	Mainly China and Turkey, also Korea	Fabric offcuts	Put in a skip and collected by Waste Contractor. Sometimes waste is sold to merchants. Sometimes offcuts are kept for further re-use
Clothing (1) men/women clothing	Fabric (cotton, linens, silk, wool, cashmere), leather, lining, zips, buttons, fusing (interlining	Fabric from Italy and Japan (mainly). Interviewer noticed that thread was Gutermann (from Germany). Sometimes clients provide the inputs	Mainly fabric offcuts	Offcuts are kept for further re-use

Industrial trade	Material inputs	Material supply	Waste outputs	Waste management
	used inside the garment), thread, waddings (paddings), ribs (elastic)			
Clothing (1) military/casual clothing	Fabric, thread, buttons, metals (including gold), paper	Would not provide an answer	Material offcuts and leftovers	Put in a skip unsegregated, and collected by Waste Contractor
Clothing (1) pattern grading	Cardboard and paper rolls	Sourced and produced in the UK	Cardboard (mainly) and paper offcuts	Put into bails and collected by Waste Contractor every two to three weeks
Food (1) artisan bread	Flour, salt, water, starter (yeast)	Flour comes from various sources, e.g. France, Germany, Canada	Food waste (dough and finished products), cardboard and paper packaging	Food waste is put in a special skip, collected and paid for by a company called Green Feed (2019), and used for animal feed. Packaging waste is put in the general-waste skip shared in the block
Food (1) Caribbean bread	Flour, water, seasonings	Supplied in the UK but sourced from abroad (e.g. Canada), "wherever price is cheaper"	Food residues. Paper towels, plastic containers.	All food residues are reused in the production. Other waste is put in a skip and collected by Waste Contractor
Food (1) beer	Water, malt, hops, yeast	Malt is sourced in the UK. Hops come from the UK, US, New Zealand,	Trade effluent, spent grains, spent hops, packaging	Spent grains and hops are collected by a local lady and used for animal feed and

Industrial trade	Material inputs	Material supply	Waste outputs	Waste management
		German, Poland, Czech Republic		composting. Other waste is collected by a Waste Contractor
Food (1) meat/poultry	Beef, lamb, chicken	Everywhere, e.g. New Zealand, Spain, France	Bones and packaging	Food waste is put in a wheelie bin and collected by Waste Contractor every night. Packaging is put in the general-waste bin and collected three times a week
Furniture (1) kitchens and cabinets	Corian (composite material used for counter-tops), glass, lacquer, marble, MDF, melamine, metal, paint, stones, wood	Corian comes from USA. Marble and stone mainly come from Italy or Greece. Melamine is produced in the UK Wood comes from Italy (mostly), USA or Africa (rarely).	Various material offcuts and shavings, cardboard and plastic packaging	Recyclable waste is put in a recycling bin. MDF dust is put in a different bin and collected in another vehicle. Hazardous waste (spraying residue) is also collected separately. The rest of the waste is put in a skip. Waste Contractor collects once a week using different vehicles respectively
Metal (1) architectural structures	Steel sheets, paint, powder coating	Main steel-sheet supplier is located 40-50 km away, other suppliers are also located in the UK. The interviewees did not know where their	Metal offcuts, scrap metal, paint spray cans	Put in a skip unsegregated, Waste Contractor collects every two weeks or once a month. Sometimes waste is handed to people who come to the site to collect

Industrial trade	Material inputs	Material supply	Waste outputs	Waste management
		suppliers source their products from		it and pay a symbolic amount (£50) in exchange. This people may, in turn, sell the scrap metal
Printing (1) signage	Perspex (commercial name for PMMA or acrylic glass), aluminium, steel, timber, LED lighting, neon lighting, PVC Foamex (commercial name for PVC foamboard), MDF, concrete, vinyl, water-based paints, special fluids for rusting surfaces	LED lighting[1] comes from China, some of the timber comes from Italy, acrylic glass[2] comes from USA. The rest is sourced in the UK	Material offcuts and packaging	Said they have containers for each material, but they only have two containers and one skip. Waste is collected by a Waste Contractor
Waste (1) C&D waste collection	Bricks, concrete, soils, timber, cardboard, plastics, greenery, shrubbery	98% of the waste is collected in London	Cardboard is recycled in the UK; timber goes to energy from waste or is re-chipped for MDF. Concrete and bricks are turned into certified recycled aggregate at the same site (MRHCC) and sold to the construction industry; plastic is re-melted into plastics in the UK, the residue (RDF) is bailed and shipped to either Holland, Germany, Scandinavia or Poland. Fines are sold for engineering works in landfills to cover the landfill cells	

Industrial trade	Material inputs	Material supply	Waste outputs	Waste management
Wood (1) joinery	Wood (mainly), adhesives, finishing products, nails, screws	All materials are sourced from UK suppliers, however, the interviewee did not know the original source	Wood offcuts and shavings, and packaging	Put in the skip unsegregated and collected by Waste Contractor.
Wood (1) tableware	Mainly wood (Sycamore mainly) and wax for sealing	Wood is grown in the UK and sourced from a nearby old mill	Wood offcuts and shavings, and packaging	Put in the skip unsegregated and collected by Waste Contractor. Sometimes waste is sold to farming companies
Wholesale (1) specialised footwear	Finished product – safety boots	Imported from China, Taiwan, Pakistan, India or Italy	Packaging	N/M
Wholesale (1) tiles and flooring	Finished products made of porcelain, ceramics, natural stone, grout and adhesives	Imported from Turkey, Italy, Spain, India and China, among other	Packaging	N/M

10.8 Haringey material consumption and waste generation

This section presents the data used for the material flow analysis (Table 0.31 to Table 0.35) carried out for Haringey in section 6.10, which covers the local material consumption and waste generation. Data is originally obtained for the UK for 2016 and extrapolated for Haringey based on its local population.

Table 0.31: Estimated population for the UK and Haringey, for 2016 (Eurostat, 2019b; ONS, 2018).

UK Population	Haringey Population
65,447,774	278,451

Table 0.32: Material flows into the DMC, for the UK, for 2016 (Eurostat, 2019a).

Material	Mass [kt]	Share	Extrapolation for Haringey [kt]
Biomass	168,013	30%	724
Metal ores	12,191	2%	52
Non-metallic minerals	233,985	42%	1008
Fossil energy carriers	149,066	26%	642
TOTAL	563,256		

Table 0.33: Domestic material consumption (DMC) and waste generation for the UK and extrapolated for Haringey, also showing additions to stock, for 2016 (Eurostat, 2019a; 2019b; 2019c).

UK DMC [kt]	DMC per capita [kt]	Haringey material consumption [kt]	UK waste generation [kt]	Haringey waste generation [kt]	Haringey additions to stock [kt]
571,978	0.00872	2,426	277,254	1,178	1,248

Table 0.34: Waste sources and the respective share in the UK, as well as Haringey extrapolation, for 2016 (DEFRA, 2019).

Waste source	Share in the UK	Haringey mass [kt]
Household waste	12%	141
C&I waste	19%	224
CD&E waste	61%	719
Other waste	8%	94

Table 0.35: Waste treatments for the UK and extrapolation for Haringey, for 2016 (Eurostat, 2019d).

Treatment	UK mass [kt]	Extrapolated for Haringey [kt]
Landfill	52,271	222
Incineration	5,684	24
Backfilling	16,809	72
Energy recovery	7,331	31
Recycling	104,002	442
Other	28,187	120
TOTAL TREATED	214,284	911

10.9 C&I waste management for England

Table 0.36 presents a breakdown of the different types of waste management (e.g. landfill, recycling) per business sector, given in kilotonnes of waste. The data is given for England in 2009 (DEFRA, 2011). The different types of waste management considered in the table are detailed next:

- Landfill: Waste taken to a landfill site. Typically, modern landfilling in the UK involves lining and capping individual cells or compartments into which waste is compacted and covered to prevent the escape of polluting liquid or gases.
- Land recovery: Waste used for the reclamation, restoration or improvement of land as a substitute for virgin materials. Includes compost-like output, inert wastes, unknown/other land recovery options.
- Energy-recovery thermal treatment (ERTT): Combustion of waste under controlled conditions in which heat is recovered for a beneficial purpose – this may be to provide steam or hot water for industrial or domestic use or for electricity generation. Includes energy from waste (EfW) facilities, pyrolysis, gasification, refused-derived fuel (RDF), unknown/other thermal treatment with energy recovery.
- Non-energy-recovery thermal treatment (NERTT): Combustion of waste without energy recovery. Includes incinerators, crematoriums, pyrolysis, gasification, unknown/other thermal treatment without energy recovery.
- Transfer station: Waste taken to a transfer site before being sent to an MRF or to the corresponding final destination. A waste transfer facility serves to bulk up waste before it is transferred to other facilities.
- Non-thermal treatment (NTT): Waste treated under physical, thermal, chemical or biological processes, which can include sorting. Includes mechanical biological treatment, autoclave, mechanical heat treatment, alternative treatment technologies, unknown/other non-thermal treatments.
- Recycling: Recovering of materials by preventing them from being disposed of, making them into new products. Includes material recovery facilities (MRFs), bring banks, reprocessor, unknown/other recycling options.
- Composting: Biological process in which organic wastes are converted into a stable granular material. The end-product, compost, can be applied to land to improve soil structure or to enrich its nutrient content. Includes windrow composting, in-vessel composting, anaerobic digestion, unknown/other composting.
- Reuse: Waste used by another business, industry or process in order to extract value from it. Includes recycled aggregates (previously used in construction), secondary aggregates (not previously used in construction), unknown/other reuse.

Table 0.36: Waste management type per business sector, for England, 2009 [kilotonnes] (DEFRA, 2011).

Business sector	Landfill	Land recovery	Energy-Recovery Thermal treatment	Non-Energy-Recovery Thermal treatment	Non-thermal treatment	Transfer station	Recycling	Composting	Reuse	Unknown	TOTAL
Food, drink, tobacco	385	1140	118	149	331	7	1732	279	379	147	**4667**
Textiles, wood, paper, publishing	395	516	120	18	221	24	1879	15	140	123	**3451**
Power and utilities	2408	155	136	21	31	2	2515	9	127	317	**5721**
Chemicals, non-metallic minerals manufacture	938	146	120	178	518	52	1297	156	163	281	**3849**
Metal manufacturing	1413	145	23	9	166	47	2204	1	45	182	**4235**
Machinery and equipment manufacture	317	35	26	7	106	150	1380	14	23	106	**2164**
Retail and wholesale	1956	4	146	170	615	247	5240	35	213	586	**9212**
Hotels and catering	823	0	39	46	23	44	1154	23	41	514	**2707**
Public administration and social work	575	2	78	914	102	55	748	25	64	312	**2875**
Education	557	3	16	25	31	38	461	45	9	312	**1497**
Transport and storage	256	6	88	57	31	44	1488	1	77	157	**2205**
Other services	1256	5	96	145	145	133	2826	103	49	590	**5348**
TOTAL	**11279**	**2157**	**1006**	**1739**	**2320**	**843**	**22924**	**706**	**1330**	**3627**	**47931**

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