Dissertation Final_ Urban Planning for the Circular Economy in London

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Faculty of the Built Environment

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Urban Planning for the Circular Economy in London:
Multi-Scalar Analysis of Small Urban Manufacturing as Sites for Circular Economic Transformation.

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Being a dissertation submitted to the faculty of The Built Environment as part of the requirements for the award of **MSc International Planning** at University College London:

I declare that this dissertation is entirely my own work and that ideas, data, and images, as well as direct quotations, drawn from elsewhere are identified and referenced.

Abstract

Cities are systems of production, consumption, and waste disposal that negatively impact our shared environment, and the current linear economic model of based on extracting raw materials, making single-use products, and disposing large quantities of materials is reaching its physical limitations. The *circular economy* (CE) has emerged as a tool to transition from a linear economic model where materials are made-used-disposed to a circular model where materials remain at their highest value for as long as possible. The circular economy challenges existing processes of making and linear models of economic growth that privilege systems of globalized mass production and consumption and re-centre localised production processes, broadly termed "urban manufacturing." This dissertation uses London as a case study for mixed-methods, multi-scalar analysis at the city, borough, and firm level to investigate how cities can utilise the planning system to drive circular economic transformation. The most recent London Plan reflects the growing importance of implementation-level spatial plans and attention to industry, and industrial land. London's boroughs translate city-wide policies into place-specific waste management strategies, industrial land protection, and employment efforts to generate social, economic and environmental benefits of CE. London's manufacturing activities are clustered in boroughs and regions, suggesting economic specialization, which boroughs can work to support. Transitioning to a circular economy requires nuanced understanding of the types of makers present in the city, government intervention to allocate adequate, affordable land for manufacturing activity, and design strategies to ensure manufacturing firms can thrive.

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Chapter I: Introduction

Cities are systems of production, consumption, and waste disposal that negatively impact our shared environment, but cities are also sites of innovation and human interaction to achieve sustainable outcomes. Cities consume 60-80% of natural resources and produce 50% of global waste and 75% of greenhouse emissions (Williams, 2019b). The current linear economic model based on "take-make-dispose" is reaching its physical limitations (Ellen MacArthur Foundation, 2013). The World Bank Group estimates that 2.01 billion tonnes of waste are produced annually and expects 3.40 billion tonnes annually by 2050 (Kaza et al., 2018). The UK generates 7 million tonnes of food and beverage waste, 350,000 tonnes of clothing, 1.4 million tonnes of electronic products, 3.7 million tonnes of plastic, and 400 million tonnes of construction materials (LWARB, 2017a). The United Nations Agenda 2030 identified 17 Sustainable Development Goals for social and economic development, which depend on sustainable management of the planet's natural resources (UN, 2015). Without intervention, cities will continue to enable environmental degradation and accelerate resource scarcity and insecurity (Turcu & Gillie, 2020). Cities must cope with these challenges under constrained conditions of increasingly fragmented, globalized value chains, reduced municipal budgets, increasing social inequality, and its consequent spatial effects on urban sprawl, decay, and densification (Metta & Bachus, 2020).

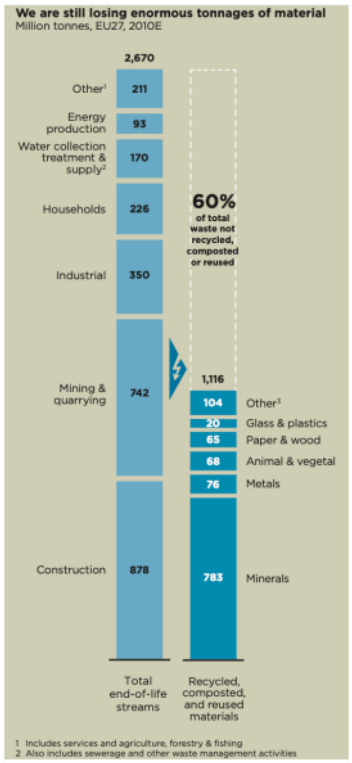


Figure 1: Gap in Waste Production and Recovery (EMF, 2013)

1. Circular Economic Development

The *circular economy* (CE) has emerged as a tool to transition from a linear economic model where materials are made-used-disposed to a circular model where materials remain at their highest value for as long as possible (Geissdoerfer et al., 2017;

Ghisellini et al., 2016; Suchek et al., 2021; van der Leer et al., 2018). The most-cited definition of the circular economy, produced by the Ellen MacArthur Foundation, is "an industrial system that is restorative or regenerative by intention and design [in which] products are designed for ease of reuse, disassembly, and refurbishment, or recycling," (Ellen MacArthur Foundation, 2013, p. 14; Appendix 1). Economists and industrial ecologists originated CE to describe industrial processes for material recycling, waste reduction, resource efficiency, and closing material loops(Allenby, 1998; Ayres & Simonis, 1994; Chertow, 2007; Wolman, 1965). The goal of CE is to decouple "economic growth from natural resource depletion and environmental degradation (Williams, 2019a, p. 2749). In 2015, the EU adopted its Circular Economy Action Plan as a theory of change for achieving sustainable development, resource management, and economic growth (Commission, 2015, 2020). In 2017, London became one of the first cities in the world to issue a Circular Economy Route Map, adopted the 2021 London Plan with specific policies for CE, and allocated £54.4 million to support the Green New Deal mission supporting green job growth (ReLondon, 2021). The Circular Economy is expected to contribute at least £7bn to London's economy, and create 40,000 new jobs in reuse, remanufacturing, and materials innovation by 2036 (LWARB, 2017a). Cities apply CE principles to generate economic, environmental, and social benefits by promoting resource efficiency, business and

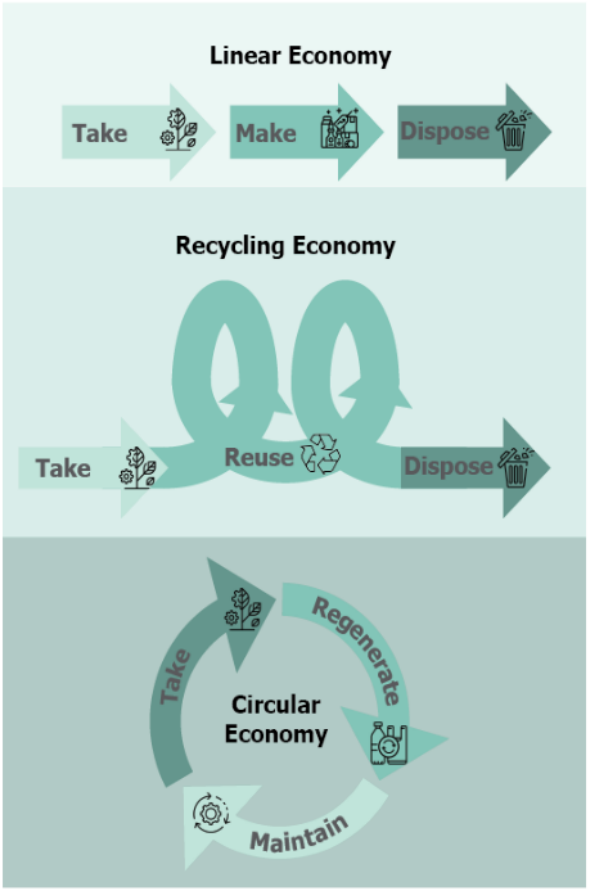


Figure 2: Linear to Circular Economy (Author's own)

product innovations, local employment, sustainable urban systems, and progress towards the SDGs (Ghisellini et al., 2016; Petit-Boix & Leipold, 2018).

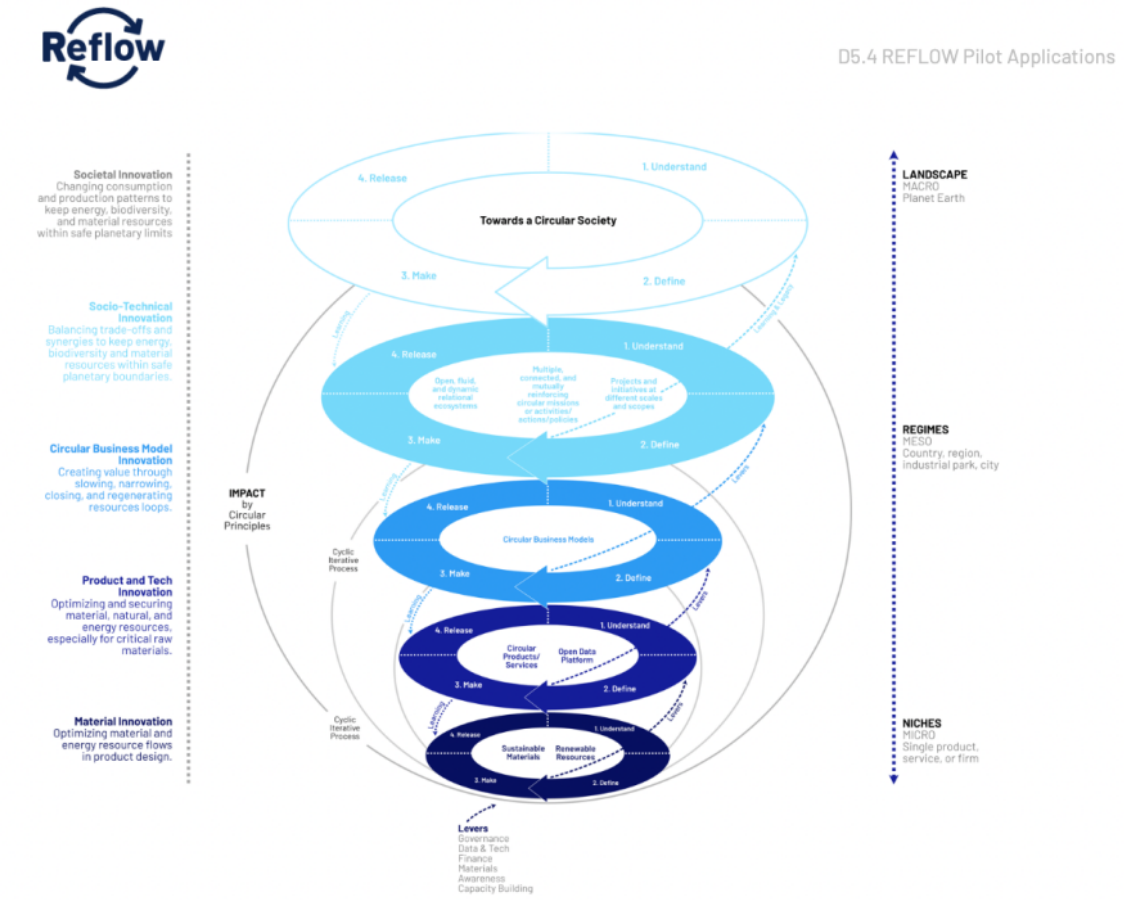


Figure 3: CE Transformation in Cities (Reflow., 2022)

2. CE and Urban Manufacturing

Fundamentally, the circular economy challenges existing processes of making and linear models of economic growth that privilege systems of globalized mass production and consumption (Lieder & Rashid, 2016). CE approaches re-centre production processes that occur in cities at various scales, broadly termed "urban manufacturing" (UM) (Tsui et al., 2021). UM's environmental benefits include reducing transport emissions, repurposing materials, and utilizing local waste flows. UM's social benefits include local economic development through job creation, skills development, and social inclusion

through low-barrier jobs and a diversity of work conditions (Tsui et al., 2021). UM firms consume a large fraction of city resources and generate significant quantities of homogenized waste, which has a high potential for recovery and recycling (Hausleitner et al., 2022, p. 93). Cities need employment and residential land, yet London has released significant amounts of industrial land to other uses, even as vacancy rates have declined (Bosetti et al., 2022; Mayor of London, 2019). While cities like London maintain a manufacturing base, "its diversity and capacity are being compromised by approaches to planning and regeneration that rarely consider the needs of manufacturing or provide the right set of conditions for manufacturing to transform towards more regenerative forms of making" (Hausleitner et al., 2022, p. 93). This dissertation focuses on small manufacturers that can generate environmental, economic, and social benefits to identify areas where boroughs can plan for industrial activity to support circular economic transition.

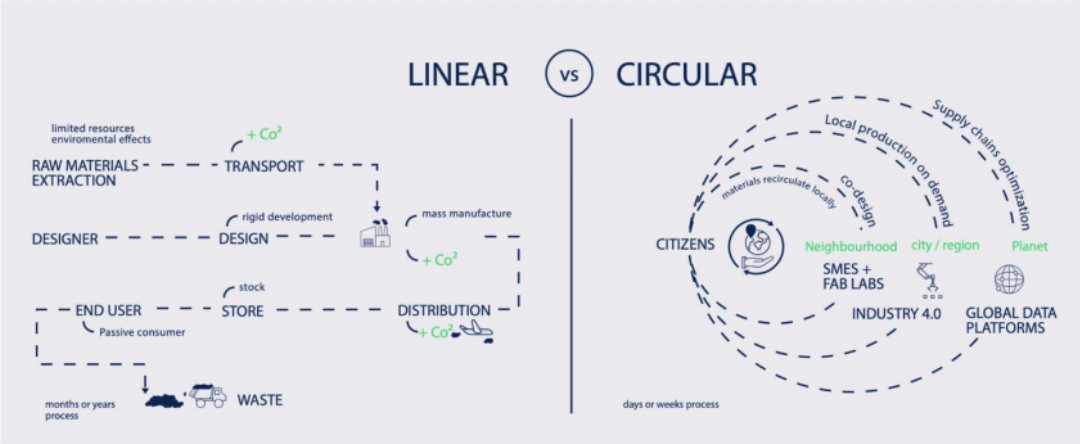


Figure 4: The Circular Economy and Manufacturing (Reflow, 2019)

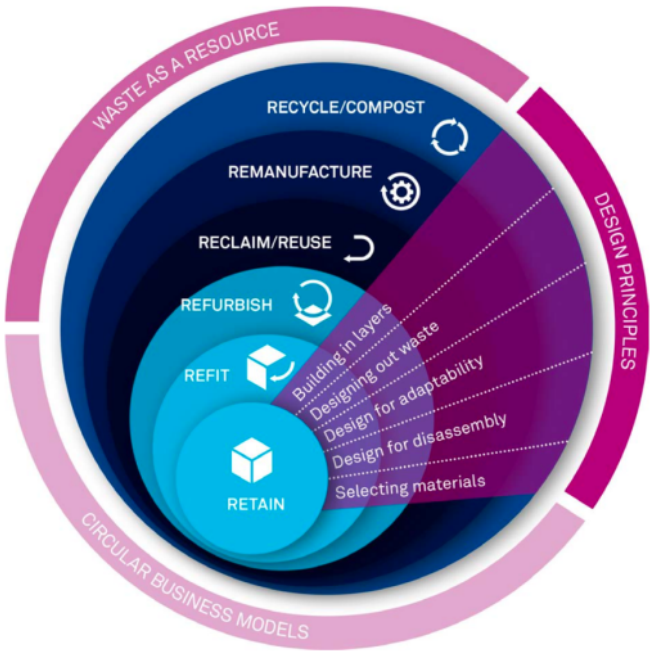


Figure 5: Design Principles for CE (LWARB, 2017a).

3. Literature Gaps

Critical gaps emerge from CE literature and practice related to analysis scale, mechanisms for achieving change, and actionable research methodologies. First, CE literature is dominated by business-led perspectives of CE at a micro-scale, with little attention to its spatial implications and application at the city-wide macro scale (Ghisellini et al., 2016; Lieder & Rashid, 2016; Prendeville et al., 2018; Williams, 2019a, 2019b). A small sample of studies at the city level are emerging, but few discuss sub-city level implementation (Deutz & Gibbs, 2008; Merli et al., 2018; Prieto-Sandoval et al., 2018; Turcu & Gillie, 2020). Second, CE approaches employ techno-business perspectives to enhance "business competitiveness" through technical design, manufacturing processes, and resource efficiency (D'Amato et al., 2017; Geissdoerfer et al., 2017; Kirchherr et al., 2017a). The "Circular Economy-Eco Innovation Nexus" (CE-EI) is a critical gap in understanding resource efficiency, business models, and spatial planning strategies together (de Jesus et al., 2021). Emphasis on business practices alone leads to a lack of understanding cities as complex, socio-economic, and political-administrative systems

that shape regulatory, political, and institutional barriers to adoption (Clift & Druckman, 2016; Moreau et al., 2017; Prendeville et al., 2018; Williams, 2019a). Thus, CE debate focuses on "people-less," "institution-less" natural and mechanical system analogies that disengage with issues of politics and powers (Turcu & Gillie, 2020, p. 7; Sahakian, 2016). Finally, literature references the need for multi-scalar, cross-sectoral frameworks for researching circular cities that reflect a paradigm shift from purely economic views of CE to one which explores circular urban development. Yet few studies complete such analysis (Lieder & Rashid, 2016; Marin & de Meulder, 2018; van der Leer et al., 2018; Williams, 2019b). Methodologies must account for heterogeneous stakeholders, top-down and bottom-up interactions, and theoretical and technical conceptions of CE (Brandt et al., 2013; Hausleitner et al., 2022; van den Berghe & Vos, 2019).

4. Dissertation Overview

The purpose of this dissertation is to explore how planning systems translate CE concepts into strategic visions, municipal development plans, and spatial patterns of firms to influence circular economic transformation. The motivating research question is: *How is London's planning system used to support SMEs that innovate and scale circular economic approaches for urban manufacturing?* It aims to fill the literature gap of actionable CE research methodologies (Kohtala, 2015) by using novel datasets, mixed-methods, and multi-scalar analysis of six urban capacities at three city scales by employing the Pop-Machina Integrated Urban Development Framework for CE intervention (2020; Appendix 3).

Following this introduction, this dissertation develops over six chapters:

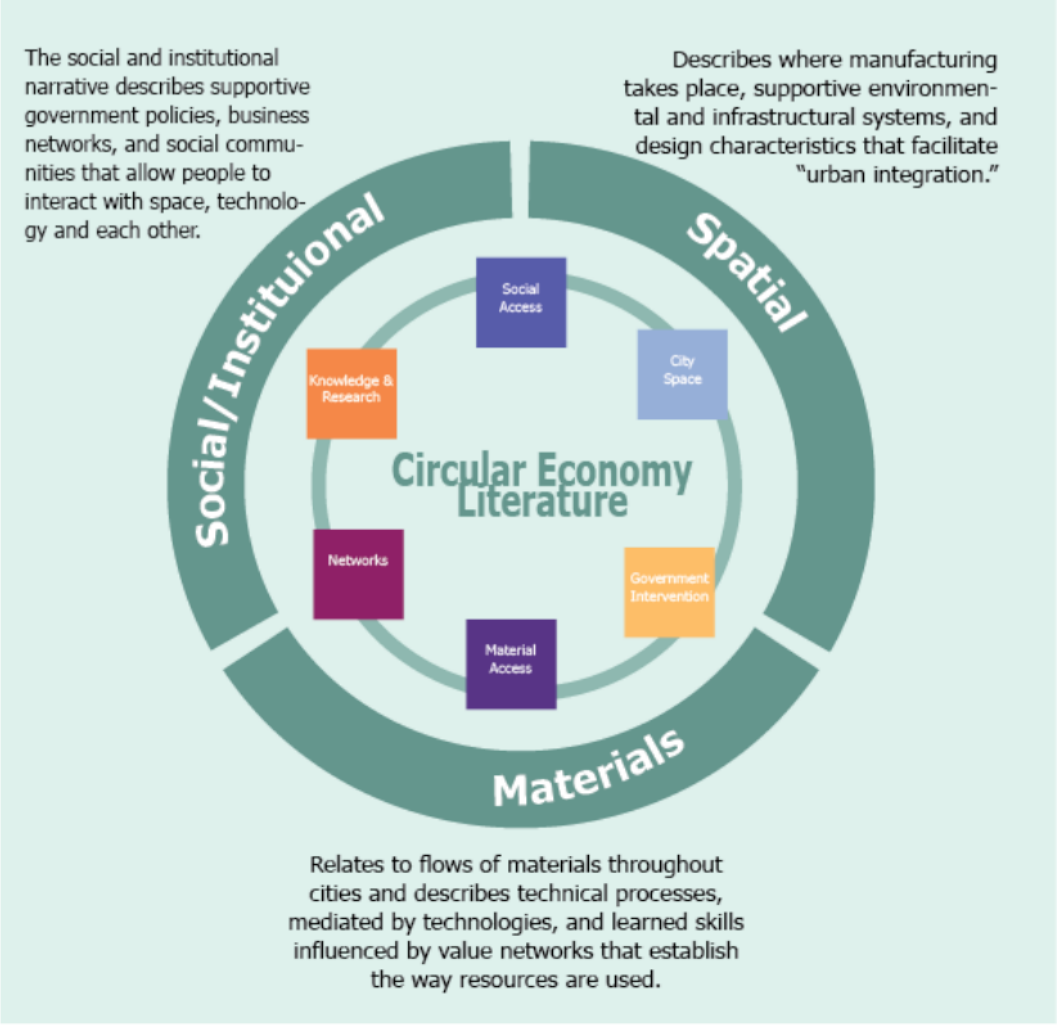
- Chapter II engages with literature regarding the circular economic theory, urban manufacturing, and planning system support for small-scale industries using the IUDF categorization of six urban capacities.
- Chapter III presents the research approach and methodology utilizing IDUF for mixed-methods thematic content analysis of planning documents and geographic spatial mapping of manufacturing firms in the FAME Database.

- Chapter IV conducts macro analysis of London-wide policy using undirected content analysis to understand how London conceptualizes CE and envisions city-wide priorities and strategies for CE implementation.
- Chapter V investigates the meso-scale through directed content analysis of borough plans to analyse trends in CE references and how boroughs translate city-wide visions to borough-level strategy and policies.
- Chapter VI engages with micro analysis of manufacturing firm clusters in London and its boroughs through geographic mapping of the FAME database.
- Chapter VII provides policy recommendations for cities developing CE strategies, local authorities implementing city-wide visions, and planning authorities supporting small manufacturing firms.

Chapter II: Literature Review

This dissertation draws on literature related to **circular economic theory**, **urban manufacturing**, and **planning system support for small-scale industry** using PopMachina IDUF for six urban capacities. Three narratives dominate CE literature - material, spatial, and social/institutional (Hausleitner et al., 2022) and correspond to the six IDUF capacities. Lessons for theoretical conceptions of the circular economy, urban manufacturing, and its implementation in cities are derived.

Figure 6: Narratives in CE Literature



1. Material Access

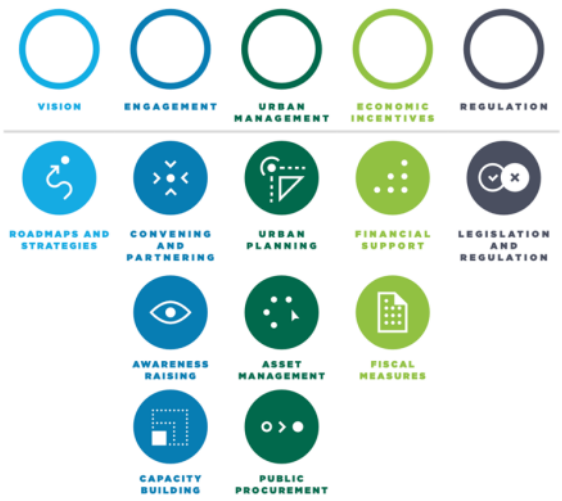
Material narratives dominate CE literature and describe flows of resources and technical processes, mediated by technologies and learned skills, that establish how resources are used (Hausleitner et al., 2022, p. 91). Literature focuses on the technological challenges of achieving zero-waste resource cycles through product design, production processes, and new business models as the driving force in the shift towards CE (Williams, 2021; Lewandowski, 2016; Marin & de Meulder, 2018). Circular business models account for four primary functions: recovering raw materials, separating useable components, transforming waste into products, and marketing to consumers (Goyal et al., 2018; Suchek et al., 2021). Supply-side resource efficiency encompasses supply chain changes and internal organizational decision-making. In contrast, demand-side resource efficiency refers to changes in companies' value proposition through changing consumer attitudes, new product offerings, and new business models which reclaim and reuse products at the end of their lifecycle (Diaz Lopez et al., 2019). However, systematic literature reviews find few references to business models in CE definitions (Kirchherr et al., 2017b; Lieder & Rashid, 2016) and identify the CE-EI Nexus as a gap in understanding the social and institutional barriers businesses face implementing CE (de Jesus et al., 2021; Suchek et al., 2021). A "lack of detailed, geographically specified data on how city resources and manufacturing resources flow in the space through the city" hinders progress towards CE (Hausleitner et al., 2022, p. 93). Dominant CE literature emphasizes technological and technocratic (non-human) solutions to close material flows, which leads to a gap in research regarding the complexity of socio-environmental aspects of CE as both a technological and socio-cultural concept (van den Berghe & Vos, 2019). The *materials* narrative dominates CE literature but fails to account for assessing and monitoring material flows and the spatial and institutional barriers businesses face.

2. Government Intervention

Circular trends in sustainable consumption place the responsibility of sustainability onto consumers as a personal moral burden (Gregson et al., 2015; Lerner & Rottman,

2021). Critical barriers to CE adoption relate to cultural factors, particularly consumers' lack of interest and awareness and a hesitant business culture which stems from a lack of government intervention, regulation, and awareness building (Kirchherr et al., 2017a; LWARB, 2017a; Suchek et al., 2021). Froy argues that "micro-industry in central locations is very difficult to maintain, even when there is strong bottom-up will and ample social capital in the area" (PopMachina, 2020, p. 25). Placing the burden of sustainability on consumers alone is "neither effective nor fair, and governments need to apply more stringent regulations for sustainability goals" (ibid). Cities need to make operational planning decisions to support small-scale production infrastructure and businesses that shape the productive culture of cities (H. Davis, 2019; Dhanani et al., 2017). Manufacturing and sustainable maker activity depend on relationships between producers, consumers, and suppliers, the availability of skilled workers, the regulatory and fiscal environment, and the cost of land and material inputs (Hausleitner et al., 2022; Suchek et al., 2021). There is no standardized formula for creating sustainable conditions to attract CE maker activity, which necessitates nuanced planning and coalition building to determine the market conditions required by firms (Hausleitner et al., 2022). The consumer-oriented shift towards sustainable consumption and producer shifts toward innovative business models alone are insufficient to achieve CE transformation, which requires government intervention.

There is increasing recognition of the connection between spatial planning, the circular economy, and sustainable development (Dhanani et al., 2017; Geissdoerfer et al., 2017; Rydin, 2011; Turcu & Gillie, 2020). Planning Click or tap here to enter text.is a political arena where growth and decline, infrastructure, resource use, and land use are managed through multi-scalar, multi-stakeholder processes which produce plans to encompass visions of urban change (Rydin, 2010; Tewdwr-Jones, 2012)(Healy et al.,



2000; Madanipour et al., 2001). UK planning authorities can negotiate with developers to obtain Section 106 planning agreements to secure employment obligations, provision of public space, and other community benefits (Wright, 2015). However, scholars question the effectiveness of S106 tools due to constraints around lack of enforcement, minimal understanding of target levels, and pressure to secure affordable housing through negotiations (Macfarlane & Cook, 2002; Tewdwr-Jones, 2012). Prendeville et al. (2018) assess three criteria of CE government intervention: developing clear intent to support CE through published statements and government agendas, identifying necessary steps for implementation, and taking identifiable action towards stated goals. While several governments display CE intent and identify steps for action, few have demonstrated actionable progress.

3. Knowledge and Research

Transitioning to circular urban development requires policy visions that attend to both supply-side technological capacities developed through business activity and creative industries, as well as demand-side social habits, behaviours, and lifestyle changes (Daniel et al., 2017; Fleischmann et al., 2016, 2017; Peck et al., 2017). Knowledge-based drivers of CE business models include corporate culture, technological development, consumer awareness, and consumption preferences (Kiefer et al., 2019; Mishra et al., 2020). Businesses shape consumer awareness and customers' purchasing decisions (Hopkinson et al., 2018). Consumer expectations and values influence supply chain strategies, product design, and business models (Confente et al., 2020; Horvath et al., 2019; Todeschini et al., 2017). Environmental management systems and accountancy practices can improve the environmental and financial firms by identifying profitable

opportunities for innovation (Scarpellini, Marín-Vinuesa, et al., 2020; Scarpellini, Valero-Gil, et al., 2020). Measuring and demonstrating progress through data analysis and indicators of sustainability build trust amongst stakeholders (Stahl et al., 2011; Turcu & Gillie, 2020). The CE cannot be achieved through individual action and requires a systemic shift in companies, industries, and economies through radical changes in societal values, norms, and behaviours (Chizaryfard et al., 2021; Prendeville et al., 2018; Suchek et al., 2021).

4. Networks

CE-EI firms derive competitive advantages from network activity, collaboration, and spatial clustering to share knowledge, equipment, and facilities and develop supply chains of waste collection firms, intermediary suppliers, and distribution channels (Duranton & Puga, 2000; Fang, 2019; Gordon & McCann, 2000; Wood & Dovey, 2015). Firms located close together benefit from linkages between input suppliers and final producers, knowledge spillovers, and labour pooling (Amin & Thrift, 1992; Becattini, 2017; Marshall, 1920). Classical economists argue that the proximity of firms leads to knowledge transmission, while others argue that knowledge exchange is a result of supply chain and labour flows (Breschi & Lissoni, 2001; Desrochers, 2000; Desrochers & Leppälä, 2011). Density increases face-to-face encounters and interactions in public space (Dovey & Woodcock, 2010; Storper & Venables, 2004; Wood & Dovey, 2015). Cooperative efforts can "attain a sustained competitive advantage" through CE business models and relationship formation (de Angelis, 2020, p. 1218). Incumbent firms can lead CE ecosystems by establishing monitoring systems and quality standards, negotiating with political actors, and demonstrating proof of concept for CE value propositions (Frishammar & Parida, 2019; Zucchella & Previtali, 2019). Clustering and partnership are especially beneficial for small firms that are resource constrained, do not have the financial means to lobby for public support, and have limited access to talent pools (COM 2018; Razminiene, 2019). Barriers to CE implementation include cooperation, trust amongst actors (Kiefer et al., 2019), and the "passive role of government institutions in the necessary collaborative process" (Suchek et al., 2021, p. 3690). City governments

should look to support networks and clusters of businesses to maximize the benefits of knowledge sharing, supply chain development, and innovative business processes by supporting networks and clusters of small manufacturing firms.

5. City Space

Supporting CE-EI activity requires allocating land (itself a scarce resource) for regenerative activities and accommodating their unique spatial needs. SMEs compete for operating space against larger firms and with more profitable land uses such as residential and commercial development, which leads to declining small business firms, under-utilization of existing small-building stock, and less industrial land overall (COM, 2018). Cities can provide space for making activities and bottom-up initiatives (repair shops, small firms) and support formal production spaces that recover products, materials, and components (waste management facilities, larger industrial units) (Hausleitner et al., 2022). Cities encourage temporary use of vacant land for "pop-up" activities, offering SMEs affordable and low-risk conditions to test solutions and scale businesses (Patti & Polyak, 2015; Williams, 2020). Pop-up activities remove redundancies (vacant sites, underutilized utilities), reactivate underused areas, and enhance local vitality. Pop-ups contribute an estimated £2.3 billion and 26,000 jobs to the UK economy (Williams, 2021b, p. 11). However, scholars argue that occupiers of temporary space find it difficult to compete with commercial activities and often move off-site before they are established (Patti & Polyak, 2015; Williams, 2020). A prominent gap in the literature is an over-emphasis on pilot projects and temporary with little attention to how cities use the planning system to support the long-term spatial needs of small manufacturing firms (Ferm, 2016; Clifford et al., 2021; Ferm et al., 2021; van der Leer et al., 2018). A paradigm shift in CE governance is needed to go beyond the allocation of temporary spaces to "intervene in markets to provide space for low-value, circular activities and enable the localised looping of resources within city regions" (Williams, 2020, p. 918).

Research in urban morphology finds that the structure of the urban form relates to activities that take place, termed “the functional mix” (Davis & Renski, 2020; Dovey & Woodcock, 2010; Duranton & Puga, 2000, 2004; Ferm et al., 2021; Ferm & Jones, 2016;

Koch et al., n.d.). Three urban settings accommodate manufacturing: inner cities, high streets, and industrial areas, each with different infrastructure, densities, and functional mix that affect the availability, accessibility, and affordability of land (Wandl & Hausleitner, 2021). UM is often perceived as incompatible with mixed-uses, including residential and commercial space, despite technological developments that allow it to be smaller, quieter, and less polluting (van der Leer et al., 2018). Larger firms require additional floorspace and are correlated with large parcels and broader streets, while smaller, mixed-use sites can accommodate small firms (Dovey & Woodcock, 2010; Hausleitner et al., 2022). Cities can support SMEs by understanding their spatial requirements and characteristics and implementing design strategies to ensure compatibility with other land uses.

6. Social Access

PopMachina defines social access related to the circular economy across three dimensions: physical access, employment access, and social inclusivity (PopMachina, 2020, p. 28). Social benefits of CE and UM include building more robust social capital (networks), human capital (skills and experience), and increasing social cohesion within communities (Moreau et al., 2017; Sahakian, 2016). Community projects can generate local economic (financial) returns and enhance physical capital (infrastructure systems), which increase the resilience and adaptiveness of communities (Williams, 2021b). Local physical and social capital are symbiotic, interdependent, and self-reinforcing (Curtis, 2003) and draw on the physical proximity of actors to reinforce resource looping and sharing (Besussi, 2018; Williams, 2019b). The CE aims to contribute to social cohesion and inclusion by introducing equal learning opportunities, uniting people around a common project, and enhancing community beliefs (Unterfrauner et al., 2019; Voight et al., 2017). Social capital enhances the benefits of investment in physical infrastructure and human capital to support the circular economy.

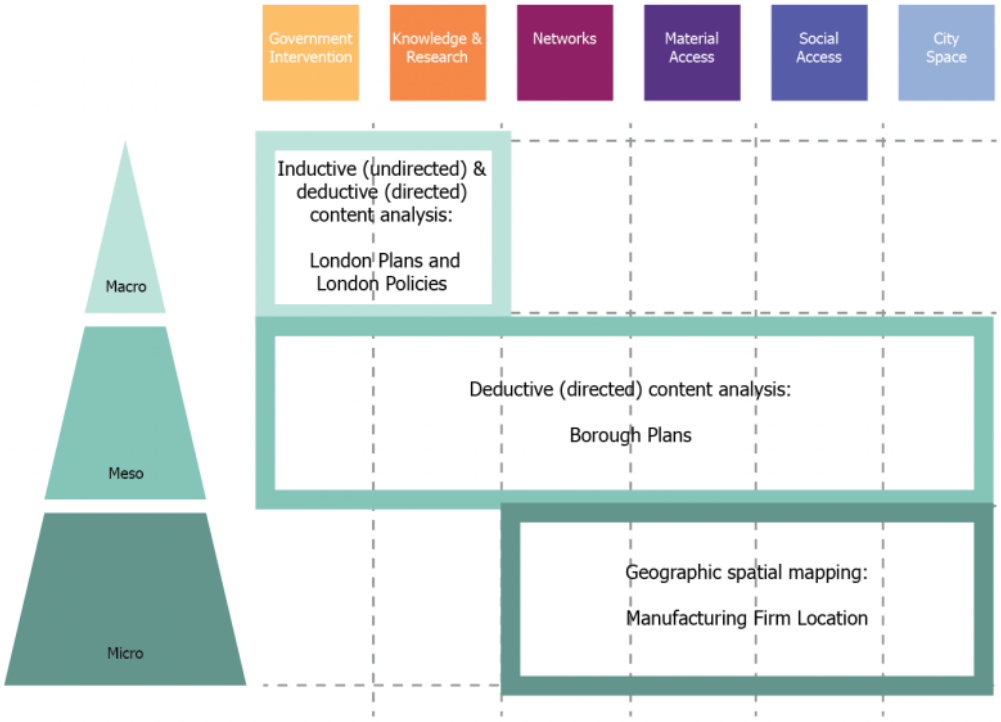
CE can generate social benefits, but not all communities are likely to benefit equally. Low-income groups are unlikely to benefit from the ecological regeneration of neighbourhoods and, due to rising land and property values, are often forced to relocate–

a phenomenon termed "green gentrification" (Lees, 2008; Lyons, 1996; Manley et al., 2011; Özogul, 2017; Paton, 2012; Williams, 2021b). UM can provide economic and social inclusion by providing low-barrier jobs and diverse work conditions (COM, 2018). Education and training are essential for equipping workers with in-demand skills (Hausleitner et al., 2022) and are critical barriers for small CE firms (García-Quevedo et al., 2020). Manufacturing activities include a range of processes of varying technical requirements, and CE must attend to both low-skill and high-skill work (Ferm et al., 2021; Ferm & Jones, 2016; Howard Davis, 2019). Low-income and poorly educated groups are more likely to be employed in jobs that are low-paid, insecure, or hazardous (Williams, 2021b). Studies find a lack of racial, gender, and socio-economic diversity in maker and manufacturing activities dominated by educated, white, middle-aged men (Christina Dunbar-Hester, 2014; Voight et al., 2017). Despite ideals of openness, collaboration, and inclusion, "social inequalities that impede access and participation are often ignored, and privilege or domination over some groups of people are not acknowledged" (Niaros et al., 2017). The CE offers potential social benefits through job creation, economic development, skills training, and community-building practices, yet presents risks for increasing social inequality.

Chapter III: Methodology

This dissertation delivers a proof of concept for interdisciplinary, multi-scalar research utilizing the PopMachina Integrated Urban Development Framework (IUDF), mixed-methods qualitative analysis of London city-wide and borough CE plans, and geographic spatial analysis of manufacturing activity. The IDUF was developed through rigorous literature review and interviews with 30 experts to assess spatial environments and production infrastructure for circular, urban maker ecosystems (PopMachina, 2020). The Ellen MacArthur Foundation's dominant RESOLVE Framework (Appendix 2) is commonly used to assess circular city initiatives but overrepresents business involvement and technical processes for waste reduction (Prendeville et al., 2018; Williams, 2019a). IDUF is an appropriate methodological tool because it analyses CE as a multi-scalar phenomenon, conceptualizes cities as open, dynamic systems, and describes technological capacities and resource flows. IDUF attends to the social, governmental, and spatial features that enable productive activity through mixed-methods analysis of six city capacities across four scales corroborated by leading CE scholars (Kirchherr et al., 2017a). IDUF presents guidance for appropriate data collection and analysis methodologies related to these six dimensions and four scales (Appendix 3). This dissertation takes a modified approach to IDUF analysis corresponding to three empirical chapters and research objectives.

Figure 7: Modified IUDF as Framework for Dissertation Methodology



1. Research Objectives

The stated research purpose of this dissertation is to analyse how planning systems influence circular economic transformation through small-scale urban manufacturing at three scales, corresponding to three sub-questions:

- **Chapter IV: Macro, London-Wide Strategic Scale.** *How does the Greater London Assembly use policy documents and London-wide plans to establish visions, priorities, and strategies for the circular economy and urban manufacturing?*

- **Chapter V: Meso, Borough Area Scale.** *How do sub-city, borough-level governments translate city-wide vision into place-specific policies that guide development planning review in London?*
- **Chapter VI: Micro, Firm Cluster Scale.** *What types, patterns, and clusters of industrial activity related to the circular economy are most prevalent across London and its boroughs?*

2. Methodological Approach

Empirical work attends to three city scales through an exploratory approach to London-wide policy informed by conference attendance and informal interviews. The following study uses London as a case study suitable for descriptive, exploratory research and employs inductive and deductive content analysis (Holsti, 1969). Content analysis is a widely used method in social sciences that consists of a systematic classification process of coding key terms, counting work frequency, grouping similar words, and identifying patterns (Antrop, 2001; Hsieh & Shannon, 2005). Researchers use content analysis to qualitatively and quantitatively assess planning documents (da Silva Oliveira, 2015; Zaleckis et al., 2019), introduce spatial dimension to content analysis (Rucks-Ahidiana & Bierbaum, 2015), and use the technique for CE analysis (Lei, 2017; Wang, 2020). Inductive, undirected content analysis involves summarising raw data and allowing theory to emerge from the data (Chandra & Shang, 2019; Corbin & Strauss, 1990), while deductive, directed content analysis, guided by existing theory, derives codes from earlier research findings (Hsieh & Shannon, 2005). Inductive content analysis of London plans and policy shaped the descriptive framework, key themes, and codes. Deductive analysis of London-wide and borough plans tests if planning policy data is consistent with assumptions and theories about CE and the IDUF framework. Spatial mapping identified patterns of activity, including firm concentration, growth, and activity type, to "trace tendencies and capacities within these morphologies that make them liable to incubate creative activity" (Wood & Dovey, 2015, p. 53).

3. Data Collection and Analysis

A. Conference attendance and Informal Interviews

Figure 8: REFLOW Conference Photos (Author's own, 2022)

Data collection and analysis draw on this author's attendance at the Circular Cities: Reflow and Beyond Conference in Copenhagen, Denmark (March 2022). Informal interviews with CE experts and conference attendees guided the selection of this dissertation's case study (London), methodology (mixed-methods, PopMachina IDUF), and database (FAME). I conducted informal interviews with ten representatives from academia, business, and municipal governments across Europe at the conference, supplemented by three informal interviews with CE experts over Zoom and email.[1] Conference proceedings and informal interviews articulated the need for novel datasets to understand material flows in and across cities and highlighted the importance of industry-specific pilot projects to demonstrate proof of concept for sustainable business intervention in cities.

B. Macro, London-Wide Strategic Scale

To understand priorities and changes in strategic visions for CE, UM, and industrial activity, I conduct inductive content analysis of two London Plans (2016 and 2021) and nine London-wide policy documents (Appendix 4). Using NVivo software, I calculated the 200 most frequently used words, including stemmed words and common stop words, to identify patterns in word usage. Word frequency alone insufficiently describes planning priorities because the 2021 London Plan is 100 pages longer than its predecessor. Planning priorities were calculated based on the number of policies listed for specific action categories (Zaleckis et al., 2019). Key themes and terms derived from inductive content analysis were supplemented with a literature review, prioritizing peer-reviewed

[1] I intended to conduct formal interviews with ten leading CE experts and representatives from each London borough, but all potential participants declined interview requests or were unreachable by email and phone.

sources that used systematic literature review and content analysis methodology (Appendix 6). These terms were used as codes for deductive, directed content analysis of the 2021 and 2016 London Plans. I compared the 2016 and 2021 Plans based on inductive data (calculated policy priorities and undirected word frequency) and deductive data (directed content analysis using key terms).

C. Meso, Borough Area Scale

To understand how city-wide visions for CE translate into local-level planning guidance, I conduct policy analysis using deductive, directed content analysis of all 33 London boroughs' plans. Current and draft planning documents were compiled from borough websites for a total of 76 documents (Appendix 5). Using NVivo, I queried the term "circular economy" in all borough plans and coded for type of policy and alignment with the six IDUF capacities to demonstrates how boroughs discuss themes related to CE (Thuvander et al., 2020).

D. Micro, Firm Cluster Scale

To understand spatial patterns of small manufacturing firms across London and its boroughs, I conduct digital, geographic mapping of SME firms using Tableau (Wood & Dovey, 2015). The dataset for firm analyses was the FAME Database, a subset of all UK companies in the Orbis Database, published by Bureau van Dijk. Scholars use the FAME and Orbis dataset to identify clusters of firm activity for the circular economy (COM, 2020; Kumar et al., 2019; Schilkowski et al., 2020) and one interviewee described FAME as "a finicky, yet powerful tool to collate firm information." To create a sample of relevant firms, I queried all active companies in Inner and Outer London whose NACE Review 2 Code (a standardized metric categorizing industrial activity) pertained to "manufacturing" or "repair." This search yielded 38980 active companies (Appendix 7). Firm postcodes were matched with geographic location data from the Office for National Statistics, Postcode Directory (ONS, 2022). Firm size was categorized using the UK Business Size Classification (Barton, 2019). I quantitatively assessed the characteristics of firms in each borough, including their size, incorporation date, and type of firm activity.

4. Ethical Issues and Risks

The most prominent but minimal risk of this study is interview confidentiality. I could only conduct three informal interviews with experts, which took place during the REFLOW Conference and over Zoom and were not recorded. I followed all ethical guidelines regarding the secure storage of participant information and de-linked personal identifiers (name, job title, email address) in my interview notes, which I stored in a password-protected document to ensure interviewee confidentiality. I completed the UCL ethical review and obtained permission to conduct interviews. I asked participants for their verbal informed consent to be interviewed for my dissertation.

Chapter IV: Macro, London-Wide Analysis

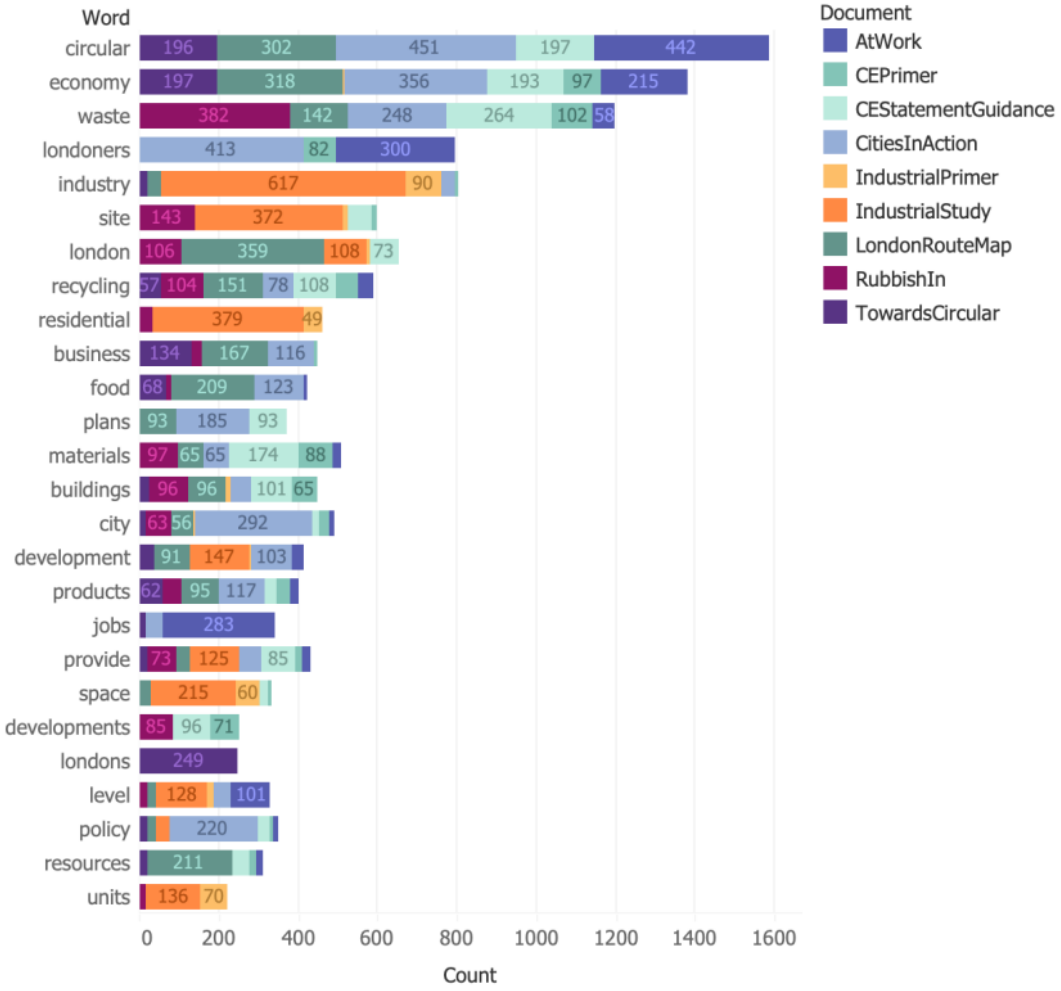
I conduct inductive and deductive content analysis of London plans and policies to understand how the Greater London Assembly establishes visions, priorities, and strategies through the planning system. Inductive content analysis was used to derive planning priorities and generate a list of codes for deductive analysis. I then compared the 2016 and 2021 London Plans based on the number of policies and references to CE terms.

1. Undirected Content Analysis

A. London Policies

I derived policy priorities from each document's 20 most frequently used words (Appendix 8, 9). All documents frequently referenced *housing, industry, buildings, waste,* and *transport*. While the same authority issued each policy document, they focus on different, specific strategies to accomplish similar visions. These terms were used as codes for directed content analysis of London Plans.

Figure 9: Priorities in London Policies (top 25 words)

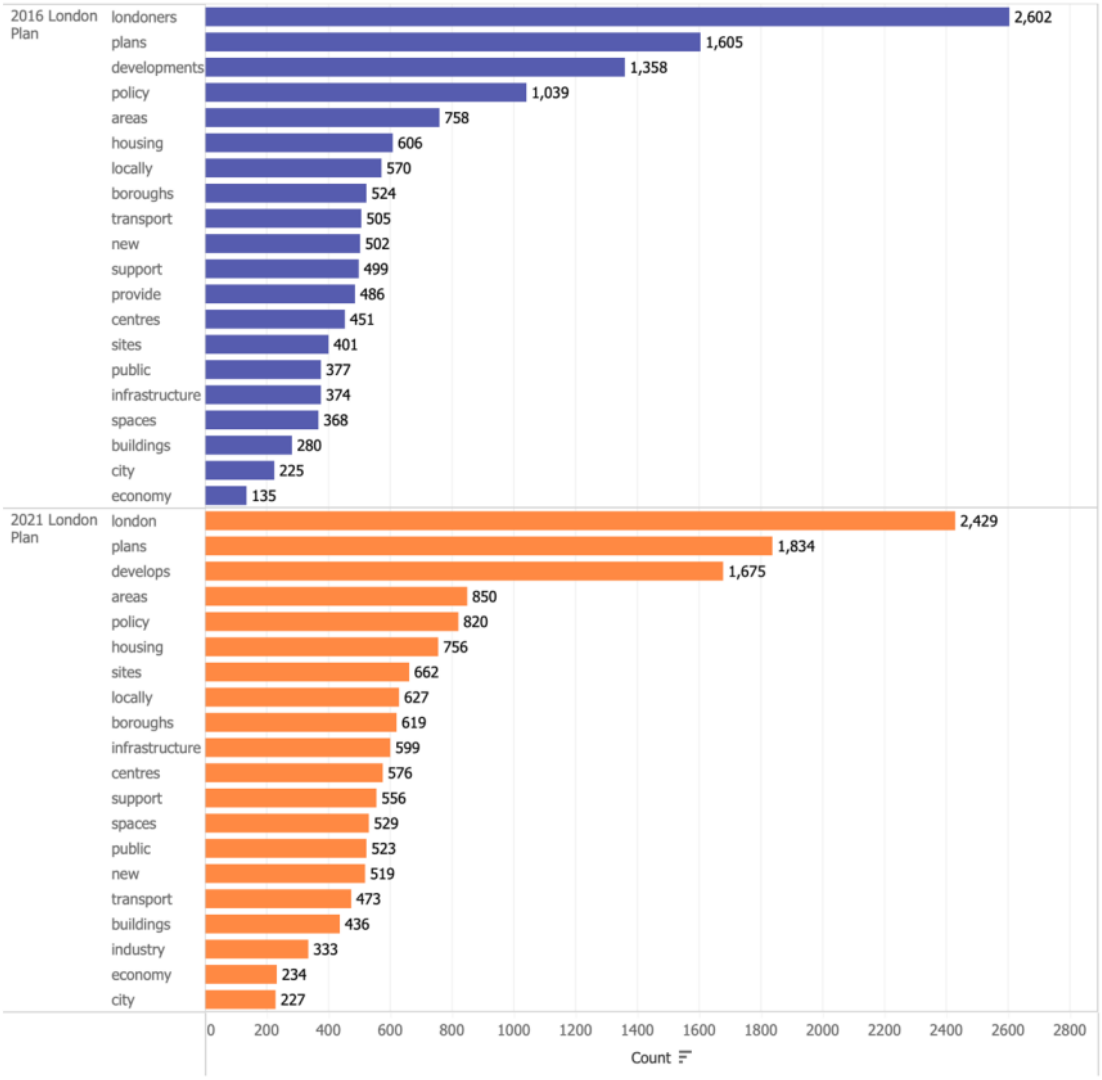


B. London Plans

The previous London Plan was adopted in 2016 and established visions for strategic development to 2036. In 2021, the GLA adopted a new London Plan to set planning policy from 2019 to 2041. London-wide policies have shifted to prioritize sustainable infrastructure, design, and industry, compared to prior emphasis on climate and spatial strategies. The 2016 Plan has the most climate and spatial strategies policies, while the 2021 Plan has the most policies for sustainable infrastructure, housing, and design. Both plans prioritize *housing* and frequently reference *transport, infrastructure,*

space, buildings, and *economy based on word frequency.* Over five years, London-wide priorities remained consistent with only minor changes in the ranking of words like transport and infrastructure. The 2021 Plan frequently references industry and includes an increased number of sustainable infrastructure policies.

Figure 10: Top 20 Words in London Plans



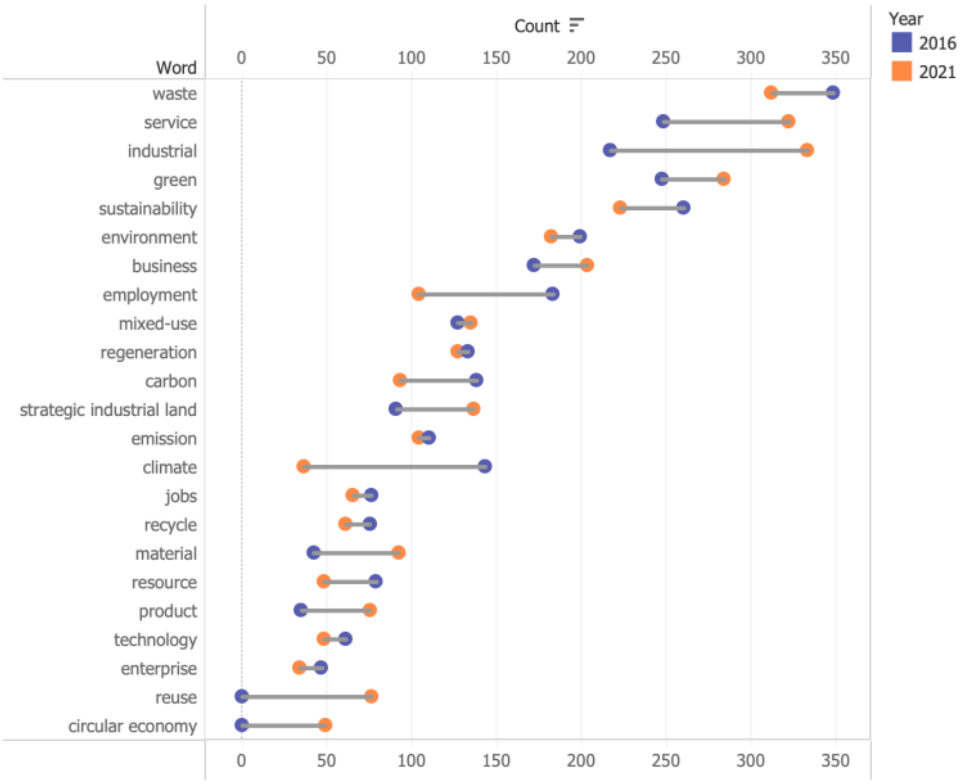
Sum of word count, for each word broken down by Document. Color shows document year. Filtered to show only the top 20 words used in each Plan.

2. Directed content analysis

A. Term trends in London Plans

Comparatively, the words *waste, sustainability, environment, employment, jobs,* and *climate* were used more frequently in 2016 than in 2021, while the words *service, industrial, business,* and *Strategic Industrial Location* were used in the current Plan than in 2016. The term *circular economy* was not referenced in the London Plan 2016 but was referenced 49 times in 2021. Words related to circular economic implementation, such as *material, product,* and *reuse*, were also more frequent in the 2021 Plan. These findings suggest the growing importance of planning for industrial activity and the circular economy in London. Analysis indicates a policy shift from big-picture concepts like climate and sustainability to implementation-focused concepts like industry, businesses, and materials.

Figure 11: Comparison of Word Frequency in London Plans



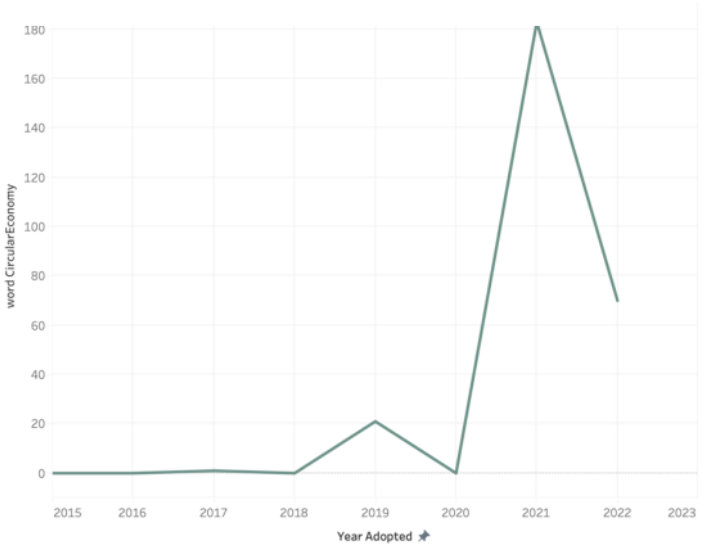
Chapter V: Meso, Borough-Level Analysis

Directed content analysis was used to understand how the circular economy is discussed at the borough level to address this chapter's primary research question, *"how is the term circular economy used to describe planning objectives, strategies, and tools in planning documents?"* The analysis consists of three parts: (1) word frequency analysis of the term circular economy; (2) thematic cluster analysis of references to the circular economy; and (3) IDUF analysis of six urban capacities related to CE references.

1. Directed Content Analysis - Word Frequency

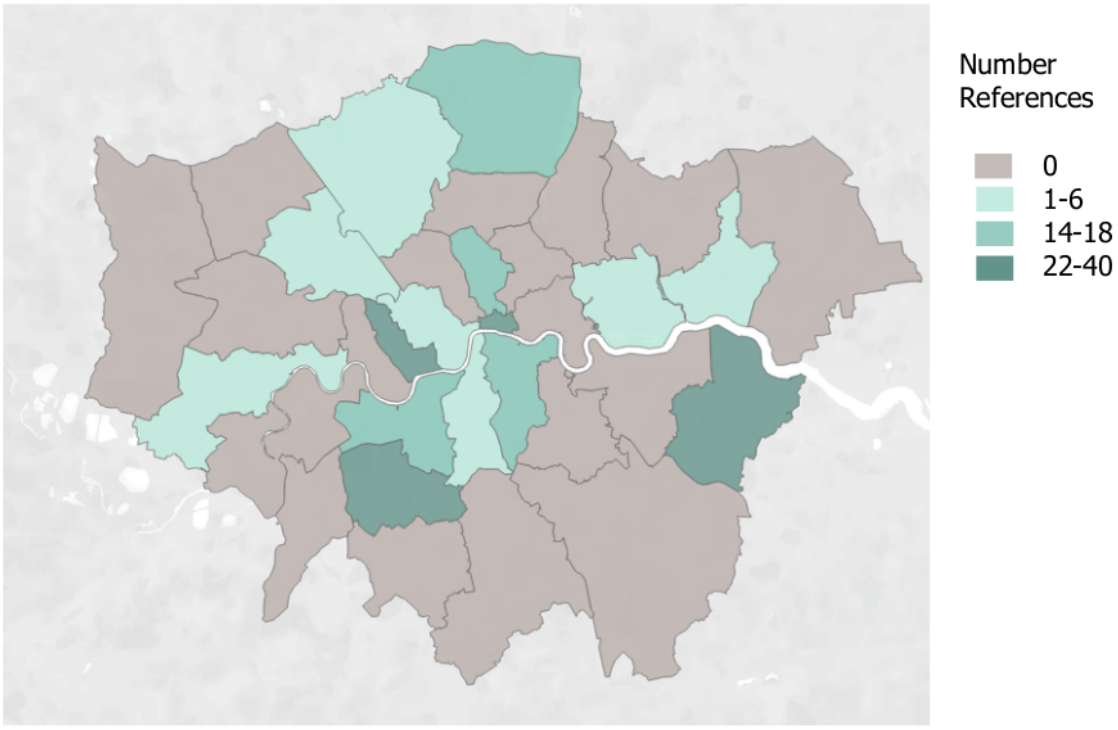
References to the Circular Economy are increasingly frequent, used by 16 boroughs (48.48%) (Appendix 10, 11). Six boroughs reference CE in their current formally adopted plans, and ten boroughs reference CE in draft plans, suggesting CE is increasingly prevalent, but many boroughs have not officially adopted CE into planning policy. The first reference to the circular economy in any London document was Bexley's 2017 Supplemental Growth Plan, and three boroughs (Islington, Hounslow, and Kensington and Chelsea) referenced CE in 2019. Following the publication of the new London Plan in 2021, 10 boroughs mention the Circular Economy. Local Plans must conform to the London Plan and are more likely to use language issued by the higher authority rather than introduce new concepts which might conflict (Özogul, 2017). While planning discourse does not determine material and spatial outcomes but can shape decision-making by becoming a frame of mind for

Figure 12: References to CE in Borough Plans



social agents (Richardson & Jenson, 2003). The data available cannot explain causality for the inclusion of CE in local plans, but increased reference to CE after 2021 could suggest that the London Plan establishes language that influences borough-specific strategies.

Figure 13: Number "Circular Economy" References in Borough Plans



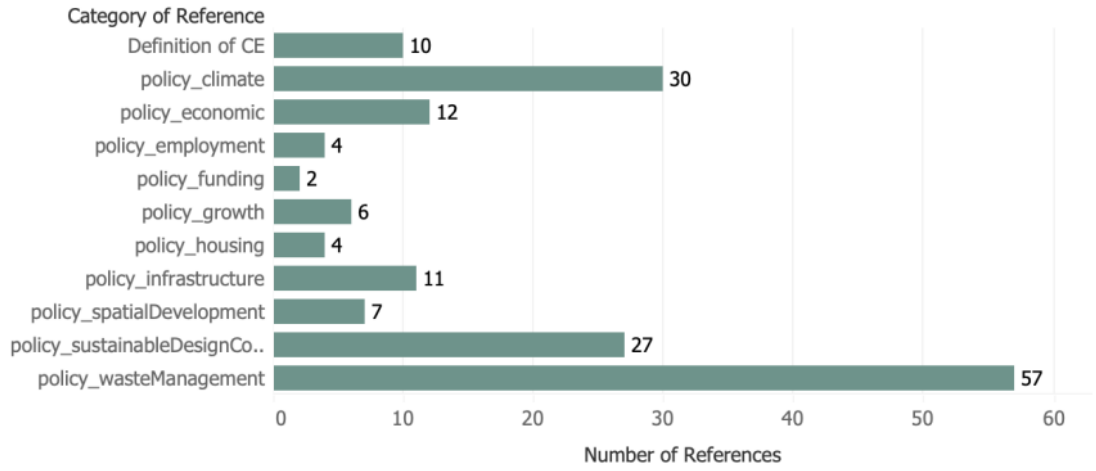
2. Directed Content Analysis, IDUF Thematic Investigation

This section analyses borough plans for CE references concerning Pop-Machina's IDUF of six urban capacities to address *"what are the key concept areas and strategies boroughs use to plan and implement the circular economy?"* Thematic clusters of CE policy references suggest its objective is to address climate change, is a tool for waste management, is implemented through waste management and sustainable design strategies, and is intended to generate environmental and economic benefits while social benefits are underrepresented. Boroughs specifically cite reducing "embodied carbon" by

enhancing recovery and recyclability of products and materials, designing buildings for repair and retrofit to reduce the need to dispose of materials, sourcing locally to reduce transport emissions, and making buildings more energy efficient. CE is referenced in 14 documents under waste management strategies, and referenced. Boroughs justify design strategies according to the characteristics of their existing building stock and prioritize retrofit and adaptable design to prolong building use and reduce development's carbon footprint. The primary economic benefits of CE are generating revenue for existing

Figure 14: Type of References to "Circular Economy"

businesses, attracting new businesses, and creating jobs, while social benefits are underrepresented and referenced primarily as an outcome of economic development.



A. Government Initiative

i. CE Statements

The primary government intervention referenced in plans is requiring developers to issue Circular Economy Statements for large-scale construction established by London Policy S17, and referenced by eleven boroughs. Developers that submit proposals for planning permission must demonstrate how much waste the proposal will generate, how

materials will be reused and recycled, and how design reduces material demands, enable reuse at the end of life, and ensure adequate waste collection (CE Statement guidance p 366). CE Statements apply to large developments referrable to the Mayor's Planning Authority, and Richmond is the only borough that requires small developments complete the assessment. CE Statements establish a framework for assessing waste streams from new development but place the onus on large developers to complete the evaluation and do not issue guidance for how these statements affect planning decisions (Turcu & Gillie, 2020).

ii. Waste strategies

Councils intervene to promote CE through waste strategies and maintaining land for waste management facilities. While the GLA revoked the requirement for Site Waste Management Plans for new construction, Westminster will maintain the requirement, and Newham states waste plans should be adopted before considering the loss of waste sites. Five boroughs seek to safeguard existing waste management facilities within the borough, and Lambeth aims to increase the number of smaller waste management facilities. The City of London, which has no existing waste management facilities, seeks to increase cooperation with other Waste Processing Authorities. Islington defines facilities as "strategic infrastructure," aims to work with North London Boroughs to consider proposals for new facilities, and calls for the "establishment of strategy and policy beyond the local level, from the Mayor of London and Central Government," (policy S10.H.) to coordinate waste strategies. The scope of government intervention varies, and boroughs intervene to require site waste plans, safeguard existing facilities, and augment capacity through coordination with other boroughs.

iii. Planning negotiations

The final category of government intervention relates to planning obligations secured by the borough from developers through planning negotiations. Enfield seeks to use its Meridian Water site, where the council is the majority landowner, to set ambitious targets for a new sustainable town centre (policy 3.5.7). Bexley and Brent seek to improve existing employment areas that suffer from poor public realm and ageing infrastructure

through improving on-site infrastructure. Section 106 contributions can benefit the existing community through in-kind payments to offset the impact of development, provision of public infrastructure, or local employment requirements (Wright, 2015). Merton is the only borough that specifically references S106 agreements to secure placement of local people during construction and end-use and fund training, work placements, and apprenticeships, particularly those that deliver low-carbon skills to improve employment prospects for residents. Councils seek to utilize planning negotiations to secure Section 106 contributions and leverage their position as landowners and infrastructure providers to incentivize development proposals that deliver their sustainability goals.

B. Knowledge and Research

i. Partnerships

The London Plan cites the development of a significant innovation campus, Imperial College London at White City, which will help deliver new technologies, companies, and processes to drive CE growth. Bexley aims to relaunch the Thames Innovation Centre to support entrepreneurial activity. Richmond and Merton seek to facilitate stronger links between business, higher education, training partners, and research and innovation infrastructure. Merton states that providing sites for learning and innovation for the circular economy will help identify skills gaps and facilitate social interaction. Increasing knowledge requires attracting innovative businesses, partnering with education providers to train workers with in-demand skills, and providing space for knowledge sharing and social interaction.

ii. Technology

The London Plan references the city's strength in technology innovation, such as carbon finance, renewable energy, and building technologies (p. 265). Barking and Dagenham, and Bexley intend to use new technologies to generate renewable energy and make industrial equipment more energy efficient. Bexley and Brent seek to attract investment in high technology and creative sectors by enhancing digital infrastructure.

Boroughs seek to attract businesses that develop and implement new technologies to scale energy-efficient, low-carbon processes. Boroughs prioritize high-tech jobs, while Merton is the only borough that recognizes job growth in more traditional, low-skilled manufacturing sectors.

iii. Data

The London Plan prioritizes data utilization to assess material flows and drive progress toward CE targets. The London Plan states that some projects set recycling and material reuse targets, but better data related to reuse on-site is needed to inform performance. The London Plan identifies datasets available to measure waste flows but does not evaluate the quality or effectiveness of these tools. The primary reference to data in borough plans are recycling and material reuse assessments calculated by developers through Circular Economy Statements. Three boroughs- Kensington and Chelsea, Richmond and Enfield - reference "whole lifecycle carbon" analysis to account for the carbon impact at all phases of development. No borough references material flows other than carbon, construction waste, household waste, or material flows related to industrial activity. There is significant scope to improve the use of data to track the recycling performance of developments and progress toward borough-wide CE targets.

C. Networks

i. Physical networks

Borough plans utilize physical network analysis to reference spatial patterns of existing employment hubs, measure concentration of businesses, and seek to increase density through industrial intensification, mixed-use development, and attracting high-growth sectors to cluster in their borough. Brent and Bexley site the high amount of industrial land and vibrancy of town centres and seek to increase employment density in well-connected areas. References to physical networks include transport connectivity and ease of access to residential areas.

ii. Social networks

The circular economy is intrinsically linked to the sharing economy for products, spaces, and knowledge. Economic geographers argue that increasing the proximity of firms will generate clustering and co-location benefits (sharing information, resources and facilities, intermediary firms). Merton recognizes that the "sharing and circular economy enables the efficient use of space and resources while contributing to facilitating social interaction" (policy TC13.5). Bexley seeks to target businesses in growth sectors to relocate and cluster in the borough by providing state of the art accommodation including shared workspaces that enable businesses to share facilities and equipment where practical (p. 10). Promoting flexible workspaces and the sharing economy is linked to cluster theory. However, boroughs lack specific mechanisms for how the built environment will facilitate social interaction or how the planning system can support social networks and collaboration between clustered firms (Froy, 2021).

D. Material Access

Material access is the dominant capacity in borough plans and references physical resources (raw materials, products, waste), highlighting human resources (skills-sharing, labour clusters), with sparse reference to social activity (cultural activities, events, retail). Policies reference two material access scales- borough-wide recycling rates and job growth or site-specific waste generation from construction and end-use. Borough waste and design strategies seek to ensure all developments have access to waste sorting and collection points to increase household recycling but do not state how they monitor progress toward this goal. Plans do not reference specific types of waste or job skills or assess where in the borough they are generated, and therefore lack understanding of borough-specific physical and human material flows. Plans mention the need to reduce the output of carbon and waste and increase skills and jobs, but no plans reference how these material flows are measured, analysed, or inform planning decisions.

E. Social Access

i. Employment Access

Employment access is the most frequently cited form of "social access," but boroughs focus strategies on attracting high-growth, knowledge-intensive industries. While Brent recognizes its employment offer overrepresents firms at risk of automation, it focuses on attracting high-tech jobs and providing infrastructures like 5G networks, incubators, accelerators, co-working spaces, research labs, and makerspaces (policy 6.4.7). Bexley aims to support sectors already crucial to the borough's economy and diversify the mix of businesses and local employment offer (policy 3.1). Richmond states it is a location where" entrepreneurs and start-ups thrive" and seeks to "nurture space accommodating modern business, with digital inclusivity and infrastructure to support smart growth" (Chapter 3). Merton identifies sectors that require fewer high-tech skills like urban farming, food growing, car/bike share, last-mile delivery, and reuse of materials and seek to use S106 Contributions to implement training, work placements, and apprenticeships to ensure residents have in-demand skills. Boroughs identify the need for training to accommodate CE growth but fail to cite specific skills needed to fill CE jobs and prioritize high-tech, knowledge-intensive industries.

ii. Physical Access

Physical access references the proximity of employment opportunities to residential areas and transport connectivity to make locations more suitable and attractive for employers. Richmond states that residents should be able to reach local employment and services without having to travel far (policy 19.13). Bexley prioritizes new development on accessible brownfield sites, improving connectivity to existing employment areas, and providing workspace within the borough, so residents don't have to commute daily out of the borough. No boroughs mention peoples' different physical needs, which may limit physical access to industrial sites, employment centres, and transportation options.

iii. Inclusivity

Social inclusivity is referenced through placemaking and the built environment. Three boroughs (Merton, Richmond, Newham) state developments should source materials locally to support existing businesses, while Merton is the only borough that specifically references procurement policies to achieve this aim. Kensington and Islington strive to plan for "mixed and balanced communities" through sustainable design principles that prioritize building retrofit rather than demolition and are adaptive to changing residents' needs. Retrofit strategies minimize disruption for people who live on estates (Kensington, policy HO7.A) and reduce the need for specialist housing (for older people) who can maintain their independence and minimize unwanted moves (Islington, policy 3.69). Boroughs envision CE as a tool to enhance social inclusion through local procurement and sustainable placemaking, enabling employment access and building reuse. However, they fail to address how CE policies for the built environment mitigate the risk of "green gentrification" or how employment will support social inclusion for marginalized groups or those whose employment opportunities are under threat (Özogul, 2017; Williams, 2021b).

F. City Space

i. Waste management facilities

The primary CE spatial reference is the protection of waste management facilities. The City of London, Southwark, and Bexley cite the "proximity principle" of the circular economy to ensure residential waste is processed close to the site of waste production and energy is generated close to the location of consumption to reduce transport emissions and optimise energy transfer. The London plan calls for these facilities to be well designed, respect the local built environment context, not be visually overbearing, and contribute to the local economy as a source of new products and jobs. Lambeth is the only borough that recognizes the need to provide smaller waste management facilities, which are more compatible with residential areas and require less industrial land. Boroughs call attention to the need to support the proximity principle by protecting

local waste management facilities, but no boroughs reference design strategies to accommodate these facilities (Appendix 12).

ii. Industrial Land Intensification

Boroughs seek to intensify existing industrial sites by providing mixed-use facilities and increasing the density of available floorspace. Bexley, Brent, Richmond, and Wandsworth specifically reference the need to protect industrial land within their boroughs to support employment opportunities and the growth of sectors that support green jobs and the circular economy. Industrial land intensification refers to increasing the density of firms, employment, and output of industrial land to maximize the efficient use of space provided (GLA, 2017). Bexley calls for intensification compatible with the broader area, provision of appropriate infrastructure, and making smaller units available as part of larger developments to support small and medium businesses (policy SP3.2). Richmond identifies demand for creative workshops and small-scale R&D incubators and co-working spaces as gaps in the workspace market, particularly flexible workspace to accommodate small and micro-firms (policy 19.11). Few boroughs reference how design strategies can accomplish land-use intensification goals, particularly for small firms.

iii. Temporary spaces

Borough strategies most frequently reference the need to protect, maintain and intensify existing industrial land, but few cite the need to provide additional, permanent employment space. Wandsworth seeks to ensure at least one hectare of available land with an "optimal amount of 'frictional vacancy to allow for the efficient churn of occupiers" (policy 18.23), which calls attention to the need to ensure available land for future businesses. Richmond highlights the benefits of temporary, pop-up or meanwhile space which include "short-term affordable accommodation for SMEs and individuals, generating a short-term source of revenue for the local economy and can attract longer-term business investment" (policy 19.9). The affordability of workspaces is a critical business decision, particularly for small firms, and is under-referenced in borough plans. The implicit assumption is that increasing the supply of available land, particularly

temporary spaces, will increase its affordability for all businesses. Few boroughs identify expansion or designation of permanent industrial land for CE and small manufacturing.

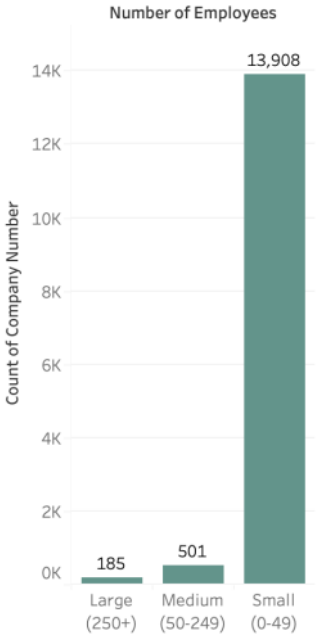
Chapter VI: Micro, Firm-Cluster Analysis

Quantitative and geographic analysis of the FAME Database is used to map manufacturing activity clusters, assess firms' characteristics according to their size, incorporation date, and type of activity, identify prominent industries in London's boroughs, and inform recommendations for CE and UM strategies.

1. Business Size

Firms in the FAME Database sample were classified by size based on the total number of employees reported, according to the UK Business size classification. Most firms are small businesses (95.30%) with up to 49 employees, 39.27% of firms have one employee, and 36.61% have 2-5 employees. Lewisham, Kensington and Chelsea, Haringey, Newham, and Harrow have the highest percentage of small firms, while the City of London and Westminster have the highest number of large and medium firms. Boroughs with a high percentage of small manufacturing firms should look to support small businesses in their CE strategy. These findings suggest the high prevalence of manufacturing firms with very few employees, reinforce the literature review that small firms dominate city manufacturing, and underscore the need for spatial planning to accommodate small-scale firms.

Figure 15: Manufacturing Firm Size (employees)



Firm size is calculated based on employee number, according to the UK Business Classification categories.

Figure 16: Number of Firms by Borough

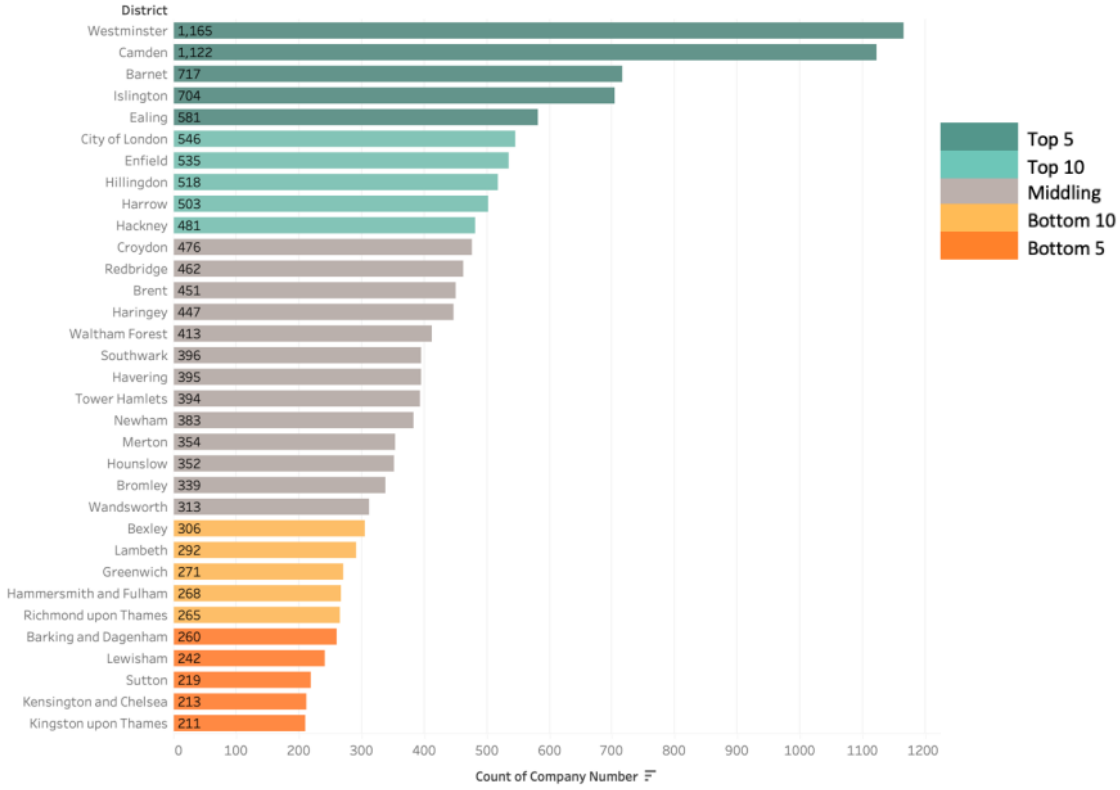
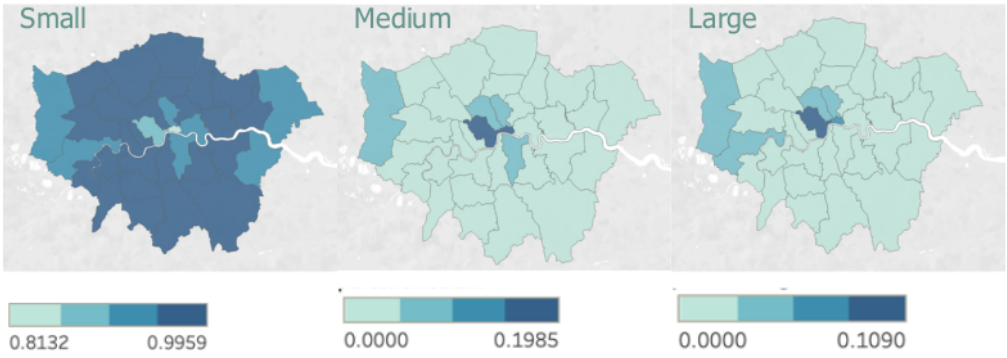


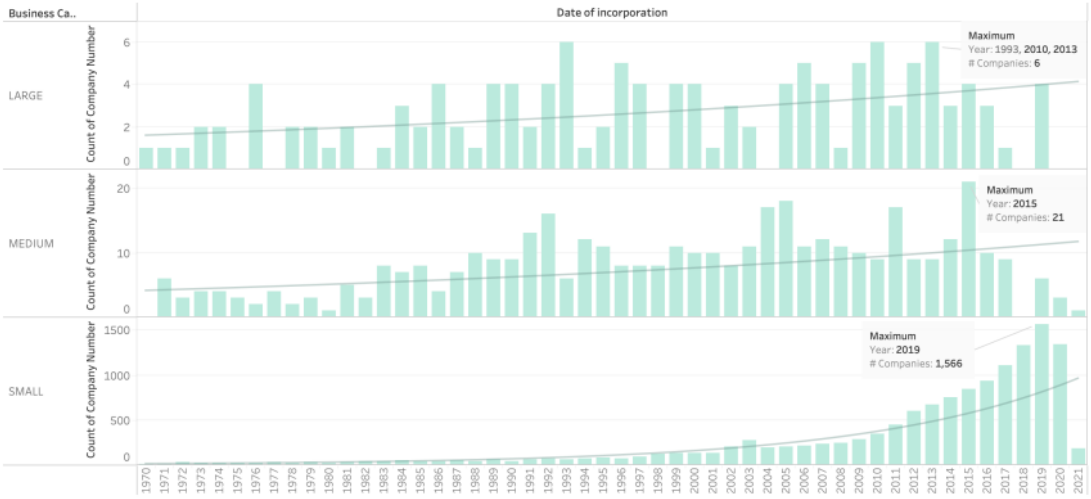
Figure 17: Clusters of Firms by Size, Percent of Total Firms



2. Incorporation Year

The FAME Database does not contain information on the growth rate of particular firms but indicates each firm's year of incorporation up to 2020, which is used to assess the growth rate of firms in each borough (Appendix 13). The rate of new business formation began increasing in the 1990s, reaching its highest point in 2019. Business growth by year is an exponential model (R^2 0.9214, p<0.0001), and ANOVA testing report that growth functions vary by company size. The coefficient for the number of companies incorporated in a year is greatest for small companies, which supports the claims that small firms are the fastest-growing category of firms. Small firms are the largest percentage of manufacturers in London, only reaching their maximum value in 2019, which suggests potential for continued growth.

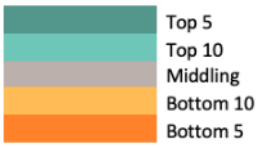
Figure 18: Firm Growth by Year of Incorporation



Count of Company Number for each Date of incorporation Year broken down by Business Category. Color shows details about Business Category. The data is filtered on group_year_small and Postcode1. The group_year_small filter excludes 6 members. The Postcode1 filter excludes NULL. The view is filtered on Business Category and Date of incorporation Year. The Business Category filter excludes NULL and Null. The Date of incorporation Year filter keeps 53 of 129 members.

Figure 19: Borough Coefficient of Growth, Ranking Number of Firms

Borough	Coefficient: Firms Incorporated	Rank: # Firms
Westminster	0.10	1.00
Camden	0.11	2.00
Barnet	0.08	3.00
Islington	0.10	4.00
Ealing	0.09	5.00
City of London	0.06	6.00
Enfield	0.11	7.00
Hillingdon	0.09	8.00
Harrow	0.08	9.00
Hackney	0.13	10.00
Croydon	0.08	11.00
Redbridge	0.09	12.00
Brent	0.10	13.00
Haringey	0.12	14.00
Waltham Forest	0.10	15.00
Southwark	0.09	16.00
Havering	0.08	17.00
Tower Hamlets	0.10	18.00
Newham	0.12	19.00
Merton	0.10	20.00
Hounslow	0.10	21.00
Bromley	0.08	22.00
Wandsworth	0.10	23.00
Bexley	0.07	24.00
Lambeth	0.11	25.00
Greenwich	0.11	26.00
Hammersmith and Fulham	0.10	27.00
Richmond upon Thames	0.09	28.00
Barking and Dagenham	0.10	29.00
Lewisham	0.10	30.00
Sutton	0.08	31.00
Kensington and Chelsea	0.08	32.00
Kingston upon Thames	0.07	33.00

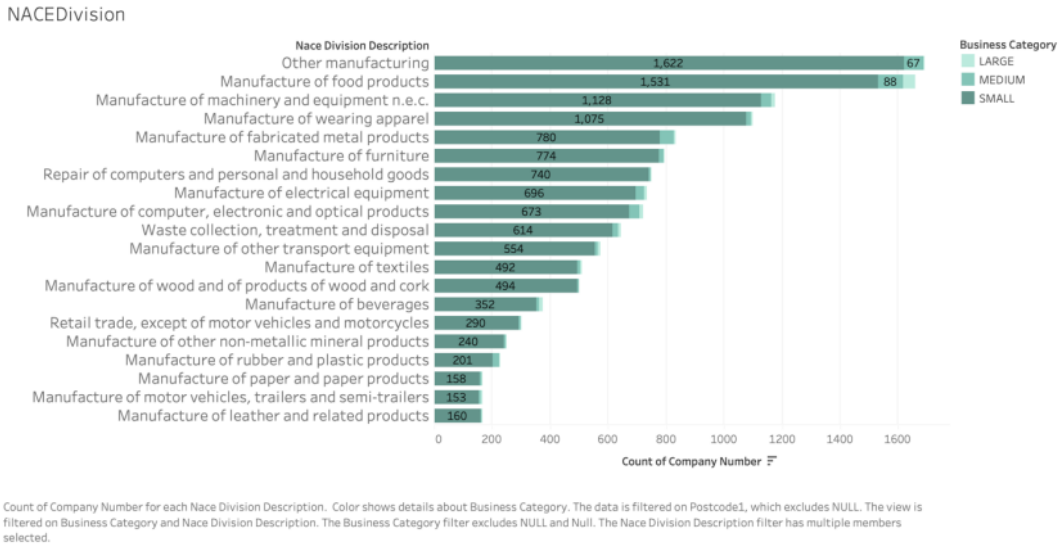


The number of firms incorporated in each borough indicates the growing number of companies throughout London and suggests variation in growth trends by borough (figure 21). Plotting the number of companies incorporated each year since 1970 returns an exponential model that shows increasing trends of new business formation, which vary by borough (R^2 0.7342, $p<0.0001$) (Appendix 13). The boroughs with the highest trendline coefficients, indicating greater growth rates over time, are Hackney, Newham, Haringey, Camden, and Greenwich. Only Camden ranked in the top 5 boroughs for total number of firms. The boroughs with the smallest trendline coefficients are the City of London, Bexley, Kingston, Barnet and Sutton. Barnet and the City of London have high number of firms, but low growth rates, while boroughs with a high number of firms are not the fastest growing. This analysis indicates that boroughs' total number of firms differs from the growth rate of new business formation. Boroughs with a high number of firms but low growth rates should prioritize business retention. Boroughs with high growth rates should continue attracting firms and augment existing support services, while boroughs with low growth rates can build support for new industries.

3. Firm Activity

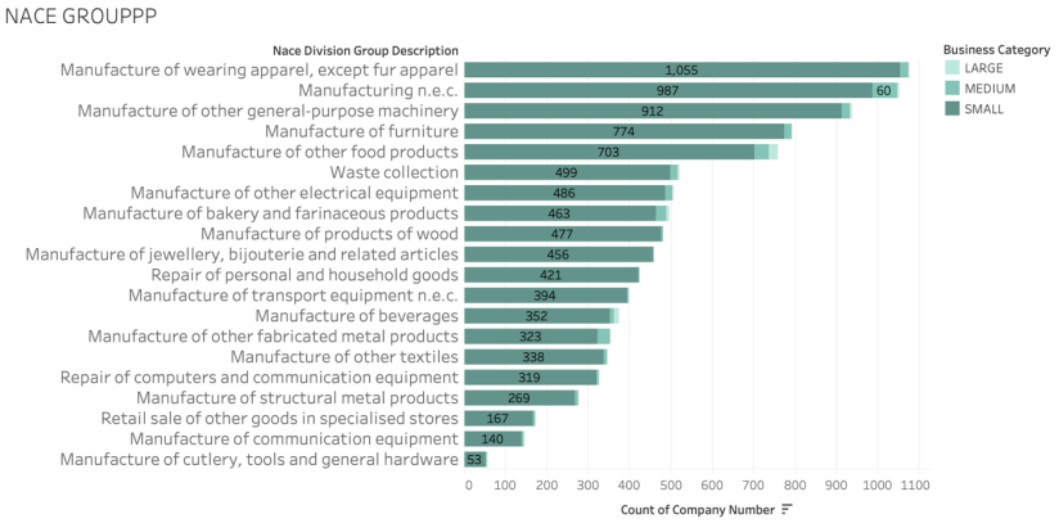
The FAME database hierarchically categorizes industrial activity according to Division, Group, and Class. Figure 22 and 23 show the top 20 divisions and groups of firm activity in London, respectively. The variety of activities across London highlights the importance of manufacturing industries for products used daily, like food, furniture, and textiles. These activities are also frequently mentioned in the London-wide strategy documents for the circular economy and industrial activity. The high prevalence of repair firms suggests that firms across London are well-positioned to innovate on repair and reuse processes to progress the circular economy agenda. This finding supports the claim that there are a high number of firms across London that already conduct business related to the circular economy.

Figure 20: London-Wide NACE Division Representation



Count of Company Number for each Nace Division Description. Color shows details about Business Category. The data is filtered on Postcode1, which excludes NULL. The view is filtered on Business Category and Nace Division Description. The Business Category filter excludes NULL and Null. The Nace Division Description filter has multiple members selected.

Figure 21: London-wide NACE Group Representation



Count of Company Number for each Nace Division Group Description. Color shows details about Business Category. The data is filtered on Postcode1 and Nace Division Description. The Postcode1 filter excludes NULL. The Nace Division Description filter has multiple members selected. The view is filtered on Business Category and Nace Division Group Description. The Business Category filter excludes NULL and Null. The Nace Division Group Description filter keeps 20 of 214 members.

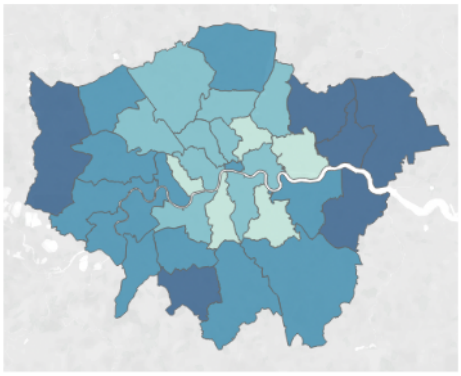
To understand the concentration of business activity in London, I analyse the location of the top 20 divisions of activity (Appendix 14). Four boroughs – Westminster, Camden, Barnet, and Islington – had the most businesses in each of the ten group activity categories, consistent with the finding that these businesses have high numbers of companies overall. The highest number of firms are in Westminster and Camden, consistent with earlier findings that these boroughs began attracting firms earlier and rank highest for new business formation since 1970.

For each borough, the percentage of firms for each activity was calculated relative to total businesses to normalize firm density across boroughs (Appendix 15). Manufacturing firms for beverage and food production are concentrated in inner London, while firms manufacturing fabricated metal, machinery, wood, and repair of household goods are concentrated in outer London Boroughs. The concentration of other manufacturing firms (jewellery, sports goods, games, and toys) and electrical equipment manufacturing is highest in the southwest, while machinery and general-purpose manufacturing are highest in the southeast. Manufacturing furniture is concentrated in west London, and transport equipment is concentrated in east London. Manufacturing

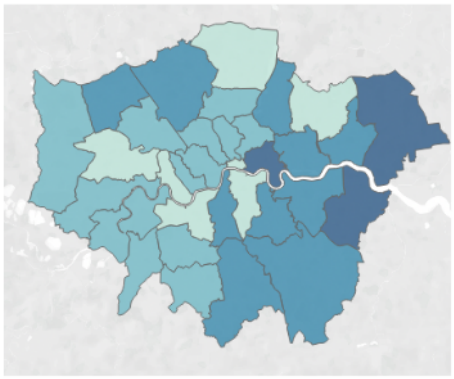
industries are clustered in regions across London. Boroughs should support activities across territorial boundaries by establishing networks of firms, collaborative platforms, and sharing mechanisms to support economic activity prevalent in their borough while enabling the industry to thrive.

Textiles, retail, non-metallic minerals, rubber, plastic, and paper are concentrated in specific boroughs spread across London. Manufacturing leather and wearing apparel is highest in both Tower Hamlets and Kensington and Chelsea. Computer and electrical manufacturing are most prevalent in the City of London and Kingston. Waste collection firms are concentrated in Barking and Dagenham and Sutton. These findings suggest that boroughs specialize in specific manufacturing activities related to the circular economy.

Figure 22: Examples of Regional Clusters

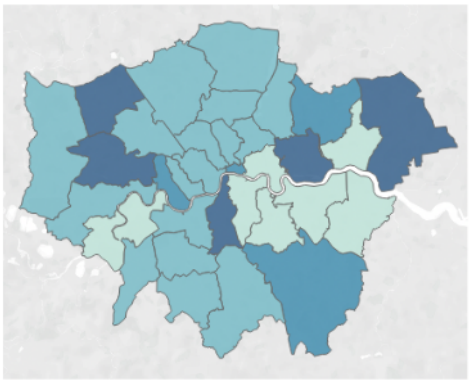


Fabricated Metal: Outer London



Transport Equipment: Inner London

Figure 23: Examples of Borough Clusters



Non-Metallic Minerals

Rubber and Plastic

4. Planning Implications

To understand whether boroughs with a high presence of manufacturing activity reference CE and UM in their Local plans, I correlated firm concentration with term references. There was no significant correlation between the total number of firms in each borough and the use of terms *circular economy, industrial, manufacturing, strategic industrial land*, or *businesses*. Borough priorities and strategies are not strongly related to firm activity within the borough which presents an opportunity for boroughs to better support existing manufacturing activity through planning policy.

Figure 24: References to CE versus Number of Firms

Median and Trendline annotated

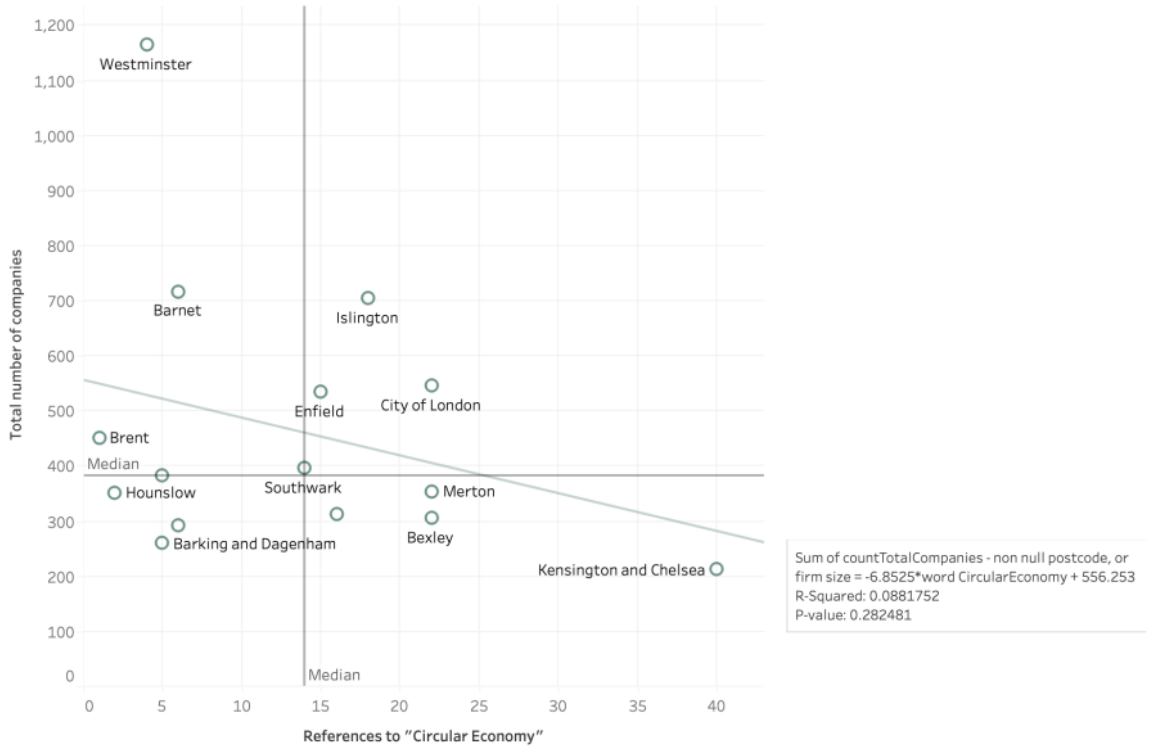
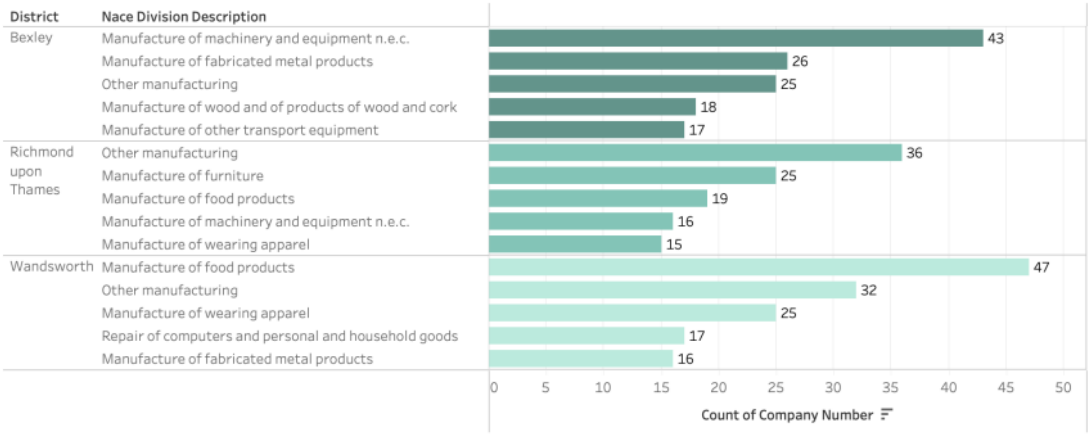


Figure 25: Term Correlations with Number of Firms by Borough

Word	Coefficient	P-Value
Circular economy	-6.85	0.2825
Industrial	-0.28	0.1541
Manufacturing	-6.19	0.2999
Strategic industrial land	-1.14	0.1351
Businesses	-0.42	0.3015
Reuse	1.42	0.7314

FAME analysis identifies boroughs with high proportions of different types of manufacturing activity which can drive progress towards CE. Richmond's stated CE goals include diversifying the employment offer and increasing floorspace for the borough's locally significant and diverse sectors. FAME analysis shows that Richmond has a high proportion of furniture, food, and fabricated metal manufacturing. Wandsworth intends to protect industrial land, intensify floorspace to accommodate core industrial uses, and anticipate the need for light industrial space. FAME analysis shows Wandsworth has a high proportion of firms manufacturing food, wearing apparel and electrical equipment. Bexley states its established industrial base connected to traditional industries makes it "well positioned to encourage businesses to transition from a linear economy," (policy SP3) and supports grassroots manufacturing through the maker movement which utilises uses, discarded, or broken materials. Bexley has a high proportion of firms that manufacturing machinery, fabricated metal, and food, which generate significant amounts of manufacturing waste that can be used as inputs for maker movement manufacturing. FAME analysis provides a greater understanding of existing manufacturing firm activity and material flows, which can inform planning policy for the built environment and waste reduction strategies to enable greater specialization and competitive advantage of locally significant sectors.

Figure 26: Borough Industry Specialization



Chapter VII: Discussion and Policy Recommendations

London stands to gain from employment growth through the circular, green economy and should support business retention and attract high-growth sectors, particularly small firms that can drive social inclusivity, employment growth, and environmental benefits through waste reduction and material reuse. The following recommendations are derived from gaps in the literature, London policy and plans analysis, IDUF analysis of borough plans, and FAME analysis of existing manufacturing activity.

1. Specify how the planning system will implement CE and the built environment provisions.

Undirected content analysis of London policies and plans indicates the growing importance of industry, the introduction of the term *circular economy*, and increasing reference to *industry, businesses, materials, products, and reuse.* Policy initiatives have shifted from big-picture concepts like sustainability, climate, and the environment, to greater specificity for implementation-level strategies for business development and industrial activity. These trends indicate a greater emphasis on implementation according to Prendeville et al.'s (2018) categories of government intervention. They also reflect criticism that CE literature over-emphasizes material reuse, product design, and business strategy (Williams, 2019a). This highlights the tension governments face in defining actionable strategies for CE implementation.

2. Build political support and funding mechanisms to implement sustainability objectives.

Planning departments face trade-offs between CE strategies and broader policy objectives. One mention of government intervention towards CE is utilising S106 contributions and negotiations with developers to provide workforce training, local procurement, and sustainable built environment design. However, councils report that meeting GLA housing targets and negotiating for affordable housing take precedence over sustainability targets and worry that CE regulations will jeopardize potential

investment in residential as developers seek less demanding market conditions elsewhere (Turcu & Gillie, 2020, p. 25). This reflects the broader trend that the English planning system is increasingly being "marketized," with planning practices dependent on growing interdependencies between municipalities and private sector actors (Raco, 2018). Government actors must balance CE implementation and sustainability objectives with the need to fund development and meet higher-priority policy objectives such as housing.

3. Acknowledge and address the ramifications of attracting growth in high-tech sectors and risks of green gentrification.

Boroughs frequently cite the employment generation potential of CE, but most focus on knowledge-intensive jobs such as start-ups, research facilities, or renewable energy technology firms. No policy explicitly addresses the socio-economic factors which make low-income, less-educated, and non-white demographic groups less likely to participate in green, high-tech sectors. Furthermore, boroughs seek to attract high-growth industries through improvements to infrastructure and the public realm but do not acknowledge that these strategies can contribute to green gentrification, which predominantly affects low-income, marginalized groups (Özogul, 2017; Williams, 2021b). Boroughs should develop strategies to ensure CE transformation includes all residents of all skill levels and socio-economic backgrounds.

4. Utilize S106 agreements to train workers with in-demand skills.

Social access relates primarily to employment access by attracting high-tech firms that utilize green technologies, and several boroughs reference the skills and training needed to support workers. Merton is the only borough that specifies how skills will be provided using S106 agreements. Boroughs should use S106 agreements to fund training opportunities for workers, provide apprenticeships in city services like waste management to build skills related to CE, and form active partnerships with educational institutions to create low-cost pathways for skills training.

5. Specify how CE Statements, waste strategies, provision of waste, and industrial facilities will affect planning decisions.

The primary data collection and indicator of London's material flows are CE Statements, which are only required for large developments in most boroughs. Boroughs reference the need for enhanced data collection regarding waste flows and meeting recycling targets but do not address how they determine these indicators. No borough issues specific guidance for how CE statements will affect planning decisions for proposed developments. Boroughs should invest in collaborative, co-production of sustainability indicators and material data analysis systems to better understand material flows and specify how these targets will guide planning policies (Kitchin et al., 2015; Stahl et al., 2011).

6. Designate additional industrial land for new facilities, particularly small firms, and articulate design strategies which ensure compatibility with existing residential neighbourhoods.

Plans seek to protect and intensify existing industrial land and better utilize temporary space for industrial activity. Boroughs reference spatial patterns of employment hubs and seek to support clustering through attracting high-growth sectors but do not specify how the provision of space will enable CE network activity. Few boroughs call for the need to designate additional industrial land, articulate spatial strategies, or infrastructure requirements of these firms. Furthermore, few boroughs reference small firms' spatial requirements that enable their compatibility with existing built forms. Boroughs can increase industrial capacity by issuing design strategies tailored for small manufacturing firms.

7. Invest in permanent, affordable workspace for small businesses.

While it is imperative to protect existing, well-established businesses, allocating sufficient land for frictional vacancy and short-term uses, the question of affordability and permanent workspace for small businesses is under-referenced. The implicit assumption is that increasing the supply of available land will increase its affordability to all

companies. However, in London, small businesses struggle to compete for operating space with large firms (GLA, 2017). Promoting flexible workspaces will allow boroughs to respond to changing business needs, promote local supply chains, and generate clusters of innovative firms, particularly those in the early stages of growth.

8. Utilize firm analysis such as the FAME database to identify existing manufacturing sectors that can be strengthened to transition to the circular economy.

Identifying existing sectors with high concentrations will allow boroughs to capitalize on existing manufacturing strengths, employment opportunities, and knowledge required to utilize materials better and reduce waste. This dissertation's FAME analysis delivers a proof of concept for how boroughs can assess their existing manufacturing base, high-growth industries, and spatial patterns of firm activity to identify sectoral strengths and competitive advantages to facilitate CE transition. Boroughs like Westminster and Camden, which have historically had high concentrations of business activity, do not have high coefficients of firm growth and, therefore, should not expect the number of firms to continue growing without intervention. FAME analysis identifies Islington, Haringey, Hackney, and Newham as boroughs with high growth potential, despite having a lower number of firms overall, and should look to support existing firms and attract new actors. Boroughs with low growth rates and low firm concentration, such as Barking and Dagenham, Greenwich, Richmond, and Sutton, have an opportunity to attract more manufacturing firms but will require significant government intervention through the planning system to enable their growth. FAME Analysis can identify the borough's key sectors that can contribute to CE transition.

Chapter VIII: Conclusions

This dissertation explores how London and its boroughs use the planning system to influence sustainable development through the circular economy and small urban manufacturing. It conducts mixed-methods, multi-scalar analysis using the Pop-Machina Integrated Urban Development Framework to assess six urban capacities. It utilizes undirected and directed content analysis of city-wide policies, London Plans, and borough plans to demonstrate how abstractions of CE translate into strategic visions, municipal development plans, and spatial patterns of SME firms at the city, borough, and firm cluster scales. This dissertation delivers proof of concept for using the FAME Database to map spatial patterns of firm activity across the city and identify priority sectors for specific geographic locations to transition to the circular economy. Using multi-scalar, mixed-methods qualitative, quantitative, and geographic analysis demonstrates how planning documents, policies, and firm concentrations can provide insights into the CE transition in cities. City-scale policies guide local planning authorities, who translate concepts into borough plans regarding their local conditions and built environment stock.

Chapter IV investigates London-wide plans and policies at a macro scale. The 2021 plan indicate the growing importance of implementation-level strategies for industry, business, and reuse activities and introduced the term "circular economy." While four boroughs referenced CE before the latest London Plan, its publication was followed by an increased number of boroughs calling attention to the concept, using similar terms to London-wide policy documents. Chapter V utilizes the PopMachina Integrated Urban Development Framework to assess thematic clusters of CE policy references. CE's primary objective is to address climate change but underrepresents social implications, is used as a tool for waste management, is implemented through waste management strategies and sustainable design principles. The dominance of waste strategies and material access, with little reference to social benefits or risks of social exclusion, confirms criticisms of CE in the literature. Chapter VI's FAME analysis reports small firms dominate manufacturing activity throughout London, and their growth rate is higher than that of other firms. Borough growth rates of new firm incorporation vary, suggesting that geographic areas

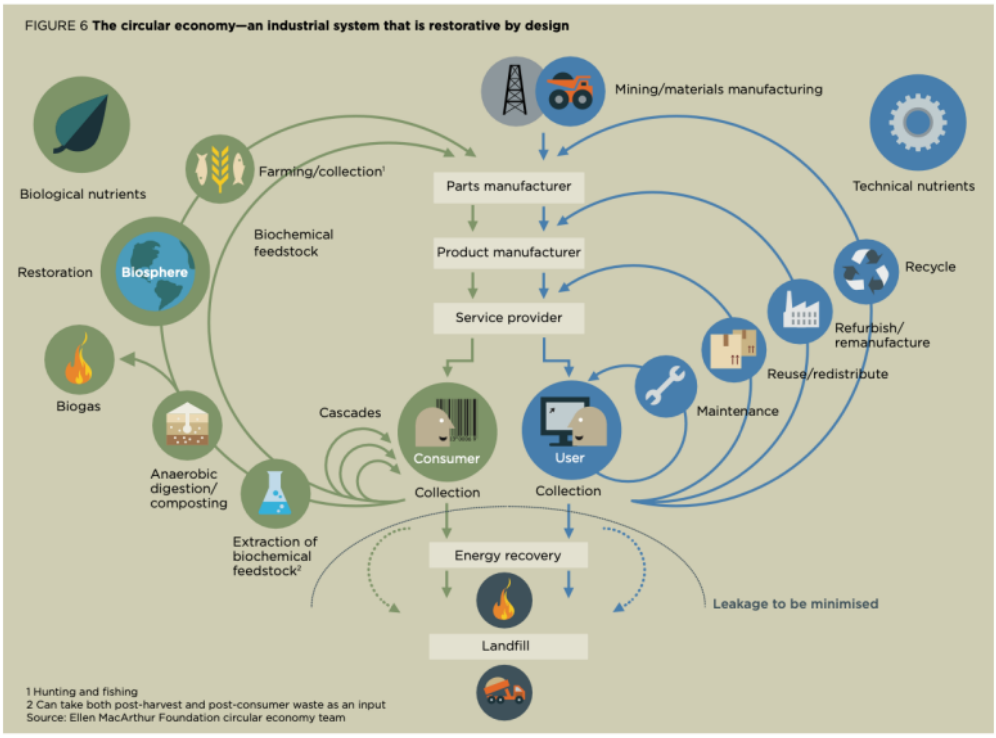
differ in their capacity to attract new businesses. Boroughs should look to support the highly concentrated activities and form partnerships to enable networks of firms across regions and the city as a whole. Chapter VII identifies recommendations for boroughs throughout London following the IDUF and FAME analysis.

London and its boroughs can transition to the circular economy by utilizing the planning system to guide land use planning, spatial patterns of firm activity, networks of makers and manufacturers, and skills development through job creation. Attracting and retaining high-growth sectors alone insufficiently addresses the socio-economic and environmental factors and features of the built environment that enable small-scale manufacturing and support social inclusion. Small urban manufacturing enables design innovation, product development, material reuse, skills development, and community-building, facilitating the transition to a circular economy.

Appendices

Appendix 1: Ellen MacArthur Foundation Butterfly Diagram of the Circular Economy

Source: Ellen MacArthur Foundation (2013)



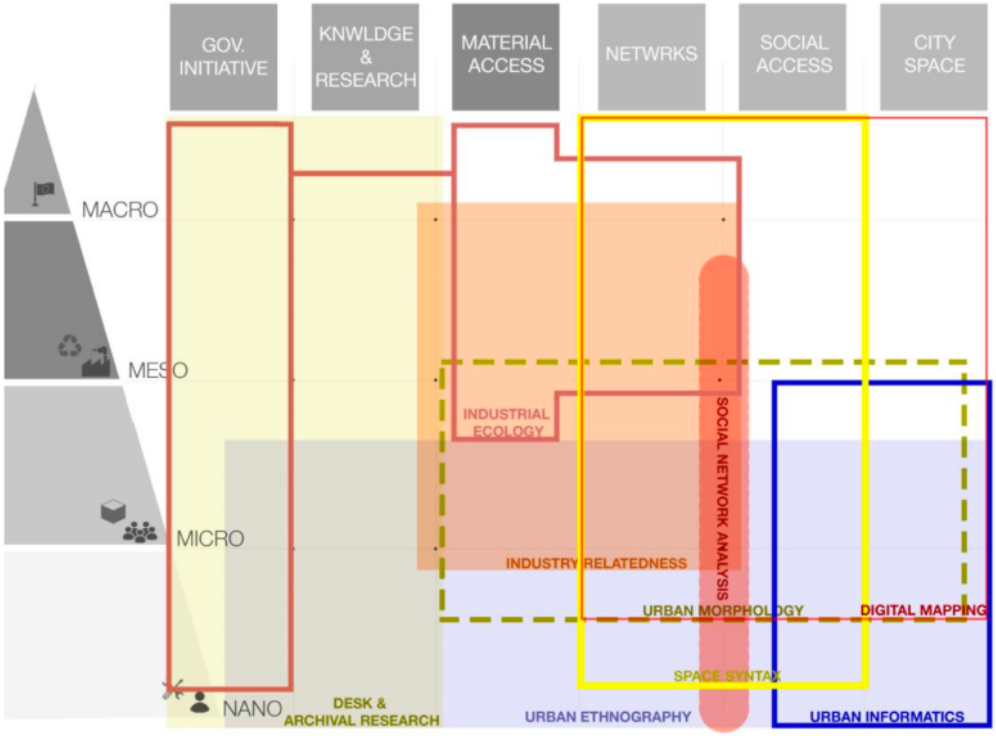
Appendix 2: Ellen MacArthur Foundation RESOLVE Framework

Source: Ellen MacArthur Foundation (2015)

SOURCE: Ellen MacArthur Foundation, SUN and McKinsey Center for Business and Environment, *Growth Within: A Circular Economy Vision for a Competitive Europe* (2015). Based on S. Heck, M. Rogers, P. Carroll, Resource Revolution (2015).

Appendix 3: PopMachina Integrated Urban Development Framework

Source: (PopMachina, 2020)



Appendix 4: London-Wide Policy Documents

Document	Author	Year Adopted	Citation
London's Circular Economy Routemap	London Waste and Recycling Board	2017	https://relondon.gov.uk/resources/londons-circular-economy-route-map
Circular Cities in Action	ReLondon	2021	https://relondon.gov.uk/resources/report-circular-cities-in-action-driving-progress-through-policy
Towards a Circular Economy	London Waste and Recycling Board	2015	https://relondon.gov.uk/resources/towards-a-circular-economy
Circular Economy Statement Guidance	Mayor of London	2020	https://www.london.gov.uk/publications/circular-economy-statement-guidance
Circular Economy Primer: Design for a Circular Economy	Mayor of London	2019	https://www.london.gov.uk/what-we-do/regeneration/advice-and-guidance/about-good-growth-design/design-circular-economy
Industrial Intensification Primer	Mayor of London	2017	https://www.london.gov.uk/sites/default/files/industrialintensificationprimer.pdf
Industrial Intensification and Co-Location Study	Mayor of London	2019	https://www.london.gov.uk/sites/default/files/136_industrial_intensification_and_co-location_study_-_design_and_delivery_testing_reduced_size.pdf
Rubbish In-Resources Out	Mayor of London, Arup	2009	https://www.arup.com/projects/rubbish-in-resources-out
The Circular Economy At Work: Jobs and Skills for London's Low Carbon Future	ReLondon	2022	https://relondon.gov.uk/resources/report-the-circular-economy-at-work-jobs-and-skills-for-londons-low-carbon-future

Appendix 5: London and Borough Plan Documents

Boroughs publish planning policy in either one Local Plan document or issue multiple documents- Core Strategy, Development Management Plans, Site Allocation, Supplemental Plans – which together constitute the borough's plan.

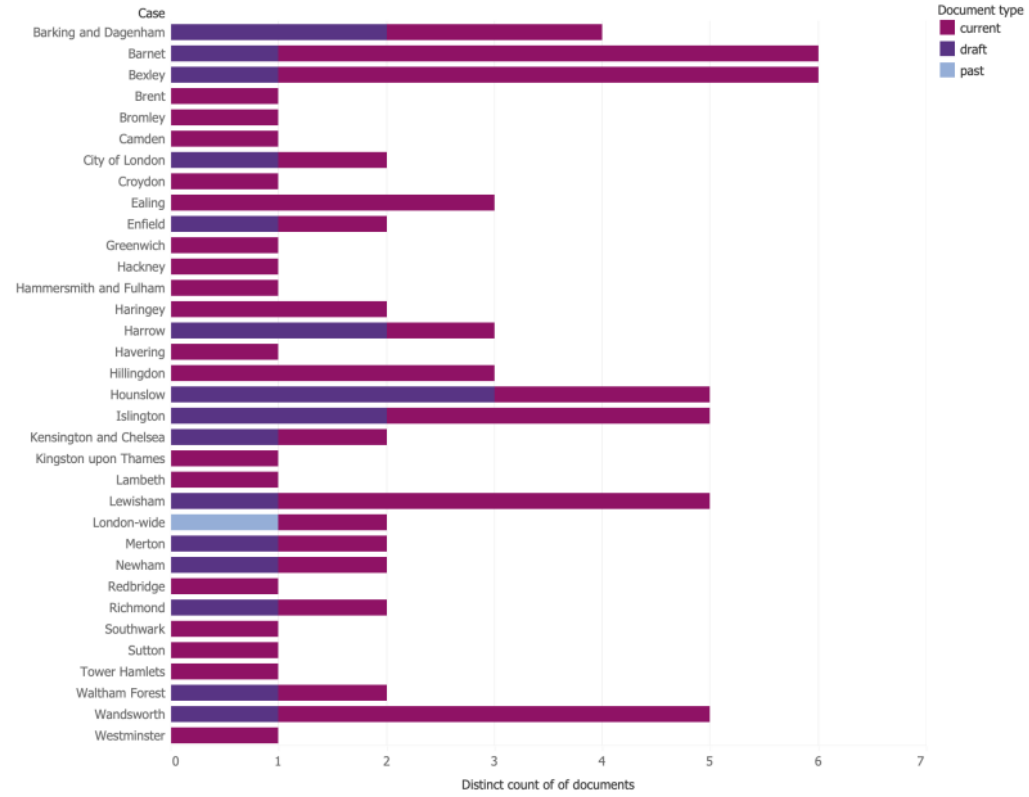
At the time of writing, 15 boroughs (45.45%) were drafting new Local Plans or undergoing public examination and inspector review of published draft plans. Four boroughs (Croydon, Ealing, Haringey, Kingston) have announced the intention to draft new plans but have not yet released any form of the draft document. Draft plans must be opened for public commentary, examined by the inspector, and undergo formal review before adoption as Local Plans, and therefore might change in response to the consultation. Despite this limitation, draft plans were included in this analysis because they must undergo an extensive process of public engagement, consultation, and revision before publication, which typically requires the council's vote of approval. While specific language and site allocation may change in response to examination, draft plans are a strong indicator of borough priorities at the time of publication.

Case	Document	Year Adopted	Document type
London-wide	London Plan 2016	2016	past
	London Plan 2021	2021	current
Barking and Dagenham	CoreStrategies	2010	current
	DevelopmentManagemetn	2011	current
	Draft 2021	2021	draft
	Industrial	2020	draft
Barnet	CoreStrategies	2012	current
	DevelopmentManagement	2012	current
	Supplemental	2017	current
	Supplemental	2016	current
	Supplmental	2014	current
	Draft 2021	2021	draft
Bexley	CoreStrategy	2012	current
	Supplemental	2021	current
	Supplemental	2017	current
	Supplemental- Learning, Skills & Employment Strategy	2021	current
	Supplemental	2019	current
	Draft 2021	2021	draft
Brent	LocalPlan	2022	current
Bromley	LocalPlan 2019	2019	current
Camden	LocalPlan 2017	2017	current
City of London	LocalPlan	2015	current
	Draft 2021	2021	draft
Croydon	Local Plan 2018	2018	current

Ealing	Core Strategies	2012	current
	DevelopmentManagement	2013	current
	DevelopmentSites	2013	current
Enfield	LocalPlan - Core Strategy, 2010	2010	current
	Draft 2019	2021	draft
Greenwich	CoreStrategies	2014	current
Hackney	LocalPlan	2020	current
Hammersmith and Fulham	LocalPlan	2018	current
Haringey	DevelopmentManagement	2017	current
	LocalPlan	2013	current
Harrow	CoreStrategy	2012	current
	DesignCode Draft	2021	draft
	Draft	2020	draft
Havering	LocalPlan	2021	current
Hillingdon	Development Strategies	2020	current
	Site Allocations	2020	current
	Strategic Polices	2012	current
Hounslow	Local Plan, Part 2	2015	current
	LocalPlan, Part 1	2015	current
	Draft - Site Allocation	2019	draft
	Draft - West Corridor	2019	draft
	Draft - West of Borough	2019	draft
Islington	CoreStrategies	2011	current
	DevelopmentStrategies	2013	current
	SiteAllocation	2013	current
	Draft - Site Allocation	2019	draft
	Draft- Strategic Development	2019	draft
Kensington and Chelsea	LocalPlan	2019	current
	Draft	2022	draft
Kingston upon Thames	LocalPlan	2012	current
Lambeth	LocalPlan	2021	current
Lewisham	CoreStrategy	2011	current
	DevelopmentStrategies	2014	current
	SiteAllocation	2013	current
	TownCenterPlan	2014	current
	Consultation2015	2015	draft

Merton	CoreStrategy	2011	current
	Draft Local Plan	2021	draft
Newham	LocalPlan	2018	current
	Draft Local Plan	2021	draft
Redbridge	LocalPlan	2015	current
Richmond	Local Plan	2018	current
	Draft Local Plan	2021	draft
Southwark	LocalPlan	2022	current
Sutton	Local Plan	2018	current
Tower Hamlets	LocalPlan	2020	current
Waltham Forest	CoreStrategies	2012	current
	Draft Local Plan	2021	draft
Wandsworth	CoreStrategies	2016	current
	DevelopmentManagemetn	2016	current
	EmploymentIndustry	2018	current
	SiteAllocations	2016	current
	Draft Local Plan	2022	draft
Westminster	LocalPlan	2021	current

Number of Documents used for Meso Analysis



Distinct count of Document (DocumentIndex) for each Case. Color shows details about Document type.

Appendix 6: Code Book of Terms for Content Analysis

Codes: Policy Categories

Name	Files	References
definition	9	10
policy_climate	8	30
policy_economic	7	12
policy_employment	2	4
policy_funding	1	2
policy_growth	4	6
policy_housing	3	4
policy_infrastructure	3	11
policy_spatialDevelopment	6	7
policy_sustainableDesignConstruction	10	27
policy_wasteManagement	14	57
Reference to CE	20	161

Codes: Thematic

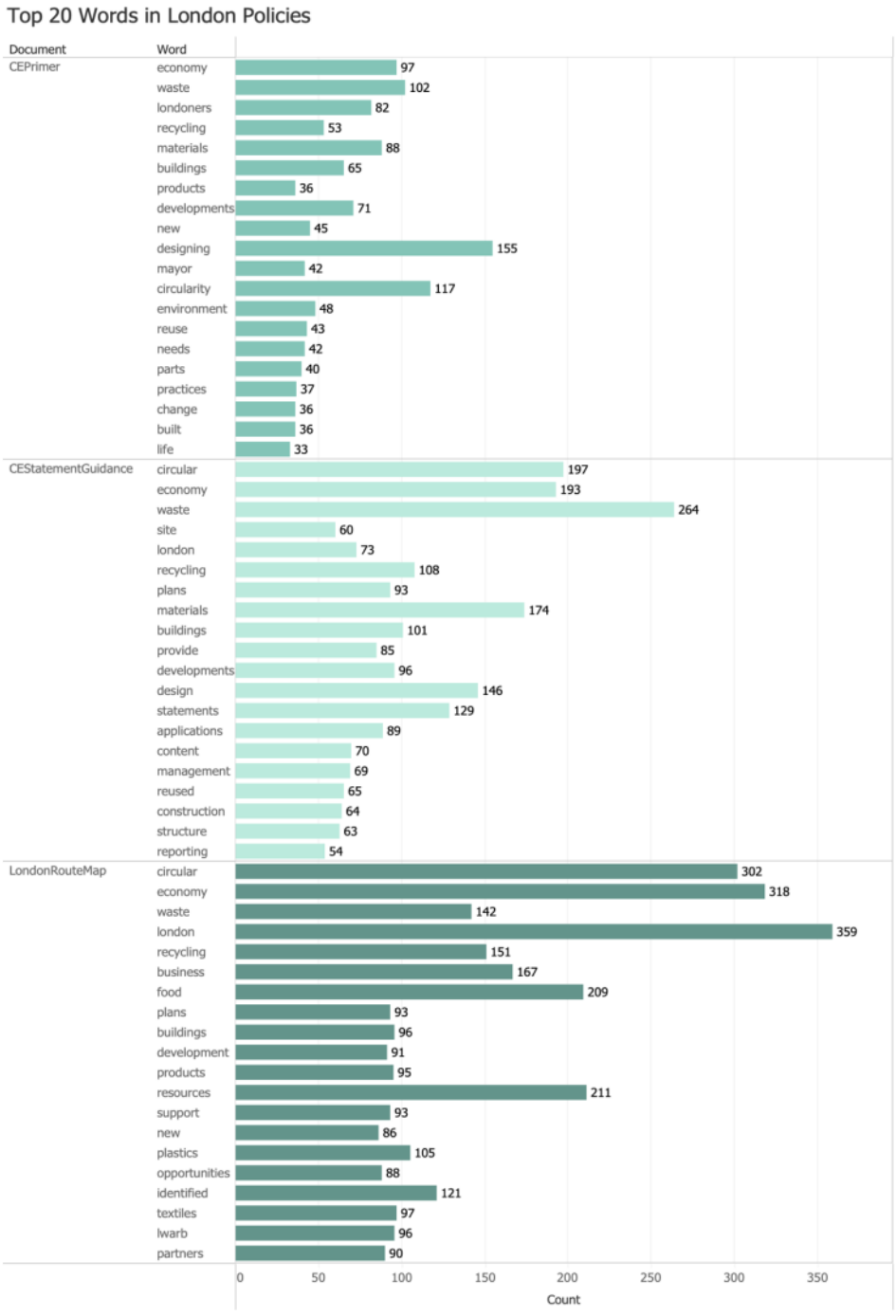
Search Terms Used in NVivo			
Accelerate growth	Data Evaluation Knowledge	manufacturers	route map
behavior change	design	Materials	Scale
boroughs	disassembly	Mayor of London	services
Businesses	Economic benefit	national	sharing
CE buildings	Ellen MacArthur	other cities	SMEs
CE Jobs	Employers	Other sectors	Start-ups
CE Policy	entrepreneur	phasing	sustainability
CE Principles	Environmental benefit	planning	systematic change
CE programs	Europe	Plastic	technology
CE Skills	Expand definition activities	Policy S17	textiles
CE Space	food	Products	Waste reduction
CE Statement	Future Transition	purchasing	
Circular economy	GLA	recycling	
city wide	government	Reduce consumption	
climate change	High skills	regional	
Collaboration	Inclusivity	repair	
competition	industrial	Resource efficiency	
conditions	innovation	retail	
Construction	Investment	Reuse	

Appendix 7: FAME Database Search Steps

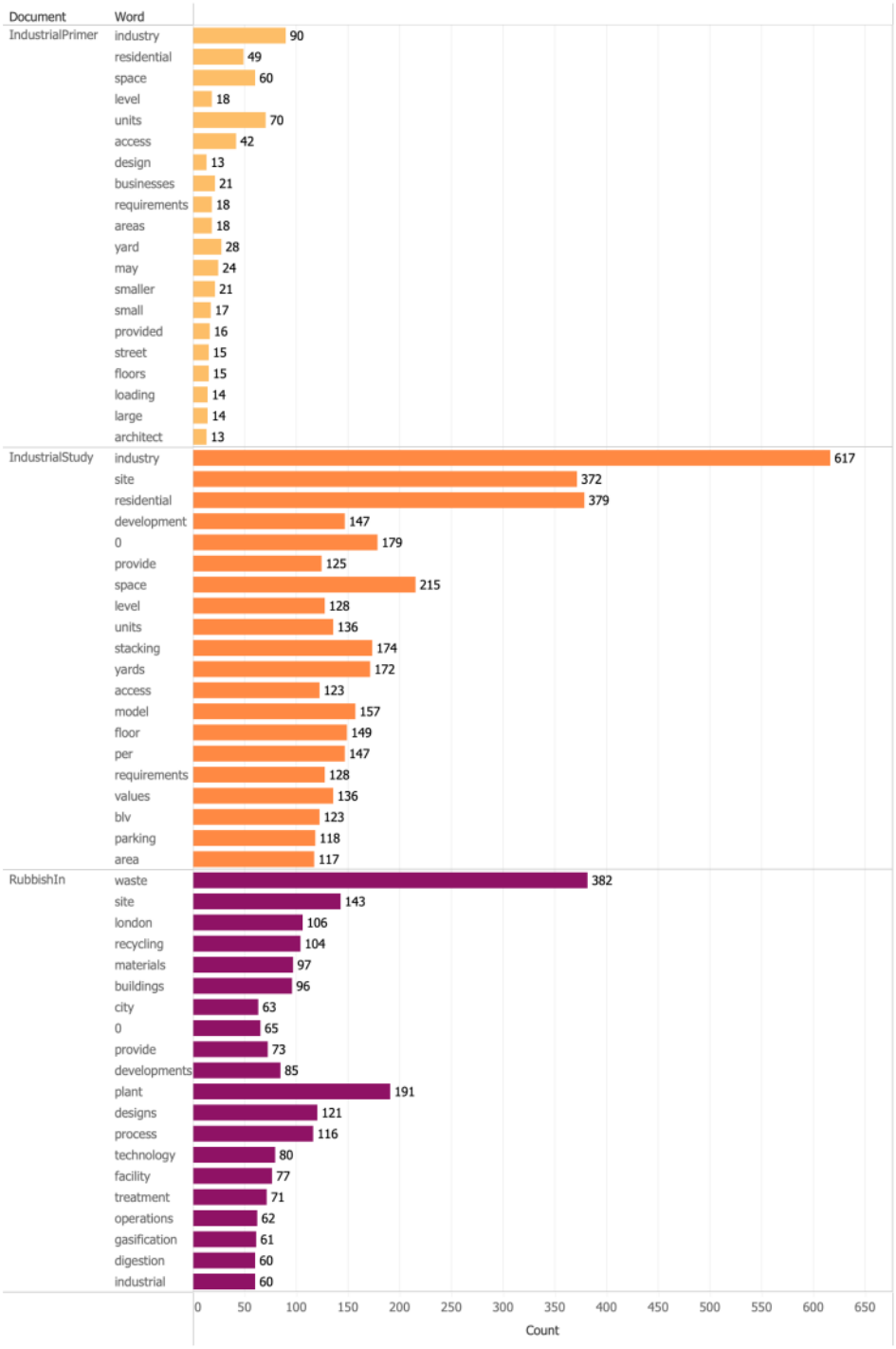
Two limitations of the dataset obtained were companies with either missing postcode data or missing employee data. I filtered the original data sample for companies missing either type of data, resulting in a sample of 14,594 unique firms. Years 2020-2022 contain a high percentage of firms with unavailable employee data. This is likely because the FAME database calculates employee numbers based on the previous year. Therefore, data would not yet be available for 2022, and many firms may not yet have completed their tax filings or registration for 2021, which would report employee numbers. Of the sample, the year of incorporation was unavailable for 4,144 firms.

Step	Search	Step Results	Missing	Search Results
1	All FAME Database	4465819		4465819
2	All Active companies - not dormant	6026706		6026706
3	London Region Companies - NUTS regions	3903966		1232899
4	NACE Review Search	565988		38980
5	FILTER - postcode Available		4144	
6	FILTER - employees available		20439	
	Final Sample			14,594

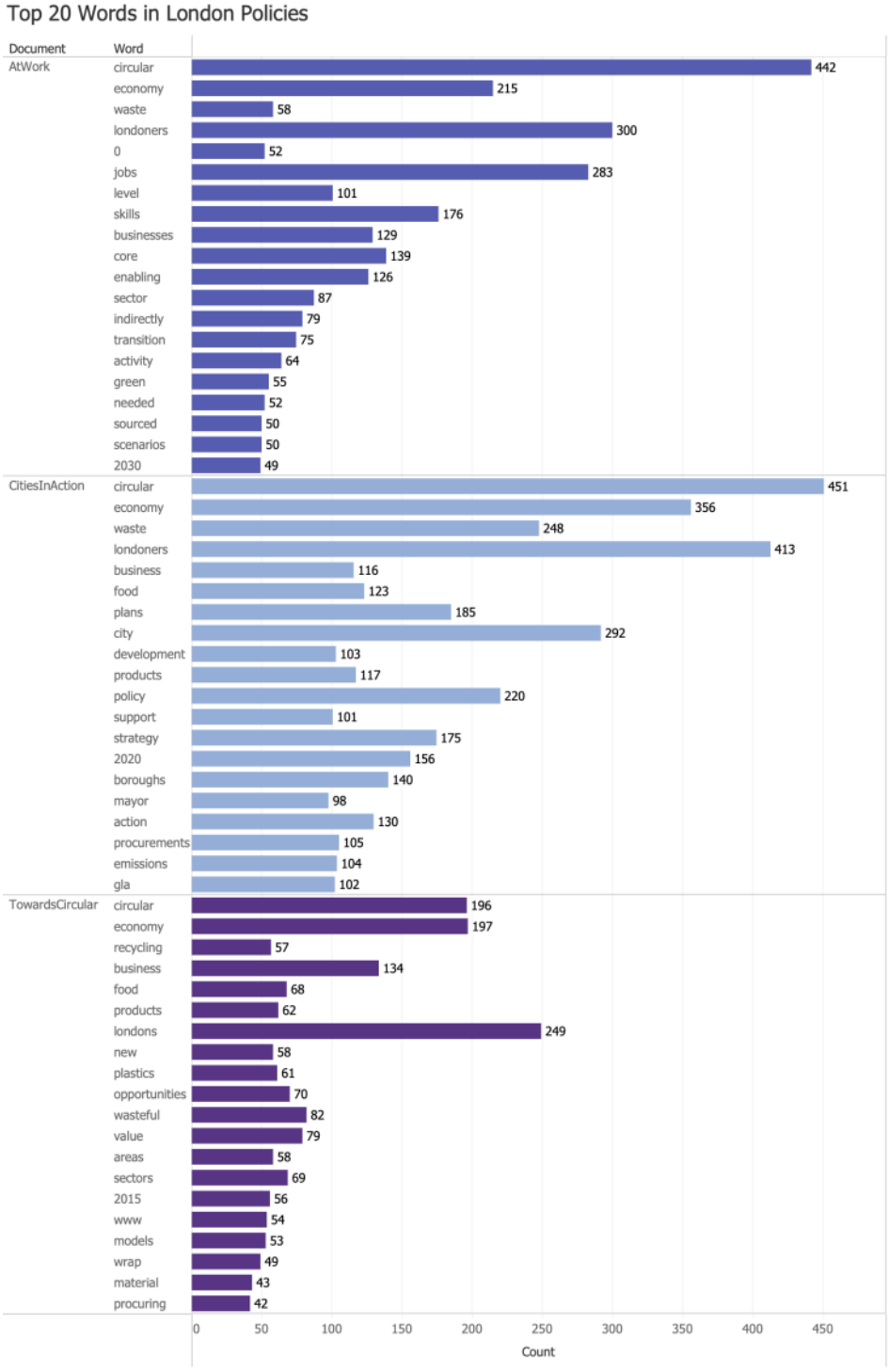
Appendix 8: Term Frequency, Policy Documents



Top 20 Words in London Policies



Count as an attribute for each Word broken down by Document. Color shows details about Document. The data is filtered on wordRanking, which keeps 20 members. The view is filtered on Document, which keeps IndustrialPrimer, IndustrialStudy and RubbishIn.


Top 20 Words in London Policies
Document
Word
AtWork
circular 442
economy 215
waste 58
londoners 300
0 52
jobs 283
level 101
skills 176
businesses 129
core 139
enabling 126
sector 87
indirectly 79
transition 75
activity 64
green 55
needed 52
sourced 50
scenarios 50
2030 49
CitiesInAction
circular 451
economy 356
waste 248
londoners 413
business 116
food 123
plans 185
city 292
development 103
products 117
policy 220
support 101
strategy 175
2020 156
boroughs 140
mayor 98
action 130
procurements 105
emissions 104
gla 102
TowardsCircular
circular 196
economy 197
recycling 57
business 134
food 68
products 62
londons 249
new 58
plastics 61
opportunities 70
wasteful 82
value 79
areas 58
sectors 69
2015 56
www 54
models 53
wrap 49
material 43
procuring 42
0 50 100 150 200 250 300 350 400 450
Count

Appendix 9: Word Clouds of London Policies 50 Most Frequent Words

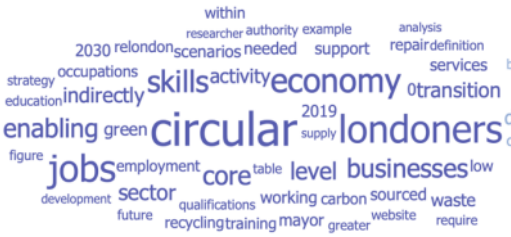
London Route Map

CE Primer

CE Statement Guidance

Towards Circular Economy

CE At Work



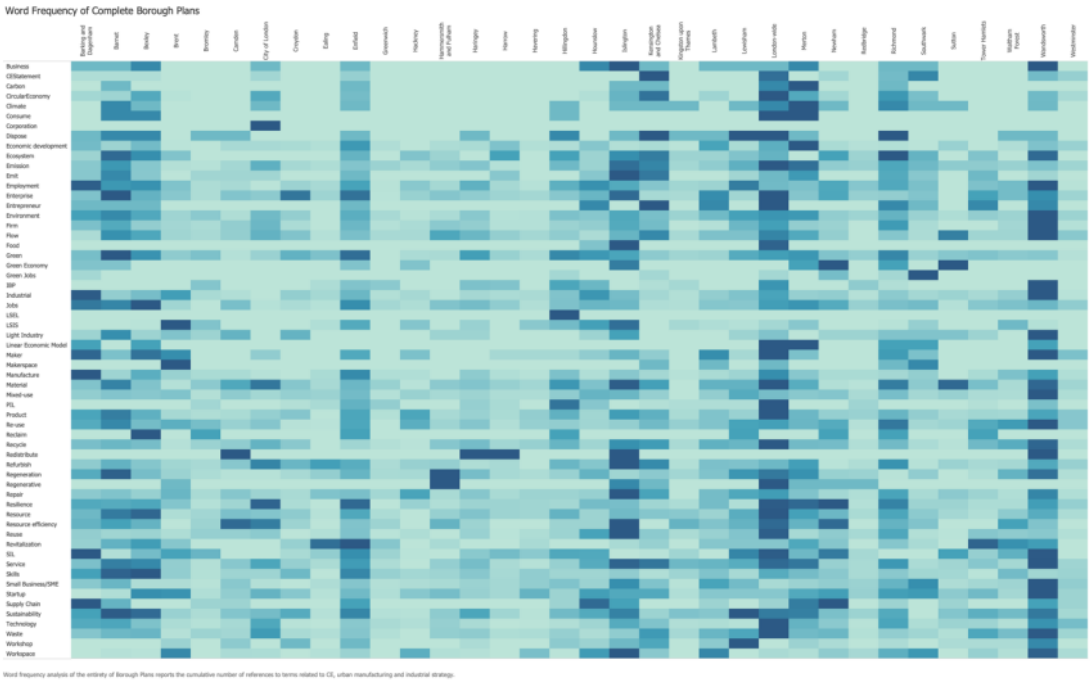
CE In Action

Industrial Primer

Industrial Study

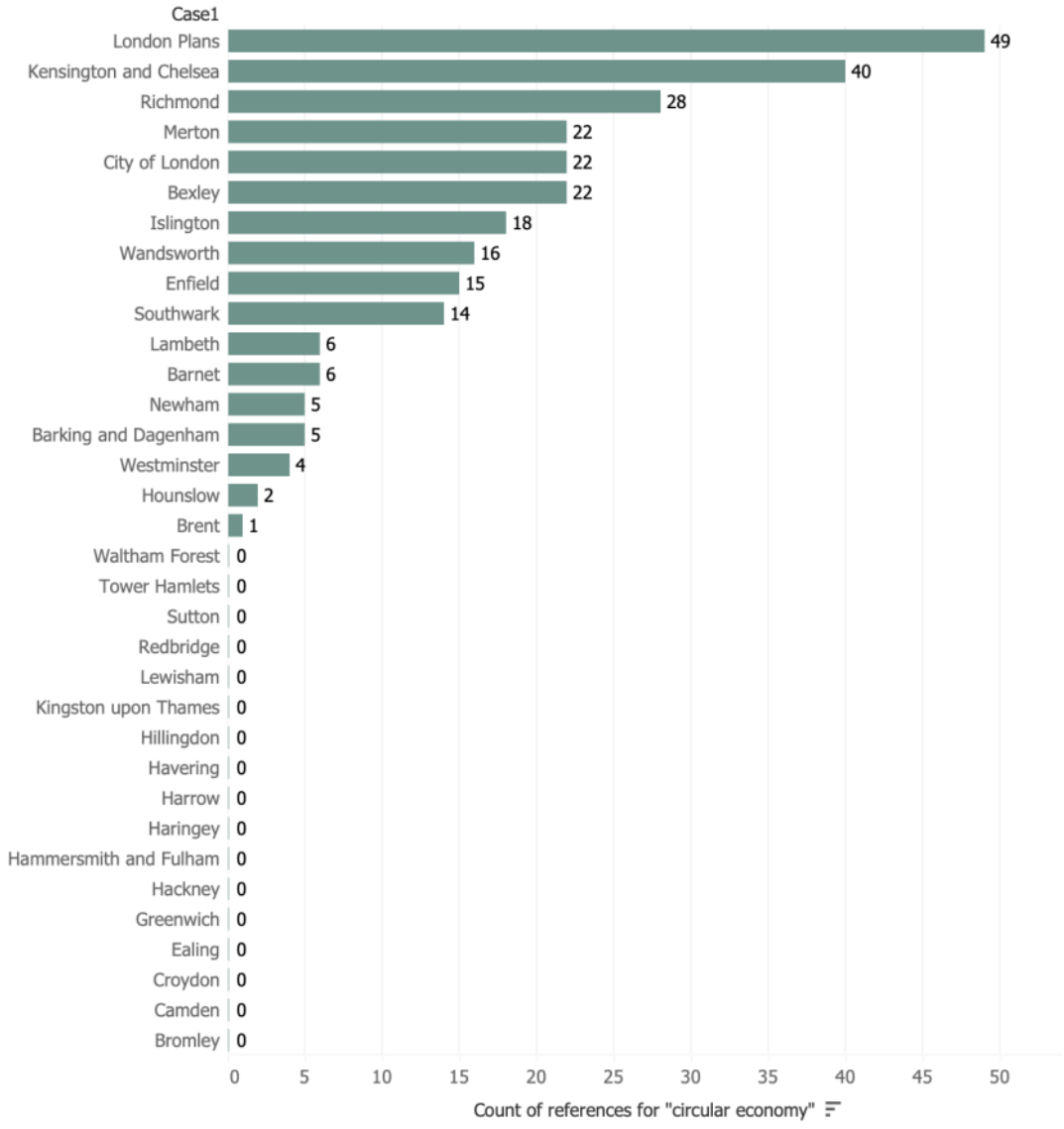
Rubbish In

Appendix 10: Top 20 Most Frequent Words in Borough Policies



Word frequency analysis of the entirety of Borough Plans reports the cumulative number of references to terms related to CE, urban manufacturing and industrial strategy.

Appendix 11: Number of References to Circular Economy by Borough



Directed search for term "circular economy" in all Borough Plans and London Plans.

Appendix 12: Examples of Site Design for Varied Size Manufacturing Firms

Source: (GLA, 2017)

Stacked workshops/studios
with residential above

Final proposal
The final proposal is organised around a central shared yard activated by workshop and studio space. Multi-level light industrial units with high ceilings can be flexibly configured within the overall structural grid. The perimeter of the block provides a positive street frontage to all sides, with a residential block facing onto the primary street edge.

KEY
1. Shared service yard / residential amenity space providing LGV and occasional HGV access to industrial workspace
2. Pedestrian entrance to workshops and studios
3. Pedestrian entrance to residential units
4. Four goods lifts provides upper floors with access to service yard below
5. Urban greening on roofs of industrial and residential accommodation
6. Option for urban greening on deck above yard

KEY
- Workshops and studios
- Goods lift
- Residential units
- Residential cores
- Yard
- Circulation
- Urban greening
- Vehicular site entrance
- Pedestrian entrance

Industrial Intensification
© WE MADE THAT

Stacked medium industrial
with residential above

Final proposal
The final proposal combines new residential development stacked above a ground-level medium scale industrial unit. To the rear of the site, smaller scale units are stacked above each other and serviced via goods lifts. A roof-level terrace over the industrial unit below provides shared amenity for the new housing, whilst ancillary uses such as offices and cycle parking act as a buffer between the residential and industrial.

KEY
1. Service yard providing HGV access to industrial workspace
2. Shared pedestrian entrance to industrial workspace and residential units
3. Pedestrian entrance to upper level industrial workspace
4. Two goods lifts provide upper floors with access to service yard below
5. Urban greening above industrial workspace provides amenity space for residential accommodation
6. Urban greening above eastern wing of residential units

KEY
- Medium industrial
- Residential units
- Residential cores
- Yard
- Urban greening
- Vehicular site entrance
- Pedestrian entrance

Industrial Intensification
© WE MADE THAT

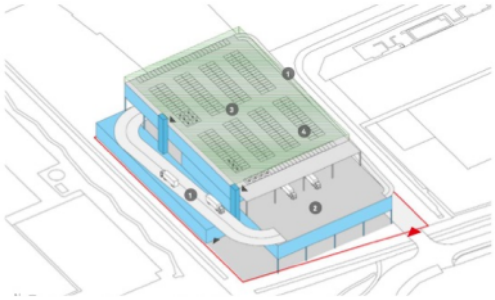
Stacked large industrial

Final proposal
The final proposal illustrates a three-storey approach to larger scale industrial provision. Ramps wrap around the building providing heavy goods vehicle access to the upper level units and service yards. The roof space is used for car parking, a likely necessity for large scale industrial development which are often located in less accessible industrial areas.

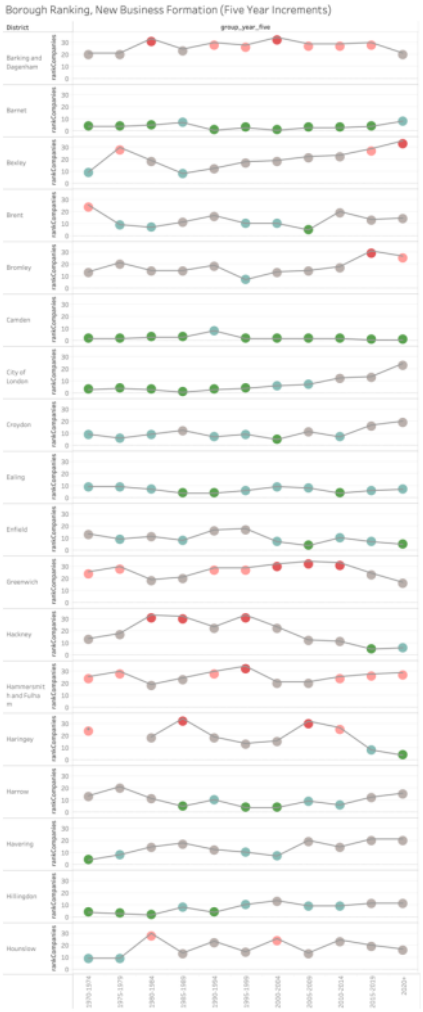
KEY
1. Ramps to upper level service yards and staff car park
2. Service yards providing HGV access to upper level workspace
3. Staff car park with pedestrian lifts to workspace below
4. Option for urban greening above car park

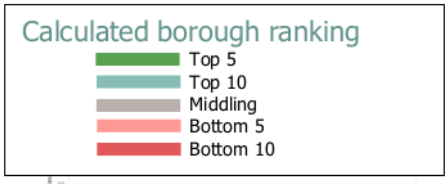
KEY
- Large industrial
- Industrial core
- Yard
- Car Parking
- Circulation
- Urban greening
- Vehicular site entrance
- Pedestrian entrance

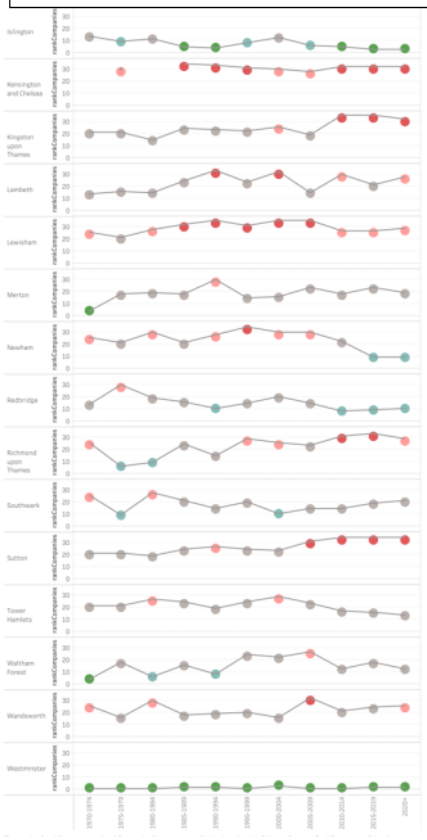
Industrial Intensification
© WE MADE THAT



Appendix 13: Number of Firms Incorporated in Each Borough, by Year

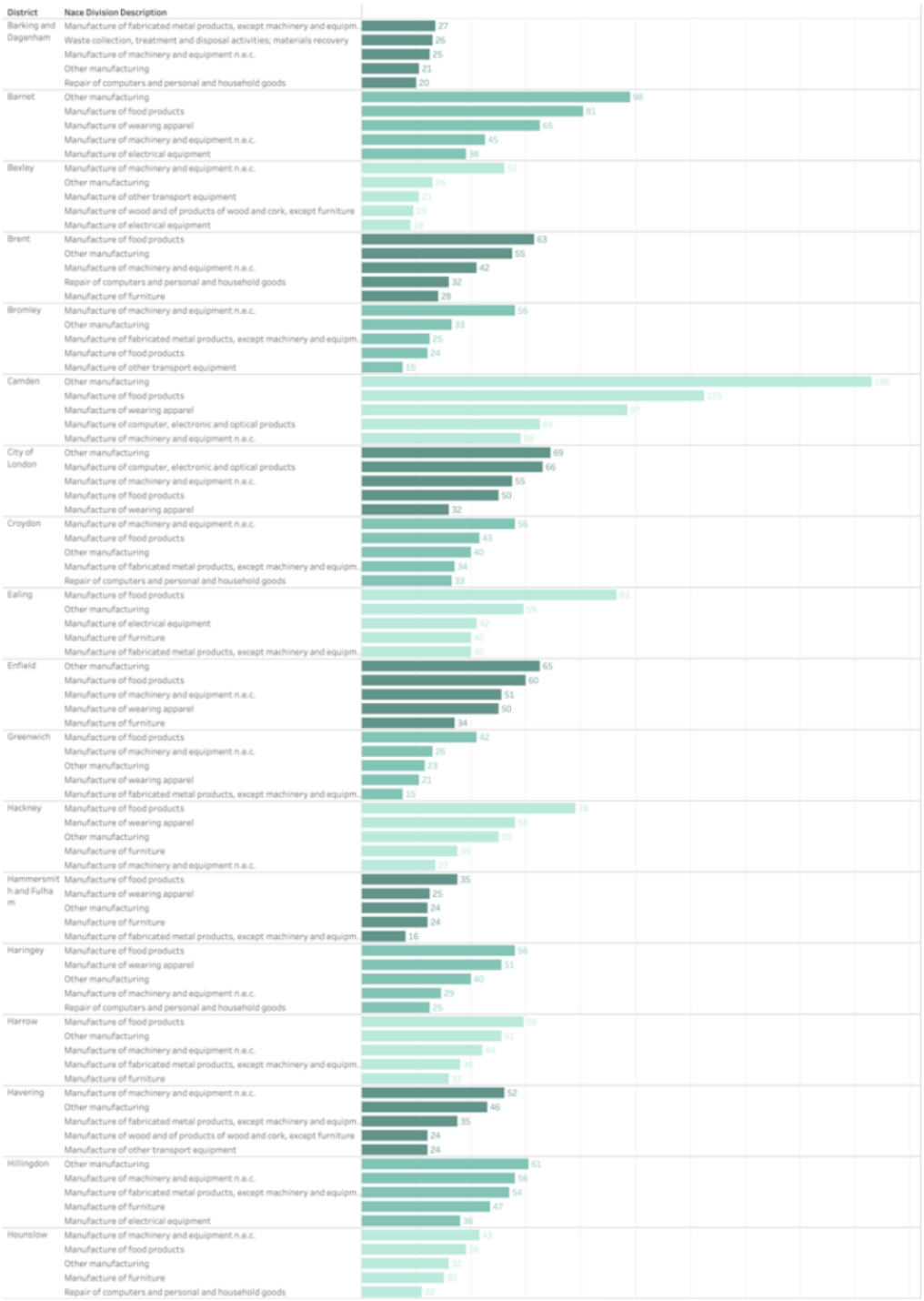


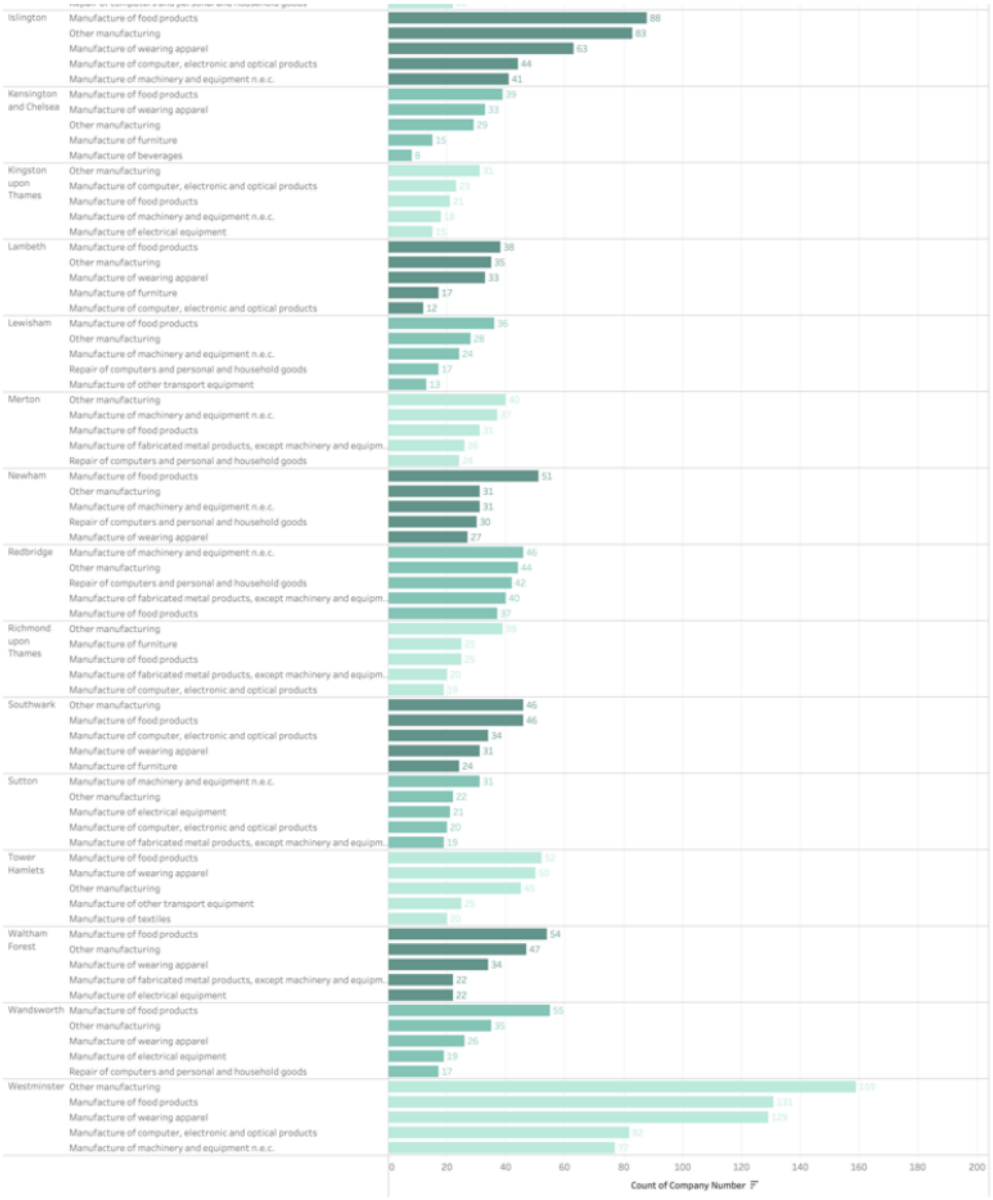




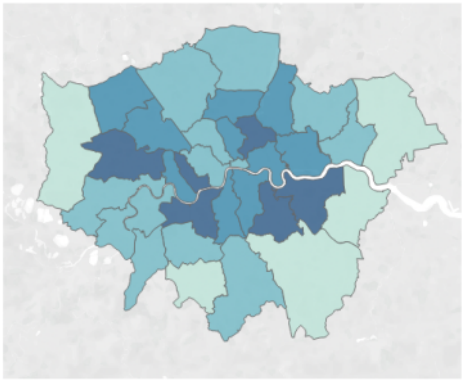
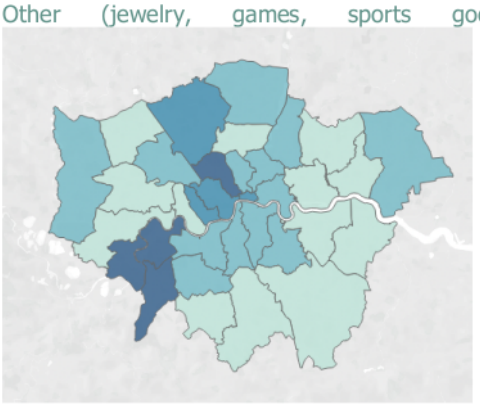
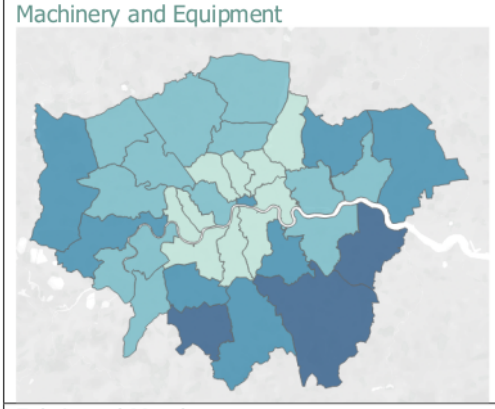
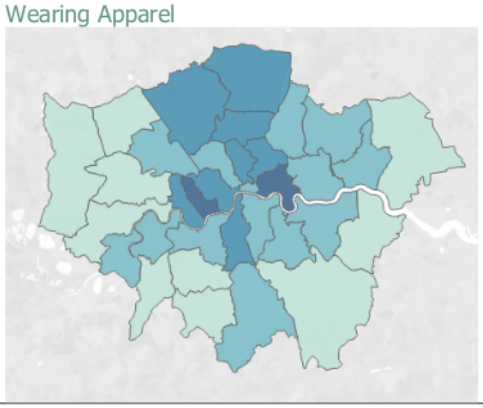
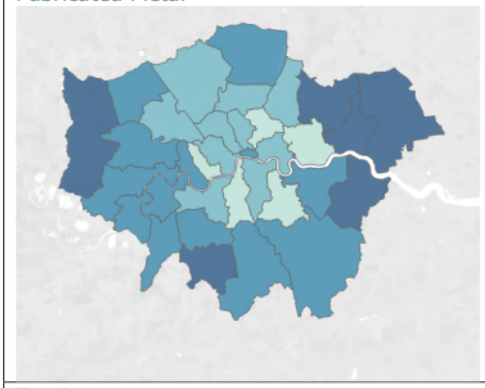
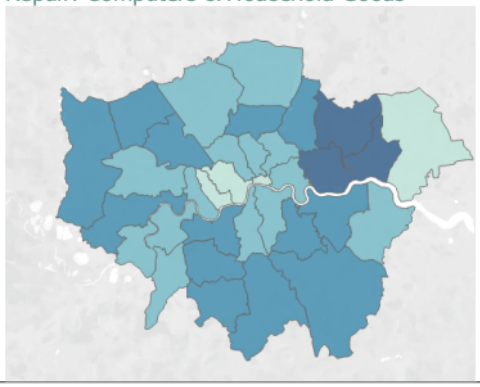
Appendix 14: Top Five Divisions of Activity in each Borough

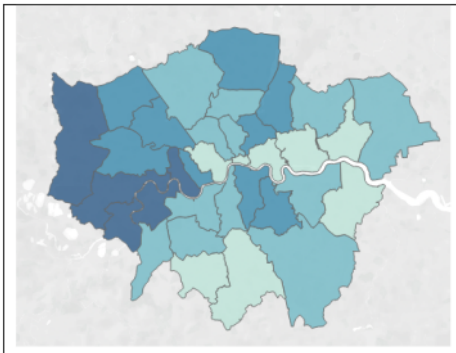
Top Five Divisions in Each Borough



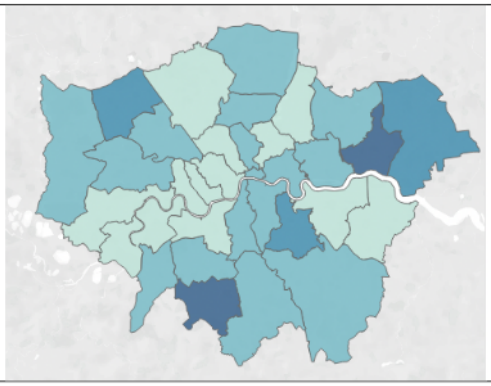

Islington
Manufacture of food products 88
Other manufacturing 83
Manufacture of wearing apparel 63
Manufacture of computer, electronic and optical products 44
Manufacture of machinery and equipment n.e.c. 41
Kensington and Chelsea
Manufacture of food products 39
Manufacture of wearing apparel 33
Other manufacturing 29
Manufacture of furniture 15
Manufacture of beverages 8
Kingston upon Thames
Other manufacturing 31
Manufacture of computer, electronic and optical products 23
Manufacture of food products 21
Manufacture of machinery and equipment n.e.c. 18
Manufacture of electrical equipment 15
Lambeth
Manufacture of food products 38
Other manufacturing 35
Manufacture of wearing apparel 33
Manufacture of furniture 17
Manufacture of computer, electronic and optical products 12
Lewisham
Manufacture of food products 36
Other manufacturing 28
Manufacture of machinery and equipment n.e.c. 24
Repair of computers and personal and household goods 17
Manufacture of other transport equipment 13
Merton
Other manufacturing 40
Manufacture of machinery and equipment n.e.c. 37
Manufacture of food products 31
Manufacture of fabricated metal products, except machinery and equipm. 26
Repair of computers and personal and household goods 24
Newham
Manufacture of food products 51
Other manufacturing 31
Manufacture of machinery and equipment n.e.c. 31
Repair of computers and personal and household goods 30
Manufacture of wearing apparel 27
Redbridge
Manufacture of machinery and equipment n.e.c. 46
Other manufacturing 44
Repair of computers and personal and household goods 42
Manufacture of fabricated metal products, except machinery and equipm. 40
Manufacture of food products 37
Richmond upon Thames
Other manufacturing 39
Manufacture of furniture 25
Manufacture of food products 25
Manufacture of fabricated metal products, except machinery and equipm. 20
Manufacture of computer, electronic and optical products 19
Southwark
Other manufacturing 46
Manufacture of food products 46
Manufacture of computer, electronic and optical products 34
Manufacture of wearing apparel 31
Manufacture of furniture 24
Sutton
Manufacture of machinery and equipment n.e.c. 31
Other manufacturing 22
Manufacture of electrical equipment 21
Manufacture of computer, electronic and optical products 20
Manufacture of fabricated metal products, except machinery and equipm. 19
Tower Hamlets
Manufacture of food products 52
Manufacture of wearing apparel 50
Other manufacturing 45
Manufacture of other transport equipment 25
Manufacture of textiles 20
Waltham Forest
Manufacture of food products 54
Other manufacturing 47
Manufacture of wearing apparel 34
Manufacture of fabricated metal products, except machinery and equipm. 22
Manufacture of electrical equipment 22
Wandsworth
Manufacture of food products 55
Other manufacturing 35
Manufacture of wearing apparel 26
Manufacture of electrical equipment 19
Repair of computers and personal and household goods 17
Westminster
Other manufacturing 159
Manufacture of food products 131
Manufacture of wearing apparel 129
Manufacture of computer, electronic and optical products 92
Manufacture of machinery and equipment n.e.c. 77
0 20 40 60 80 100 120 140 160 180 200
Count of Company Number

Appendix 15: Maps of Firm Clusters

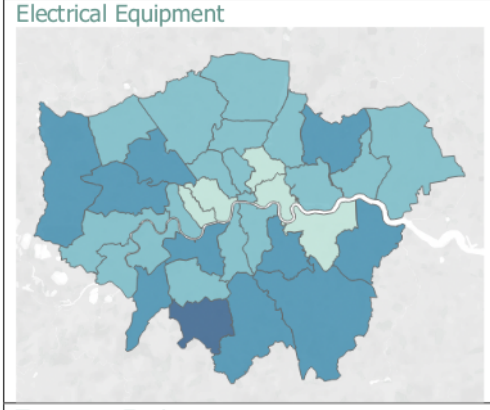
Clusters in Regions	Clusters in Boroughs
Food 	Other (jewelry, games, sports goods) 
Machinery and Equipment 	Wearing Apparel 
Fabricated Metal 	Repair: Computers & Household Goods 
Furniture	Waste Collection



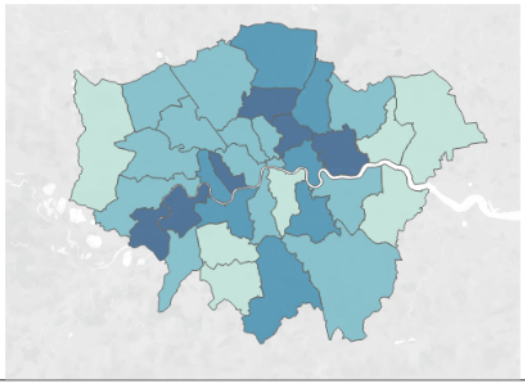
Electrical Equipment



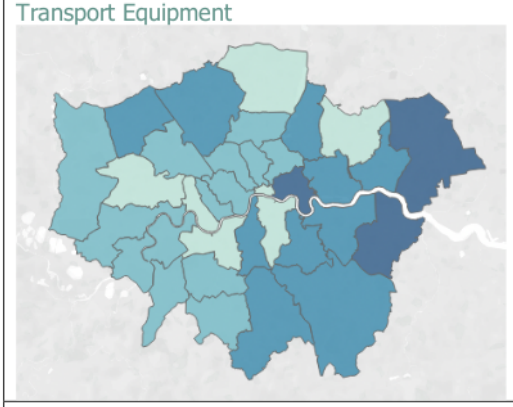
Textiles



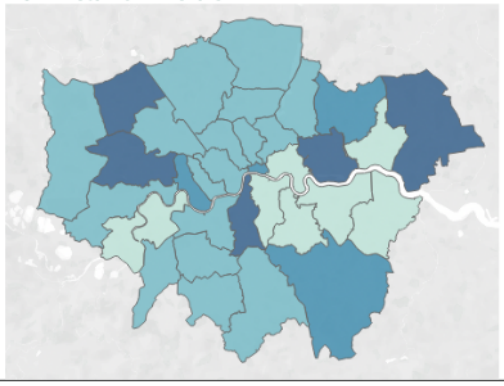
Transport Equipment



Non-Metallic Minerals



Wood



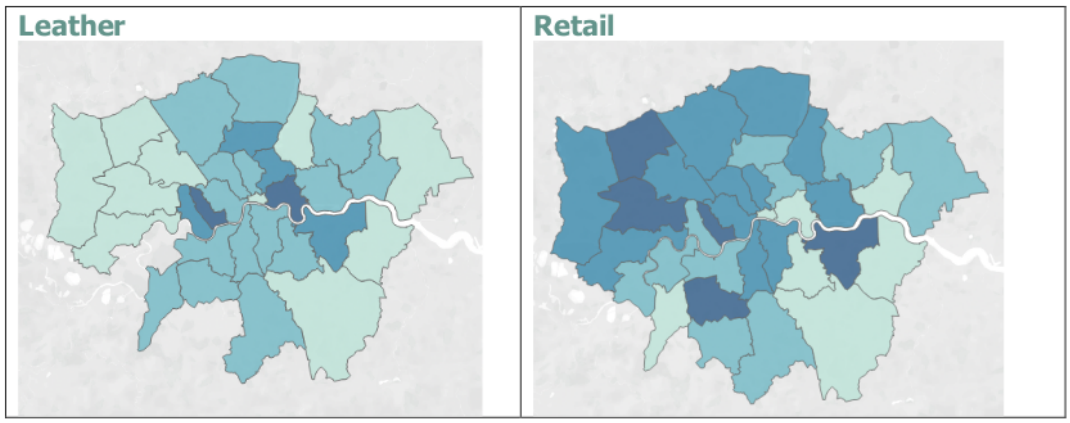
Rubber & Plastic

Beverages

Paper

Computers, electrical equipment

Motor Vehicles


Leather
Retail

Appendix 16: Ethical Clearance Forms and Risk Assessment Forms

Note: this is a copy of the proforma that each student MUST complete and submit directly on Moodle. Please reproduce your submission here for the purpose of your supervisor signing off on its review and approval.

Ethical Clearance Pro Forma

It is important for you to include all relevant information about your research in this form, so that your supervisor can give you the best advice on how to proceed with your research.

You are advised to read though the relevant sections of UCL's Research Integrity guidance to learn more about your ethical obligations.

Submission Details

1. **Name of programme of study:**
   International Planning

2. **Please indicate the type of research work you are doing (Delete that which do not apply):**
   Dissertation in Planning (MSc)

3. **Please provide the current working title of your research:**
   Makerspaces and Small Businesses as sites of Circular Economy – Eco-Innovation Nexus: Urban planning for circular economy transformation in London and Amsterdam

4. **Please indicate your supervisor's name:**
   Dr. Marco Dean

Research Details

5. **Please indicate here which data collection methods you expect to use. (Tick all that apply/or delete those which do not apply.)**

- Interviews
- Secondary data analysis

6. **Please indicate where your research will take place (delete that which does not apply):**
   - UK and Overseas

7. **Does your project involve the recruitment of participants?**

'Participants' means human participants and their data (including sensor/locational data and observational notes/images.)

Yes

Appropriate Safeguard, Data Storage and Security

8. Will your research involve the collection and/or use of personal data?

Personal data is data which relates to a living individual who can be identified from that data or from the data and other information that is either currently held, or will be held by the data controller (you, as the researcher).

This includes:
- Any expression of opinion about the individual and any intentions of the data controller or any other person toward the individual.
- Combinations of data which may reveal identifiable data, such as names, email/postal addresses, date of birth, ethnicity, descriptions of health diagnosis or conditions, computer IP address (of relating to a device with a single user).

Yes

9. Is your research using or collecting:
- special category data as defined by the General Data Protection Regulation*, and/or
- data which might be considered sensitive in some countries, cultures or contexts?

*Examples of special category data are data:
- which reveals racial or ethnic origin, political opinions, religious or philosophical beliefs, trade union membership;
- concerning health (the physical or mental health of a person, including the provision of health care services);
- concerning sex life or sexual orientation;
- genetic or biometric data processed to uniquely identify a natural person.

No

10. Do you confrm that all personal data will be stored and processed in compliance with the General Data Protection Regulation (GDPR 2018)? (Choose one only, delete that which does not apply)

- Yes

11. I confirm that:

- The information in this form is accurate to the best of my knowledge.
- I will continue to reflect on and update these ethical considerations in consultation with my supervisor.

Yes

RISK ASSESSMENT FORM
FIELD / LOCATION WORK

DEPARTMENT/SECTION: BARTLETT SCHOOL OF PLANNING

LOCATION(S): LONDON UK

PERSONS COVERED BY THE RISK ASSESSMENT: Kyra Kocis

BRIEF DESCRIPTION OF FIELDWORK (including geographic location):

My primary mode of data collection is analysis of primary documents and datasets published online. Where applicable, I intend to conduct a small sample of online interviews with research participants (experts in the field, policymakers, firm owners). My primary analysis of sites within each city will be conducted through online sources (ie Open Street Map). Time permitting, there is a small chance I will visit key sites in London to get a sense of the context for my study.

COVID-19 RELATED GENERIC RISK ASSESSMENT STATEMENT:

Coronavirus disease (COVID-19) is an infectious disease caused by coronavirus SARS-CoV-2. The virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes. Droplets fall on people in the vicinity and can be directly inhaled or picked up on the hands and transferred when someone touches their face. This risk assessment documents key risks associated fieldwork during a pandemic, but it is not exhaustive and will not be able to cover all known risks, globally. This assessment outlines principles adopted by UCL at an institutional level and it is necessarily general. Please use the open text box 'Other' to indicate any contingent risk factors and control measures you might encounter during the course of your dissertation research and writing.

Please refer to the Dissertation in Planning Guidance Document (available on Moodle) to help you complete this form.

Hazard 1: Risk of Covid -19 infection during research related travel and research related interactions with others (when face-to-face is possible and/or unavoidable)

Risk Level - Medium /Moderate

Existing Advisable Control Measures: Do not travel if you are unwell, particularly if you have COVID-19 symptoms. Self-isolate in line with NHS (or country-specific) guidance.

Avoid travelling and face-to-face interactions; if you need to travel and meet with others:

- If possible, avoid using public transport and cycle or walk instead.
- If you need to use public transport travel in off-peak times and follow transport provider's and governmental guidelines.
- Maintain (2 metre) social distancing where possible and where 2 metre social distancing is not achievable, wear face covering.
- Wear face covering at all times in enclosed or indoor spaces.
- Use hand sanitiser prior to and after journey.
- Avoid consuming food or drinks, if possible, during journey.
- Avoid, if possible, interchanges when travelling - choose direct route.
- Face away from other persons. If you have to face a person ensure that the duration is as short as possible.
- Do not share any items i.e. stationary, tablets, laptops etc. If items need to be shared use disinfectant wipes to disinfect items prior to and after sharing.
- If meeting in a group for research purposes ensure you are following current country specific guidance on face-to-face meetings (i.e rule of 6 etc.)
- If and when possible meet outside and when not possible meet in venues with good ventilation (e.g. open a window)
- If you feel unwell during or after a meeting with others, inform others you have interacted with, self-isolate and get tested for Covid-19
- Avoid high noise areas as this mean the need to shout which increases risk of aerosol transmission of the virus.
- Follow one way circulation systems, if in place. Make sure to check before you visit a building.
- Always read and follow the visitors policy for the organisation you will be visiting.
- Flush toilets with toilet lid closed.

-'Other' Control Measures you will take (specify):

NOTE: The hazards and existing control measures above pertain to Covid-19 infection risks only. More generalised health and safety risk may exist due to remote field work activities and these are outlined in your Dissertation in Planning Guidance document. Please consider these as possible 'risk' factors in completing the remainder of this standard form. For more information also see: Guidance Framework for Fieldwork in Taught and MRes Programmes, 2021-22

Consider, in turn, each hazard (white on black). If **NO** hazard exists select **NO** and move to next hazard section.

If a hazard does exist select **YES** and assess the risks that could arise from that hazard in the risk assessment box.

Where risks are identified that are not adequately controlled they must be brought to the attention of your Departmental Management who should put temporary control measures in place or stop the work. Detail such risks in the final section.

ENVIRONMENT	The environment always represents a safety hazard. Use space below to identify and assess any risks associated with this hazard
e.g. location, climate, terrain, neighbourhood, in outside organizations, pollution, animals.	Examples of risk: adverse weather, illness, hypothermia, assault, getting lost. Is the risk high / medium / low ? In the event I conduct a few site visits in London, there is low (but not zero) environmental risk related to the weather, or getting lost in an unfamiliar area.

	CONTROL MEASURES — Indicate which procedures are in place to control the identified risk
	work abroad incorporates Foreign Office advice
	only accredited centres are used for rural field work
X	participants will wear appropriate clothing and footwear for the specified environment
	refuge is available
	work in outside organisations is subject to their having satisfactory H&S procedures in place
X	OTHER CONTROL MEASURES: please specify any other control measures you have implemented: To minimize this risk I will not visit sites in poor weather conditions, and not visit alone.

EMERGENCIES	Where emergencies may arise use space below to identify and assess any risks
e.g. fire, accidents	Examples of risk: loss of property, loss of life

There is a minimal risk of emergencies including loss of life.

	CONTROL MEASURES — Indicate which procedures are in place to control the identified risk
	participants have registered with LOCATE at http://www.fco.gov.uk/en/travel-and-living-abroad/
X	contact numbers for emergency services are known to all participants
X	participants have means of contacting emergency services
X	a plan for rescue has been formulated, all parties understand the procedure
	the plan for rescue /emergency has a reciprocal element
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

FIELDWORK	**1**	May 2010

EQUIPMENT	**Is equipment used?**	**NO**	**If 'No' move to next hazard** **If 'Yes' use space below to identify and assess any risks**
e.g. clothing, outboard motors.	Examples of risk: inappropriate, failure, insufficient training to use or repair, injury. Is the risk high / medium / low ?		

CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**
	the departmental written Arrangement for equipment is followed
	participants have been provided with any necessary equipment appropriate for the work
	all equipment has been inspected, before issue, by a competent person
	all users have been advised of correct use
	special equipment is only issued to persons trained in its use by a competent person
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

LONE WORKING	**Is lone working a possibility?**	**NO**	**If 'No' move to next hazard** **If 'Yes' use space below to identify and assess any risks**
e.g. alone or in isolation *lone interviews.*	Examples of risk: difficult to summon help. Is the risk high / medium / low?		

I will not conduct fieldwork alone – I will always visit a site with a buddy.

CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**
	the departmental written Arrangement for lone/out of hours working for field work is followed
	lone or isolated working is not allowed
	location, route and expected time of return of lone workers is logged daily before work commences

	all workers have the means of raising an alarm in the event of an emergency, e.g. phone, flare, whistle
	all workers are fully familiar with emergency procedures
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

ILL HEALTH	**The possibility of ill health always represents a safety hazard. Use space below to identify and assess any risks associated with this Hazard.**
e.g. accident, illness, personal attack, special personal considerations or vulnerabilities.	Examples of risk: injury, asthma, allergies. Is the risk high / medium / low? I have no medical conditions, so the risk of ill-health is low. There is a minimal risk of personal attack when I visit a site, but I will always travel with a buddy.

CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**
	all participants have had the necessary inoculations/ carry appropriate prophylactics
	participants have been advised of the physical demands of the research and are deemed to be physically suited
	participants have been adequate advice on harmful plants, animals and substances they may encounter
	participants who require medication should carry sufficient medication for their needs
X	OTHER CONTROL MEASURES: please specify any other control measures you have implemented: I will always visit a site with a buddy

TRANSPORT	**Will transport be required**	**NO**		**Move to next hazard**
		YES	**X**	**Use space below to identify and assess any risks**
e.g. hired vehicles	Examples of risk: accidents arising from lack of maintenance, suitability or training Is the risk high / medium / low? There is a low risk of traveling via public transport to a site visit.			

CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**
X	only public transport will be used
	the vehicle will be hired from a reputable supplier
	transport must be properly maintained in compliance with relevant national regulations
	drivers comply with UCL Policy on Drivers http://www.ucl.ac.uk/hr/docs/college_drivers.php
	drivers have been trained and hold the appropriate licence
	there will be more than one driver to prevent driver/operator fatigue, and there will be adequate rest periods
	sufficient spare parts carried to meet foreseeable emergencies

	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

DEALING WITH THE PUBLIC	**Will people be dealing with public**	**YES**	**If 'No' move to next hazard** **If 'Yes' use space below to identify and assess any risks**
e.g. interviews, observing	Examples of risk: personal attack, causing offence, being misinterpreted. Is the risk high / medium / low? I intend to conduct a few selected interviews with key personnel – leading academics related to the CE, urban planners, firm owners. I have a master's degree in social science research methods, through which I gained a great deal of interview training, knowledge of sensitivities and positionality in interviewing, and an in-depth understanding of how to conduct "expert interviews". I will only be conducting interviews online.		

CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**
X	all participants are trained in interviewing techniques
	advice and support from local groups has been sought
X	participants do not wear clothes that might cause offence or attract unwanted attention
X	interviews are conducted at neutral locations or where neither party could be at risk
X	OTHER CONTROL MEASURES: please specify any other control measures you have implemented: Only conducting online interviews.

FIELDWORK **3** May 2010

WORKING ON OR NEAR WATER	**Will people work on or near water?**	**NO**	**If 'No' move to next hazard** **If 'Yes' use space below to identify and assess any risks**
e.g. rivers, marshland, sea.	Examples of risk: drowning, malaria, hepatitis A, parasites. Is the risk high / medium / low?		

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk
	lone working on or near water will not be allowed
	coastguard information is understood; all work takes place outside those times when tides could prove a threat
	all participants are competent swimmers
	participants always wear adequate protective equipment, e.g. buoyancy aids, wellingtons
	boat is operated by a competent person
	all boats are equipped with an alternative means of propulsion e.g. oars
	participants have received any appropriate inoculations
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

MANUAL HANDLING (MH)	Do MH activities take place?	NO	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g. lifting, carrying, moving large or heavy equipment, physical unsuitability for the task.	Examples of risk: strain, cuts, broken bones. Is the risk high / medium / low?		

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk
	the departmental written Arrangement for MH is followed
	the supervisor has attended a MH risk assessment course
	all tasks are within reasonable limits, persons physically unsuited to the MH task are prohibited from such activities
	all persons performing MH tasks are adequately trained
	equipment components will be assembled on site
	any MH task outside the competence of staff will be done by contractors
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

FIELDWORK **4** May 2010

SUBSTANCES	**Will participants work with substances**	**NO**	**If 'No' move to next hazard** **If 'Yes' use space below to identify and assess any risks**
e.g. plants, chemical, biohazard, waste	Examples of risk: ill health - poisoning, infection, illness, burns, cuts. Is the risk high / medium / low?		
CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**		

	the departmental written Arrangements for dealing with hazardous substances and waste are followed
	all participants are given information, training and protective equipment for hazardous substances they may encounter
	participants who have allergies have advised the leader of this and carry sufficient medication for their needs
	waste is disposed of in a responsible manner
	suitable containers are provided for hazardous waste
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

OTHER HAZARDS	**Have you identified any other hazards?**	**NO**	**If 'No' move to next section** **If 'Yes' use space below to identify and assess any risks**
i.e. any other hazards must be noted and assessed here.	Hazard: Risk: is the risk		
CONTROL MEASURES	**Give details of control measures in place to control the identified risks**		

Have you identified any risks that are not adequately controlled?	**NO**		**Move to Declaration**
	YES		**Use space below to identify the risk and what action was taken**

DECLARATION	The work will be reassessed whenever there is a significant change and at least annually. Those participating in the work have read the assessment.
	Select the appropriate statement:
X	I the undersigned have assessed the activity and associated risks and declare that there is no significant residual risk
X	I the undersigned have assessed the activity and associated risks and declare that the risk will be controlled by the method(s) listed above

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FIELDWORK 5 May 2010

References

Allenby, B. R. (1998). *Industrial Ecology: Policy Framework and Implementation*. Prentice Hall.

Amin, A., & Thrift, N. (1992). Neo-Marshallian nodes in global networks. *International Journal of Urban and Regional Research*, *16*, 571–578.

Antrop, M. (2001). *The language of landscape ecologists and planners A comparative content analysis of concepts used in landscape ecology*.

Ayres, R., & Simonis, U. (1994). *Industrial Metabolism: Restructuring for Sustainable Development*. United Nations University Press.

Barton, D. (2019). *Business Population Estimates for the UK and Regions: 2019 Statistical Release*. Department for Business, Energy & Industrial Strategy. https://www.gov.uk/government/statistics/business-population-estimates-2019/business-population-estimates-for-the-uk-and-regions-2019-statistical-release-html

Becattini, G. (2017). The Marshallian industrial district as a socio-economic notion. *Revue d'Economie Industrielle*, *157*(1), 13–32. https://doi.org/10.4000/rei.6507

Besussi, E. (2018). *Localism and Neighbourhood Planning* (J. Tomany & J. Ferm, Eds.; 1st Edition). Routledge.

Bosetti, N., Quarshie, N., & Whitehead, R. (2022). *Making Space: Accommodating London's industrial future Report of the Industrial Land Commission*.

Brandt, P., Ernst, A., Gralla, F., Luederitz, C., Lang, D. J., Newig, J., Reinert, F., Abson, D. J., & von Wehrden, H. (2013). A review of transdisciplinary research in sustainability science. *Ecological Economics*, *92*, 1–15. https://doi.org/10.1016/j.ecolecon.2013.04.008

Breschi, S., & Lissoni, F. (2001). Localised knowledge spillovers vs. innovative milieux: Knowledge "tacitness" reconsidered. In *Papers Reg. Sci* (Vol. 80).

Chandra, Y., & Shang, L. (2019). Inductive Coding. In Y. Chandra & L. Shang (Eds.), *Qualitative Research Using R: A Systematic Approach* (pp. 91–106). Springer Singapore. https://doi.org/10.1007/978-981-13-3170-1_8

Chertow, M. R. (2007). *" Uncovering " Industrial Symbiosis*. *11*(1).

Chizaryfard, A., Trucco, P., & Nuur, C. (2021). The transformation to a circular economy: framing an evolutionary view. *Journal of Evolutionary Economics*, *31*(2), 475–504. https://doi.org/10.1007/s00191-020-00709-0

Christina Dunbar-Hester. (2014). Radical Inclusion? Locating Accountability in Technical DIY. In M. Ratto & M. Boler (Eds.), *DIY Citizenship: Critical Making and Social Media* (pp. 75–88). MIT Press.

Cities of Making. (2020). *Case Study Report: The Maker-Mile in East London*.

Clift, R., & Druckman, A. (2016). *Taking Stock of Industrial Ecology*. Springer.

COM: Cities of Making, Dellot, B., Warden, J., & Vickery Hill, A. (2018). *Cities Report Cities of Making*. www.citiesofmaking.com

Commission, E. (2015). Closing the loop - An EU Action Plan for the Circular Economy. In *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions*. https://doi.org/10.1016/0022-4073(67)90036-2

Commission, E. (2020). *Circular Economy Action Plan: For a cleaner and more competitive Europe*. https://doi.org/10.2779/05068

Confente, I., Scarpi, D., & Russo, I. (2020). Marketing a new generation of bio-plastics products for a circular economy: The role of green self-identity, self-congruity, and perceived value. *Journal of Business Research*, *112*, 431–439. https://doi.org/10.1016/j.jbusres.2019.10.030

Corbin, J., & Strauss, A. (1990). Grounded Theory Research: Procedures, Canons, and Evaluative Criteria. In *Qualitative Sociology* (Vol. 13).

Curtis, F. (2003). Eco-localism and sustainability. *Ecological Economics*, *46*(1), 83–102. https://doi.org/10.1016/S0921-8009(03)00102-2

da Silva Oliveira, E. H. (2015). Place branding in strategic spatial planning: A content analysis of development plans, strategic initiatives and policy documents for Portugal 2014-2020. *Journal of Place Management and Development*, *8*(1), 23–50. https://doi.org/10.1108/JPMD-12-2014-0031

D'Amato, D., Droste, N., Allen, B., Kettunen, M., Lähtinen, K., Korhonen, J., Leskinen, P., Matthies, B. D., & Toppinen, A. (2017). Green, circular, bio economy: A comparative analysis of sustainability avenues. *Journal of Cleaner Production*, *168*, 716–734. https://doi.org/10.1016/j.jclepro.2017.09.053

Daniel, R., Fleischmann, K., & Welters, R. (2017). Professional development in the creative industries: Methods and insights from regional practitioners. *Australian Journal of Career Development*, *26*(3), 113–123. https://doi.org/10.1177/1038416217720780

Davis, H. (2019). *Working Cities: Architecture, Place and Production*. Taylor and Francis.

Davis, J., & Renski, H. (2020). Do Industrial Preservation Policies Protect and Promote Urban Industrial Activity?: Examining the Impact of New York City's Industrial Business Zone Program. *Journal of the American Planning Association*, *86*(4), 431–442. https://doi.org/10.1080/01944363.2020.1753563

de Angelis, R. (2020). Circular economy: laying the foundations for conceptual and theoretical development in management studies. *Management Decision*, *59*(6), 1209–1227. https://doi.org/10.1108/MD-05-2019-0587

de Jesus, A., Lammi, M., Domenech, T., Vanhuyse, F., & Mendonça, S. (2021). Eco-innovation diversity in a circular economy: Towards circular innovation studies. *Sustainability (Switzerland)*, *13*(19). https://doi.org/10.3390/su131910974

Desrochers, P. (2000). *Market Processes and the Closing of "Industrial Loops" A Historical Reappraisal* (Vol. 4, Issue 1).

Desrochers, P., & Leppälä, S. (2011). Opening up the "Jacobs spillovers" black box: Local diversity, creativity and the processes underlying new combinations. *Journal of Economic Geography*, *11*(5), 843–863. https://doi.org/10.1093/jeg/lbq028

Deutz, P., & Gibbs, D. (2008). Industrial ecology and regional development: Eco-industrial development as cluster policy. *Regional Studies*, *42*(10), 1313–1328. https://doi.org/10.1080/00343400802195121

Dhanani, A., Froy, F., & Davis, H. (2017). Can the Organisation of Commercial Space in Cities Encourage Creativity and "Self- Generating" Economic Growth? *11th International Space Syntax Symposium, SSS 2017*, 15. http://discovery.ucl.ac.uk/1563605/1/SSS11 article.pdf

Diaz Lopez, F. J., Bastein, T., & Tukker, A. (2019). Business Model Innovation for Resource-efficiency, Circularity and Cleaner Production: What 143 Cases Tell Us. *Ecological Economics*, *155*, 20–35. https://doi.org/10.1016/j.ecolecon.2018.03.009

Dovey, K., & Woodcock, I. (2010). *the Character of Urban Intensification*. 2002–2010.

Duranton, G., & Puga, D. (2000). Diversity and specialisation in cities: Why, where and when does it matter? *Urban Studies*, *37*(3), 533–555. https://doi.org/10.1080/0042098002104

Duranton, G., & Puga, D. (2004). Micro-foundations of urban agglomeration economies. *Handbook of Regional and Urban Economics*, *4*, 2063–2117.

Ellen MacArthur Foundation. (2013). Towards the Economy. *Russian Economic Developments (in Russian)*, *8*, 26–29.

EMF, E. M. F. (2015). *Delivering the Circular Economy: A Toolkit for Policymakers*. https://emf.thirdlight.com/link/kewgovk138d6-k5kszv/@/preview/1?o

Fang, L. (2019). Manufacturing Clusters and Firm Innovation. *Economic Development Quarterly*, *33*(1), 6–18. https://doi.org/10.1177/0891242418800770

Ferm, J. (2016). Preventing the displacement of small businesses through commercial gentrification: are affordable workspace policies the solution? *Planning Practice and Research*, *31*(4), 402–419. https://doi.org/10.1080/02697459.2016.1198546

Ferm, J., Clifford, B., Canelas, P., & Livingstone, N. (2021). Emerging problematics of deregulating the urban: The case of permitted development in England. *Urban Studies*, *58*(10), 2040–2058. https://doi.org/10.1177/0042098020936966

Ferm, J., & Jones, E. (2016). Mixed-use 'regeneration' of employment land in the post-industrial city: challenges and realities in London. *European Planning Studies*, *24*(10), 1913–1936. https://doi.org/10.1080/09654313.2016.1209465

Ferm, J., Panayotopoulos-tsiros, D., & Griffiths, S. (2021). Planning urban manufacturing, industrial building typologies, and built environments: Lessons from inner London. *Urban Planning*, *6*(3), 350–367. https://doi.org/10.17645/up.v6i3.4357

Fleischmann, K., Hielscher, S., & Merritt, T. (2016). Making things in Fab Labs: a case study on sustainability and co-creation. *Digital Creativity*, *27*(2), 113–131. https://doi.org/10.1080/14626268.2015.1135809

Fleischmann, K., Welters, R., & Daniel, R. (2017). CREATIVE INDUSTRIES AND REGIONAL ECONOMIC DEVELOPMENT: CAN A CREATIVE INDUSTRIES HUB SPARK NEW WAYS TO GROW A REGIONAL ECONOMY? In *Australasian Journal of Regional Studies* (Vol. 23, Issue 2). https://bmee.org.au/the-cluster/

Francesca Froy. (2021). *"A marvellous order": how spatial and economic configurations interact to produce agglomeration economies in Greater Manchester* [Thesis for the Degree of PhD]. University College London.

Frishammar, J., & Parida, V. (2019). Circular business model transformation: A roadmap for incumbent firms. *California Management Review*, *61*(2), 5–29. https://doi.org/10.1177/0008125618811926

García-Quevedo, J., Jové-Llopis, E., & Martínez-Ros, E. (2020). Barriers to the circular economy in European small and medium-sized firms. *Business Strategy and the Environment*, *29*(6), 2450–2464. https://doi.org/10.1002/bse.2513

Geissdoerfer, M., Savaget, P., Bocken, N. M. P., & Hultink, E. J. (2017). The Circular Economy – A new sustainability paradigm? In *Journal of Cleaner Production* (Vol. 143, pp. 757–768). Elsevier Ltd. https://doi.org/10.1016/j.jclepro.2016.12.048

Ghisellini, P., Cialani, C., & Ulgiati, S. (2016). A review on circular economy: The expected transition to a balanced interplay of environmental and economic systems. *Journal of Cleaner Production*, *114*, 11–32. https://doi.org/10.1016/j.jclepro.2015.09.007

GLA, G. L. A. (2017). *Industrial Intensification Primer*. https://www.london.gov.uk/sites/default/files/industrialintensificationprimer.pdf

Gordon, I. R., & McCann, P. (2000). Industrial clusters: Complexes, agglomeration and/or social networks? *Urban Studies*, *37*(3), 513–532. https://doi.org/10.1080/0042098002096

Goyal, S., Esposito, M., & Kapoor, A. (2018). Circular economy business models in developing economies: Lessons from India on reduce, recycle, and reuse paradigms. *Thunderbird International Business Review*, *60*(5), 729–740. https://doi.org/10.1002/tie.21883

Gregson, N., Crang, M., Fuller, S., & Holmes, H. (2015). Interrogating the circular economy: the moral economy of resource recovery in the EU. *Economy and Society*, *44*(2), 218–243. https://doi.org/10.1080/03085147.2015.1013353

Hausleitner, B., Vickery Hill, A., Domenech, T., & Muñoz Sanz, V. (2022). Urban Manufacturing for Circularity: Three Pathways to Move from Linear to Circular Cities. In A. van T. Libera Amenta, Michelangelo Russo (Ed.), *Regenerative Territories: Dimensions of Circularity for Healthy Metabolisms* (GeoJournal, pp. 89–103). Springer.

Healy, P., Vigar, G., Hull, A., & Davoudi, S. (2000). *Planning, Governance and Spatial Strategy in Britain: An Institutionalist Analysis*. Macmillian.

Heltzel, D., Heinemann, B., Seipold, D., Bocconi, S., & Heltzel -dh, D. (2022). *D5.4 REFLOW Pilot Applications*. https://zenodo.org/record/6564708/files/Deliverable%205.4_REFLOW%20Pilot%20Applications_v1.0.pdf

Holsti, O. R. (1969). *Content Analysis for the Social Sciences and Humanities*. Addison-Wesley.

Hopkinson, P., Zils, M., Hawkins, P., & Roper, S. (2018). Managing a Complex Global Circular Economy Business Model: Opportunities and Challenges. *California Management Review*, *60*(3), 71–94. https://doi.org/10.1177/0008125618764692

Horvath, B., Khazami, N., Ymeri, P., & Fogarassy, C. (2019). Investigating the current business model innovation trends in the biotechnology industry. *Journal of Business Economics and Management*, *20*(1), 63–85. https://doi.org/10.3846/jbem.2019.6880

Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, *15*(9), 1277–1288. https://doi.org/10.1177/1049732305276687

Kaza, S., Yao, L., Bhada-Tata, P., & van Woerden, F. (2018). *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050*. https://openknowledge.worldbank.org/handle/10986/30317

Kiefer, C. P., González, P. D. R., & Carrillo-hermosilla, J. (2019). Drivers and barriers of eco-innovation types for sustainable transitions: A quantitative perspective. *Business Strategy and the Environment*, *28*(1), 155-172. https://doi.org/10.1002/bse.2246

Kirchherr, J., Reike, D., & Hekkert, M. (2017a). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling*, *127*(April), 221–232. https://doi.org/10.1016/j.resconrec.2017.09.005

Kirchherr, J., Reike, D., & Hekkert, M. (2017b). Conceptualizing the circular economy: An analysis of 114 definitions. In *Resources, Conservation and Recycling* (Vol. 127, pp. 221–232). Elsevier B.V. https://doi.org/10.1016/j.resconrec.2017.09.005

Kitchin, R., Lauriault, T. P., & McArdle, G. (2015). Knowing and governing cities through urban indicators, city benchmarking and real-time dashboards. *Regional Studies, Regional Science*, *2*(1), 6–28. https://doi.org/10.1080/21681376.2014.983149

Koch, D., Marcus, L., Steen, J., Chiaradia, A., Hillier, B., Schwander, C., & Wedderburn, M. (2009). *Spatial Centrality, Economic Vitality/Viability Compositional and Spatial Effects in Greater London Proceedings of the 7th International Space Syntax Symposium Edited by*.

Kohtala, C. (2015). Addressing sustainability in research on distributed production: An integrated literature review. *Journal of Cleaner Production*, *106*, 654–668. https://doi.org/10.1016/j.jclepro.2014.09.039

Kumar, V., Sezersan, I., Garza-Reyes, J. A., Gonzalez, E. D. R. S., & AL-Shboul, M. A. (2019). Circular economy in the manufacturing sector: benefits, opportunities and barriers. *Management Decision*, *57*(4), 1067–1086. https://doi.org/10.1108/MD-09-2018-1070

Lees, L. (2008). Gentrification and social mixing: Towards an inclusive urban renaissance? *Urban Studies*, *45*(12), 2449–2470. https://doi.org/10.1177/0042098008097099

Lei, L. H. ; J. T. M. (2017). Research on maker-space policy system of Shanghai. *Shanghai Economic Research*, *37*(3), 34–41.

Lerner, M., & Rottman, J. (2021). The burden of climate action: How environmental responsibility is impacted by socioeconomic status. *Journal of Environmental Psychology*, *77*. https://doi.org/10.1016/j.jenvp.2021.101674

Lewandowski, M. (2016). Designing the business models for circular economy-towards the conceptual framework. In *Sustainability (Switzerland)* (Vol. 8, Issue 1, pp. 1–28). MDPI. https://doi.org/10.3390/su8010043

Lieder, M., & Rashid, A. (2016). Towards circular economy implementation: A comprehensive review in context of manufacturing industry. *Journal of Cleaner Production*, *115*, 36–51. https://doi.org/10.1016/j.jclepro.2015.12.042

LWARB, L. W. and R. B. (2017a). *London's Circular Economy Route Map*. https://relondon.gov.uk/resources/londons-circular-economy-route-map

LWARB, L. W. and R. B. (2017b). *London's Circular Economy route map*. https://www.lwarb.gov.uk/wp-content/uploads/2015/04/LWARB-London's-CE-route-map_16.6.17a_singlepages_sml.pdf

Lyons, M. (1996). Gentrification, socioeconomic change, and the geography of displacement. *Journal of Urban Affairs*, *18*(1), 39–62. https://doi.org/10.1111/j.1467-9906.1996.tb00365.x

Macfarlane, R., & Cook, M. (2002). *Achieving Community Benefits Through Contracts: Law, Policy and Practice*. The Policy Press and Joseph Rowntree Foundation.

Madanipour, A., Hull, A., & Healey, P. (2001). *The Governance of Place: Space and Planning Processes* (1st Edition). Routledge.

Manley, D., van Ham, M., & Doherty, J. (2011). Social mixing as a cure for negative neighbourhood effects: Evidence-based policy or urban myth? *Mixed Communities: Gentrification by Stealth?*, *2011*, 151–167. https://doi.org/10.1332/policypress/9781847424938.003.0011

Marin, J., & de Meulder, B. (2018). Interpreting circularity. Circular city representations concealing transition drivers. *Sustainability (Switzerland)*, *10*(5). https://doi.org/10.3390/su10051310

Marshall, A. (1920). *Principles of Economics*. Macmillan.

Mayor of London. (2019). *Industrial Intensification and Co-Location Study: Design and Delivery Testing*. https://www.london.gov.uk/sites/default/files/136_industrial_intensification_and_co-location_study_-_design_and_delivery_testing_reduced_size.pdf

Merli, R., Preziosi, M., & Acampora, A. (2018). How do scholars approach the circular economy? A systematic literature review. In *Journal of Cleaner Production* (Vol. 178, pp. 703–722). Elsevier Ltd. https://doi.org/10.1016/j.jclepro.2017.12.112

Metta, J., & Bachus, K. (2020). *Mapping the circular maker movement: from a literature review to a circular maker passport D2.1 Mapping the maker community ecosystem and the urban metabolism processes*. http://www.pop-machina.eu

Mishra, S., Jain, S., & Malhotra, G. (2020). The anatomy of circular economy transition in the fashion industry. *Social Responsibility Journal*, *17*(4), 524–542. https://doi.org/10.1108/SRJ-06-2019-0216

Moreau, V., Sahakian, M., van Griethuysen, P., & Vuille, F. (2017). Coming Full Circle: Why Social and Institutional Dimensions Matter for the Circular Economy. *Journal of Industrial Ecology*, *21*(3), 497–506. https://doi.org/10.1111/jiec.12598

Niaros, V., Kostakis, V., & Drechsler, W. (2017). Making (in) the smart city: The emergence of makerspaces. *Telematics and Informatics*, *34*(7), 1143–1152. https://doi.org/10.1016/j.tele.2017.05.004

ONS, O. of N. S. (2022, May). *Postcode Directory*. Geoportal - Statistics.Gov.

Özogul, S. (2017). THE SPATIAL POLITICS OF DIVERSITY DISCOURSES: REGENERATING CROYDON METROPOLITAN CENTRE ARTICLE HISTORY. *UPLanD-Journal of Urban Planning*, *2*(1), 57–65. http://upland.it

Paton, K. (2012). Making working-class neighbourhoods posh? exploring the effects of gentrification strategies on working-class communities. *Classed Intersections: Spaces, Selves, Knowledges*, *2010*, 137–158.

Patti, D., & Polyak, L. (2015). From practice to policy: Frameworks for temporary use. *Urban Research and Practice*, *8*(1), 122–134. https://doi.org/10.1080/17535069.2015.1011422

Peck, D., Ouillon, S., & Dibb, S. (2017). Understanding the societal, entrepreneurship and economic aspects of developing a circular economy in cities: a case study of coventry in the UK. In C. A. Bakker & R. Mugge (Eds.), *Product Lifetimes and The Environment*. IOS Press. https://doi.org/10.3233/978-1-61499-820-4-329

Petit-Boix, A., & Leipold, S. (2018). Circular economy in cities: Reviewing how environmental research aligns with local practices. In *Journal of Cleaner Production* (Vol. 195, pp. 1270–1281). Elsevier Ltd. https://doi.org/10.1016/j.jclepro.2018.05.281

PopMachina. (2020). *An Integrated Urban Development Framework*. http://www.pop-machina.eu

Prendeville, S., Cherim, E., & Bocken, N. (2018). Circular Cities: Mapping Six Cities in Transition. *Environmental Innovation and Societal Transitions*, *26*, 171–194. https://doi.org/10.1016/j.eist.2017.03.002

Prieto-Sandoval, V., Jaca, C., & Ormazabal, M. (2018). Towards a consensus on the circular economy. *Journal of Cleaner Production*, *179*, 605–615. https://doi.org/10.1016/j.jclepro.2017.12.224

Raco, M. (2018). Private Consultants, Planning Reform and the Marketisation of Local Government Finance. In J. Ferm & J. Tomaney (Eds.), *Planning Practice: Critical Perspectives from the UK*. Routledge.

Razminiene, K. (2019). Circular economy in clusters' performance evaluation. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, *14*(3), 537–559. https://doi.org/10.24136/EQ.2019.026

Reflow, R. P. E. (2019). *White Paper: Co-Creating Circular & Regenerative Flows in Cities*. https://reflowproject.eu/wp-content/uploads/2020/06/Reflow_Whitepaper.pdf

ReLondon. (2021). *Circular Cities in Action*. https://relondon.gov.uk/resources/report-circular-cities-in-action-driving-progress-through-policy

Richardson, T., & Jenson, O. B. (2003). Linking Discourse and Space: Towards a Cultural Sociology of Space in Analysing Spatial Policy Discourses. *Urban Studies*, *40*(1), 7–22.

Rucks-Ahidiana, Z., & Bierbaum, A. H. (2015). *Qualitative spaces: Integrating spatial analysis for a mixed methods approach*.

Rydin, Y. (2010). *Governing for Sustainable Urban Development*. Routledge.

Rydin, Yvonne. (2011). *The purpose of planning : Creating sustainable towns and cities.* Policy Press.

Sahakian, M. (2016). The Social and Solidarity Economy: Why is it Relevant to Industrial Ecology. In R. Clift & A. Druckman (Eds.), *Taking Stock of Industrial Ecology* (1st edition, pp. 205–228). Springer.

Scarpellini, S., Marín-Vinuesa, L. M., Aranda-Usón, A., & Portillo-Tarragona, P. (2020). Dynamic capabilities and environmental accounting for the circular economy in businesses. *Sustainability Accounting, Management and Policy Journal*, *11*(7), 1129–1158. https://doi.org/10.1108/SAMPJ-04-2019-0150

Scarpellini, S., Valero-Gil, J., Moneva, J. M., & Andreaus, M. (2020). Environmental management capabilities for a "circular eco-innovation." *Business Strategy and the Environment*, *29*(5), 1850–1864. https://doi.org/10.1002/bse.2472

Schilkowski, C., Shukla, M., & Choudhary, S. (2020). Quantifying the circularity of regional industrial waste across multi-channel enterprises. *Annals of Operations Research*, *290*(1–2), 385–408. https://doi.org/10.1007/s10479-019-03168-4

Stahl, C., Cimorelli, A., Mazzarella, C., & Jenkins, B. (2011). Toward sustainability: A case study demonstrating transdisciplinary learning through the selection and use of indicators in a decision-making process. *Integrated Environmental Assessment and Management*, *7*(3), 483–498. https://doi.org/10.1002/ieam.181

Storper, M., & Venables, A. J. (2004). Buzz: Face-to-face contact and the urban economy. *Journal of Economic Geography*, *4*(4), 351–370. https://doi.org/10.1093/jnlecg/lbh027

Suchek, N., Fernandes, C. I., Kraus, S., Filser, M., & Sjögrén, H. (2021). Innovation and the circular economy: A systematic literature review. *Business Strategy and the Environment*, *30*(8), 3686–3702. https://doi.org/10.1002/bse.2834

Tewdwr-Jones, M. (2012). *Spatial Planning and Governance: Understanding UK Planning*. Bloomsbury Publishing.

Thuvander, L., Latino, F., Zangelidis, C., Adelfio, M., Naserentin, V., & Logg, A. (2020). Towards spatial integration of qualitative data for urban transformation - Challenges with automated geovisualization of perception of urban places. *IOP Conference Series: Earth and Environmental Science*, *588*(5). https://doi.org/10.1088/1755-1315/588/5/052041

Todeschini, B. V., Cortimiglia, M. N., Callegaro-de-Menezes, D., & Ghezzi, A. (2017). Innovative and sustainable business models in the fashion industry: Entrepreneurial drivers,

opportunities, and challenges. *Business Horizons*, *60*(6), 759–770. https://doi.org/10.1016/j.bushor.2017.07.003

Tsui, T., Peck, D., Geldermans, B., & van Timmeren, A. (2021). The role of urban manufacturing for a circular economy in cities. *Sustainability (Switzerland)*, *13*(1), 1–22. https://doi.org/10.3390/su13010023

Turcu, C., & Gillie, H. (2020). Governing the Circular Economy in the City: Local Planning Practice in London. *Planning Practice and Research*, *35*(1), 62–85. https://doi.org/10.1080/02697459.2019.1703335

UN, U. N. (2015). *Transforming our World: The 2030 Agenda for Sustainable Development*.

Unterfrauner, E., Shao, J., Hofer, M., & Fabian, C. M. (2019). The environmental value and impact of the Maker movement—Insights from a cross-case analysis of European maker initiatives. *Business Strategy and the Environment*, *28*(8), 1518–1533. https://doi.org/10.1002/bse.2328

van den Berghe, K., & Vos, M. (2019). Circular area design or circular area functioning? A discourse-institutional analysis of circular area developments in Amsterdam and Utrecht, The Netherlands. *Sustainability (Switzerland)*, *11*(18), 1–20. https://doi.org/10.3390/su11184875

van der Leer, J., van Timmeren, A., & Wandl, A. (2018). Social-Ecological-Technical systems in urban planning for a circular economy: an opportunity for horizontal integration. *Architectural Science Review*, *61*(5), 298–304. https://doi.org/10.1080/00038628.2018.1505598

Voight, C., Unterfrauner, E., & Stelzer, R. (2017). Diversity in FabLabs: Culture, Role Models and the Gendering of Making. In & D. M. (Eds.) In I. Kompatsiaris, J. Cave, A. Satsiou, G. Carle, A. Passani, E. Kontopoulos, S. Diplaris (Ed.), *Internet Science* (pp. 52–68). Springer.

Wandl, A., & Hausleitner, B. (2021). Investigating functional mix in Europe's dispersed urban areas. *Environment and Planning B: Urban Analytics and City Science*, *48*(9), 2862–2879. https://doi.org/10.1177/2399808320987849

Wang, X. (2020). Research on Sichuan Province's Innovation and Entrepreneurship Policy Text Based on Content Analysis. *Open Journal of Social Sciences*, *8*(5).

Williams, J. (2019a). Circular cities. *Urban Studies*, *56*(13), 2746–2762. https://doi.org/10.1177/0042098018806133

Williams, J. (2019b). Circular cities: Challenges to Implementing Looping Actions. *Sustainability (Switzerland)*, *11*(13), 875. https://doi.org/10.1016/j.jclepro.2018.01.089%0Ahttps://doi.org/10.1016/j.jclepro.2018.09.120%0Ahttps://doi.org/10.1016/j.eist.2017.03.002%0Ahttps://doi.org/10.1080/09654313.2019.1642854

Williams, J. (2020). The role of spatial planning in transitioning to circular urban development. *Urban Geography*, *41*(6), 915–919. https://doi.org/10.1080/02723638.2020.1796042

Williams, J. (2021a). *Circular Cities: A Revolution in Urban Sustainability* (1st edition). Routledge.

Williams, J. (2021b). Circular cities: What are the benefits of circular development? *Sustainability (Switzerland)*, *13*(10). https://doi.org/10.3390/su13105725

Wolman, A. (1965). The Metabolism of Cities. *Scientific American*, *213*(3), 179–190.

Wood, S., & Dovey, K. (2015). Creative Multiplicities: Urban Morphologies of Creative Clustering. In *Journal of Urban Design* (Vol. 20, Issue 1, pp. 52–74). Taylor & Francis. https://doi.org/10.1080/13574809.2014.972346

Wright, T. (2015). New development: Can 'social value' requirements on public authorities be used in procurement to increase women's participation in the UK construction industry? *Public Money and Management*, *35*(2), 135–140. https://doi.org/10.1080/09540962.2015.1007708

Zaleckis, K., Grazuleviciute Vileniske, I., Vitkuviene, J., Tranaviciutė, B., Dogan, H. A., Sinkiene, J., & Grunskis, T. (2019). Integrating Content Analysis Into Urban Research: Compatibility With Sociotope Method and Multimodal Graph. *SAGE Open*, *9*(1). https://doi.org/10.1177/2158244019840115

Zucchella, A., & Previtali, P. (2019). Circular business models for sustainable development: A "waste is food" restorative ecosystem. *Business Strategy and the Environment*, *28*(2), 274–285. https://doi.org/10.1002/bse.2216

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GRADEMARK REPORT

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