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Developing a circular economy at the regional scale: a case study of stakeholders in North Humberside, England and Styria, Austria

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Abstract

Resource security, environmental and other economic benefits which may stem from a circular economy are attracting significant interest from policymakers and other stakeholders at the regional scale. Previous research in the related area of industrial symbiosis suggests that the region is likely to be an important scale for fostering collaborative resource efficiency initiatives. Public agencies are promoting industrial symbiosis activity as part of circular economy plans with a view to capture economic benefits for their locality. Existing research into this has taken a partial approach, focusing on the regional scale with limited attention to either larger scales of governance or the scale of operation of companies. There has been limited attention to considering how potentially conflicting interests of place-based authorities and firms might impact on the ability of a place to attract and retain benefits from circular economy activity. The aim of this thesis is to analyse the spatial distribution of potential benefits from a circular economy by assessing the potential for a given place to benefit. This thesis critically analyses the interplay between firms and local agencies, in order to understand the influences on transitioning to a circular economy within a particular locality. This research explores how the expectations of companies compare to visions of public agencies in terms of circular economy development, with a particular focus on the local region. I explore findings of empirical research focusing on both North Humberside (England) and Styria (Austria) on developing a circular economy in medium sized industrial regions. Semi-structured interviews were undertaken with policymakers across various scales and businesses located in the region of North Humberside and Styria to explore CE initiatives from multiple stakeholder perspectives. The interviews were complemented by other methods including discourse analysis, observations and a survey, primarily focussing on organisations located in North Humberside. Both regions appear to be on a transition to cleaner forms of production, as illustrated by the 'Energy Estuary' in North Humberside and the 'Green Tech Valley' in Styria. Findings further suggest there are divergent views on developing circular economy activities between local stakeholders. Local policy sees the circular economy as a way to improve the economic and environmental performance of the region. Conversely, business seek to foster circular economy initiatives between value chain partners, who tend to be globally distributed. This is likely to raise operational challenges for developing regional level circular economy collaborations.

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Abbreviations

CDA-Critical Discourse Analysis

CE-Circular Economy

CR-Critical Realism

DEFRA-Department for Environment, Food & Rural Affairs

EU-European Union

HCC-Hull City Council

HWA-Humber Waste Alliance

IE-Industrial Ecology

IS-Industrial Symbiosis

KPI-Key Performance Indicator

LEP-Local Enterprise Partnership

MNC-Multi National Company

NH-North Humberside

NDA-Non-Disclosure Agreement

PPP-Public Private Partnership

SME-Small & Medium Sized Enterprise

TNC-Transnational Company

TQM-Total Quality Management

USP-Unique Selling Point

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Chapter 1 Introduction

Numerous initiatives have been taken by policymakers and entrepreneurs in order to minimise the impact of the growing economic system on the planet. Moreover, the sustainable development goals (United Nations, n.d.,) have been developed to raise both awareness and action in relation to building a more sustainable future worldwide. The circular economy (CE) has gained attention in international policy, business and academic contexts and is often postulated as a tool to help reach sustainability targets, particularly at the EU level (Gregson et al., 2015; Hartley et al., 2020; Calisto Friant et al., 2021). There is increasing recognition of the potential benefits for economies and societies of moving away from a 'make-use-dispose' model and pursuing a CE model, which can assist with maximising resource efficiency and achieving environmental targets (European Commission, 2015). In a CE resources are kept in use for as long as possible, maximum value is extracted from them whilst in use, and materials are recovered at the end of product life (Geissdoerfer et al., 2017). The CE aims to keep products, components and materials at their highest utility and value overtime (Ellen Mac Arthur Foundation, 2015). Establishing a CE requires a systemic and transformative approach to production and consumption that designs out waste and keeps materials and products in use for as long as possible (World Economic Forum, 2015). This thesis will focus on the potential for place-based benefits of the CE in the wider context of global supply chains. It will also critically explore the challenges, which may hamper firms in transitioning to a CE within a particular geographic context.

There are numerous definitions of a CE (Kirchherr et al., 2017), suggesting there is still ambiguity and a lack of academic consensus on the definition. However, there is agreement that at its core a CE strives to reduce emissions, increase longevity of products and close material loops of production, in order to minimise waste (Ellen Mac Arthur Foundation, 2015; Geissdoerfer et al., 2017; Kirchherr et al., 2017; Korhonen et al., 2018). The concept of a CE has rapidly gained popularity, evolving into a broad range of ideas which have taken prominence in policy and business discourses (Gregson et al., 2015; Walker et al., 2021). Notably there are also more radical visions of CE as playing a role in an economy where growth is not the focus (Hobson & Lynch, 2016). In this thesis I support the definition of Geissdoerfer et al. (2017: 757) of the CE as a 'regenerative system in which resource input and waste, emission, and energy leakage are minimised by slowing, closing, and narrowing material and energy loops.' This definition

sums up the environmental aims of a CE and outlines the essential and widely agreed strategies of a CE without making assumptions on the potential costs and benefits, or their social/geographic distribution and social implications thereof. These matters require further analysis, to which this research contributes.

Progress towards a CE involves action of multiple stakeholders, including the public, to tackle issues relating to production and consumption (Ghisellini et al., 2016). Furthermore, coordination and cross-sectoral collaboration is required to achieve benefits beyond the scope of individual organisations (Deutz, 2009; Velenturf, 2016). However, given the differing priorities of companies and regions, there is likely to be a number of challenges as diverse stakeholders seek to transition to a CE (Webster, 2021). Local authorities are interested in building local competencies in their administrative region and improving economic performance through creating local employment opportunities and improving the welfare of local citizens (Malecki, 2018). Conversely business seek to work with supply chain partners to execute their overall strategy who tend to be globally distributed, which neglects the potential for regional level collaborations with local organisations, these different stakeholders engaged in CE initiatives may have different motives for participating (Webster, 2021). Cooperation across the value chain, for example, requires consideration of the priorities of product designers, manufacturers, users, recovery/exchange and disposal companies (Lozano et al., 2016; Geissdoerfer et al., 2017; Herczeg et al., 2018). Nonetheless, common motivations for business to pursue CE initiatives focus on new business opportunities, improved financial return and efficiency savings (Brown et al., 2019). There appears to be a common industry expectation of economic advantages from CE practices, which will be shared with value chain partners (Noya et al., 2017; Whalen, 2019; van Keulen & Kirchherr, 2020). The relationship between the companies and the places where they operate, though, is rarely considered in this context. Taking a 'place-based' approach to developing a CE, by focusing efforts based around a particular location, has been a separate academic discussion with insufficient attention given to companies and their supply chain relationships (Goldstein & Newell, 2019). Furthermore, a place-based approach to a CE introduces additional stakeholders, which involves not just relevant industry bodies, but also those representing the place itself, including local government and other public agencies (Costa & Ferrão, 2010; Fischer & Pascucci, 2017; Vanhamäki et al., 2020). These bodies can bring the additional motivation of seeking economic benefits for the

place itself (Deutz & Gibbs, 2008; Kębłowski et al., 2020), in turn improving regional development opportunities locally.

Policy support for the CE includes the European Commission adopting its new CE Action Plan establishing CE thinking as a central strategy for the implementation of the European Green Deal in March 2020 (European Commission, 2020). The UK is also developing their own CE Package, building on the European policies (DEFRA, 2020). At the national level in the UK the Industrial Strategy (HM Government, 2018), the Resource and Waste Strategy (DEFRA and Environment Agency, 2018) and the Decarbonisation strategy (Department for Business Energy and Industrial Strategy, 2021) all highlight the importance of the CE for the UK to meet its targets in relation to reducing carbon emissions and also to achieving a more sustainable and prosperous society for the years to come.

There has been a shift to a wider stakeholder approach to the company's role in society (e.g., Carroll & Shabana, 2010; Freeman et al., 2010), away from the traditional responsibility to increase profits for their shareholders (Friedman, 1970). Companies often assume there will be economic and environmental benefits to their value chain, as a result of pursuing CE initiatives (Noya et al., 2017; Whalen, 2019; van Keulen & Kirchherr, 2020). Conversely, from a policy perspective, reduction of environmental impacts is one central CE driver, alongside securing European-based production and employment as well as resource security (Lazarevic & Valve, 2017). Furthermore, expectations, interpretations and responsibilities of partners may differ not only between actor groups but also related to the scale of analysis.

Much of the discussion of the CE has overlooked the spatial dimension (Schulz et al., 2019; Tapia et al., 2021) focusing instead on volume of material in resource recovery loops (e.g., Bocken et al., 2016) rather than geographic scale, or location. Small scale loop closing may draw on consumption slowing approaches to the CE such as repair which could create widely distributed demand for circular services (Stahel & Clift, 2016; Hobson, 2020). However, attention to small-scale (i.e., local to regional) CE development has focused on place based initiatives, (e.g., Prendeville et al., 2018; Campbell-Johnston et al., 2019) or regions (Vanhamäki et al., 2020). Small scales of loop closing benefit from local contextual benefits, such as accessibility and connectivity between proximally located regional stakeholders (Tapia et al., 2021), with the potential to implement new technology for resource recovery, albeit short rather than longer term agreements may be

easier to achieve (Vanhamäki et al., 2020). Notably, though, regional CE initiatives are not independent of their national and supranational scalar context.

The sub-national scale features in discussions of CE-policy implemention primarily in terms of the role of the city (e.g., Prendeville et al., 2018; Campbell-Johnston et al., 2019). Conversely, the role of regions and the relationship between place and the CE is under-examined. Local authorities have responsibilities for improving the prosperity of their administrative region, however regional governmental empowerment is limited in England compared to the European context (John, 2014). The characteristics of a place and its wider connections determine options, e.g., the type of businesses and resources present locally (Petit-Boix & Leipold, 2018); in addition, the level of public support, the interest and capacity of the local authority and other public and private sector organisations. Local authorities may be interested in CE initiatives for both economic and environmental reasons. For example, in the UK as elsewhere local authorities have a statutory responsibility for waste management (Deutz & Kildunne, 2021) alongside a potential ambition of environmental leadership and an interest to promote themselves as places for investment on that basis (Wurzel et al., 2019). However, a transition of places to a CE is likely to require co-operation and collaboration between local partner organisations, including business (Fischer & Pascucci, 2017). This may be particularly the case with respect to CE development involving closing loops between regional partner organisations (i.e., industrial symbiosis (IS)) (Chertow, 2000). Thus, the varying motivations and expectations that different stakeholders may have regarding the CE and the extent to which these align are highly significant.

This thesis explores specifically the role of places and their potential in capturing the benefits of a CE. Policymakers at the regional level are interested in improving the economic development of their region and creating local employment opportunities. Business are considered key agents in improving the overall performance of the region, although businesses located within a region are tied to various locations globally through their supply chain, and so may have limited interest in the overall economic and environmental performance of a particular region (Randles, 2007). Developing a regional scale CE implies harmonising the priorities of multi-scalar place-based and business interests, the implications of which have not been examined. This thesis considers the challenges for creating a regional-scale CE that might arise from the differing priorities and values of companies and public agencies in the context of a specific place. The

following section will provide an overview of the case study locations in England and Austria.

1.1   Overview of Case Study Locations

The regions studied are North Humberside (NH) in the north east of the UK and Styria in southern Austria. Notably, NH is made up of the city of Hull and the wider region of East Riding of Yorkshire. Similarly, Styria is made up of the city of Graz and a wider more rural region surrounding it. The borders of both locations are porous with many people and companies crossing from the city to the outer region on a regular basis for work. Moreover, the organisations studied are also located both within the city and also in the outer regions, hence why I have taken a regional focus in this study. These case study regions were selected based on their homogenous characteristics including similar factors being present in each region, including the following factors; population size, industrial structures and local environmental ambitions. While there are many similarities between the regions, both locations are located in unique places, which may also help elucidating contextual CE related issues in each location. Notably, due to feasibility constraints and resources, more of a focus was placed on the NH region, Styria was used to corroborate and validate findings in another case study location, with differing governmental and cultural issues present.

North Humberside

NH comprises of the city of Hull and the East Riding of Yorkshire unitary authorities (combining the roles of district/metropolitan and county councils). Hull has undergone long term industrial decline since the 1970's particularly in fishing and other maritime industries. This has contributed to the city's relatively high unemployment rate, which as a proportion of the economically active population was 7.3 per cent in Hull compared to 4.8 per cent nationally in 2016 (Jonas et al., 2017). The Humber estuary hosts the ports of Hull, Grimsby, Immingham and Goole and collectively handle 65 million tonnes of cargo annually and contribute 2.2 billion pound to the UK economy per annum and support 33,000 jobs (Associated British Ports, 2019). In the relatively deprived city of Hull, the manufacturing sector is one of the largest industries in the area with 54,000 people working in the wider engineering and manufacturing sectors (Invest Hull, n.d.-a).

The city boundaries of Hull tightly follow the built up area; many companies are located in the neighbouring and more prosperous East Riding of Yorkshire, hence there is a need to study the surrounding areas.

Recently, there have been ambitions to shift away from highly polluting industries to an economy built on low carbon and green jobs (Humber LEP, 2019b). Green jobs can be defined as occupations which reduce the environmental impact of a company, although there is still a lack of consensus on how green jobs are operationalised in a CE context (Moreno-Mondéjar et al., 2021). Economic development strategies based on carbon capture and storage and an economy built on hydrogen are seen as key areas central to regional development and also achieving emission targets locally (Humber LEP, 2019a). Additionally, the wider Humber region has been declared as a free-port location, which is an economic development technique used to attract commerce to the region in return for appealing business conditions (Humber Free Port, n.d.). The role of the CE in this transition is less clear, but there is interest from the both local councils in the region, the framing of which is analysed within this thesis.

Styria, Austria

Graz is the capital city and administrative centre of the wider province of Styria; it is Austria's second largest city with an estimated population of 250,000 in 2019 (Austria Info, 2019). The Styrian region is proximal to other lower cost locations, including Slovenia and Hungary, which results in regular cross-border economic activities. Styria's 'Green Tech Valley' has 180 organisations involved in the cluster and has been recognised by the European Union (EU) for the high-quality management and innovation of the cluster and also claims to be the global number 1 Green Tech Cluster (Green Tech Cluster, n.d.). Styria's economy relies on engineering and automotive companies who provide lucrative jobs, while local universities provide highly skilled workers for these companies. The city of Graz has won various European and international awards for its eco-city initiatives (Rohracher & Späth, 2014). These awards demonstrate the international attention both the city of Graz and the wider region of Styria have received for their various sustainability initiatives in recent years. Similar to Hull, many of the organisations in this study are located outside the administrative boundaries of the city of Graz, therefore I have included the wider region of Styria as the case study location.

1.2   Main Aim and Research Questions

This research focuses on policymakers' and non-small and medium sized enterprise (SME) manufacturing companies' perspectives on developing a CE in the regions being studied, in a multi-scalar context. The aim of this PhD is to examine the extent to which the economic and social benefits postulated for a CE can be captured in a specific location. CE initiatives for companies appear to offer increased competitiveness, which provides a point of interest from an economic development perspective, in addition to providing routes to environmental improvements. However, while increased competitiveness is favourable to companies, how that is to be accomplished, and the means by which companies seek to make environmental improvements, will reflect company considerations. The latter are likely to be influenced both by the location of the company and its business connections to locations. Thus, company logic in selecting CE or other environmental strategies may be quite distinct from that of public bodies in a given location. Furthermore, it is uncertain where any benefits of cost savings would be reinvested. This research will critically analyse the interplay between firms and local authorities (and other public bodies), in order to understand the influences on transitioning to a CE within a particular locality and the spatial distribution of benefits.

The following research questions have been developed to help steer the focus of the literature review, methods and the overall structure of this thesis. The research questions and the background reasoning for each question are as follows:

Research Question 1:

-How do policymakers envision the CE and what are company expectations for a CE?

This question seeks to explore how policymakers and companies currently perceive the potential of a CE. The questions will explore a range of policy visions for a CE, from the EU, national and regional level. This question explores how both policymakers and business see the CE evolving and the capabilities of a CE to reach environmental and economic targets. Policymaker visions and company expectations will be contrasted in order to shed light on potential discrepancies between these stakeholder perspectives on

developing CE activities. Finally, there is likely to be operational and feasibility challenges in relation to implementing these CE activities, hence the constraints of these visions and expectations will also be explored in order to understand the limitations of implementing these CE strategies.

Research Question 2:

-How do multi-level policy strategies and global value chains impact on the ability to develop a regional CE?

This question incorporates multiple levels of policy (EU, national, regional) and studies how these policy levels interact with one another when attempting to develop CE policies initiatives. More specifically, this question examines how these different policy levels may impact on the potential of developing regional CE activities. In contrast, companies and their value chain connections will be examined in order to understand how interconnected value chain systems are likely to affect the potential to foster regionally resilient CE activities between proximal stakeholders. Previous research has pointed at multi-scalar challenges in relation to developing regionally oriented policies, this question will explore these issues using a CE lens of analysis. From a commercial perspective, value chain research explores how companies set up operations in global locations in order to capitalise on local advantages. This research question will critically consider company value chain commitments and the associated implications on fostering regional CE activities.

Research Question 3:

-How do regional development initiatives and company embeddedness impact on the ability to develop regional CE opportunities?

Research question 3 has been devised to study the relationship between regional development and company embeddedness in local CE development. More precisely, this question has two pillars, firstly, from a policy perspective it will study how CE may play a role in regional development, which will be contrasted with the concept of company embeddedness in the region and the potential impact on CE performance locally. This question critically examines the concept of company embeddedness, to uncover linkages between company commitment to a place and the potential for fostering mutually aligned CE activities amongst stakeholders and the potential implications for regional development locally.

These above research questions will steer the flow of the literature review and the overall organisation of the findings and discussion sections of this thesis. The questions will be answered through interviews, discourse analysis, observations and a survey.

1.3   Structure of Thesis

The structure of this thesis is as follows. Firstly, an interdisciplinary literature review (chapter 2) will be conducted. The literature review initially draws on geographic discussions in relation to place and spatial approaches to regional development and resource efficiency activities. Next the origins of CE will be provided, particularly considering the importance of topics such as Industrial Ecology (IE) and IS to regional CE development. Then business approaches which are relevant to a CE will be studied, namely covering issues in relation to; value chain management, organisational structure and international business activities. Finally, the policy perspective in relation to regional CE development, covering issues such as clustering, place competitiveness and multi-scalar challenges between policymakers and business. Next the methods (chapter 3) will be addressed, firstly covering the methodology; interdisciplinary research and critical realism (CR). The research design and a detailed explanation of the case study locations will then be set out, followed by the data collection methods; interviews, discourse analysis, observations and a survey. The methods are concluded with ethical and personal considerations on the overall methodological process, followed by associated research limitations. The findings has three separate chapters and primarily draws on the empirical data from interviews and discourse analysis and is complemented with observations/survey insights. Chapter 4 addresses company expectations and policy visions for a CE and the associated limitations, Chapter 5 explores multi-scalar stakeholder considerations in relation to building a regional CE, considering both multi-level policy challenges and global value chain commitments. Chapter 6 investigates policy and business connections to place, from both a regional development and company embeddedness approach to developing a CE. The discussion (Chapter 7) will then follow

which is organised to address the three research questions. The discussion chapter also addresses the overall barriers in transitioning to a regional CE, and will compare; policymaker and business CE approaches, the case study locations CE perspectives and a discourse analysis versus interview findings comparison. The discussion chapter will also integrate research findings with previous academic work and consider how this thesis further develops existing literature. The final chapter is the conclusions (Chapter 8) which will summarise the research undertook in this thesis and highlight the main contribution to theory and sets out potential avenues for future research to investigate. Finally, I will offer practical recommendations on transitioning to a regional CE, which are tailored specifically to policymakers and companies.

Chapter 2 Literature Review

This thesis explores the nexus of both business and policy CE research with a focus on the regional level. This literature review will explore interdisciplinary research topics in order to gain broad perspectives on the contributing factors which impact on the transition to a CE within a particular geographic context. Literature themes were selected based on their relevance to regional development and business/policy approaches to CE related issues. The topics covered in this literature review will cover three main areas: (2.1) Geographic debates covering topics of economic development and the significance of places for companies in a globalisation context; (2.2) Origins of the CE; (2.3) Management debates from organisational structure to supply chain management; and (2.4) CE with a focus on the proposed economic benefits and need for local stakeholder collaborations.

2.1 Geographic perspectives on building a regionally place-based circular economy

The motivation and potential role of the regional stakeholders in developing a CE represents the main focus of this thesis. Regional development literature offers useful insights into the challenges facing local stakeholders when seeking to develop CE activities and the potential for a CE to improve local prosperity opportunities. The two main schools of thought associated with regional development include the political economy's perspective and the business perspective. On the political side, Storper (2013: 264) defines regional competitiveness as, 'The capability of a region to attract and keep firms with stable or increasing market shares in an activity, while maintaining stable or increasing standards of living.' In contrast, from the business perspective, Porter (2000a) is focusing on companies and links local commercial performance to regional and economic development potential. Both schools of thought emphasise the need for high

performing companies, but Storper pays more heed to the function of the place in contributing to the presence of such companies and is also considering the impact on the place. Moreover, regional development explores how geographic areas seek to improve various aspects thought to be conducive to economic development within the region's territorial boundaries (e.g., infrastructure, employment opportunities, community services, wealth and volumes of production) (McCall, 2010). Coe and Hess (2010, p.131) acknowledge the interplay between different scales of activity by describing regional development as 'the dynamic outcome of the complex interaction between region-specific networks and global production networks within the context of changing regional governance structures.' This effectively encompasses the core topics associated with regional development in a globalised world, where supply chains transcend countries, jurisdictions and governance levels, which is particularly relevant to building a regional CE.

2.1.1   Places and spatial approaches to regional development

This thesis is particularly focussed on the role of places in fostering regional CE activities and the potential for places to benefit from a local CE. Places are complex and there is much debate surrounding the precise definition of place, according to Cresswell (2014: 1) 'no-one quite knows what they are talking about when they are talking about place […] It is a word wrapped in common sense […] Place, then, is both simple (and that is part of its appeal) and complicated.' Stedman (2002) builds on this and describes place identity as how people interact with places and describe themselves as belonging to a specific place. Interestingly, Lewicka (2008) regards place attachment and place identity as two different, although related ideas, often used interchangeably. However, in the context of place marketing it seems helpful to consider place attachment as relating to an individual, while place identity is a communal concept (Warnaby & Medway, 2013). Other scholars describe place as a 'lived concept', where stakeholders interact and participate with one another and argue that places should be seen as the result of different practices and in turn the place then reflects these practices and the firms within them (Cresswell & Hoskins, 2008).

There are numerous debates in relation to the role of scale in human geography, as Jonas (1994: 262-263) argues 'The presentation of scale is integral to academic and more generally social, political, and cultural struggles', with additional reflections further emphasising the importance of relational understandings of scale (Jonas, 2006). Other

work, such as Brenner (2004) discusses rescaling of statehood, which involves a hierarchal process where central governments are devolving power and responsibility for future economic development to regional authorities. This seems to have fostered competition between regions in attracting firms to a particular place and regions are partaking in place promotion. This re-scaling of economic governance, is also evident in the literature on regional development, within which the role of urban 'hubs' takes substantial importance (Giordano & Roller, 2003). This devolution of power from nation states has increased both the agency and responsibility of local authorities to address economic development at a local level, in turn resulting in more place promotion and competition between regions. Although, others are critical of regional devolution and argue little empowerment is given to local authorities to tackle regional issues in the English context (Farrelly, 2010).

The concept of place promotion builds a bridge between the concepts of place and economic development. Place promotion concepts are relevant to this thesis, as environmental initiatives, such as the CE, are often considered tools to attract companies to locate in particular regions (Pohl, 2015). However, there appears to be a lack of consistency in regards to defining place promotion (Boisen et al., 2018), with both scholars and policymakers using inconsistent definitions. Place promotion involves the use of marketing mechanisms to communicate specific images of particular geographic locations to a target audience (Gold and Ward, 1994). These target audiences often consist of companies choosing where to locate their operations. Kotler and Gertner (2002) examine various cases of how regions have attempted to attract firms to locate in their jurisdiction and conclude that incentives to the region are important, but in addition regions rely on the committed work of local authorities to building success. Governmental incentives alone are rarely enough to entice a firm to locate in a region as a combination of both market and supply chain factors also play a vital role (Kotler and Gertner, 2002). Place promotion develops overtime, it is not just about generating attention for the offerings of the place, but subsequently also converting the attention into awareness that positively affects the image of a place (Boisen et al., 2018). The concepts of place branding and boosterism have also gained traction in an environmental context with cities using their green ambitions as a way to attract investment to the city (Andersson, 2016; García-Quevedo et al., 2020).

To add to the complexity, places differ to companies in organisational structure and purpose and issues often arise in treating places in an identical manner to companies.

Clegg and Kornberger (2010, p.9) explore potential conflicts of interests within places 'Legally speaking, commercial brands are owned by organizations that hold the copyright over them, but who owns a city?' This question is important to consider as many challenges are likely to arise from potentially conflicting interests between places and their stakeholders. Boisen et al. (2011) investigate places as social constructions and argue that they are not distinct entities but part of a scalar hierarchy, which creates challenges and often confusion for audiences of place promotion strategies. There are also issues associated with attracting firms to one particular place, Medway et al. (2008) study the idea of place 'fuzziness' in place marketing, arguing that while many places have a clear spatial definition, in terms of administrative boundaries, others can be more informally defined and often involve overlapping administrative jurisdictions, which can cause confusion for audiences (Warnaby, 2009).

Places do not exist in isolation, but are connected with other places through various mechanisms and bundles (Pierce et al., 2011), which transcend one particular location and result in interconnected networks. Notably for a regional CE, Deutz (2014) argues that environmental policy aims to create green job opportunities, but does not replace investment competition between places. Relational thinking moves away from the absolute idea of space, as it transcends the boundaries between objects and space, in turn rejecting forms of spatial totality (Jones, 2009). Both individuals and institutions are likely to have strong relational ties to many communities, which allows them to experience and shape competing place-frames at the same time. The role of political power appears to be vital to the success or failure of place-making collaborations (Leitner & Sheppard, 2002), which could be of particular relevance to building a regional CE across proximal places. According to Amin (2002) the relational space economy is less to do with territorial properties such as local identification and scalar politics than with the effects of spatial connectivity. Moreover, regions can be seen as places of overlapping, but not always connected, relational networks with historic connections and as spatial formations of constantly changing composition and levels of reach (Amin & Thrift, 2002). This resonates with CE challenges, which are likely to transcend regional boundaries due to the nature of value chain systems. The concept of the value chain includes broader thinking in relation to value creation through the management of both upstream (supplier) and downstream (customer) activities (Walters & Lancaster, 2000).

2.1.2 Places and regional resource efficiency approaches

Research by Swyngedouw et al. (1997:169) explains scaled places as 'the embodiment of social relations of empowerment and disempowerment and the arena through and in which they operate'. Similarly, geographical scale is considered complex and incorporates relational factors, including space, place and the environment and is more complicated than simply understanding geographies through size or levels (Howitt, 1998). From an environmental perspective the concept of place is important to consider, due to the complexities and place-transcending nature of environmental governance. Often when analysing environmental governance, concepts such as space and scale are taken for granted (Bulkeley, 2005). There is often an assumption that environmental governance decisions are passed down from international, to national, and then local scale (Bulkelely & Betsill, 2003). However, these concepts in relation to spatial and scalar arrangements of environmental governance neglect the ways in which environmental issues are both formed and regulated across various scales (Bulkeley, 2005). Local regions have attempted to incorporate environmental concerns and policies into strategic plans in recent years (Counsell & Haughton, 2004). For some places, promoting sustainable development within a region is used as a place marketing technique (Deutz & Gibbs, 2004). Furthermore, previous attempts to use clustering principles to tackle environmental issues, have had limited success in practice, such as the case of local IS (Mirata & Pearce, 2006) and eco-park projects (Gibbs & Deutz, 2005). This is also relevant to developing CE activities at the regional level, as places and their local stakeholders are likely to have differing perspectives on developing CE strategies. There are also other calls for cooperation between regional stakeholders in developing place-based CE approaches, as observed by Kampelmann (2020) in the urban wood sector in the United States, Canada, the Netherlands and Belgium. Stanojev and Gustafsson (2021) acknowledge regional sensitivities between different places and call for smart specialisation in order to build tailored CE solutions based on nuanced contextual and cultural factors associated with each specific region.

2.2 Origins of the circular economy

The CE draws on many earlier concepts (Ghisellini et al., 2016); of these IE and IS are the most relevant for this study. IE can be defined as the 'flows of materials and energy in industrial and consumer activities, of the effects of these flows on the environment, and of the influences of economic, political, regulatory, and social factors on the flow, use, and transformation of resources' (Allenby & Richards, 1994, p.v). Early thinking in

this area by Frosch and Gallopoulos (1989) drew similarities between industrial ecosystems and biological ecosystems. This analogy helps explain the underlying thinking behind the CE in terms of closing loops of production (Tibbs, 1992). Other significant research and schools of thought on the CE include Stahel and Reday-Mulvey (1981) and their work in relation to slowing and closing production loops, industrial metabolism (Ayres & Simonis, 1994) and IS (Chertow, 2000) which is part of the wider IE field (Schiller et al., 2014b). Although the concept of the CE has gained prominence in academic and policy discussions in recent years (Kirchherr et al., 2017) it draws on similar earlier resource efficiency concepts. IS is notably relevant to this thesis and discussions on place-based CE development focussed on a specific region (e.g.Kalmykova et al., 2018; Virtanen et al., 2019; Vanhamäki et al., 2020).

IS can be described as the exchange of residues (waste and/or by-products) between companies (Chertow, 2000), i.e., how pre-consumer waste loops can be closed at the early stage of the production system (Desrochers, 2000). Moving from linear throughput to closed-loop material and energy use can reduce negative externalities associated with pollution and waste disposal, while also reducing demand for resources (Ehrenfeld & Gertler, 1997; Chertow, 2000; Chertow et al., 2008; Penn & Dalton, 2018). IS research explores how firms share and collaborate in terms of resource usage in order to transition from open loops of production to closed loops (Chertow & Ehrenfeld, 2012). Moreover, similarly to how biological ecosystems rely on one another to evolve, adapt and survive, industrial ecologists draw comparisons to how firms co-evolve and co-develop in order to prosper in the long term (Allenby & Cooper, 1994). IS works on three levels: factory level, inter-firm level and regional or global level (Chertow, 2000), each of these areas needs to be connected in order for the sharing of resources to become efficient. For this study I am particularly interested in studying inter-firm collaborations at the regional level, which is likely to require collaborative IS efforts between proximal regionally based stakeholders, which is discussed in the following section.

For IS and IE to occur successfully it is often assumed there is a need for geographic proximity between participating firms to allow for resources to be shared. Schiller et al. (2014a) argues the need for firms to be in close proximity due to their mutual reliance, in order for IE to be effective. Although on the other side of the debate some scholars argue that IS can still work effectively across significant distances and that economic and environmental forces will dictate what distance is geographically feasible (Jensen et al., 2011). Given renewed interest in IS-related activity in the context of the CE, there is a

need for renewed consideration of the significance of place and scale for symbiotic relationships to flourish.

2.2.1 Collaboration for a circular economy

Similar to the above resource efficiency principles, there is a call for collaboration between various stakeholders when implementing circular practices, due to mutual reliance when passing resources between firms and turning a waste from one firm into a resource for another (Paquin et al., 2014; Velenturf, 2016). There is also a need for trust between organisations in order to develop relations with one another when promoting CE ambitions (Fischer & Pascucci, 2017). Building trust required for collaborative symbiotic relations between companies can benefit from geographic proximity, which was evident in the following studies; (Ehrenfeld & Chertow, 2002; Mirata, 2004; Chertow & Ashton, 2009). After this, awareness and competencies regarding how IS develops and trust is built between partners is needed to build a successful and mutually beneficial relationship (Doménech & Davies, 2011). More complex and often fruitful IS relations are formed after trust has been built between firms (Paquin & Howard-Grenville, 2012). Finally, as the IS network grows stronger over time this is likely to result in more innovative IS opportunities (Mirata & Emtairah, 2005).

The role of the region has gained increased traction as a suitable scale to build resource efficiency initiatives between partner organisations. These organisations are likely to include companies, regional authorities and local communities. However, building regional partnerships between these actors is likely to require a common goal and alignment between regional actors (Tapia et al., 2021). Yet different stakeholders have different priorities, companies have ties to global locations, while local authorities are focussed on enhancing the prosperity of their own region. Regions are also interconnected to one another and skills are transferable across regions (Hidalgo et al., 2018), meaning that skilled workers may move between locations.

The role of place-based authorities in IS has been the subject of debate with indications that, for example, companies may respond better to a business-led approach (Heeres et al., 2004) and that IS as an economic development initiative cannot override the constraints of geographic context (Deutz & Gibbs, 2008). Costa and Ferrão (2010) advocated a 'middle-out' approach whereby regional authorities assisted business in navigating the IS-supportive national policies (in Portugal), but which did not require direct policymaker engagement with IS. Examples of this type of approach include Rincón-Moreno et al. (2020) who examined how public agencies can help to overcome issues between companies, focusing on SMEs. Other recent work is seeking to build local coalitions and in particular is focusing on resource exchanges between local stakeholders (Tapia et al., 2021). IS research in the case of Finland emphasises the crucial role that individual 'champions' play in organisations to facilitate IS initiatives (Kokoulina et al., 2019) as they break down barriers between industrial sectors to improve collaboration opportunities. Other authors have utilised a social network analysis approach to review previous regional level IS research (Vahidzadeh et al., 2020), with key barriers in relation to IS often associated with a lack of knowledge and technical experience to implement IS initiatives (Raabe et al., 2017). A common feature of these IS studies is social and economic barriers which remain when seeking to implement collaborative IS activities between diverse stakeholders.

The above body of work tends to be assuming an essentially common interest in IS, and more recently in the CE, so that the challenge is how to overcome barriers rather than a potentially more fundamental conflict of interest. Randles (2007) examined the scalar mis-match between places and companies with plants in multiple locations globally – the company studied prioritised its internal (but geographically large-scale) interests over those of the locations where it was based. Additionally, companies have supply chain connections that transcend countries, jurisdictions and governance levels (Coe et al., 2008; Coe & Hess, 2010). The connection of companies to multiple regulatory jurisdictions can be problematic from an IS perspective (Goldstein & Newell, 2019), for example in terms of meeting a range of product specifications. CE initiatives will need to work within the constraints of these relationships (Goldstein & Newell, 2019), or else will involve a significant re-arrangement of practice. The spatial implications of this, especially in terms of place-based agencies' ambitions to retain value locally, need consideration. Thus, my research steps back from specific barriers to or drivers for

collaboration to examine the underlying perspectives of the stakeholders involved, using a multi-scalar policy context alongside businesses with a presence at the regional scale.

Whilst the challenges of implementing CE and related initiatives has been explored, the influence of geographic context has not been investigated in significant detail (Deutz & Lyons, 2015). Previous studies of eco-industrial parks (developments attempting to bring about IS on the scale of an industrial estate) have found that, despite their apparent potential as a regional development strategy, the success factors were associated with being situated in a geographically favourable location (Deutz & Gibbs, 2008). Despite the seeming unwillingness of companies to relocate on account of IS potential, in the absence of other favourable criteria (Deutz & Gibbs, 2008), companies do indeed relocate (Markusen, 2002). Markusen (2002) describes locations as 'slippery spaces'; in a globalised world companies may decide to leave the region, which can create problems for other partners in a symbiotic relationship (Doménech & Davies, 2011). More specifically, much of IS research fails to give sufficient attention to scalar problems between companies and local stakeholders in collaborating for the success of IS within a particular place (Randles, 2007; Simboli et al., 2014). Furthermore, Coe and Hess (2010) argue that it is often difficult to manage regional development in a globalised world, as supply chains are complex and transcend countries, jurisdictions and governance levels, which also creates challenges from an IS perspective (Goldstein & Newell, 2019).

2.2.2 Facilitating a regional circular economy

From a local policy perspective, the purpose of local authorities is to promote the economic development of stakeholders and the local economy. In the context of environmental initiatives, scholars have studied the role of the municipality in acting as an enabler of IE, by taking on the role of the 'institutional anchor tenant' (Burström & Korhonen, 2001). It has been argued in the past that regional policy needs to strike a balance between environmental concerns and economic growth (Welford, 1993). In a CE context, local municipalities could facilitate the symbiotic mutual co-operation between the industrial actors in the region, which might otherwise be reluctant to engage in such efforts with each other because of external pressures such as competition between businesses in the region (Burström & Korhonen, 2001). However, there are also limitations to the role of the municipality in these networks and there are logistical barriers to overcome. There has been previous research on the need for an organisation to take on the role of the facilitator in terms of symbiotic relationships. These support actors have been described in the following formats in the past as 'anchor tenants' (Chertow,

1998), 'separate co-ordinating units' (Linnanen & Halme, 1996) and 'initiators' (Brand & de Bruijn, 1999). It could be argued that these support actors and local authorities play vital roles in fostering collaborative relations between stakeholders when developing local CE initiatives. Moreover, the party who takes on the role of the IE co-ordinator should ideally have a long term and vested interest in the success of the network as they can think beyond economic incentives in the short-term, by identifying future opportunities and exploring the potential for achieving success over the long term (Mirata, 2004). Traditional economic measures for success still play an important role in assessing the feasibility of evolving IE networks (Chertow, 1999), which suggests resource exchanges still need to make financial and competitive sense for all involved (Esty & Porter, 1998). Local authorities appear to be well suited to take on the role of a facilitator in an IE network, as they have a long-term commitment to the region, but the commitment of firms to specific regions is less clear, which may negatively impact the potential success of regional CE activities.

More recently scholars have highlighted the importance of the city's role in developing CE initiatives (Petit-Boix & Leipold, 2018; Campbell-Johnston et al., 2019), which is important to consider in my research at the regional level. Much of this work examines the potential challenges and barriers which cities and their stakeholders face when transitioning to a CE. To date, the CE is often dominated by a business focused agenda, raising questions about the placement of the CE within a broader urban sustainability agenda (Murray et al., 2017). At the city level, there are both top-down and bottom-up approaches to developing CE initiatives. Top-down methods consist of institutional change such as strategy and policy decisions including public-private partnership (PPP) projects concerned with developing and facilitating market initiatives (Ghisellini et al., 2016; Lieder & Rashid, 2016). While, bottom-up change describes company collaborations within supply chains, social movements and social innovation such as entrepreneurial activities initiated and run by civil society, NGOs, communities and businesses (Ghisellini et al., 2016; Lieder & Rashid, 2016). Cities are also limited by their capacity and geographic boundaries. The limited scope of the instruments to impact stakeholders along the value chain means many CE studies are prioritising lower value CE options such as recycling (Petit-Boix & Leipold, 2018). There is little focus on higher value R-options, potentially indicating the limited approach towards a holistic CE transition and capacity to do so at the city scale (Petit-Boix & Leipold, 2018). There appears to be a key role for spatial planning and facilitation to play in developing a CE

(Breure et al., 2018; Fidélis et al., 2021) and coordinating resource efficiency collaborations between proximally located stakeholders.

There is a need to understand the challenges in relation to a CE in different geographical contexts and the spatial politics associated with collaboration at the city level (Fratini et al., 2019). Fratini et al. (2019) study CE approaches in European cities and find over-emphasis is given to sociotechnical actors such as business and technology, and that little consideration is given to citizens. This mirrors the findings of Prendeville et al. (2018), who explain that cities often claim to include citizens voices in the policy making process, but the resulting policy measures are tailored to support business competitiveness. Fratini et al. (2019) emphasise more research is needed which explores key actors involved in CE transitions, including analyses of unfolding EU CE policies (Calisto Friant et al., 2021). Another point of caution which should be pointed out is that CE initiatives do not only generate potential benefits, there are also a number of risks. For example, material circulations produce a degradation of the material quality and quantity, which are likely to require additional energy and resource inputs that are often disregarded (Cullen, 2017). Another hurdle to overcome is in relation to hazardous material in waste streams which may re-enter value chains in a CE, which still need to be fully identified and understood (Bodar et al., 2018). Questions remain as to how to determine the most effective approach or combination of approaches for local CE development in a given locality and indeed to what extent a regional CE is feasible. This ambiguity has in turn created challenges for local authorities and businesses seeking to transition to a CE (Prendeville et al., 2018). As places transition to more circular oriented economies there is a need to recognise the potential winners and losers this will create on both regional and global stakeholders, these social aspects will also be considered in this research project.

2.3   Business approaches to developing resource collaborations

From a business perspective, there are varied narratives of CE practices and the term CE is often used interchangeably with sustainability in companies (Walker et al., 2021). In Walker et al.'s (2021) study CE was portrayed by companies as a tool primarily to improve their environmental performance. Contrastingly, despite the apparent lack of a common understanding of CE concepts, recent research found in the manufacturing sector over 70 percent of survey respondents were aware of the CE (Liakos et al., 2019).

Research in the UK indicates that business prioritises its own role in the development of a CE (Farrelly et al., 2020), somewhat dismissive of the public who are seen merely as

consumers. Moreover, there is a lack of requirement or an agreed template for CE matters in corporate sustainability reporting which means that few companies directly disclose CE related issues (Opferkuch et al., 2021). Work on sustainability reporting more generally cautions that companies can use the disclosure of certain sustainability details to help generating favourable impressions of their sustainability performance, in turn preserving organizational legitimacy (Bansal & Clelland, 2004). Springett (2003) emphasised that businesses have actively sought to mitigate the radical edge of sustainable development so that it would merely refer to the level of environmental and social commitment that corporations are comfortable with. It is rare for a sustainability report to feature examples of how the business may be seeking to reduce output (Springett, 2003), for example. Other scholars argue that companies are not in actuality addressing sustainability issues but are merely creating an image of sustainability by paying lip service to the topic (Aras & Crowther, 2009). From a socio-political perspective, sustainability reporting is not just used to inform financial market participants but also to manage impressions (Bansal & Clelland, 2004). The aim is to help companies facing social and political pressure from non-market stakeholders, such as NGOs and policymakers. The disclosure of certain sustainability details can be used for generating favourable impressions of an organization's sustainability performance, in turn preserving organizational legitimacy (Bansal & Clelland, 2004).

The development of a CE requires the alignment of interests and a willingness to collaborate between different types of stakeholders who may operate across different scales e.g. companies who may themselves range in scale from local to global and governmental bodies who each have a specific scale of interest, albeit influenced by other scales. Moving onto the value chain perspective, decisions such as where a firm decides to locate and how they interact with external stakeholders and organise their supply chains, are complex topics which need to be studied when examining CE development at the regional level, to understand broader international company commitments. The following literature will explore various business approaches to developing CE activities. Firstly, an overview of value chain approaches to a CE will be given and how this is likely to require the collaboration of both upstream and downstream partners to successfully transition towards a CE. Collaboration between designers, manufacturers and disposal firms is critical for understanding potential barriers affecting a regional transition to a CE, hence why a value chain approach is important in order to offer broad insights on the challenges facing a regional CE. From this, how a company decides to organise their

structure offers useful perspectives on how organisations may be tied to both local and global locations with varying level of commitments. The concepts of international business and building local alliances will be examined as they may offer company perspectives on building local CE connections. Finally, internal firm approaches to topics such as operations management will be considered to gain views on improving resource efficiency at the company level and how this may affect external relations with stakeholders. Other concepts exploring sustainable business models will be addressed to gain an overview of company thinking in relation to pursuing CE strategies.

2.3.1   Overview of value chain systems

Resource efficiency activities undertaken by companies are inevitably embedded within wider supply chain systems to which the company belongs (Goldstein & Newell, 2019). Supply chain management research studies how to optimise the input and output of resources in production processes (Randles, 2007). Individual companies comprise networks of entities in multiple locations, each of which can be within external networks (e.g., of customers and suppliers), with varying degrees of interconnectivity (Coe et al., 2008). Further, other research emphasises the strong level of supply chain embeddedness in society (Shahmehr et al., 2015) and that specific resource dependent supply chains are more geographically tied to local regions (Silvestre, 2015). Indeed, every function and aspect of companies in a global production network is grounded in a specific location, with associated environmental and social aspects in specific geographic areas (Goldstein & Newell, 2019) in addition to creating complexities throughout supply chains (Coe et al., 2008). Furthermore, many companies are themselves situated in multiple locations and have ties to various international regions (Randles, 2007).   As with CE literature, supply chain literature also fails to give sufficient attention to places and the environmental impact of companies on these locations (Goldstein & Newell, 2019).

The successful implementation of environmental initiatives across the value chain relies on cooperation between customers and suppliers to ensure sufficient availability of materials (Vachon & Klassen, 2006). Similarly, at the local level municipalities have struggled to develop CE initiatives due to a lack of available resources locally (Petit-Boix & Leipold, 2018). In terms of IS and supply chain collaboration Herczeg et al. (2018) conducted an empirical qualitative study using interviews to highlight the complexities involved in symbiotic partnerships. They call for transparency and trust across the supply

chain, allowing companies to form strategic alliances, resulting in both economic and environmental wins. Thus some shared understanding is needed between companies to do business whether that is a standard buying-selling transaction of their product or an exchange of a residue (waste or by-product). Companies would struggle to survive without developing an ability to do that with respect to their core business functions (Teece, 2010) (and many have developed complex international value chains), but have less experience and less motivation for residues. However, policymakers have seen IS-type initiatives as the route to economic efficiencies thereby enhancing the competitiveness and attractiveness of their own particular territory (Deutz & Gibbs, 2008). By emphasising stakeholder views at the regional scale, within a larger multi-level policy context, this thesis makes a significant contribution to the analysis of the issues related to building a regional scale CE.

2.3.2   Supply Chain Management and the circular economy

In order to understand supply chain management issues, it is important to explore underlying drivers of pursuing global supply chain management strategies. Particularly, it is vital to study the process of offshoring and the underlying drivers to why firms decide to locate components of their organisation in various regions internationally. The factors which lead firms to locate within a particular location are worth considering when examining CE developments in specific geographic contexts, to gain insights into company strategy when deciding where to locate subsidiaries. Literature discusses the potential for developing competitive advantage through effective supply chain management with partners along each point in the value chain (Li et al., 2006). Scholars identify cost, quality, delivery and flexibility as important competitive capabilities in supply chain management (Tracey et al., 1999).

Companies tend to view places based on the potential economic opportunities they can create by locating in that particular area (Blanchard, 2021). The process of offshoring is frequently recognised as an underlying mechanism for internationalisation, which is done by evaluating the costs and benefits associated with the decision to locate internationally (Dunning, 1998). There are various reasons for this, which are often associated with gaining competitive advantage (Tracey et al., 1999), which can be defined as the extent to which an organisation is able to create a stronger position over its competitors by developing capabilities that allow them to differentiate themselves in the market (Tracey et al., 1999). From an internal company perspective it is worth investigating the initial reasons for offshoring parts of supply chains to global locations and also the rise in the

reshoring process and utilising a more regional sourcing approach to suppliers (Gray et al., 2013). In the UK and European context, supply chain complexity has led to various companies seeking to re-shore parts of their supply chain to their home country to avoid complicated and bureaucratic customs process post-Brexit (Gupta et al., 2021). More specifically Gupta et al. (2021) highlight the likely detrimental impact of reshoring parts of supply chains on the well-being of citizens of developing nations who are reliant on these jobs. Similarly, there has been recognition of the potential for reshoring supply chains closer to home countries in order to build more resilience amongst supply chain partners, which has been further evidenced and accelerated by the global disruption of Covid-19 (Barbieri et al., 2020). It is important to consider potential re-bound effects when shifting from a global to regional CE in practice and the potential knock-on effects this may have on societies in developing nations, based on pursuing more proximal regional supply chain strategies, which may cause challenges for vulnerable stakeholders who rely on this employment.

Reverse logistics issues are also useful to consider in terms of managing supply chains for a CE. This involves, closing productions loops between supply chain partners, which may lend itself favourably to fostering more circular production systems (Julianelli et al., 2020). Reverse logistics strategies may offer greater potential for closing regional loops of production between supply chain partners (Makarova et al., 2018), although there are many complexities to successfully implementing reverse logistic systems at the regional level, similar to the challenges faced in IS resource exchanges. These supply chain concepts have gained traction for the potential environmental solutions it can offer to both companies and society (Goldstein & Newell, 2019). Scholars including Kovács (2008) have drawn on the linkages between environmental supply chain management and IE by highlighting the importance of firms passing down corporate environmental responsibility strategies through their supply chains in order to improve the overall environmental impact of the firm and its value chain partners. Kovács (2008) research underlines the importance of tracking material and energy flows through several layers in the supply chain, and across industries, as is also highlighted in the literature on IE (Erkman, 1997; Goldstein & Newell, 2019). Moreover, many scholars have discussed cost concerns as a potential barrier to sustainable supply chain practices (Wycherley, 1999; Cooper et al., 2000; Min & Galle, 2001; Al-Odeh & Smallwood, 2012; Esfahbodi et al., 2016), which often act as a hindrance to exploring the potential of sustainable supply chain implementation. Similarly, a common flaw of environmental purchasing

literature is that it often solely considers relationships between the customer and the direct supplier in the value chain (Green et al., 1996), however corporate environmental responsibility extends beyond company boundaries, to further upstream in the value chain beyond direct supplier relationships (Kovács, 2008). This is vital to acknowledge, as building a CE within a specific place relies on collaboration throughout the entire value chain, which may result in complexities between international supply chain partners (Bressanelli et al., 2019).

As firms expand internationally, this often increases complexity when ensuring the production process still runs smoothly with globally distributed supply chain partners (Dornier et al., 2008). Additionally, sustainability concerns often create further issues for supply chain collaboration. Wycherley (1999) notes many smaller and medium sized enterprises may struggle to reach high levels of environmental performance throughout their supply chain due to a lack of experience and resources, which suggests a level of inter-firm collaboration may be needed in order to improve environmental performance between various sectors and firms. Successful implementation of environmental initiatives across the supply chain relies on cooperation between both upstream and downstream actors (Bowen et al., 2001; Vachon & Klassen, 2006), although this may be challenging due to the complexity of global supply chain systems, as evidenced by Awasthi et al. (2019) in the electronics sector.

The work of Genovese et al. (2017) explores the potential for integrating the core principles of CE within supply chain management and demonstrates the advantages from an environmental perspective, although it is likely to be challenging from an economic point of view. Genovese et al. (2017) make a cautionary note that in a circular supply chain system there would still be a degeneration of the raw materials in production systems over time, as circular flows of material exchanges are connected with the physical flows of matter-energy, which are not circular (Stokes, 2016). Local authorities could help identify synergies between supply chain actors and economically incentivize the use of by-products in other supply chains, in turn assisting the transition towards a more sustainable economy (Genovese et al., 2017). By identifying synergies between supply chains, bodies such as local authorities could promote the use of by-products as raw materials to be re-processed in other supply chains, which may help to reduce the use of virgin resources, carbon emissions and waste. These bodies could facilitate a CE transition by improving the economics of exchanging resources between firms to make it more viable, as noted previously in the IS context (Chertow, 1998).

Traditionally supply chains are organised via global production systems, where suppliers can benefit from local competitive advantages in each region (Gereffi & Lee, 2012). Research in relation to the role of supply chain management for regional development suggests the potential of regionally-organised supply chain systems for enabling economic development opportunities locally (Closs et al., 2014). Developing regional supply chains for a CE has been explored in the Italian context, where they argue for the potential of CE in revitalising industrial districts which have been in decline (Bressanelli et al., 2022), they also explain the importance of public institutions in enabling regional collaborations for a CE. Moreover, shifting from a global production system to a regional system is likely to result in less uncertainty over supplier relations and result in greater control and increased potential to use regional suppliers (Alvarado-Vargas & Kelley, 2019), which may lend itself to fostering CE activities locally. Although, as highlighted by previous research in relation to IS at the regional level, fruitful connections are often difficult to form due to challenges in relation to forming open and trusting relations with partners (Chertow & Ehrenfeld, 2012).

Notably, supply chain systems are determined and constrained by the organisational structure of the company, which is likely to shed light on the potential feasibility of companies working together towards developing regional collaborations for a CE.

2.3.3   Organisational Structure for a circular economy

As mentioned above companies are part of wider supply chains, although organisational structure is also likely to play a key role in how companies arrange their business model systems and may dictate their openness to external collaboration. Companies are rooted within specific social, cultural, political and institutional contexts which influence the ways in which they develop (Dicken, 2002) and how they interact with stakeholders within these contexts. Moreover, where the firms' home country is based and how the firm decides to organise their operations may affect how they interact with places. Transnational companies (TNC) combine characteristics of global and multi-domestic companies, as they respond simultaneously to the potentially conflicting strategic needs of global efficiency and national responsiveness (Harzing, 2000). This structure allows local subsidiaries within a TNC to efficiently adapt to the local market, based on the local requirements of the region. While, multinational companies (MNC) operate from a centralized headquarters, MNCs have the ability to transfer and exploit knowledge more effectively in the intra-corporate context than through external market systems (Gupta & Govindarajan, 2000). On the local scale, SMEs are firms with less than 250 employees

and are independently owned (OECD, 2001). Managers in SMEs often rely on their intuition when making decisions, which suggests decisions can be made more promptly, but may not necessarily follow the rationally best-fit strategy for the firm (Brouthers et al., 1998).

There is an increasing number of TNCs developing external networks with local indigenous organisations, which are native to the local region, allowing internationally operating firms to gain local knowledge on implementing change in the local context and environment (Zanfei, 2000). However, since MNCs are governed from a centralized location it may be difficult to build local networks with firms as they tend to follow strategy which is passed down from headquarters to local subsidiary locations. Moreover, the concept of relational embeddedness refers to the extent to which a firms' relationship with local stakeholders and can act as a source of learning and integration with organisations in the region (Shahmehr et al., 2015), which may also lend themselves to developing regional symbiotic partnerships. There is general agreement that actors who are strongly tied to each other are more capable of knowledge and information exchange (Lane & Lubatkin, 1998; Hansen, 1999), which is useful to consider in terms of developing potential regional CE collaborations.

2.3.4 International Business, Spatial Connections and Strategic Alliances

International business explores concepts in relation to why firms decide to locate in a particular region and how they organise their global operations optimally. However little attention is given to firms' ties to a region and also their interest in local sustainability initiatives. Companies tend to move to international locations in order to take advantage of local geographical opportunities (Dunning, 2000). In a globalised world, it is the combination of the fragmented nature of factories, offices, and services and the global integration of continued concentration of economic ownership and control, that has enabled some cities to flourish (Sassen, 2018). Today cities are embedded within a highly uncertain geo-economic environment controlled by monetary uncertainties, speculative movements of financial capital, global locational strategies of transnational corporations and increased local competition (Brenner & Theodore, 2002). Massey (1995) explores these concepts in more detail using the example of the electronics industry. Locational decisions of electronics firms often separate research and development from production. In the case of electronic firms, these processes are separated in order to take advantage of the local factors, with the research & development process and the final assembly process separated based on specific local advantages in each international location.

The organisational and spatial structure of non-SMEs has an impact on how they organise their spatial structures. How these firms organise their international components of operations are important to consider, as this may have implications for their supply chains and fostering relationships between local partners. The following factors are cited as the main reasons for locating different aspects of operations internationally; cost reduction motivations (Stratman, 2008), market expansion, human capital acquisition (Lewin et al., 2009), innovation and growth (Dunning, 2000; Lewin & Peeters, 2006). Moreover, Ghemawat (2003) claims the main motives for cross-border integration of markets include capital, labour and knowledge acquisitions. The above researchers highlight the main drivers of internationalising operations to be predominantly economically driven, but there is a relative lack of attention given towards the local geographic area and companies' ties to a region, which may create challenges for developing local symbiotic relations between firms. There are also costs for firms to carry out business internationally, so managers have to weigh up the positives and benefits of each market they enter. The 'Ownership, Location, Internationalization' OLI framework can be used to help making market entry decisions, by studying the scope and geography of value added activities by multinational enterprises (Dunning, 1977; 2001). It appears motives pay little attention to sustainability factors amongst local partners, hence there may not be a willingness to collaborate with local partners. Therefore, if internationalisation decision making is designed to take advantage of local differences between markets, this may result in difficulties for local collaboration, as firms have come to the region primarily for the economic benefit of their firm, hence any potential CE collaborations needs to make financial sense for the firm.

Building on the above concepts of internationalisation, now I will focus on the connections between firms, places and local stakeholder connections. Once firms have decided to locate in the region, there is a need to understand how these organisations interact with local firms and international suppliers, which highlights the importance of strategic alliance from a symbiotic partnership perspective. The concept of strategic alliance has grown amongst firms who seek to collaborate with partners. Strategic alliance explores how firms seek to work together in trusting relationships, in order to benefit from knowledge sharing and supply chain collaborations (Narasimhan & Nair, 2005). The authors Whipple and Frankel (2000) highlight the factors needed for successful strategic alliances, which they summarise as character-based trust and competence-based trust. Character-based trust involves integrity, motives, reliability, openness and discreteness.

Competence trust involves specialized operational knowledge, interpersonal competence, business sense and decision making ability. These characteristics are considered to be central to the development of successful strategic alliances between firms across various industries and settings. On a similar note, Gerlach (1992) explores the concept of alliance capitalism which stems from the social organization of Japanese business and that of the 'Keiretsu' system, based on inter-firm linkages, which may offer useful insights to developing local CE initiatives between regionally based firms.

Additionally, the principles of clustering are also likely to be of relevance to developing effective strategic alliances. For example, this could be the case for firms using similar inputs into their production system in turn locating in the same region, or it could be between flagship firms and their network of suppliers, such as Toyota and their network of suppliers in Japan (Rugman & Verbeke, 2003). Moreover, Storper and Harrison (1991) have characterised regional clusters according to the extent to which specialisation of related activities is possible, the size of individual production units, the level of connection between the units and the governance structure within the system. These relationships represent a form of alliance capitalism and it appears that these activities need to be focussed within a local area to reduce distance related transaction costs (Dunning, 2006). Thus a strategic alliance is often most suited to firms situated in the same place. It should be noted though, that a strategic alliance is often difficult to achieve, despite many firms setting up alliances they often struggle to develop and grow these relationships (Smith & Barclay, 1997). Trust is likely to play a pivotal role to firms in developing long lasting collaborative strategic relationships, however this is often difficult to achieve over longer terms. Researchers have examined the importance of trust to local symbiotic relationships and have found limited success due to the complexities involved (Doménech & Davies, 2011; Paquin & Howard-Grenville, 2012), this may also have some relevance to developing strategic alliances for circularity. Moreover, there seems to be a need for an underlying social embeddedness to be developed at the regional level and between firms, in order to build the social capital and trust needed to develop regional CE activities (Leder et al., 2020). A regional CE relies on relationships and connections between stakeholders, so social networks between firms are important to study, as these help to understand inter-firm working relationships (Ashton, 2008; Schiller et al., 2014b). Granovetter (1985) coins this concept in relation to social networks as 'embeddedness', referring to how firms are built on social foundations and relationships. The idea of embeddedness explores how social relationships affect

economic activities, due to external relations impacting ones' ability to make rational decisions, this issue in turn leads to the problem of embeddedness (Granovetter, 1985). Similarly, Harvey and Braun (1996) references the importance of territorial 'permanences' associated with human landscapes and relationships between local actors, which have developed overtime in order to promote economic development. From this, it appears that organisations with a long-term commitment to a particular region may be more likely to work co-operatively with one another after relationships and knowledge sharing is established. This is often a gradual process, as in the case of Kalundborg, which took over 25 years to design effective local symbiotic relationships (Ehrenfeld & Gertler, 1997).

Additionally, internal company resource efficiency activities are useful to explore when examining the CE at a regional level, as it is often internal firm agendas which affect decision making and innovations within an organisation, these will be explored in more detail below.

2.3.5   Company Approaches to circular economy strategy development

The following will give an overview of operations management techniques such as lean management, which is often cited as a way to improve internal resource efficiency. These topics were selected as they were evidently relevant to shedding light on both internal company thinking in relation to efficient resource management and also building external collaborations necessary for a CE transition. Additionally, an overview of business model approaches for the CE is also given, while this is not the direct focus of the thesis, they are important to be aware of to gain an understanding into the commercial value creation process.

Lean management topics (Dahlgaard & Mi Dahlgaard-Park, 2006) are used to explain efficiency approaches to operations management, by reducing waste and maximizing economic efficiencies. Waste is minimised by improving quality and reducing the number of defects in the production system. Moreover, lean supply chain strategies concentrate on waste reduction, allowing firms to eliminate non-value adding activities related to excess time, labour, equipment, space and inventory throughout the supply chain (Corbett & Klassen, 2006). Similarly, total quality management (TQM) involves the management of quality at every stage of operations (Radnor, 2000), which helps to decrease product defects and waste, in turn having positive implications on addressing environmental issues. TQM has been recognised and adapted to solve environmental issues, by applying

quality focussed initiatives to environmental problems in turn helping to improve overall quality and environmental performance (Pil & Rothenberg, 2003). Lean management approaches to CE have recently advocated for the incorporation of environmental considerations into operations management (Kurdve & Bellgran, 2021). CE strategies in operation production systems appear to be seen as the optimal method for achieving both environmental and improved resource efficiency performance (Lim et al., 2022). It is apparent lean management principles have many parallels with CE thinking as they both strive to ensure products are more durable, while simultaneously reducing costs for the firm and improving environmental performance.

Core business organisational capabilities are likely to play a role in their desire to collaborate with one another. These organisational capabilities are key areas to explore to determine the potential and interest of a company in pursuing CE strategies (Sehnem et al., 2021). Organisational capabilities represent the core attributes of a company which are central for them achieving their business goals, they allow the company to focus on their most pertinent interests (Davies & Brady, 2000). Moreover, organisations also need to possess dynamic capabilities (Teece, 2010) to successfully adapt to pursue CE strategies, which require the knowledge and experience to pursue opportunities successfully. Traditional business models revolve around capturing economic value (Teece, 2010). In the past it was often accepted that the sole responsibility of a firm was to increase its profits, meaning it could neglect wider societal concerns (Friedman, 1970). In contrast and more recently, there is also literature recognising the importance of creating 'Shared Value' (Porter & Kramer, 2011), where companies aim to solve societal and environmental issues, while simultaneously pursuing the firm's financial imperative of profit. Porter and Kramer (2011) also shed light on the potential of cluster development between supply chain partners within specific localities throughout the supply chain. Local cluster developments also result in positive knock on effects, as jobs are created, new companies formed and demand for ancillary services increases (Porter & Kramer, 2011). Triple bottom line thinking (Elkington, 1997) offers a more comprehensive appraisal of business success, in terms of the three pillars of economic, social and environmental results. A triple bottom line approach has been utilised by companies who recognise that by addressing societal and environmental issues can offer a form of sustainable competitive advantage (Boons & Lüdeke-Freund, 2013).

More specifically, business model innovation for a CE has gained increased interest in both academics and industry over the past decade, as it is seen as a way to both reduce

costs and improve environmental performance. In general, business models describe how organisations create, deliver and capture value (Osterwalder & Pigneur, 2010). Business model innovation is considered vital to the creation of sustainable business opportunities (Boons & Lüdeke-Freund, 2013; Boons et al., 2013; Bocken et al., 2014), which has also been specifically studied in a CE context (Santa-Maria et al., 2021). Moreover, Joyce and Paquin (2016) have updated the traditional business model canvas to include triple layered principles into the value creation process, while Lewandowski (2016) demonstrates the potential of CE inclusion in the business model ideation process. Increasingly, sustainability challenges have created the need for more sustainable innovation in business models, by developing solutions which are both win-win for companies and the environment (Porter & Kramer, 2011). Sustainable business models go beyond fulfilling a company's 'license to operate' and provides a conceptual link between sustainable innovation and economic performance at higher strategic levels (Boons & Wagner, 2009). However it should be noted, there also are many challenges associated with sustainable business model implementation, which can be summarised as; regulatory, market/financial and behavioural/social barriers (Laukkanen & Patala, 2014). More specific CE challenges in relation to the lack of resources available to properly explore potential CE business model innovation techniques also exist (Antikainen et al., 2017). There are also struggles with more circular designed products gaining widespread adoption in society, as highlighted by (Hopkinson et al., 2018), who highlight the need to overcome branding challenges in relation to societal expectation and quality concerns in relation to the reuse of materials in production processes.

More work is needed to understand the various challenges facing different stakeholders on their journey towards circularity at the regional level. The next section will move on to examine how policy-related topics compare with the business literature when developing a regional CE.

2.4   Policy Perspectives on developing a circular economy

From a policy perspective, itis apparent that EU CE policy continues to focus on end-of-life solutions (Calisto Friant et al., 2021), it seems the CE is perceived as an approach to waste management rather than offering solutions for waste prevention. The CE is firmly situated as a sustainable growth policy at the EU (e.g., Lazarevic & Valve, 2017) and national scale, for example in Sweden (Johansson & Henriksson, 2020), where CE policy is presented as a driver for competitiveness and job creation. Recent work on CE initiatives at the city scale in Europe has found that the interests of business actors and

technological considerations are given more priority than citizens (Fratini et al., 2019), with an emphasis on business competitiveness and policy perspectives (Prendeville et al., 2018; Colombo et al., 2019; Johansson & Henriksson, 2020) even when claims are made to being responsive to citizens (Prendeville et al., 2018; Fratini et al., 2019).

Missing from previous CE research into stakeholder perspectives is a multi-scalar approach which examines the views of policymakers and companies at different scales, i.e., not just at the regional scale, but considering that within the wider context. In this thesis I refer to multi-level governance issues (including supranational, national and regional policy isssues) and also broader non-state governance-related multi-scalar activities and actors, which potentially affect a range of stakeholders in society, in particular commercial enterprises and their connections with policymakers at different scales. This research project incorporates a multi-scalar approach to studying a regional CE, as it recognises the inter-dependencies between multiple state and governance levels and also the complexities associated with fostering CE activities among regional partners in a globally interconnected society.

European CE policy formation goes through several rounds of consultations with stakeholders and is designed to set a strategy for the EU, while allowing for discretion within member states on how to implement action (European Union, n.d.). At the national level in England, governmental policy lays out a vision for the country in a particular respect; the proposals go through a consultation process to develop specific policy instruments (e.g., DEFRA, 2018). At the regional level in England, local authorities set an agenda for their region, although their autonomy is limited compared to European counterparts (John, 2014), for example, in Austria the regional state authorities have more power over shaping their own local regional agenda (Sedlacek et al., 2020). In the English context, national government's idea of empowering regions as actors in a policy field is not always matched by a requisite devolution of power (Farrelly, 2010), which has been indicated in fields such as climate governance, where regional level responsibilities are not always matched by sufficicnt resources to tackle these issues locally (Bulkelely & Betsill, 2003; Farrelly et al., 2020).

Moreover, and significant to this thesis, the core elements for successful regional development can be summarised as specialization, human capital and institutions (Storper, 2013). Specialization explores how regions focus on a specific sector to help stimulate development, this draws other similar firms to the region and also the human

capital needed for the particular industry to thrive overtime. Local institutions are in place in order to entice and facilitate firms to a region and to remain in the region over time. As noted before, this phenomenon can be described as the desire to be a 'sticky place', although this is often a challenge due to 'slippery spaces' and how locations may struggle to anchor firms to a region (Markusen, 2002). A collaborative relationship between actors appears to be necessary for long term economic development within a region, as there is a mutual reliance on a variety of stakeholders to succeed. Lee (2010) argues for formative relations between territorial and relational spatialities, for effective local development, suggesting economic development should be formed by social relations of value, which reflect mutually agreed preferences between various stakeholders within society. Similarly, these concepts are relevant for the CE due to the importance of trust between stakeholders (Paquin & Howard-Grenville, 2012), in order for symbiotic relationships to form. These concepts are investigated in Deutz and Gibbs (2008) who found limited success in relation to resource sharing relationships in eco-industrial parks in the US. Although the firms in the parks had some predisposition to collaborative activities, recruitment of tenants was challenging. The eco-industrial park concept was not sufficiently attractive or perceived as having an economic potential sufficient to overcome other location priorities. This conflict of locational and environmental priorities may also apply to a CE, which needs to be considered in the European context, and also in the light of the relatively high policy profile of the CE and with the greater awareness of environmental issues (Belaud et al., 2019; Hartley et al., 2020).

Previous local governmental CE research has highlighted the promising potential for the CE at the regional level, for example in terms of securing a local supply of resources (Bolger & Doyon, 2019). However, there is a need for more critical interrogation of the challenges facing CE in improving the performance of specific regions, there needs to be further examination of the challenges facing the transition to a CE at the regional level. Moreover, others also call for more recognition of social aspects of CE to be included (Padilla-Rivera et al., 2020) alongside economic and environmental ambitions. Ambiguity remains surrounding the role of CE in achieving sustainable development and little attention is focussed on the societal transformations needed to adjust to more circular behaviours at the regional level (Geissdoerfer et al., 2017; Padilla-Rivera et al., 2020).

2.4.1   Regional circular economy development and societal challenges

For a region to remain competitive in the long term there is a need for skilled and adaptable labour, these individuals working in a particular sector tend to locate within the

same geographic area, which in turn attracts similarly qualified individuals, in turn fostering a cluster of skills and industries within a specific location (Coe et al., 2004; Storper, 2013). Moreover, overtime as regions develop and grow, some prosper while others struggle and fail, which is often down to the resilience of the economic activities located within the region (Porter, 2000a). The ability to adjust and move up and down the value chain, from production systems to ancillary services, allows for regions to remain competitive overtime (Storper, 2013). The role institutions play is important to study in order to understand how they can ensure skills can be transposed from one activity and adapted to another overtime (Owen-Smith & Powell, 2004). This is particularly relevant to the CE within a specific locality, as companies will require the workforce to have adaptable and transferable skills, if local industries are to pursue more circular production systems. The scholars De los Rios and Charnley (2017) argue that human capital skills in areas such as eco-design, material science and engineering techniques are vital to achieving resource efficiency and closing loops of production. The need for upskilling in the Humber region in order to shift from a heavily polluting location to one built on cleaner production is important to reflect on, this is observed by Rogers et al. (2021) who elucidate the lack of skills presently available in the city of Hull in the repair sector. Also relevant to the Humber region are the challenges associated with shifting from jobs which are traditionally focussed on heavy industry to re-skilling for circularity (De los Rios & Charnley, 2017). Recent work exploring the potential for CE to improve economic development has been explored by Sverko Grdic et al. (2020), who optimistically advocate for the potential of the CE in achieving improved employment opportunities across the EU.

From a broader societal perspective, previous CE research has paid little attention to the social dimensions, as evidenced by (Geissdoerfer et al., 2017; Kirchherr et al., 2017; Roos Lindgreen et al., 2020). There are increased calls to incorporate social dimensions and increased embeddedness into residue exchanges at the regional level in order to increase the likelihood of the success of resource exchanges between regional partners (Binder, 2007; Laurenti et al., 2018). These societal issues and the requirement for improved social capital between stakeholders has also been observed in previous IE research (Ehrenfeld & Chertow, 2002; Baas & Boons, 2004). However, balancing the economic, environmental and social commitments of an inclusive CE requires buy-in from a diverse range of stakeholders, who are unlikely to always agree with one another (Webster, 2021), which is likely to lead to challenges for regional CE implementation. Similarly for a

successful CE activities there is a need for social capital to build trusting connections (Stahel & MacArthur, 2019) with potential partner companies, to create mutually beneficial and lasting connections. It is apparent that questions still remain in relation to the level of commitment companies have to regional stakeholders and how this may not necessarily align with their own strategic and supply chain agenda. These ideas are useful to study from a regional CE perspective, as effective inter-firm relations are likely to be important in order to develop mutually beneficial transactions between firms.

The concept of power is relevant to consider in order to understand the challenges associated with CE and regional development. Regions are sites of ongoing complex social processes between competing forces and actors as opposed to coherent organisations (Cumbers & Mackinnon, 2010). From a supply chain management perspective, power often plays a pivotal role to internal and external firm relationships. TNCs often can assert more power compared to SMEs due to their financial ability (Clark & Christopherson, 2007). However, this may also lead to conflict and tense relations between the more dominant customer and vulnerable supplier. Contrastingly, in some industries such as the food sector, 'soft power' is effectively utilised between firms (Morgan et al., 2008), in turn mitigating against potential conflicts associated with other forms of power. Moreover, Markusen (2002) concludes that co-operative forms of soft power tend to work more effectively than competitive forms of direct power. It appears that economic geographers, have given some attention to power when studying regional development, however more work is needed in the context of developing a regional CE within global supply chain systems.

These power dynamics are important to acknowledge in terms of considering who holds the potential to create the change necessary for CE development at the regional level (Nogueira et al., 2020). In the city of London, research has shown the multi-scalar power and policy dynamics at play when attempting to foster CE activities at the city level and within London municipalities (Turcu & Gillie, 2020), these authors conclude that austerity hit local municipalities suffer due to financial constraints and they lack power to operationalise circularity at the city level in England. There appears to be a need for improved alignment between regional partners in order to foster greater alignment of interests so that the relevant stakeholders possess the power needed to facilitate regional CE activities.

2.4.2   Place Competitiveness and clustering approaches to resource efficiency

The concept of the city as a place which competes with other cities is important to note, in order to understand how and why firms decide to locate and remain in a particular region. Companies often rely on external suppliers and partners in order to operate in an economically viable system. In some locations, these factors come together relatively easy, allowing a sector to flourish, for example the automotive sector in Germany (Storper, 2013). This is particularly evident in the case of BMW in Eastern Bavaria, which has developed successfully, due to the support of the local government, access to skilled flexible labour and also by drawing on efficient global production networks (Coe et al., 2004).

In the words of Porter (2000a, p.16) 'A cluster is a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities.' Policymakers seek to develop clusters in order to foster relationships between partners in the same sector within a region, for example, the Green Tech Cluster in Styria (Gibbs & O'Neill, 2017), which brings together environmentally oriented companies based in the region. Cluster initiatives are understood to have a positive impact on local firm-level partner relationships and collective dynamics within a particular place (Gordon & McCann, 2000; Porter, 2000b). Similarly, Deutz and Gibbs (2008) explain that cluster developments can offer increased networking opportunities and benefits for IE initiatives. Although others argue these networks rarely translate into practical cooperative action, as observed by Fromhold-Eisebith and Eisebith (2008) in the automotive sector.

The work of Klepper (2010) explores how in the past the Silicon Valley semiconductor cluster initially formed and developed. There was a highly innovative company, 'Fairchild Semiconductor', to enter the region, which resulted in spin-off firms and suppliers to develop in the locality. This research suggests that the first entrant to the region plays a major role to the success of the cluster, which could have similar implications for developing a regional CE. Silicon Valley has evolved and transformed, yet is still considered a success story in the technology sector, with many other regions seeking to emulate this success across the world (Hospers, 2003). However, companies may not be prepared to relocate in order to join a policymaker's vision of a cluster. This is illustrated by the experience of eco-industrial parks in the US (Deutz & Gibbs, 2008), where the more financially successful projects were those not attempting to recruit

companies directly into IS networks and those that were in more economically prosperous locations, which may also be relevant for potential CE projects.

In an increasingly globalised world it is difficult to explain why clusters still remain important, as advancements in technology, transport and communications diminishes firms' ties to locations (Porter, 2000a), this was increasingly evident during Covid-19 which may also cause longer term shifts to online networking. Despite these technological developments which should in theory break down international barriers, it appears that there is still a local buzz effect, including knowledge sharing and potential competitive advantages for firms in operating in close proximity within a local cluster (Bathelt et al., 2004). Porter (2000a, p.32) argues that clusters allow for 'special access, special relationships, better information and powerful incentives' for local organisations, which are often difficult to achieve over longer distances. Moreover, Storper (2013) explains the value that people and organisations still place on face to face encounters, as it allows for instant interaction, discussion and altering of tone based on the other person's response, which can only be achieved by being physically present (Goffman, 1978).

2.4.3 Multi-scalar perspectives on fostering a regional circular economy

Previous climate related research has explored the constraints of developing regionally sensitive climate-related activities, work by Jonas et al. (2010) sheds light on the diverse challenges and constraints facing regional level stakeholders in climate oriented regional development. Notably, regions tend to be porous, meaning official boundaries transcend the official borderlines of the administrative location. Previous research suggests that there is often challenges when seeking to foster collaboration between regional actors in a particular location. Resource efficiency literature focuses on the role of IE in regional development (Deutz & Gibbs, 2008) and finds clustering approaches are often used as a way to both reduce businesses' environmental impact in a location, while also offering a means to improve regional development.

There has been a rescaling and devolution of governance (Jones & MacLeod, 2009). Although, Jonas et al. (2010) argue that initiatives to 'green' local regions have received mixed success, due to more focus being on promoting economic development, often at the expense of societal concerns, creating similar questions to consider and explore using a CE lens of analysis. The concept of scalar mismatch between firms and the level of governance is a crucial area to examine as firms and authorities seek to improve circularity within a specific place. If scales are not aligned between authorities and firms,

they may struggle to transition to a regional CE. There still seems to be no clear consensus on the best way forward for governing CE issues; the concepts of place and scale have been relatively neglected in previous CE work.

There is a vast amount of literature debating the optimal level in relation to governance over climate-related issues, including; a supra-national block (Schenk et al., 2004); national level, a sub-national region, (McEvoy et al., 2004) urban centres such as cities/municipalities (Wurzel et al., 2019) or at the micro level eco-industrial parks (Gibbs & Deutz, 2005) or local 'Transition Regions' (Cooke, 2010). Leck and Simon (2013) address multi-scalar collaboration and shed light on the importance of 'relational dynamics' between multi-scalar actors in order to tackle environmental issues successfully. These multi-scalar challenges are also visible in commercial operations, as TNCs by nature transcend traditional scalar boundaries. A large amount of work in economic geography has focussed on exploring relations between TNCs and their activity on urban and regional development (Yeung, 2009), who goes onto explain that understanding TNCs activity is key to understanding regional development in a globalised world. This has led to the formulation of the concept of 'glocalization' (Swyngedouw, 1997) which suggests that despite having international operations, many firms also adapt their strategy to the local market where they are operating, in order to fit in with local dynamics and cultural norms. The governing authority associated with regulating TNCs may struggle due to the fact that the TNC may not only operate in their jurisdiction, but across multiple geographic and administrative boundaries (Randles, 2007). Randles (2007) goes onto explore the concept of scalar mismatch between TNCs and local governing authorities. By doing so, this author highlights situations where the firm and local authority either align or misalign in terms of tackling environmental issues. Randles (2007) uses the case of Holcim, a Swiss TNC in the cement industry to illustrate how their company's championing environmental and ethics policy has either filtered down positively or negatively to local host sites.

The above 'glocalized' approach may offer potential insights to developing globally competitive but regionally sensitive strategies to fostering CE initiatives at the regional level. Recent work argues for the role of repair locally in the mobile phone market, but admits that repair-ability is often limited by global producers in making products which can be easily repaired (Türkeli et al., 2019), this is likely to further evolve with the rise of the right to repair movement (Rogers et al., 2021). However, Türkeli et al. (2019) sheds light on the contextual differences and challenges to the repair market for mobile phones

in different locations, finding that in China repair is expensive due to high prices for re-used materials, while in the Netherlands there are challenges in adapting local behaviour in favour of repairing a phone versus buying a new model.

A neglected aspect of CE research so far has been to understand the relevance of particular places and how local actors interact in terms of developing a CE. There appears to be a relative lack of alignment between the ambitions of local authorities and firms when building a regional CE in a globally interconnected world. To conclude, the literature in relation to economic geography and more specifically regional development sets a foundation for why firms choose to locate and remain in a region and also how they interact with local stakeholders and global suppliers. In an increasingly globalised world, where internationally operating firms dominate, this creates increased challenges for governing authorities at various scales from supra-national bodies to local authorities.

The next section will cover the methodology, research design and methods which will be used in this research project. The methodology will cover the underlying philosophy associated with the methods, while the research design will focus on the case study approach and the methods are the tools to be used to conduct this research project. This research will use a qualitative case study approach, within an underlying philosophical CR framework.

Chapter 3 Methods

This chapter will highlight the methods used in this research project., It will first give an overview of the methodology used including interdisciplinary research and CR, the research design will then be outlined including an overview of the case study locations-NH and Styria will be given. Then the data collection methods used for this project with a corresponding in-depth analysis and reasoning for each method will be given, finally the methods section is concluded with personal reflections on the above methods, ethical considerations and limitations of the research methods used in this project.

3.1 Methodology

The project followed both an interdisciplinary and CR approach to conducting research. An interdisciplinary approach was used as it offered a way to explore the CE from a diverse range of academic backgrounds, including topics such as; supply chain management, IE and regional development. This interdisciplinary academic background offered a solid foundation to study policymakers and business approaches to CE development, while considering both their motivations for pursuing CE strategies at the regional level. A CR approach was used as it offered a way to dig below the surface meanings of a text/conversation, allowing for the researcher to explore key themes in greater detail. This offers an innovative way to build a coherent understanding of various CE related topics by exploring underlying themes and phenomena and how these fit in with wider social issues, such as local employment opportunities in a CE. While the research approach utilised an intensive (qualitative research) approach, an extensive (semi-quantitative) survey was also conducted, which offered potential 'demi-regularities' (Fletcher, 2017) also known as tendencies or insights, which could be studied in further detail during research interviews. The following section will provide more detailed information on both the interdisciplinary and CR approach to studying CE concepts from diverse perspectives in this project.

3.1.1 Interdisciplinary Research

This research project will draw on a number of academic fields. These do not necessarily explicitly deal with the CE, but engage with ideas and practices that are important to the implementation of a regional CE. A core reason why researchers engage in

interdisciplinary research is due to the inherent complexity of the phenomenon being studied (Cheng et al., 2009), which requires them to draw upon more than one academic discipline. According to Schmidt (2008) interdisciplinary research is an effective tool to solve various societal-pressing problems. Interdisciplinary research is particularly relevant when studying broad ranging topics, such as the CE, with social, economic, environmental and spatial dimensions affecting potential regional CE development.

To understand interdisciplinary research it is important to understand what exactly is meant by a discipline, which can be described as institutions which 'control human conduct by setting up predefined patterns of conduct' (Berger & Luckmann, 1991: 55). Academic disciplines are an extension of that, providing both communities for building knowledge within a common set of expectations and background knowledge and training, but also a means of quality control – with work being judged against the execution of expected style, methods/methodology. Disciplines themselves are socially constructed and evolve over time, they serve useful functions in terms of the organisation and focussing of effort in the progress of knowledge, which is not contradicted by interdisciplinary research (Denzin & Lincoln, 2008). However, interdisciplinary research is opening the possibility to consider in combination different aspects of problems, and/or to compare different perspectives on the same problems, which are customarily considered separately by the present arrangement of academic disciplines.

This research project aims to break down the barriers associated with a particular discipline, by drawing on research from fields such as; IE, Economic/Regional Development, International Business and Value Chain Management. Work within these fields has previously addressed CE issues, although due to the transcending nature of a CE, this project seeks to bridge the gap between these interdisciplinary topics to build a comprehensive understanding of transcending and multi-faceted CE concepts. The above fields are particularly relevant for this project as they represent both the place and business perspective to developing various sustainability initiatives, including the CE.

There are a number of concerns that have been raised regarding the effectiveness of interdisciplinary research. A common criticism of interdisciplinarity in academia is that if an individual researcher attempts to comprehend too many academic fields, they will struggle to contribute effectively to research (Gethmann et al., 2015). However, the research team involved in this project includes two people (including the PhD student) with backgrounds in International Business, Corporate Social Responsibility and Supply

Chain Management and also two Human Geographers experienced in Regional/Economic Geography and Urban Governance. The common link between these researchers is the CE and the desire to move beyond traditional disciplines to study the CE from an interdisciplinary perspective. This collaborative team is fundamental to the feasibility of this research project, as each individual can share his/her expertise in their particular area, allowing for discussion and debate on the common theme of the CE, from a variety of perspectives. Moreover, I am based in a Geography department, while with my Co-supervisor I have the opportunity to discuss topics from a business-oriented perspective on a regular basis.

Finally, this research project is part of a wider European interdisciplinary CE research group called 'Cresting', which meets for workshops and knowledge exchange twice a year (online during Covid-19). This project falls under the category of work package (WP) 4, which aims to understand who benefits from the CE. This WP has three sub-projects, WP 4.2 looks at assessing the impact of the CE on national and local employment experience, while WP 4.3 explores re-defining the boundaries of the in/formal economies with the CE. This particular project contributes to WP 4.1, which aims to examine the extent to which the economic and social benefits postulated for a CE can be captured in a specific location. I work on a regular basis with WP 4 colleagues and as a result have gained interdisciplinary and international perspectives on regional CE matters from a skills and third-sector perspective. Moreover, there have also been regular opportunities to discuss differing perspectives and diverse areas of study with colleagues located in Universities across Europe. This has offered nuanced approaches to CE issues, from a broad range of perspectives and has allowed me to further develop my interdisciplinary approach to CE research, by taking into account varied international stakeholder and academic perspectives.

3.1.2 Critical Realism

CR compromises between the attempted objectivity of a positivist approach and a highly subjective constructivist approach (Sayer, 1992). It claims there is a reality independent of the researcher, but that we can only study it via the perspectives of organisations/individuals, who are not objective. This is summed up by Sayer (1999: 3) who explains that CR 'proposes a way of combining a modified naturalism with a recognition of the necessity of interpretive understanding of meaning in social life'. Marsh and Furlong (2002) liken a CR approach to 'skin' rather than a 'sweater', as a

social scientist cannot simply remove their own orientation to the topic of study when conducting research. Another significant aspect of CR is that although all views may be socially constructed, they are not all equally correct; some are likely to be closer to the objective reality than others (Sayer, 1992; Easton, 2010; Fletcher, 2017), i.e., the reality which is independent of both the researcher and the research subjects. However, it should be noted that both the researcher and the research subjects have the potential to change that reality in the course of their activities and their interactions with each other.

CR allows for analysis of complex situations by acknowledging, and seeking to identify and understand, the underlying influences on particular phenomenon that may not be indicated by a superficial investigation of an empirical situation (Fletcher, 2017). The work of Fletcher (2017) highlights how CR can be used as part of intensive research by explaining in a step by step manner the process involved in carrying out the study, this approach was utilised in my research to maintain a strong and robust CR approach throughout the study. By explicitly displaying the techniques used, this approach allows findings to be more transparent and easily understood. According to Fletcher (2017) a CR approach explores both ontology, (what is real) and how this is not always transferable to epistemology, (our knowledge of reality), meaning that what a researcher observes may differ to the reality of what is actually happening in practice. A CR approach helps to shed light on why things appear as they do in practice, but recognises the significance of the underlying factors which contribute to this reality.

In this research into the CE at the regional level, from a local authority, company and other organisational standpoints, it is important to explore the factors behind particular decisions including the social/geographical/economic constraints on decision makers. Hence, it is important to not only analyse the decision being made but also to explore the underlying contributing processes and reasoning for these decisions and how different factors impact on the decisions being made. Often managers rely on heuristics or intuition (Easton, 2010) as an aid to decision making. CR allows researchers to gain an understanding of the underlying factors of why and how these managerial decisions were selected as appropriate within an organisation in a certain context. By using CR as the core underlying methodology helps to substantiate using a case study design to conduct this project on exploring the CE within different manufacturing-oriented firms. Furthermore, CR allows for theories to be used as a way to get closer to reality and identify causal relations (Easton, 2010), which help to explain events and relationships in non-academic settings, including commercial and policy-related organisations. CR

encompasses three different levels from the empirical level, to the actual level and the real level (Fletcher, 2017). For this reason, an intensive research approach using predominantly semi-structured interviews will allow for an in-depth analysis of the underlying factors which contribute to particular decisions being made and seeks for explanations behind the decision-making patterns. For this research project, it is important to not only understand the empirical level, but the underlying root causes and mechanisms behind these events at the real level (Easton, 2010; Fletcher, 2017). These causal relations can be identified through the process of analysing findings and forming connections between interconnected themes. Semi-structured interviews allow for an open yet directed conversation between the interviewer and the interviewee, which allows for key themes to be studied, but simultaneously remains open to new insights which were not predicted when formulating interview questions, allowing for the researcher to critically interrogate findings and strive to undercover key phenomena at the real level (Sayer, 1999; Fletcher, 2017).

One of the strengths of CR is that it is not tied to a specific academic field, given that it draws in a philosophical position arguably equally relevant to a field of social science enquiry, it is often considered helpful therefore to lay the foundation for an interdisciplinary research approach (Danermark, 2002). CR has been used across various academic disciplines relevant to this study including; Economics (Lawson, 1997), Geography (Yeung, 1997), Sociology (Layder, 1990), Interdisciplinary science (Dickens, 2003) and Management Studies (Fleetwood & Ackroyd, 2004), which supports the intention to use CR in conjunction with an interdisciplinary research approach for this research project. CR assumes how an 'active thought experimentation' is required before the research begins (Hart et al., 2004). As a result, CR actively includes previous academic research into the data collection and analyses phase of the research process, which provides a solid foundation for the research project to be conducted. CR provides a coherent and rigorous philosophical justification for using a case study research design (Easton, 2010). CR in case study research involves developing research questions which identify particular phenomena of interest and explores what causes them to occur in a particular setting. Hence, a CR approach will allow for a greater understanding of why firms take certain actions in relation to their procurement, disposal and CE strategies and the factors which contribute to these decisions. More specifically, the research examines the relationship between supply chain considerations and CE matters at the regional scale.

The following section will explain the research design and key data collection methods used in this project which includes; interviews, discourse analysis, observations and a survey.

3.2   Research Design

This research design followed the general protocol of an embedded multiple case study approach with more than one unit of analysis (Yin, 2017), which in this case meant examining two distinct regions, NH and Styria. However, it should be noted that NH was the primary case study, partially due to feasibility constraints (language and locational) of the researcher. Significantly more interviewees/observations were based in this location and the survey/discourse analysis likewise was conducted mainly with NH companies. In line with CR principles, Styria was then used to corroborate NH findings and to examine causal relationships and contingent conditions (Easton, 2010; Fletcher, 2017) in another case study setting with different systems of governance, and with the aim of uncovering structural factors and contingencies at play across both regions. This helped to shed light on regional CE nuances and further bolstered the overall reliability of findings in both case study locations (Dooley, 2002).

Within these regions, a small number of companies were selected in order to explore some key concepts and relationships across a variety of manufacturing-oriented firms at different scales. The local actors including HCC and the Green Tech Cluster Styria and their relations with companies will also be studied and compared across the locations. This study focused on a number of companies based in NH and Styria, while the unit of analysis will deal with the interactions and relations between local stakeholders in transitioning to a CE. The respective supply chains and waste disposal chains of the selected firms were included in the study, in order to gain a holistic approach to the organisations and to explore their material inputs and outputs.

According to Yin (2017, p.13) a case study is an empirical enquiry that 'Investigates a contemporary phenomenon within its real-life context'. This form of research design was appropriate for this project as it allowed for underlying conditions be studied, for in depth analysis of organisations to be conducted and in particular the geographic context to be considered. Case studies can follow both single and multiple case study approaches (Yin, 2017), either based within one organisations or a number of organisations. This thesis

followed the principles of a multiple case study approach, as it was set in two locations and included various organisations. Scholars argue that the findings from multiple case studies are often more compelling and therefore more robust (Herriott & Firestone, 1983), which helped bolster the validity and reliability of this research project.

Notably, there are positives and negatives associated with comparative case study research styles. On one side, comparative case studies allow for different phenomena to be studied and thus this can help develop inferences and build theory arising from 'replication logic' across various practical settings (Eisenhardt, 1989; Yin, 2017). On the other hand, to present a complete and unbroken narrative of each case may not be feasible (which was experienced in this research project in the location of Styria). The challenge in a multiple case setting is to remain within the constraints of the study, while simultaneously displaying the emergent theory and the empirical evidence that supports the theory (Eisenhardt & Graebner, 2007). However, by combining case studies in a comparative manner, various phenomenon can be studied across different practical settings and international locations. According to Yin (2017), in order to study relationships between inter-organisational partners more than one organisation is needed, where the company and its partnerships represent the unit of analysis. This project will follow a similar research strategy as it studies globalised value chains by examining companies within two separate regions and in two different countries with differing governance structures/systems, which will allow for insights to be tested across both locations. One of the strengths of case study research is that by delimiting the empirical field of interest (e.g. to a certain place and time) it is feasible to bring different research methods into use, in order to gain a rich and contextualised understanding of the issue of interest (Easton et al., 1995).

3.2.1 Case Study Locations

The case study locations of NH and Styria were selected primarily based on the commonalities between the two regions in terms of population size, industry present in the region and local CE ambitions, with NH being the primary case study location and Styria acting as a location to corroborate NH findings, while also offering knowledge

exchange opportunities between similar places on their respective journeys to developing regional CE initiatives. The regions of NH and Styria are shown on the following maps, which were designed for this thesis to give an overview of the geographic regions studied in their wider context. This provides a more detailed description of the case study regions and a contextual understanding of the places studied. In Figure 1 both case study regions are displayed in their wider context and location within Europe. The Austrian and regional Styrian context is shown in Figure 2, with NH and the surrounding counties highlighted in Figure 3. Finally, the city of Hull, nearby towns and relevant industrial locations are illustrated in Figure 4.
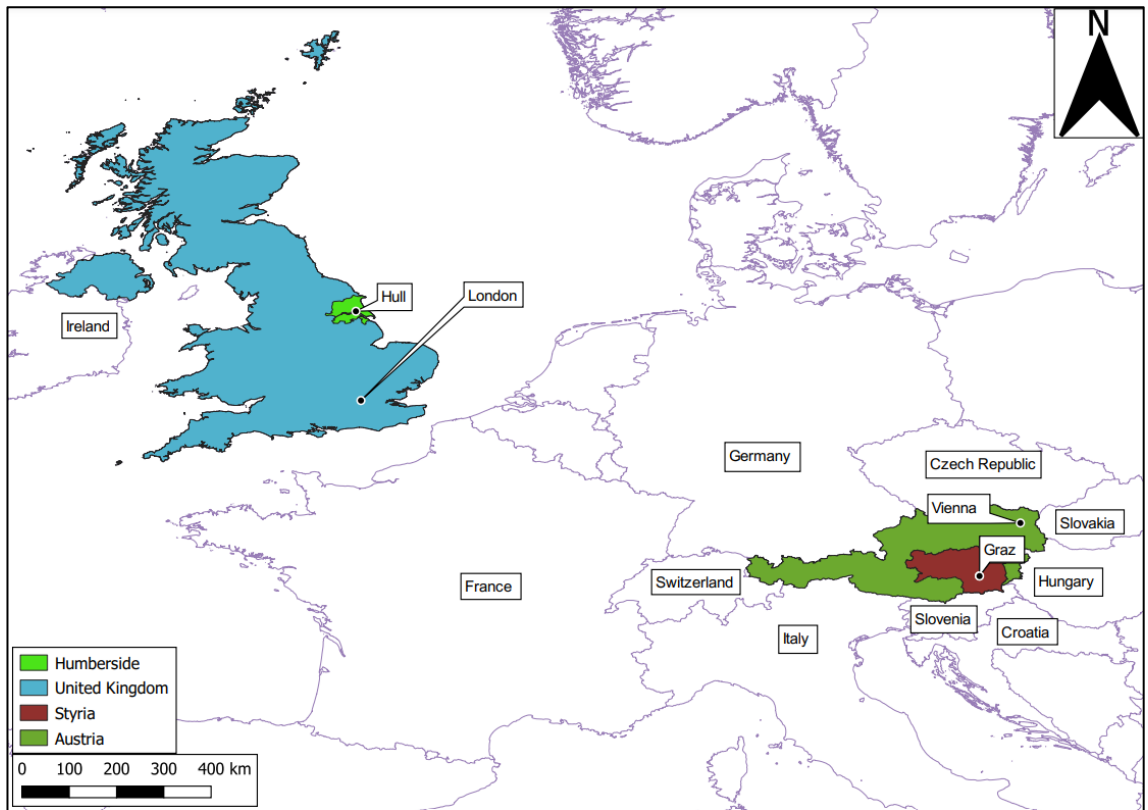
Figure 1: Map of Europe, with the case study regions shown in their wider national context
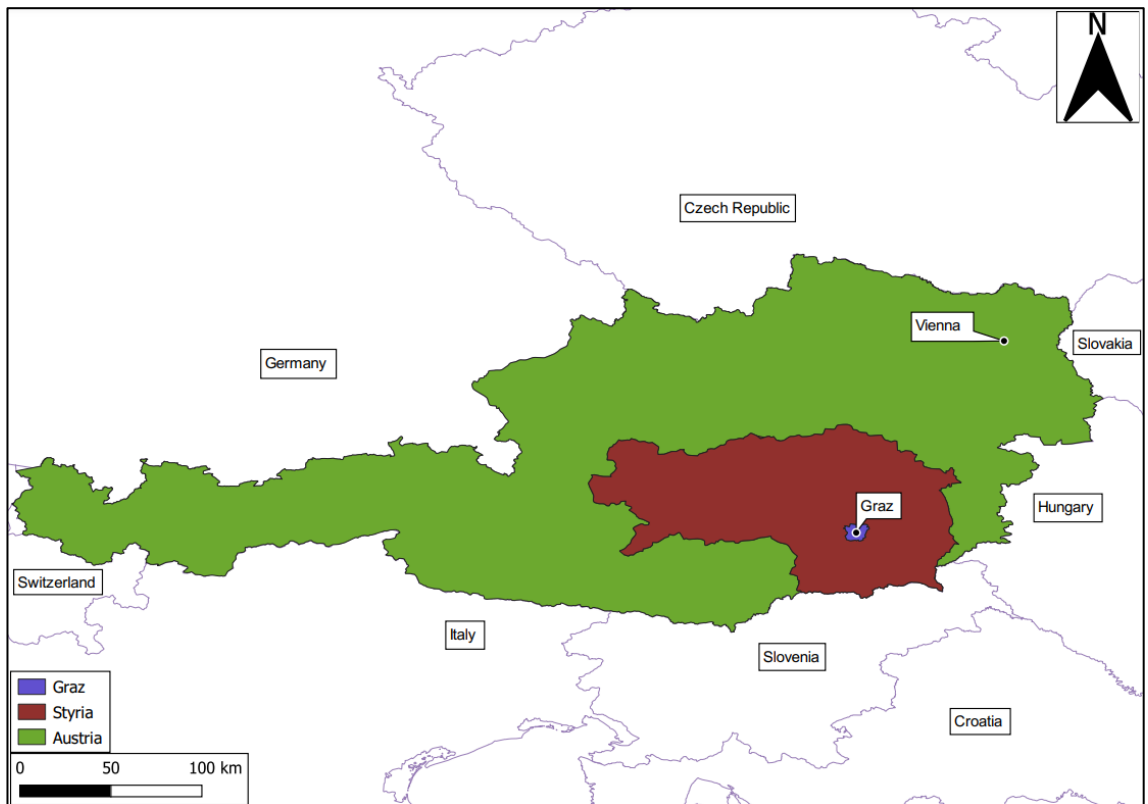
Figure 2: Map of Austria, with the region of Styria and city of Graz displayed
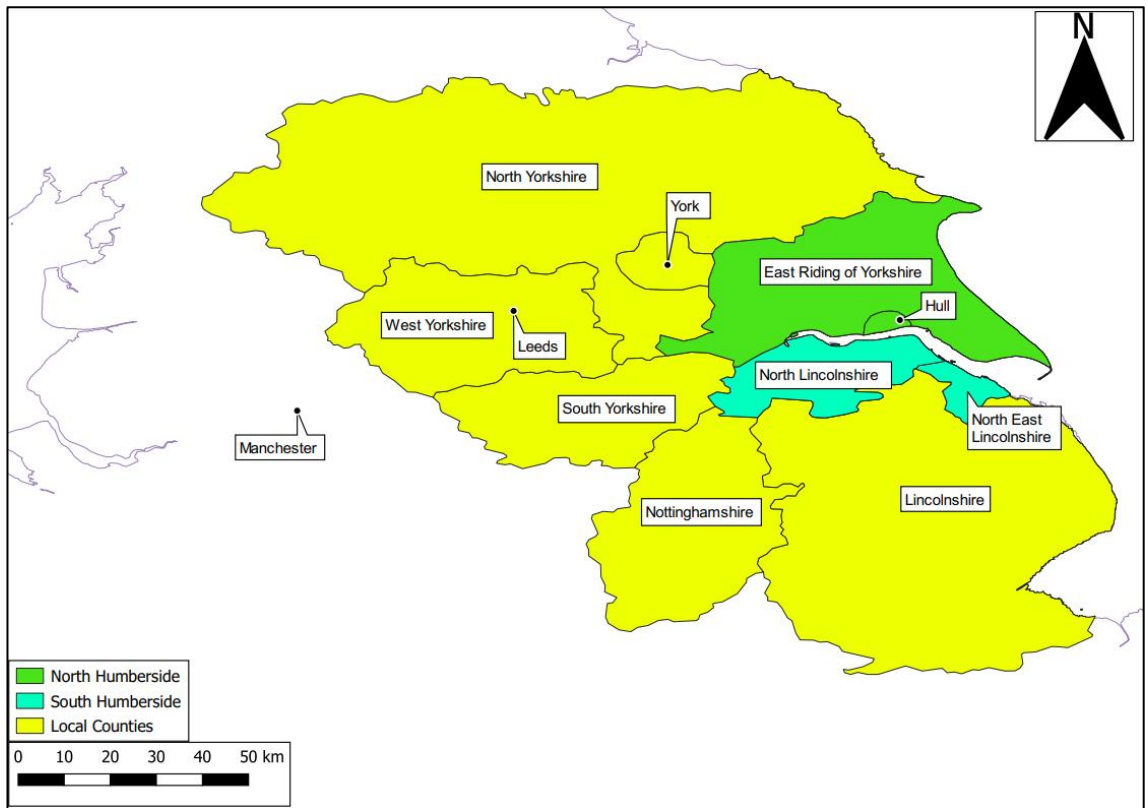
Figure 3: Map of North Humberside with surrounding counties and nearby cities displayed
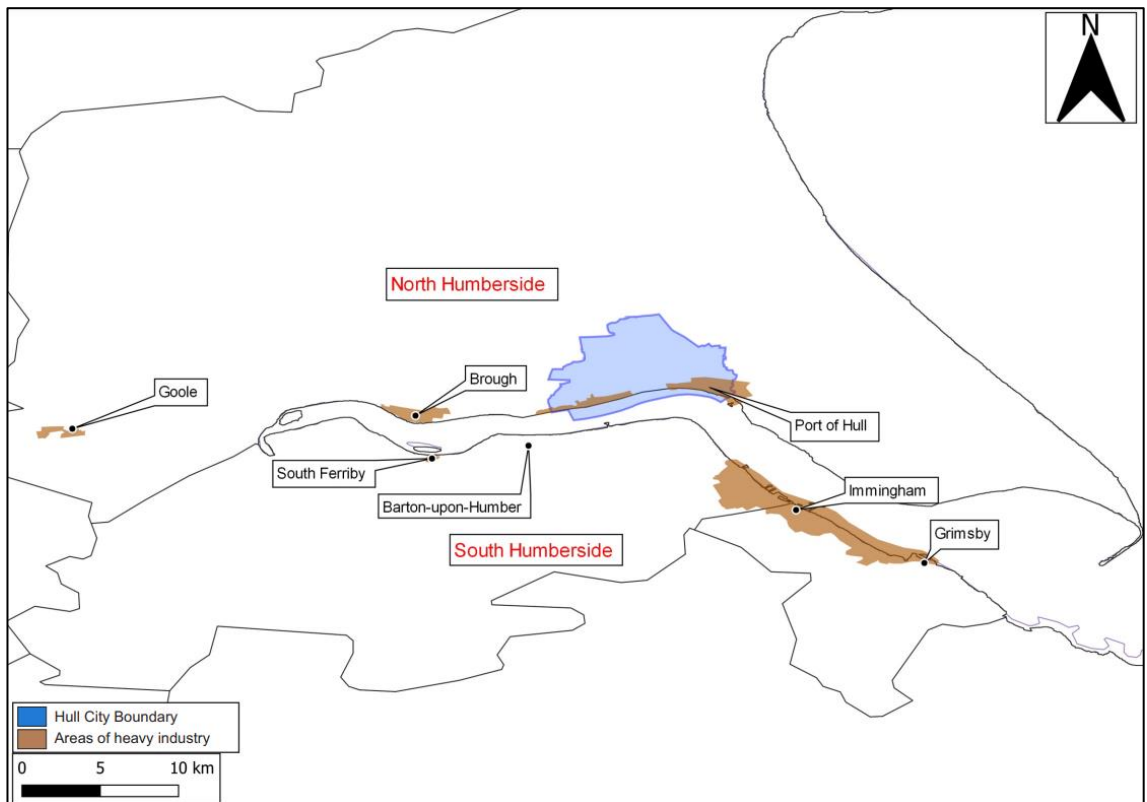
Figure 4: Map of Hull with nearby industrial locations and towns displayed

North Humberside, England

NH was the location chosen for this CE study (Figure 2), as it is a traditional manufacturing-oriented economy, where both local policymakers and business appear to have a desire to shift towards a low carbon economy (Invest Hull, n.d.-b). Following the UK government's decision to abolish regional development agencies in 2010, Local Enterprise Partnerships (LEPs) took their place to drive economic development at a local level (Rossiter & Price, 2013). This region is promoted by the Humber LEP, which uses the term 'Energy Estuary' as a place-promotion technique for the region as an environmentally conscious place which aims to shift from a heavily polluting region (Humber LEP, 2019a) to a cleaner economy (based in part on the offshore wide industry and bioenergy (Wurzel et al., 2019). Most recently, the region has launched a campaign in relation to reaching the City of Hull's net zero ambitions by 2045 (Hull City Council, 2022), called 'Oh Yes Net Zero' which acts as a strong promotional technique for the region, with leading stakeholders committing to the agenda of the campaign (Oh Yes! Net Zero, n.d.). While the York, North Yorkshire and East Riding LEP has developed its agenda to promote the CE within the region, as a key pillar of development for the region, they do so by acting as a facilitator for local business to come together and discuss resource efficiency collaborations across the region (Circular Yorkshire, 2021). This shift is also evident amongst businesses in the region, through the recent formation of the local waste working group the 'Humber Waste Alliance' (The Deep, n.d.), many of the companies studied in this project are also members of this business group.

For this project there are a number of key actors to consider, including both business and policymakers. The policy levels which were studied include; the European Union (EU), the national English level and the regional level in Hull and East Riding. There are a number of local agencies operating in the region including: Hull and Humber Chamber of Commerce, Humber Bondholders and Humber LEP (which includes local authorities both north and south of the Humber estuary). HCC and East Riding Council are the local authorities responsible for the governance of the NH region. The companies which were studied are all located in NH, with either the company headquarter or a subsidiary located in the region (see Table 2, for more company information). Broadly, these companies operate in the manufacturing and logistics sector, have over 250 employees and are some of the main employers in the region. These above attributes combined make NH and the

local actors in the region an interesting location to conduct this CE project. Moreover, previous academic research on IS was also focussed on the wider Humber region (e.g.Mirata, 2004; Penn et al., 2014; Velenturf, 2016), partially due to the industrial base of the region and in the past the presence of a regional 'National Industrial Symbiosis Programme' office (Mirata, 2004).

The region comprises of the City of Hull and the East Riding of Yorkshire unitary authorities (combining the roles of district/metropolitan and county councils). Hull is a medium-sized deprived city (estimated 260,673 inhabitants in 2017 (Kingston Upon Hull Data Observatory, 2017)), and the East Riding is a largely rural and more prosperous authority with a population of 341,173 in 2019[1]. Predominant industries in the region are in manufacturing, chemicals, food, construction and pharmaceutical, with the proximity to the Humber estuary and various ports often being cited as a key reason to set up in the region (Associated British Ports, n.d.).

Although rooted in one place, and offering a contextualised insight to CE-potential (Simboli et al., 2014; Deutz & Lyons, 2015) an in depth case study can offer insights for other locations. I take a CR approach (Sayer, 1999) which has been summarised in geographical terms as seeking 'causal structures: particular combinations of contingent conditions and more general pressures that might explain the changing fortunes of particular places' (Cox, 2021, p.7). In other words, through the lens of a particular place I aim to uncover insights to processes and phenomena that are of wider relevance (Easton, 2010; Fletcher, 2017).

Local Governance of the Humber Region

There are a number of local agencies in place designed to attract and retain firms in the region including; HCC, Hull and Humber Chamber of Commerce, Humber Bondholders and Humber LEP. HCC and East Riding Council are the local authorities responsible for the governance of the NH region. In addition, LEPs are in place to promote the economic development of their region, while city councils are responsible for the local governance of the city, covering topics from planning to economic development. The LEPs in this region include the Humber LEP and the York, North Yorkshire and East Riding LEP.

The city of Hull is predominately industrially focussed whereas the East Riding region is more rural and agriculturally oriented. Moreover, the city of Hull is mainly a labour

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[1] https://intel-hub.eastriding.gov.uk/council-facts/

focussed constituency while the neighbouring region of East Riding is traditionally a conservative focussed electorate base.

Additionally, Marketing Humber Bondholders is a membership run private organisation in place to attract and retain companies to the region. Large organisations located in the region pay into being part of the Bondholders group, to fund the organisation in their endeavours to attract both companies and people to the region. Marketing Humber works closely with other local agencies in terms of promoting the region and promoting the area as a good location to set up, with affordable land, close access to the Humber ports and a gateway to continental Europe (Marketing Humber, n.d.).

Hull and Humber Chamber of Commerce work on behalf of their member business organisations to represent and lobby local and national government on behalf of local organisations on matters which affect business in Hull and the wider Humber region. Moreover, they organise meetings for their members to address common problems and to help foster local collaborations (Hull and Humber Chamber of Commerce, n.d.).

Furthermore, clean growth represents a strategic focus for Hull's industrial strategy in the coming years as the city attempts to attract more firms to the region and grow in the years to come (Hull City Council, 2020). These attributes combined make NH and more specifically the internationally operating non-SME manufacturing firms in this region an interesting location to conduct this CE project.

Styria, Austria

As outlined above the region of Styria was chosen as the comparison location for this study. My co-supervisor was based at the University of Graz, and has strong connections to the local region and stakeholders. This allowed me to efficiently gain a strong contextual understanding of the Styrian economy and helped to facilitate connections with relevant stakeholders for this research project. The main organisations relevant to this study in the Styrian region are; Graz City Council, The Provincial Government of Styria and the Green Tech Cluster Styria. Graz City Council is responsible for the economic development of the city of Graz and also managing administrative issues within the city. The regional government of Styria has responsibility for the management of the wider Styria region, covering a broad range of economic, social and environmental issues. They also have more devolved power at the state level, therefore the regional government

in Austria appear to have greater control over local waste management and climate issues in comparison to the English context.

Particularly relevant to this project is the Green Tech Cluster. The Green Tech Valley in Styria has the potential to benefit from local gains, through export opportunities and inward investment opportunities to the region (Gibbs & O'Neill, 2017). However multi-scalar issues between local and international operations must be acknowledged, as networking activities often transcend existing governance levels (Rohracher & Späth, 2014). The ambition of Styria to become a global sustainability leading region is also supported by the regional Styrian government. Styria's regional state policy aims to integrate the development of eco-industries into regional development strategy (Pohl, 2015). However, it should be noted that despite the promotion of green forms of industry, Styria's Economic Strategy 2025 also includes less environmentally friendly sectors such as the automotive industry (Unit for Economic Affairs and Innovation, n.d). The Green Tech Cluster represents a networking and support organization for business operating in a broad range of Green-Tech industries. It is a government-supported initiative, involving a range of organisations including research, industry and the regional government (Schreuer et al., 2010). Styria appears to fall under the category of a transition region, as defined by Cooke (2011) as a sub-national administrative area, with policies and support mechanisms in place to support green industries and clusters of related green industries.

This research will explore the similarities and differences between NH and the region of Styria in terms of developing the CE within a local region. The city of Hull and the wider region appears to be at an early stage of a transition to a CE, with a number of firms and local agencies seeking to explore the potential for improving regional sustainability performance. While, it could be argued that Styria is more developed in the transition to a CE, with the Green Tech Cluster playing a pivotal role in this development and helping to enable a transition to a more sustainably oriented region. As such by comparing NH with Styria this may allow for knowledge sharing in the CE to take place between similarly sized industrially based local economies. It should also be pointed out that both international and national regulations play a role in the governance of regions. In both NH and Styria the EU plays a vital role in setting sustainability initiatives for member states to follow. Nationally in the UK, DEFRA plays a particularly important role in setting benchmarks for sustainability initiatives, the UK Industrial Strategy sets out how the UK economy intends to develop its economy in the future, while in Austria the Environment agency plays a national role in developing sustainability across the country.

3.3 Data Collection Methods

The data collection methods for this research project primarily consisted of semi-structured interviews and discourse analysis, with both policymakers and business. These approaches were complemented with empirical observations at a number of organisations and also a semi-quantitative survey with businesses located in the Humber region, which helped to triangulate findings. All data collection methods were used in NH, while in Styria only interviews and observations were used (due to language constraints of conducting the survey and discourse analysis in Austria). The following outlines the research questions and the associated data collection methods used to answer each question and the reasoning for this approach.

Research Question 1:

-How do policymakers envision the CE and what are company expectations for a CE?

This question is answered through interviews with multi-level policymakers and business in both NH and Styria. Semi-structured interviews were key to shedding light on potential constraints to developing CE activities, additionally strong rapport and open communication was vital to explore constraints with interviewees in an honest manner. Discourse analysis also offers English insights on companies' vision for a CE. Finally, observations in NH and Styria would allow for more contextualised insights on answering this research questions as I could observe what was happening on a regular basis within the organisation. The survey would display where companies' suppliers are located and where their outputs are sent, which may help to shed light on the feasibility of CE strategies in England.

Research Question 2:

-How do multi-level policy strategies and global value chains impact on the ability to develop a regional CE?

This question primarily draws on discourse analysis and interviews to explore both multilevel policies and global commercial value chain perspectives on developing a regional CE. Discourse analysis was applied to policy documents at the EU, national and regional level in England to understand the potential alignment for enabling regional CE perspectives. Interviews with a diverse range of policymakers were also conducted on this matter and contrasted with business interviews. Discourse analysis of company

reports would also offer value chain insights. Observations during my secondment at HCC would offer regular policy insights over a period of time on CE and regional policy discussions, while the survey would shed light on the distribution of companies and their value chain partners, in the NH context.

Research Question 3:

-How do regional development initiatives and company embeddedness impact on the ability to develop regional CE opportunities?

Again, interviews and discourse analysis represent the core data collection methods and these findings are complemented through the use of observations at local organisations and a survey with businesses. In particular regional policy documents are of relevance to this question, as they are likely to shed light on how policymakers perceive CE's potential in terms of improving local regional development opportunities in NH. Observations were used to gain a more contextualised understanding of the concept of commercial embeddedness as I could gain tacit insights in relation to how companies relate to the region where they are situated. While the survey data would help shed light on where NH companies' value chain partners are situated internationally.

3.3.1   Interviews

Interviews can be described as a purposeful discussion between two or more parties (Kahn & Cannell, 1957). Interviews were the primary method for data collection as it allowed for broad ranges of insights on the topic of study. Stakeholders from a variety of backgrounds were interviewed, from the private to public sector. Interviews also allowed me to speak to key individuals from both a business and policy perspective and explore broad topics in relation to a CE in a structured and open manner. The interview process was guided by literature to explore key academic themes and to answer research questions. The interview protocol was developed based on key literature debates, to address current gaps in research and to address the associated research questions in this project. The interview questions were divided into both business and policy driven questions (see appendix), these questions offered a general guide for interviews to follow, yet it is important to note there was still room for more open discussions to allow for unexpected insights to occur organically during conversation. As explained by Gubrium et al. (2012) the researcher should ask as few questions as possible to allow for the

respondents to tell their stories in their own words without interruption, which in turn reduced the risk of bias. Interviews represented a way to be able to naturally discuss specific concepts, which would be difficult to achieve using other methods (Blaxter, 2010). Another key benefit of interviews was my freedom and ability to rephrase questions in order to ensure the interviewee understands what is being asked, which in turn helped to improve the accuracy of the data (Dörnyei et al., 2015). However, on the other side a drawback of this open approach to interviews is that it was at times difficult to build a strong consensus between different respondents, as each interview was unique and did not follow all the same questions.

The interviews were conducted in a semi-structured format covering a broad range of CE related issues, to allow for an open yet directed conversation on key issues of interest (Ryan et al., 2009; Tracy, 2019). Semi-structured interviews facilitated discussions around key issues which allowed for directed but open discussion on key topics of study, as opposed to simply answering questions in a deceptively simple manner. Semi-structured interviews are useful to explore key themes in a broad and conversational manner, which allows for the interviewee to offer unexpected contributions to matters which were not set out before the interview questions formation (Longhurst, 2003). This conversational approach allowed me to focus the interview in a particular direction, while still allowing for an open and interactive dialogue to occur, which is likely to lead to rich data being obtained (Tracy, 2019). I was not confined to sticking to an overly rigid process which created the potential for spontaneity and helped shed light on unanticipated topics, which were not considered at the initial interview formulation stage.

3.3.1.1 Conducting the Interviews

In total 32 interviews were conducted, 23 based in the UK, 1 EU official (via email correspondence), and 8 based in Styria. By interviewing individuals from a range of companies and from different levels of their supply chain allowed for a representation of CE issues from different perspectives. Moreover, this thesis consisted of non-probability purposive heterogeneous sampling (Saunders & Lewis, 2012). This sampling technique involved identifying respondents who were well placed to answer the interview questions based on their experience, which allowed for research participants to be selected based on my own researcher judgement after connecting through local networking events and after conducting background desk research on potentially relevant organisations. A non-random sampling strategy was utilised to target large scale companies which have globally distributed value chains, with

associated complex inputs and outputs in the production process. The companies studied in both regions were broadly operating in the manufacturing, food, medical, engineering and other associated sectors (See Table 2 for more specific details of commercial interviewees and their respective industry). While third sector organisations and smaller sized firms are also likely to play a key role in fostering a regional CE, they were outside the scope of this research project, and therefore were not included in the study sample.

Interviews lasted between 30 minutes and 75 minutes and were conducted from spring 2020 to autumn 2021. The length of the interview depended on the availability of the interviewee, the level of detail given in responses to the questions asked and how the conversation evolved. Interviewees were recruited via both in person and online networking, to connect with relevant people in the sector. Before Covid-19 I had the opportunity to attend many networking events and participate in working groups on the topic of sustainability within the region and also further afield, which allowed me to meet with key individuals and informally discuss my research. After the events I would remain in contact via email and LinkedIn and in some cases an official interview was set-up and consent forms to participate in the interviews were signed. I also had the opportunity to visit Graz in April 2019, where I met on an informal basis with some key individuals in the Styrian region from both a business and policy perspective, a return research trip was planned for April 2020 but instead these Styrian based interviews were shifted online due to Covid-19 and associated travel restrictions.

During the closing phases of the interview a general discussion around who else within the interviewee's organisation may be helpful to consult, in order to offer more specific knowledge on a particular area and/or gain a wider nuanced perspective on the issues being studied. This snowballing approach (Saldaña, 2015) occurred quite informally, for example, if a question was asked and the interviewee was not familiar with the topic they would mention a colleague who would be able to offer a more comprehensive answer. Similarly, within business as some questions focussed on specific topics, for example, financial issues or marketing these topics were best directed to managers responsible for this matter. This was useful to compare the responses of different respondents as it offered unique insights from varying company roles in terms of shifting towards a CE. This multi-pronged interview approach also acted as a way to improve triangulation of research findings as it allowed for the viewpoints of different business roles to be heard on the topic of developing CE strategies within organisations. Companies were recruited for the

embedded case studies via local networking events, in order to meet potential interview participants. By meeting respondents on a face to face basis allowed for a connection to be made and a background to the research to be given to people in order to provide a deeper understanding of my research. These individuals consisted of experienced staff working in procurement, supply chain management, sustainability and other senior management roles within the firm, which offered a broad range of perspectives on CE development.

Moreover, it was important the interviewee understood both sustainability and supply chain management perspectives, while also ensuring they had a general familiarity with CE concepts. From a policy perspective a broad range of individuals from regional development to waste management experts were recruited as interviewees, in order to gain different perspectives on the multifaceted topic of the CE in the policy sector. If a particular person was not available for an interview then I would ask to be referred to another individual who was experienced on the topic being studied. After the interviewee agreed to the meeting a mutually convenient time was decided and the meeting would take place online, either through Microsoft Teams, Zoom or another platform which the particular company used. Other recruitment means such as via LinkedIn and company websites also allowed for specific key individuals to be contacted to take part in the research. LinkedIn allowed for me to connect directly with individuals, by searching for the company and job title and messaging this individual to see if they would be willing to take part in the research. This was particularly helpful during Covid-19 as in person events were cancelled and switched to online formats. A more formal description of the project was given to the potential interviewee, usually via email, then they either decided to take part in the interview or not.

In April 2019, I visited the University of Graz for 3 weeks, with the intention of returning in 2020 for a follow up visit (this was subsequently cancelled due to Covid-19 restrictions). During this visit in 2019 I was able to make initial contact with potential interviewees in the region, which was done with the assistance of my supervisor based at the University of Graz who was familiar with the region. This research visit allowed for initial informal interviews to take place which allowed me to scope out the most relevant organisations in the region in terms of developing CE activities at the regional level with both companies and policymakers in the Styrian region. More formal interviews were planned for 2020/2021, which took place online.

Interviews were set up to take place in person in Hull beginning in March 2020. However, due to unfortunate timing these were swiftly adjusted to take place online due to Covid-19. While the online format was not the initial plan, the interviews were still able to be conducted effectively online, extra attention was given to building trust and setting an informal atmosphere at the beginning of the interview to allow for honest and open discussions. In some circumstances due to the interviewee being unable for an online interview at the previously agreed time, these interviews were then delayed and re-arranged to a more suitable time. It should be noted that due to unexpectedness of Covid-19 and the dramatic shifts in the ways of working much of the initial interview conversation was often naturally centred around current affairs, lockdowns and the Covid-19 pandemic in general. Then I would try to shift focus to the specific interview questions, which then were conducted as normal. Upon reflection, there was sometimes an overemphasis on some particular aspects such as the impact Covid-19 may have on supply chain management and the potential for reshoring parts of the supply chain, additionally there was regular mentions of shifting to online events due to Covid-19. In general, myself and the interviewees had good internet connections, with strong volumes and sound, which ensured that interview recordings were clear and could be transcribed and analysed accurately. If the connection was poor during the interview I would ask the interviewee to repeat the point or ask the question again to ensure the response was accurately recorded. The interviews were recorded, (subject to consent from interviewees), transcribed and filed securely, then the data from the interviews were coded, categorized and analysed based on the relevant themes and coding scheme.

In order to improve the overall legitimacy of this research various procedures were used to improve reliability and validity and reduce bias in interviews. The interviewee's agreed to take part in the study, this ensured interviewees were willing and open to take part in a discussion. I also followed participant requests regarding the level of confidentiality and anonymity. In addition, a non-disclosure agreement was signed by myself if required by the interviewee. This research project also went through a rigorous iterative ethical approval process in 2018/2019, which involved senior university staff and the Faculty of Science and Engineering ethics committee scrutinising and providing detailed feedback on the proposed research approach at an early stage of this project. This helped to ensure the highest levels of ethics were followed, which also set a transparent foundation for this research project and fostered an honest and open approach throughout the research process. Interviewees also signed a consent form, which also provided them the

opportunity to highlight how they would like to be referred to in the research in turn protecting their confidentiality and resulting in more trust and in turn honest conversations. These precautionary steps will give participants a sense of trust in the study, meaning they are more likely to be open and honest in their responses, in turn reducing respondent bias. In addition, after interviewing the respondent, if there were any ambiguous areas in the data which need to be checked the interviewee was contacted to seek their clarification, in order to further ensure robust and reliable results. More detailed information on the interviewees, coding and analysis process is provided below.

3.3.1.2 Description of Interviewees

A diverse selection of manufacturing firms in NH were selected based on their international scale of operations and working in the manufacturing sector, with either a UK or International Headquarters located in NH. In addition, a small number of manufacturing oriented firms were selected in Styria in order to compare with NH firms. Policymakers at the EU, national (UK) and various regional agencies in NH and Styria, who had responsibilities for economic development, place promotion, sustainability and waste management were also interviewed. The following tables provide an overview of both Authority (Table 1) and Company (Table 2) interviewees (and their reference letter to protect anonymity), their organisation and their job function.

Table 1: Authority Letter, Type of Authority and Role of Interviewees

Authority	Authority type	Role (s) of interviewees
A	City Council	Climate Change Manager. Head of Waste Management. Policy and Partnership Manager
B	Chamber of Commerce	External Affairs Manager
C	European Union Agency	Politician
D	City Council	Sustainability Manager. Strategic Planning Manager. investment Manager
E	National Environmental Agency	Statistician and Evidence Analyst Waste Management (joint interview, two interviewees)
F	National Trade Agency	Circular Economy Lead and Waste Specialist (joint interview, two interviewees)
G	Economic Development Agency	Energy Manager
H	Place promotion Agency	Managing Director
Styria Authorities		
A	Regional Government	Waste and Resources Manager
B	Place promotion Agency	Circular Economy Manager
C	City Council	Economic Development Manager

Table 2: Company Letter, Company Sector and Role of Interviewees

NH Companies	Sector	Role (s) of interviewees
A	Medical	Head of Sustainability
B	Work-wear	Head of Sustainability
C	Food	Group Marketing Director. Head of Procurement. Group purchasing controller. Second Nature coordinator.
D	Off-shore wind energy	Health, Safety and Environment Engineer. Regional Innovation Manager
E	Waste management	Waste contract manager
F	Waste management	Regional General Manager Humberside
G	Chemicals	Business development and circular economy specialist
H	Port Authority	Energy Manager
Styria Companies		
A	Mobility	ReUse Management and Circular Economy Manager
B	Engineering	Managing Director of Manufacturing
C	Environmental management	Manager
D	Recycling	Strategic Project Developer
E	Automotive	Global research and Development manager

3.3.1.3 Coding Process

This coding scheme for analysing interviews was formulated using a deductive, yet flexible approach (Hsieh & Shannon, 2005), which allowed for theory to guide the process, while still remaining open to new research insights. The list of codes was mainly pre-determined based on the literature review, which was an iterative process as codes were updated, adapted and new codes added based on the interviews and emerging topics of discussion, which ensured data was categorized under the most appropriate code(s). According to Saldaña (2015) 'your preconceptions of what to expect in the field may distort your objective and even interpretive observations of what is "really" happening there' (146). This quote shows the importance of remaining open to the possibility of new insights from participants throughout the interviews, by combining an inductive coding approach to pre-determined deductive codes.

Within each code sub-codes were developed in order to organise data into the more precise categories. The process for analysing interviews followed a strict coding process (Tracy, 2019). Coding is the active process of identifying, labelling, and systemizing data which belongs to a particular theme or phenomenon (Tracy, 2019). The first step of the process was to develop a code-book based on the research questions and literature review, these offered initial themes to guide the coding process. Since interviews focussed on both policy and business, two distinct code-books were needed one for policy and one for business. The codebooks also had a definition for each code to help consistently manage the data and accurately categorize interview data to the relevant code and sub-code. Interviews went through several thorough rounds of coding to rigorously analyse findings

and draw connections between interviews. This allowed overall themes to be developed. Codes in the margins were firstly used to initially highlight apparent themes which were evident and could be later categorized to the relevant coding theme. The first-cycle code (Saldaña, 2015) is the type of code that is descriptive and shows the data's basic content and focuses on what exactly is present in the data. Next a secondary-cycle of coding was implemented to critically examine codes already identified in primary cycles. This stage involved synthesizing these codes and interpreting the meaning of the data in finer detail. Secondary coding allowed me to identify patterns and causal relations between key themes (Tracy, 2019). As I used a CR approach to coding, I analysed the data by looking for 'tendencies' or linkages between the data (Danermark et al., 2005, p.70). Causal relations and interconnections were formed between themes (Saldaña, 2015), in order to answer the research questions and contribute new insights and perspectives to theory and practice. Finally, steps were taken to synthesise data between different interviews and develop robust findings and conclusions based on interview data. The coding was iterative which allows for the coding process to be adapted and for new emergent themes to be recorded. This allowed for new insights to be made based on each interviewee's unique perspectives on the topic of developing regional CE initiatives.

I followed an introductory to Nvivo course at the beginning of this project. The Nvivo training offered useful insights and preparation for conducting interviews and key ideas in relation to developing themes, codes and sub-codes were utilised in the interview process. However, I decided against using Nvivo as the time and resources needed to invest into learning the system to a sufficiently high standard did not correspond to the level of analysis needed for this research project. Instead I followed the guidelines of Tracy (2019) for qualitative research and conducting semi-structured interviews, which ensured I followed a robust and rigorous approach to analysis. The following tables outline the coding system and business (Table 3) and policy (Table 4) codebooks which were developed for this project, with the selection criteria to allocate data into each specific category explained.

Table 3: Business Codebook

Business codes/subcodes	Criteria for inclusion

Place (P):	The reasons for locating in a particular place
PC-Place Cost	Data in relation to the cost of locating in a place
PT-Place Tie to region	Data in relation to ties to the region
PA-Place access	Data in relation locating in a place due to access to infrastructure
PS-Place skills	Data in relation to locating in a place due to skills available
PN-Place networks	Data in relation to locating in a particular place for network opportunities
PI-Place incentives	Data in relation to locating in a particular place for incentive reasons
Supplier (S):	Supplier and supply chain related questions
SSC-Supplier sustainability credentials	Data in relation to choosing a supplier based on their credentials
SS-Supplier source	Data in relation to the source of the supplier
SRM-Supplier recycled material	Data in relation to using suppliers who use recycled materials
SC-Supplier change	Data in relation to changing suppliers
SC-Supplier price	Data in relation to choosing a supplier based on price
SGD-Suppliers globally distributed	Data in relation to suppliers being globally distributed
Resource efficiency (R):	Issues dealing with resource efficiency
REC-Resource efficiency collaborate	Data in relation to RE and collaboration
REI-Resource efficiency initiatives	Data in relation to develop RE initiatives
RER-Resource Efficiency Responsibility	Data in relation to responsibility for developing RE
Waste (W):	Topics in relation to waste
WDM-Waste disposal mechanisms	Data in relation to mechanisms used to dispose of waste

WDF-Waste disposal firm	Data in relation to the waste disposal firm used
WDA-Waste disposal alternatives	Data in relation to alternatives for disposing of waste
WDC-Waste disposal contracts	Data in relation to waste disposal contracts
WT-Waste Tracking	Data in relation to tracking of waste
By-products (BP):	Moving by products to another organisation
BPF-By product feasibility	Data in relation to the feasibility of moving by-products to another organisation
BPC-By product connection	Data in relation to developing connections for by-product exchanges
BPF-By product financials	Data in relation to the financial aspects of by-product exchanges
Decisions (D):	Topics in relation to decision making systems
(DI)-Decisions Independent	Data in relation to the independence of decision making at the firm
(DPI)-Decisions previous investment	Data in relation to decision making based on previous investments
Circular Economy (CE):	Topics discussed directly related to the circular economy
CED -Circular economy defined	Data in relation to CE definitions
CESC-Circular economy supply chain	Data in relation to CE and supply chain issues
CES-Circular economy strategy	Data in relation to the CE and strategy
CEB-Circular economy barriers	Data in relation to barriers in relation to developing the CE
CEF-Circular economy future	Data in relation to future of the CE
Sustainability	Topics in relation to broader sustainability issues
SR-Sustainability reporting	Data in relation to sustainability reporting

SI-Sustainability initiatives	Data in relation to sustainability initiatives
SC-Sustainability confidentiality	Data in relation to confidentiality issues of sustainability topics
Authorities role	The authorities role in developing CE
AL Authority Local	Data in relation to local authorities role in developing CE
AN Authority National	Data in relation to national authorities role in developing CE
Authority International	Data in relation to international authorities role in developing CE

Table 4: Policy Codebook

Authority codes/subcodes:	Criteria for inclusion
Local authority: Topics in relation to Local Authorities	Topics in relation to Local Authorities
LACA-Local authorities and companies attract	Data which is connected with the LA attracting companies to locate in a region
LACR- Local authorities and companies retain	Data in relation to the LA working to retain companies in the region
LACL- Local authorities and companies location	Data in relation to companies setting up in a particular location
LAC-Local authority collaborate	Data in relation to LA collaborating with other stakeholders
LAG-Local Authorities Governance	Data in relation to LA and their governance role of the region
Relational places (RP):	Topics in relation to the concept of relational places
RPC- Relational places compete	Data in relation to RP competing with one another
RPC- Relational places collaborate	Data in relation to RP collaborating with one another

Local sustainability initiatives (LSI):	Initiatives in place to promote sustainability within the region
LSIS- Local sustainability initiatives strategy	Data in relation to LSI strategies within the region
LSIH/C-Local sustainability initiatives challenges	Data in relation LSI and the associated challenges
LSIF-Local sustainability initiatives funding	Data in relation to LSI and funding of these initiatives
LSIP-Local sustainability initiatives power	Data in relation to the power of authorities in developing LSI
LSIC-Local sustainability initiatives collaboration	Data in relation to the need for collaboration to develop LSI
LSIR-Local sustainability initiatives recovery	Data in relation to LSI as mechanism for recovery post-Covid-19 and in terms of economic development
LSIT-Local Sustainability initiatives targets	Data in relation to LSI for reaching sustainability targets
CE-Circular economy	Topics in relation to the circular economy
CEI-Circular economy importance	Data in relation to the importance of the CE
CEC-Circular Economy Challenges	Data in relation to the challenges facing the CE
CEF-Circular economy future	Data in relation to the future of the CE
CEOS-Circular economy organisational structure	Data in relation to the CE and organisational structure issues
Circular Economy supplier	Data in relation to CE and supplier/supply chain relations
CEE-Circular economy environment	Data in relation to the CE as a means to protect the environment
CEED-Circular economy economic development	Data in relation to the CE as a means to improve economic development
CER-Circular economy region	Data in relation to CE within the region

CEP-Circular economy promote	Data in relation the CE being used to promote
CED-Circular economy department	Data in relation to the CE and the departments involved
CET-Circular economy targets	Data in relation to targets for the CE
CEC-circular economy conflicts	Data in relation to potential conflicts of interests in relation to CE development
CEF-Circular economy financial	Data in relation to CE and financial considerations

3.3.2 Discourse Analysis

Discourse analysis was chosen as way to examine EU and UK based policy and company/policy statements in NH regarding CE related issues. A multi-scalar policy perspective was used which incorporated EU, national and regional approaches to CE development. These statements are the official communications and hence offer publicly available insights regarding CE development from both a business and policy perspective. The companies were selected based on being located in the manufacturing sector and also due to the availability of publicly available information on their sustainability matters. Polices were selected at multi-scalar levels of the EU, UK and the regional level to gain a comprehensive understanding of broad environmental policies which discussed CE issues in varying levels of detail. It should be noted that due to language constraints that this discourse analysis method was solely conducted with a focus on the UK context and a comparison study was not conducted in the Austrian context. DA was used as a way to triangulate and compare findings between UK based interviews and business/policy reports. This will act as a way to check interview discussions with the company's official statements on the same issue and to reflect on potential discrepancies.

Discourse can be defined as ideas, concepts and categories through which meaning is given to phenomena, and which is produced and reproduced through an identifiable set of practices (Hajer & Versteeg, 2005), thus discourse has particular relevance to how social relations are discussed, and within which I include 'place' as an item of analysis (Jessop, 1998). According to Hardy et al. (2004) 'discourse analysis provides a more profound interrogation of the precarious status of meaning' (19), which allows the researcher to investigate the content of a text and elucidate alternative apparent meanings. The 'discussion' itself is the object of analysis (Wetherell et al., 2001).

More specifically, critical discourse analysis (CDA) was also used in this project, as it allows the researcher to make connections between the language used in the text and the apparent meaning in social practice (1992) through its particular analytical concepts (Farrelly, 2010). For example, the author of a business or policy report may have a clear agenda and intended audience, but CDA allows the researcher to explore other apparent meanings and the approach to 'social actors' (also known as participants in social practices) (Van Leeuwen, 2008). It places a strong focus on how different social actors are discussed and perceived, through the language used, which helps to elucidate the actors who are seen as key players and significantly those that are by implication excluded because they are not given a role or acknowledged in the discourse (Van Leeuwen, 2008). Thus, CDA allowed me to gain an impression of how the stakeholders relevant to a regional CE are viewing both their own and each other's role.

I applied Van Leeuwen's CDA approach to critically explore the wider context and how the CE is perceived, discussed and manifested in various documents. Van Leeuwen's approach to CDA focuses on linguistic features such as word choice and meaning, and sociological aspects involving how these words are understood and interpreted in practice. By studying Van Leeuwen's sociosemantic categories (see Table 5) I aim to bridge the gap between the literal and sociological representation of language in different social contexts (Basov et al., 2019), which helps to uncover the sociological meaning when examining how participants of social practices are described in discourses (Van Leeuwen, 2008). This approach was also integrated into interview analysis, as it allowed to dig below the surface meaning of the data, to shed light on the underlying meaning associated with the language.

Table 5: Sociosemantic categories for CDA and social actors (based on Van Leeuwen, 2008)

Personalisation vs Functionalisation	Language used is emotional to connect on a personal level versus language which is practical and precise. Social actors can be represented by what they are (personalisation) versus by what they do (functionalisation).
Inclusion v Exclusion	Language which is purposefully inclusive using terms such as 'we' or 'us' versus language which is designed to leave out actors

	from the agenda. More broadly, social actors can either be included or left out of the document.
Foregrounding vs Backgrounding	Social actors can either be foregrounded with the use of emphasis or backgrounded by de-emphasising them.
Genericization vs Specification	Language used describes actors in a broad general sense or refers to particular identifiable individuals
Activation vs passivation	Language used to describe how actors are viewed, they are described as 'agents' or 'patients', which suggests the level of importance of their role. Actors are either given an active or passive role in an activity.

Policy Documents

In total twelve policy reports were studied (Table 6). I selected reports to cover the scales of governance from an EU, to the national English level and the regional level in Hull and East Riding. This offers an understanding of CE policy at the regional level in its multi-scalar context (John, 2014). By incorporating multi-scalar perspectives on studying CE development at the regional level, allows for a comprehensive approach to studying transcending and cross-sectoral challenges which are likely to impact a regional CE. Documents were chosen based on relevance to economic development, sustainability and CE related concepts. Notably, the policies in (Table 6) are not legally binding but are designed to set an overarching strategy for their administrative area, hence CDA is particularly useful due to the potential for diverging opinions and interpretations. A transition to the CE is likely to rely on efforts of multi-actors across multiple scales (Marin & De Meulder, 2018). Previous CE research has taken a similar multi-scalar approach within the EU/UK setting (e.g., Gregson et al., 2015). Although EU policy is less directly relevant in the UK post-Brexit, it still acts as a benchmark when developing future environmental policy (DEFRA, 2020).

Table 6: Multi-level policy documents used in the critical discourse analysis

EU level
European Industrial Strategy (2020)
European Green Deal (2019)
Circular Economy Action Plan: for a cleaner and more competitive Europe (2020)

National level
UK Industrial Strategy: Building a Britain for the future (Department for Business, Energy and Industrial Strategy, 2017)
Our Waste, Our Resources, a strategy for England (Department for Environment, Food and Rural Affairs, 2018).
UK Circular Economy Package policy statement (Department for Environment, Food and Rural Affairs, 2020)
UK Industrial Decarbonisation Strategy (Department for Business, Energy and Industrial Strategy, 2021).

Hull and East Riding, Regional level
Humber Clean Growth Local White Paper (Humber LEP, 2019)
Hull City Council Declaration of Climate Emergency (2019)
Hull City Council 2030 Carbon Neutral Strategy (2020)
East Riding Council Environmental Policy (2017)
East Riding Council Economic Strategy (2018)

Business documents

The companies whose documents were studied were selected based on their presence in the case study region, their industrial sector and the availability of sufficient quantity of data particularly related to sustainability issues. Unlike the interviewees, they are not self-selected by a willingness to participate or selected as representing CE best practice, but they represent what is present in the region. Sustainability reports are publicly accessible document that represent the company to its community and customers, potential investors and government bodies (Buhr, 2010). The companies selected have over 250 employees, with either the company headquarter or a subsidiary located in the region. Company reports were used to gain an insight into companies' views on CE issues. I examined a number of the most recently available company sustainability reports to explore how they discuss sustainability topics, in particular CE issues. If sustainability reports were not available I instead used company websites, which had dedicated sustainability/environmental sections, more specific details are provided in Table 7 below.

Table 7: North Humberside Business Documents used in the critical discourse analysis

Company	Sector	Document	Location	Size and Type
Siemens Gamesa	Wind-Turbine production	Global Consolidated non-financial report 2019	UK production site in Hull	Large, 250+ employees, Public limited company
Cranswick	Food production sector	National Annual Report 2019 and Sustainability section on website	National Headquarter, East Riding of Yorkshire	Large, 250+ employees, Public limited company

Croda	Chemicals production	National Sustainability report 2019	Global Headquarter, East Riding of Yorkshire	Large, 250+ employees, Public limited company
Arco	Workwear distribution	Sustainability section on website	Global Headquarter in Hull	Large, 250+ employees, Family owned company
Smith and Nephew	Healthcare sector	Global sustainability report 2019	UK production site in Hull	Large, 250+ employees, Public limited company
Associated British Ports (ABP)	Port Authority	Environment section on website	UK site in Hull	Large, 250+ employees, Public limited company

3.3.3 Observations

Observations form a part of ethnographic research which involves observing participants in their real-life environment (Atkinson et al., 2001). Observations were chosen as a method as they allowed me to study participants in their day-to day setting. Observations were used in this research project and allowed for interviews to be triangulated with empirical insights (Flick, 2004), by observing participants in various organisational settings. Triangulation can be used to help improve the reliability and validity of the research process and can be used to cross-check findings by using a combination of qualitative methods (Flick, 2004). There is a common criticism in qualitative research that as a researcher you may be seeking to prove your own theories on the subject of study, which has been considered and managed in this research project. By being based within organisations (specifically HCC) for a prolonged period of time allowed me to observe and reflect upon daily decision-making processes in relation to my research on CE. This helped me to understand more about the internal culture of the organisation, how problems are discussed and how decisions are made within the organisation. Thus

my role as a researcher carrying out observations is likely to be beneficial to the research process as it allows for data to be obtained over a prolonged period of time (Tracy, 2019).

According to Jorgensen (1989) participant observations are useful when there may be differences between views between insiders and outsiders perspective on a certain situation. It could be argued that organisations' employees have different views to outsiders, so therefore using participant observations allows for interesting insights to be made from an internal perspective. This helped to bolster my findings from the interviews and mitigate against any potential subjectivity that I may have as a researcher. It should be noted that as a researcher it is common to see what you want to see, as researchers may suffer from confirmation biases (Nickerson, 1998). Therefore, careful consideration and reflection was needed when observing, to ensure I did not wrongly interpret interactions and that I received an accurate representation of reality. Additionally, my role as an outsider may interfere with how actors behave and conduct their daily tasks since there is an external researcher watching them (Tracy, 2019), hence my presence at the organisation may have influenced the data being collected, which could be harmful to the research process. To counteract against potential negative side-effects of my role as a researcher at the organisation, I sought to build rapport and trust with the participants (Tracy, 2019), in order to foster openness and to ensure accurate data was obtained. Some authors note that the researcher and participant relationship is often fluid (Eppley, 2006), which is important for building trust and for insightful data to be obtained. Observations also acted as a means for triangulating findings from interviews and offered a way to avoid issues in relation to inaccurate self-reported accounts which may occur during interviews (Mays & Pope, 1995).

Observations took a wide variety of forms and were in person between September 2018 and March 2020, then adapted to online formats until December 2021 due to the switch to online events as a result of Covid-19. Observations acted as another form of triangulation for the interviews, since I could take notes and reflect on daily interactions in relation to CE developments in a number of organisations, at local working groups and regional conferences, which focussed on both economic development and sustainability matters. I conducted observations at a range of organisations in NH, including Hull City Council, York and North Yorkshire LEP and the Humber Waste Alliance group. At these events, I acted as a participant and could both partake and reflect on activities by being involved in the discussions at these events, which allowed for me to both contribute to the conversations while concurrently reflecting on how the discussions evolved and how

CE topics were considered by different stakeholders present. The following subsections will explain in more detail why each organisation was included in this study and will reflect on the approach of observing participants at these organisations.

Hull City Council

A secondment of 6 weeks was spent on a part-time basis at HCC's economic development department in spring 2019, working under direct management of the Climate Change Manager. I was based within the economic development department and had a designated place to work in the open plan office, which allowed for cross-departmental insights on a daily basis. Moreover, my time at the council allowed me to meet on a regular basis with the Climate Change Manager and other managers in the areas of economic development. Some of the key observations from these meetings were based around HCC 2030 carbon neutrality ambitions and how they intend to develop the local CE in the region and the associated challenges. My time at the council allowed for informal and exploratory meetings with key individual working in economic development, climate initiatives, waste management and also with LEP representatives.

This secondment allowed for internal observations from a first-hand perspective over an extended period of time. A research notebook was kept during this internship at HCC to record key insights and noteworthy issues for future reference. Furthermore, by being based at HCC this allowed for me to observe and reflect upon policy and decision-making processes in relation to waste management and resource efficiency from a local authority perspective, on a day to day basis.

Humber Waste Alliance (HWA)

This group provided the opportunity to observe the sentiment of business in the Humber region in relation to the CE and how they perceive waste management issues. I was part of this group, as a representative of the University of Hull, which allowed for informal yet insightful information to be shared in relation to challenges affecting firms in terms of waste and resource efficiency. Furthermore, this group acted as a link between research and practice and was a useful channel in terms of recruiting reliable research participants and survey respondents. I attended the meetings on a regular basis between September 2018 and December 2021, both in person and online, which provided the opportunity to gradually observe and reflect on how CE discussions evolved over this period.

The HWA group was formed by local businesses and NGO's in the region, with the main aim of reducing waste production in the region and knowledge sharing between organisations. I was a regular participant at their monthly meetings where I actively participated as both a representative of the University and also as an observer of business interactions at the regional level. The key members of the group include the major business, predominantly from the manufacturing sector in the region and also the local councils and other local authorities who work in the area of environmental management.

York, North Yorkshire and East Riding LEP

This 'Circular Yorkshire' group was set up by the LEP and brings together business, researchers, policymakers and consultancies within the Yorkshire region to facilitate a CE transition in the region. I regularly attended their meetings and events as a representative of the University of Hull and to conduct empirical observations (both in-person and online). Prior to Covid-19 I attended in-person events at the York Racecourse and York Railway Museum, which were early stage initial launch events for developing a 'Circular Yorkshire'. These meetings were useful to gain an in depth understanding of what was currently taking place in terms of CE development within the wider Yorkshire region and to observe a number of key cross-sectoral players at dedicated full-day CE development events. During Covid-19 the participation level at these events appeared to initially fall, but they were re-arranged to less demanding and more online friendly 'Circular Yorkshire Week' events, where I regularly participated in discussions and observed interactions between stakeholders present. The LEP divided the meetings into different groups based on industrial sectors and tasked each group with discussing various aspects of what a 'Circular Yorkshire' means to their specific sector. Agriculture and food manufacturing were observed as key players in the region and the LEP have developed case studies to act as guides for businesses seeking to adapt to more CE practices. The meetings were held in York specifically, so there was often a lack of engagement from the firms in the East Riding region, which is the area of focus for my research. Notably, East Riding has recently shifted away from the Yorkshire LEP to join the Humber LEP group.

Green Tech Cluster, Styria, Austria

In Styria, Austria I visited the office of the Green Tech Cluster in April 2019. I had conversations with Green Tech Cluster employees to learn more about the organisation to build regional connections, I could also observe how the Green Tech Cluster was set

up to interact with local organisations and how the different aspects of the cluster were organised. The cluster acted as central and meeting location in Graz and could be seen as an anchor between like-minded green-tech companies in the region. The Green Tech Cluster is in place to act as a cluster facilitator for organisations in the Styrian region. They do not have formal requirements to become a member and is set up as a PPP between government and local business.

To conclude, these range of observations offered critical insights into diverse practical organisational settings. After these meetings/events, I self-reflected on what I observed and noted any key points of interest which may be useful to further explore during interviews and/or to refer back to during future analysis. These observations offered insights into both timely and evolving CE discussions in practice and helped to shed light on how different stakeholders both contributed to and re-acted to CE conversations at particular meetings and events.

3.3.4 Survey

A survey of manufacturing companies in NH was conducted to examine their material flows and to understand where they source inputs and send outputs. The survey was distributed through various online channels including the Humber Waste Alliance, HCC's Enterprise Panel, Humber LEP and the Humber Bondholders. The survey was designed for managers with a strong knowledge of supply chain and sustainability issues to ensure accuracy in their responses. This was done by highlighting on the opening survey page that the survey was designed for companies located in the manufacturing sector and the ideal respondent would have experience with sustainability and supply chain topics.

The survey was designed and conducted at an early stage in this project and was intended to contribute to providing an initial base level of knowledge to various research questions and potentially highlight areas which require further examination through interviews. The total number of survey responses was 12, while 2 were excluded due to not being located in the relevant sector and duplication of companies. The survey was run through the JISC online survey software. The respondents were from firms of various sizes who were broadly located in the manufacturing sector. This allowed for a diverse respondent base, which allowed for various CE aspects to be explored based on firm size, turnover and industrial sector amongst other characteristics. The input from HCC at the survey design stage ensured that the survey remained highly relevant and impactful to the council and other local stakeholders.

The survey can be described as qualitative survey (Jansen, 2010), as it does not aim to analyse the frequency of certain characteristics in a sample, but instead the diversity of these characteristics. The survey followed a predominantly purposive sampling approach to reach the target companies (Hibberts et al., 2012). It was conducted on a confidential and anonymous basis to give respondents the opportunity to answer honestly and not simply provide the answer which they thought was desirable. Moreover, precautionary steps were taken to ensure that as the researcher I understood which companies were answering the questions to ensure I knew how many respondents from each company responded so the results were not skewed in favour of one particular company. Moreover, the survey was designed with reference to the seven-step framework of (Gideon, 2012), designed to guide survey development in the social sciences. These steps were used to ensure the survey questions were developed without bias or leading questions and to ensure that the questions were clear and concise, which allowed for the respondent to efficiently and accurately respond to the questions. The survey went through several rounds of development and adjustments and then was piloted with experienced participants to ensure it was finely tuned and asked the most relevant questions in the most accessible way. Moreover, the feedback from the statistics expert at HCC, helped ensure the survey was user friendly and would produce the most relevant data for this research project.

Table 8 (see appendix) was formed based on survey response data and highlight various companies' value chain activities and display where their suppliers are based and where their customers are located in a simple visual manner. The purpose of this table is to effectively highlight the level of global distribution in each companies' value chain. By graphically depicting the material flows into and out of NH, it should offer businesses a starting point to understanding the challenges facing material flows at the regional level. Additionally, companies' survey responses offered a form of triangulation to further bolster the findings from the qualitative methods, particularly interviews. The survey offered a semi-quantitative understanding of where firms stand in relation to resource management issues. This survey gave an initial starting point to my research project and will also provide insights to new areas to focus interviews on based on 'demi-regularities', which are rough trends or patterns in empirical data (Fletcher, 2017).

3.3.5   Ethics Statement for Data Collection

As mentioned above ethical considerations were a core focus of this project, from conceptualization, throughout the data collection stage and into analysis. This project went through a rigorous Ethical approval process which met the standards of the University of Hull ethical approval committee, which is made up of experienced researchers. This process involved completing an ethical approval form which outlined my research plan and the style of participant involvement in the research process. The interviewees also signed a consent form which highlighted their desired level of anonymity and how they wished to be referred to in this research project. This helped to build trust with interviewees and ensured that they were able to talk openly regarding the topic, while still keeping a level of anonymity. In this project the interviewee's job function is provided but the company is only referred to by a letter, which corresponds to a specific company sector.

In conclusion, interviews acted as the main data collection technique and combined with the other data collection techniques allowed for a broad range of perspectives and viewpoints to be incorporated into the study resulting in rich data on the multi-faceted topic of developing regional CE activities. The mixture of methods allowed for triangulation of the data in order to improve the reliability and validity of the research findings. These mixed methods approaches allowed for a diverse range of topics to be included in this project, however there are still limitations to these methods which need to be considered. The following will discuss how these limitations were mitigated against to ensure the data collection methods were as robust as possible. There is also a need to reflect on the above research methods and consider my personal and professional background and how this may influence my understanding and interpretation of CE issues.

3.4   Personal Considerations and Reflections on Data Collection Processes

The following will highlight key considerations and reflections on the data collection process. This section will actively consider my positionality as a researcher and will

discuss the importance of continuous reflexivity throughout this research project and finally will critically reflect on my role as a researcher in the data collection process.

3.4.1 Positionality and Reflexivity

The personal experience and history of the researcher (Louis & Barton, 2002) are likely to impact on their positionality and stance on their approach to the topic of study. My positionality as a researcher is likely to influence data collection when conducting qualitative research, as I may have assumptions or biases based on previous life experiences. According to Louis and Barton (2002) the positionality of the researcher is often influenced by socio-cultural factors including race, gender and social class, which the researcher has little control over, hence the researcher should reflect on how these characteristics impact on their assumptions during data collection. Moreover, reflexivity has been increasingly recognized as a vital step when conducting qualitative research and generating new knowledge (Horsburgh, 2003; Blaxter, 2010). Researchers need to be aware and understand their role in the creation of knowledge and to carefully monitor the impact of their biases and personal experiences on their research, to maintain the right balance between personal and universal when collecting data (Berger, 2015). The researcher is likely to be passionate about their own particular research area and hence needs to be aware of this interest during the data collection phase and be able to take a reflective step back, in order to reduce potential subjectivity.

Moreover, my personal background and educational experience in predominantly management related areas is likely to influence my assumptions and ideas, I used self-reflexivity to understand how these experiences may influence the research process (Tracy, 2019). Additionally, the process of participant recruitment is likely to be influenced by the researcher's own background and connections in their geographic setting (Robinson, 2014). Therefore, reflexive acknowledgement of any potential biases were considered to improve transparency and limit potentially harmful consequences of the researchers' involvement in the research process (Robinson, 2014).

There has been increased attention given to the issue of researcher subjectivity in qualitative research, which has made subjectivity concerns more visible (Lather & St. Pierre, 2013). To counteract potential negative side-effects associated with qualitative

research a few different qualitative methods can be combined, such as interviews and empirical observations, to help triangulate research data, which was done in this project. I used the literature review as a guide to identify research gaps, formulate research questions and steer interviews into a particular direction to cover relevant research themes, while interviews were also designed in a semi-structured format to allow for unexpected insights to be incorporated into the discussion in a more spontaneous manner.

Personally, upon reflection I'm a native English speaker with a background in Business Studies, which should be acknowledged in this interdisciplinary research project. Not all participants spoke English as a first language, particularly in Styria. Upon reflection since the quality of English amongst all participants was of a very high standard there were very few communication issues. As a precaution, when coding interviews I took extra time to consider interview responses, moreover during the interview if something was ambiguous I tried to clarify and support interviewees in choosing their desired word, while at the same time not providing my own perspective. It should be noted that all interviews in Austria had managerial positions and often conducted daily business in English due to the international nature of the organisation, which allowed for interviews to be conducted to a very high standard in English.

When conducting the interviews covid-19 forced them all to take place online. This was both a new experience for myself and the interviewees, which may have affected how topics were discussed due to interviewees potentially being under stress and going through difficult personal and organisational challenges.

3.4.2 The Researcher's role in conducting interviews

From the start of this project I was aware of the potential pitfalls associated with qualitative research methods, by understanding these pitfalls I could then actively mitigate against associated criticisms. Subjectivity is one of the key aspects a researcher needs to be aware of as they may often bring their own biases to the research they are carrying out (Lather & St. Pierre, 2013; Tracy, 2019) which may impact on the accuracy of the data being collected. Moreover, the researcher brings their own epistemological background to studying the ontological world (Fletcher, 2017), which can create data collection challenges. This means that I have my own personal experiences which I bring

to this project which is likely to impact on how I both conduct research and interpret empirical findings.

Moreover, there is also a lack of agreement on what type and the level of involvement of researchers' influence is appropriate when using qualitative methods to collect data. Some scholars such as Scheurich (1997) argue in a post-modern world the importance of acknowledging the 'baggage' we as researchers bring when using qualitative methods, which in turn allows for transparency and scrutiny. Although, it is clear that the researcher has an ethical obligation to seek out the truth when collecting data in qualitative research. A critical exploration is required to accurately capture the thoughts of participants and depict their experiences in the most true form possible (Miller et al., 2012).

Additionally, the issue of bias in qualitative research is ambiguous and is often debated (Ortlipp, 2008). Researchers need to be aware of their potential subjectivity and know the actions they can take to mitigate against any potential biases to ensure their research is as accurate and reliable as possible. Moreover, subjectivity can also be seen as a positive aspect in qualitative research, as it is the basis of the researcher making a new contribution to their field, which results from the unique combination of their personal experience with the data they have collected (Peshkin, 1988). This also fits in with the underlying philosophy of CR approaches to qualitative research, which critically reflect on the central role of the researcher in a case study research project (Easton, 2010). However, the researcher needs to be transparent and provide a detailed background to their experience in relation to the topic of study (Clark & Vealé, 2018). It could be argued that the researcher has too much influence in the interview process, which may introduce bias into the research (Brown, 2001). Some scholars have highlighted how to reduce negative consequences of the researchers' influence on the interview process, which include the practical steps which can be taken in order to limit potential biases that researchers may bring to interviews. For example, after the interview if there were any ambiguous areas in the data which need to be checked the interviewee was contacted to seek clarification, in order to ensure reliable and valid results (Chenail, 2011).

Additionally, the sampling technique which the researcher utilises to recruit interviewees is also likely to have an impact on the data collection stage. My research followed purposive sampling, where the researcher decides what exactly needs to be known and then finds people who are willing to provide the information through their own experience (Bernard, 2017). Purposive sampling is often subject to criticisms of bias and subjectivity

(Collier & Mahoney, 1996), as the researcher seeks to talk to specific people and organisations. This was the most appropriate form of sampling to be used for this particular project, as it allows for experts to offer their insights into the topic of study. Although, there is a need to be reflexive and acknowledge the limitations of this sampling approach to data collection (Berger, 2015).

The common critique of the researcher's involvement and their potential subjectivity in qualitative research can be counteracted by acting as a disciplined researcher and following the above transparent and rigorous procedures and continuously reflecting upon potential biases to collecting data when using qualitative research method, which was actively considered throughout this project. During the research process I was aware of my role in conducting the interviews and the importance of remaining both transparent and open, during the interview process to steer conversation to the topic of study, while still allowing for new insights to emerge. I ensured to reflect on my perceived ideas on the topic being studied and continuously self-reflected on the process, this helped to ensure that the interview process was conducted in a rigorous and non-biased manner.

To conclude it appears clear to me as a qualitative researcher that I have the power to control various aspects of the research process, which could be seen as both a positive and a negative. My personal life and experiences are likely to impact on their ability to carry out qualitative research systematically, methodologically and objectively. However, by acknowledging and reflecting on potential challenges associated with the researcher's influence on qualitative research should help to counteract against bias and subjectivity. Moreover, by following a CR approach to the research process allows for a systematic and consistent approach to conducting qualitative research, which ensures the researcher's influence is controlled. The researcher needs to work towards objectivity and be aware of the potential biases they have in relation to the particular subject being studied. As Gubrium et al. (2012) note the researcher's moral commitment to seek out what is true, and the researcher's ethical imperative to examine his/her own personal ideas is essential to qualitative research, I will ensure to take this forward with me when conducting my research. The common critique of the researcher's involvement and their potential subjectivity in qualitative research can be counteracted by acting as a disciplined researcher and following the above transparent and rigorous procedures and continuously

reflecting upon potential biases to collecting data when using qualitative research methods.

3.5   Summary of Methods and Research Limitations

In summary this project followed deductive methodological approach, while still allowing for inductive insights to emerge. The methodology consisted of an interdisciplinary CR approach, which drew on a range of data collection techniques in the case study locations of NH and Styria. The diverse range of methods used elucidated varying insights on developing regional CE activities. The following findings section of this thesis integrates the data obtained from these interdisciplinary methods and in turn offers robust insights, by drawing on international case study locations to gain a deeper underlying understanding of nuanced issues in relation to regional CE development.

Like most research projects, there are also some limitations associated with this project, which will now be discussed with corresponding explanations of how I mitigated against them when possible. Firstly, Covid-19 and the associated initial lockdown occurred when this research project was entering the interview data collection stage in March 2020. This resulted in uncertainty surrounding how to collect data successfully in unprecedented and rapidly evolving times globally. The inability to meet in person, meant that interviews had to be shifted online and conducted via online meeting technologies. Due to the unfortunate timing most of the introductory conversations in interviews were in relation to Covid-19 issues as this was dominating current affairs at the time. But I became aware of this and aimed to steer conversations back towards CE concepts after the initial introductory opening phase of the interview.

At times, interviewees who I contacted did not respond; this was difficult to manage as potential interviewees had to volunteer to take part. Email reminders were sent to these people and I was very flexible on times for interviews to suit with interviewees and their busy managerial schedules. In some instances people agreed to take part in interviews, but then cancelled due to other work commitments. If this happened I asked to be put in contact with other similarly experienced and appropriate individuals at their company to replace them for the interview, which was often successful and worked well as a contingency plan in interviewee recruitment.

One mitigation for the challenges of recruiting interviewees under unusual circumstances was undertake the discourse analysis of policy and company documents. This provide insightful as regards the UK context, but due to language constraints discourse analysis could not be for the Austrian case study. Therefore, a direct comparison could not be made on discourse. My research trip to Styria, pre-lockdown, allowed for a contextualised understanding and representation of the region, which helped me gain a nuanced localised perspective on the topics being studied. Interviews and observations both were conducted in Styria and allowed for useful comparative insights to be made with NH and also offered the potential for knowledge sharing between these international regions.

Finally, the number of survey respondents was low. The number of respondents is statistically insignificant, but it was not the intention to gain a statistically representative number of respondents. Instead the focus was on ensuring that key individuals completed the survey, to gain critical insights from the most relevant companies in the region. The target audience was individuals with experience in the manufacturing/logistics sector with a strong knowledge of their own company's supply chain operations and sustainability related issues. Thus, while the survey respondent rate was low, the participants still represented a strong proportion of the manufacturing sector and were all experienced individuals working in relevant companies for this study. For language issues the survey was not conducted in Austria, which means that the data is also not available for comparison. Care has been taken comparisons made between the two case studies reflect the data available in each case.

These limitations were acknowledged during the research project and steps were taken to reflect and mitigate against potential detrimental issues in the research process, as outlined above. The next section will discuss the findings of this research project.

Chapter 4 Exploring stakeholder perspectives on a circular economy: company expectations and policy visions

This chapter will consider why companies and policymakers seek to pursue CE activities, their varied understandings of CE strategies and their general visions and motivations for pursuing CE initiatives. It explores both commercial and policy visions for a CE drawing on interviews, policy/business documents and complemented through survey and observations in both NH and Styria. This work contributes to key debates in relation to regional CE development and explores the challenges in relation to aligning local stakeholder interests for developing a regional CE.

Previous work suggests that companies' main priorities are associated with increasing shareholder value (Friedman, 1970), while regional authorities have a responsibility to improve the economic performance of a region (John, 2014). This chapter critically investigates and advances research in relation to previous resource efficiency topics such as IS (Deutz & Gibbs, 2008; Velenturf, 2016), while using a CE lens of analysis to study both business and policy approaches to understanding regional CE issues. I will address previous gaps in research, which highlight a lack of understanding and ambiguity in relation to what exactly is involved in a CE (Kirchherr et al., 2017). These research findings will further develop and extend literature in relation to policy development at various governance levels, such as EU approaches to CE (Lazarevic & Valve, 2017; Calisto Friant et al., 2021), national level perspectives (Johansson & Henriksson, 2020) and city-level approaches (Campbell-Johnston et al., 2019). The chapter has two sections exploring different aspects of business and policymakers' approaches to CE development.

4.1 Commercial approaches to pursuing CE activities

This section explores commercial expectations of what is involved in a CE and how companies discuss CE change occurring in their own company and industry, predominantly drawing on insights from NH and then contrasting findings with the case of Styria. It draws primarily on interviews to offer insights into how companies understand and consider CE activities and how this translates into actions and strategies at the organisation. Exploring company expectations for a CE (and the associated limitations) will help to develop insights into how companies currently understand and seek to develop CE strategies.

From the research data, it became evident that there were broad and ambiguous expectations in relation to a CE, which was displayed by a diverse range of businesses in both NH and Styria. It appears there is a lack of a consistent understanding between different stakeholders on what is specifically involved and included in a CE, this is evidenced in the following quote by the **Regional Innovation Manager, Company D, Hull:**

"Yeah we use it, it's maybe an indistinct term it's one of these vague terms like digitalisation, it can be mean different things to different people. To me it covers all sorts of things like sustainability of supply, end of life issues, decommissioning, recycling, refurbishment, repurposing. In some industries it's known as grey parts or recycled parts."

An engineering perspective from an employee at the same company suggests there is a lack of true understanding of CE issues at managerial levels, with a strong emphasis put on end of life issues, as seen in the following quote by the **Health, Safety Environment Engineer, Company D, Hull:**

"It would be used at a managerial level, in meetings I've heard the term used, there's discussion about what happens wind turbines at the end of life, I've seen pictures of blades being finished after use ended up in huge pits. It's something I know quite a lot about from my personal background, but I don't think it's talked about very much in its true sense."

This end of life approach to waste management is also reflected in the following quote by the **Group Marketing Director, Company C, Hull:** *"So, thinking about the circular economy I guess to us it means to eliminate as much waste as possible and maximise circular use resources. Ideally our waste at one end of the system would be an input at the start of another. Whether it be internally or externally".*

Notably, in the above quote there is mention of closing production loops either within the organisation or through external collaboration, although the implementation challenges of this potential CE strategy was overlooked. It also appears that business are taking part in CE activities without classifying it as CE, the following interviewees seem to reference potential resource efficiency exchanges, although they do not view this in terms of recycling, which raises questions as to what companies understand and expect to be part

of circularity, as displayed in this quote **Business development and Circular Economy specialist, Company G, Hull:**

"I think circular economy is obviously focusing on the end of life of a material and just making sure any product is designed that at end of life it becomes a resource for the next product. Rather than looking at where to dispose of it, working out how it can then be a valuable resource for the next cycle"

These hypothetical strategies show companies are aware of potential CE strategies, such as closing production loops, but there is limited attention given to implementation of these CE initiatives in practice.

These diverse and wide ranging approaches to a CE were also regularly evident in Styria, as encapsulated in the following quote by the **Managing Director of Manufacturing, Company B, Graz:** *"The reduction of CO2 emissions and water consumption, maximizing energy efficiency and efficient use of raw materials like wood in pulp and paper process [...] with the focus on waste production, energy efficiency, optimization of production processes and establishment of an environmental system"*

This broad perspective on company expectation on the potential for CE development is also evident in the following quote by **Manager, Company C, Graz**: *"the main focus was like to argue that you could implement measures for sustainability or for environmental protection, energy saving and like have an economic effect by cost reductions and like saving money."*

This above wide-ranging approach to a CE was evident amongst many businesses, it seems that CE has taken on an all-encompassing term which ranges from recycling to reduction in energy usage, while this shows the strong ambitions for a CE, it may result in a lack of concrete CE strategies being developed amongst regional partners.

In both NH and Styria, the data provides a consistent message that a companies' main purpose was to generate profit and remain financially sustainable, as evidenced by the following quote from the **Head of Sustainability, Company A, Hull:** *"as a sustainability professional trying to raise the profile of sustainability so that we're not necessarily buying the cheapest stuff if it's less sustainable. But it's a very fine line because we're here to make money at the end of the day."*

This business continuity perspective was particularly evident in NH and suggests that CE strategies are seen as a way to improve long term business performance and was often

cited as a strategic consideration for business in future years, which is encapsulated in the following quote by the **Head of Sustainability, Company A, Hull:** *"I think in five and ten years' time this will be the differentiator if you like between who survives in many industries, not just ours".* While waste is being recorded, in order to reduce costs and reach commercial key performance indicators (KPI), as illustrated in the following quote by the **Head of Procurement, Company C, Hull:** *"waste is very high on the KPI agenda and waste is monitored very closely".* This focus on waste measurement may help favour creative approaches to residue management, such as IS, in order to decrease associated costs of waste disposal. Similarly, cost savings appear to take strategic importance over environmental motivations when pursuing CE strategies, as demonstrated by **Health, Safety and Environment Engineer, Company D, Hull**: *"I think it's down to companies and their willingness to engage, which needs to be from senior managers, who need to be sold the business case. But as of now lots of CE information senior managers don't get, they get cost reduction but maybe not CE strategies."* This quote foregrounds businesses' role in tackling CE challenges, while concurrently acknowledging they may not understand CE strategies, instead focussing on reducing costs. Interviewees repeatedly considered these apparent cost savings to be the primary motivator for developing CE strategies, while the positive knock-on environmental effect tends to come after cost saving aspirations, this point is illustrated by the following quote from the **Sustainability Co-ordinator, Company C, Hull:** *"Everywhere that you can we are looking for savings. If you go to packaging. Even before it was for a sustainable reason we have always been trying to make sure we are using packaging as efficiently as we can. Just because it is expensive apart from anything else".* From this, it was evidently clear that cost was a primary motivator in pursuing CE activities, which suggests that policies must offer commercially viable CE opportunities, or they risk poor uptake by business, in turn resulting in a slower transition to a more CE oriented society.

While cost factors dominated discussions of CE drivers for business, the role of changing attitudes and behaviours of consumers also play a vital role. This change in consumer sentiment was often described as the 'Blue Planet' effect (in England) and resulted in environmental issues rising on companies' agendas, as exemplified by the following quote from the **Regional General Manager, Company F, Hull:** *"plastic is probably developing the infrastructure in terms of processing plastic is evolving. Obviously the, I think The Blue Planet has changed that. Because people are less likely to throw it away now and more likely to want to have it recovered".*

Moreover, the CE also seems to represent a marketing opportunity for some companies in NH, as it offers a way for them to differentiate themselves from competitors, which can be seen in the following quote by the **Group Marketing Director, Company C, Hull:** *"we have got a very big focus on making sure we are effectively working to our vision to be the world's most sustainable meat company and that covers every aspect of our business again from our farming operations to our factory units into the local communities as well".* The above quote displays an internalised company approach to sustainability, giving an active role to their supply chain partners in sustainability transitions. However, it is important that companies understand the values of a sustainable CE, in order to transition to a sustainable future. There is a need for companies to consider the implications of their own particular industry, such as meat, on contributing to wider environmental issues.

In contrast, more directly apparent than in the UK context, Austrian businesses recognise the strong role that policy can play in promoting the CE, while in the UK, business view CE initiatives from a more siloed business to business perspective, as demonstrated in the following quote by the **Reuse and Circular Economy Manager, Company A, Graz:**

"We need, the Government and politicians to ensure that the resources are not so cheap this is the main problem now for me and all this, this must be pushed to that we change faster. I think we will change, all the industries all will change, but they will take more time for this. I would say it is not a regional topic it is a totally collaboration topic from the whole world."

This was echoed by other companies in Styria who admit that legislation is the driving force in CE developments at the regional level, as this sets the agenda and requires companies to make changes for CE development. This point is encapsulated in the following quote by the **Global R&D manager, Company E, Graz:**

"Yeah, so, there is a shift towards sustainability which started some years ago really and now this new topic, also on EU level, circular economy comes up. So, we are researching on that and they are the first request from our customer, you know, the awareness in the public especially. On one side it is for us, the drive is always the legislation."

The above quote foregrounds the role of both supra-national and national governmental authorities to set regulations and to legislate to mandate and accelerate a drive towards increased sustainability and circularity.

In contrast, in England there was a suggestion by a number of companies that the local council was actually holding back their regional CE activities, due to their lack of agility to make changes for the potential benefit of a regional CE, which was typified in the following quote by the **Group Purchasing controller, Company C, Hull:** *"the issue that you've got with it is that the councils will have contracts in place with their, their collections and it will be too expensive to get out of the contract and these contracts can be ten years old."*

These above long-term commitments in terms of waste management services appear to act as a disincentive for developing innovative CE solutions in England. Business also suggest that they are guiding the council in terms of recycling and CE activities and councils are slow to change, which in turn companies argue hinders CE progress, as displayed in the following quote by the **Group Purchasing controller, Company C, Hull:** *"We are all ready to go. So when the local councils can collect at kerbside we are there really […] We are probably guiding them".* The above quote foregrounds their own company role in driving sustainable change, while also passively dealing with the council, which points towards a lack of open and aligned collaboration between business and policymakers CE understandings.

In Austria, there is a similar sentiment from companies on the financial motivation to take part in CE activities, the CE is envisioned by Graz companies as a way to simultaneously optimise production processes, reduce costs, whilst also reducing environmental impact. However, the challenges of these potential CE aspirations and transitions are overlooked, as shown in the following quote by the **Managing Director of Manufacturing, Company B, Graz:**

"The reduction of CO_2 emissions and water consumption, maximizing energy efficiency and efficient use of raw materials like wood in pulp and paper process. So, in terms of international production focusses, our senior management is a key person to drive circular economy development and improve process along with our sustainability strategy, with the focus on waste production, energy efficiency, optimization of production processes".

The above quote effectively encompasses the wide-ranging visions many companies have in relation to CE strategies, CE was regularly seen as a win-win solution to environmental and economic challenges, while the practical steps for CE implementation were generally neglected by interviewees.

This economic and environmental win-win perspective is typified by the following NH-based business website example, further corroborating the apparent CE win-win thinking amongst business: *"Carbon management, waste reduction and improved resource efficiency remain key business priorities for ABP, with resource efficiency teams across the company looking at continual improvements that can be made" (ABP website).* The reference to 'resource efficiency teams' appears to show an inward focus as they are solely discussing the potential of internal capacity in this respect. They cite 'continual improvements that can be made', which demonstrates the use of passive language, thereby creating a sense of sharing responsibility for implementation, while still implying they are taking action.

CE expectations regularly appear to be motivated by end of life considerations, notably relating to packaging, as indicated by this quote from a NH-based company: *"These include initiatives to make product packaging improvements as well as waste and energy management schemes. For example, 99% of packaging waste at the NDC is sent for recycling." (Arco website).* Arco addresses the need for internal resource efficiency initiatives, though these initiatives (such as waste management projects) are also likely to require collaborations with value chain partners. Functional language is used when discussing waste management, which is likely used to appeal to both suppliers and investors, as it gives them clear direction to plan future strategies. Arco appears to focus on end of life solutions, by placing a strong emphasis on recycling. However, it seems that recycling is outsourced and in turn the recycling organisation is backgrounded from the discussion. Arco also appear to distance themselves from the responsibility of their packaging waste (evident through the usage of the passive expression 'sent for recycling'), which suggests they have not explored alternative CE strategies. This company is a distributor located downstream in the value chain and they fail to acknowledge the potential for regional sourcing and collaboration opportunities for the CE.

CE expectations vary somewhat according to the nature of the company. For example, in sectors such as healthcare, environmental interests are less well tied to product development. This was evidenced in the following extract from a healthcare product company based in NH: *'The most critical requirement for packaging in healthcare applications is patient safety and ensuring product integrity', (Smith and Nephew, 33).* This quote shows the company's main priority is protecting product users and their health concerns, highlighting the need for high quality packaging, which is prioritised above

environmental concerns. Specifying 'product integrity' suggests the primary function of the packaging is to provide safety, which is paramount in the healthcare sector, so any CE ambitions must meet strict quality criteria. This was similar to findings in the food sector where strict quality regulations appear to impinge on the potential for fostering CE activities, as demonstrated by the following quote by the **Group purchasing controller, company C, Hull:** *"Because we are direct food we have to have what we call a virgin-layer, so a brand new layer between the recycled layer when building the material [...] It is governed by full regulations".*

The above quote highlights strict regulation governing the food sector, while also foregrounding the role of policymakers in setting regulatory benchmarks for products, in the interest of protecting food and customer safety. In turn, the company seems to take on a passive role in developing CE activities as they are following governmental regulations, which appears to disincentives innovating towards other potential CE solutions. Similarly, in Styria, there appears to be a need for more legislation to drive CE change, which suggests that legislation is likely to play a central role in driving CE success in the years to come, as evidenced in the following quote by the **Global R&D manager, Company E, Graz:**

"And, about the circular economy sustainability we would need a much clearer defined framework much more in advance. So, to know where we have to have it, because, you have to imagine that the development of a new product takes years and the changing of a supply chain to fit to a new legislation that takes years"

Business in NH and Styria appear to recognise the opportunities of IS (without using the expression), which is reflected by the **Business development and Circular Economy specialist, Company G, Hull:**

"So yes, we use like waste material from another process so we do always look at ensuring that we can use, if someone is throwing something away and we can use it as a raw material, we would use that. But on a standard definition, I wouldn't call that recycled per se"

This apparent IS reference is also expressed by another company in the following document extract: *'Prioritise materials that are re-used, re-manufactured, or recycled' (Smith and Nephew, 9).* This quote comes under the 'Our sustainability vison and mission' section of their report which suggests although they have taken an internal company

perspective to residue disposal, they are open to IS opportunities when sourcing inputs. The language used is general as it covers a broad range of issues but also functional and precise, which portrays a techno-centric approach to CE development. On the other hand, ABP recognise they have unused materials which other companies may find useful as an input to their production process, as stated on their website: *'We aim to facilitate beneficial use opportunities for our dredged material as far as we can. We maintain a central register of our dredging and disposal operations' (ABP website).* The use of language such as 'facilitate' illustrates the potential role a well-placed port authority can play in fostering collaborative IS exchanges, but to 'maintain a central register' appears to be a more passive approach.

However, there appears to be issues with implementing these IS strategies in practice. The Green Tech Cluster in Styria aims to bring companies together for various collaborative initiatives, although with little direct attention given to IS strategies, as observed during my visit. Yet from my time carrying out observations at HWA, there was very little discussion in terms of sharing resources between businesses present, instead discussions were more tailored to end of life management of waste. Similarly, data from the survey pointed to respondents being overall open to pursuing IS exchanges, but when asked if they were currently involved in any such IS initiatives in practice only a minority of companies were and on a limited basis.

These complexities associated with implementing CE concepts were recognised by companies in both NH and Styria, some companies explained that too much focus is put on exploring strategies, but more effort is needed to action these strategies, as illustrated in the following quote by the **Sustainability co-ordinator, Company C, Hull:** *"But I would say we are at a point where we have put the strategy there. We now need to deliver it actually."* The above quote also sheds light on the lack of commercial CE implementation knowledge when attempting to operationalise CE strategies in practice. Moreover, CE activities appear to be an after-thought and not part of the company's core strategic capabilities. It was also common for business to foreground their own role in CE developments, while other important actors such as charities are passive recipients of CE activities, as typified in the following quote by the **Head of Sustainability, Company B, Hull:**

"what we will try and do is find an outlet for those products, rather than destroy them. So we have, you know, you have got your, also within sustainability strategy we donate

well over 1% of all profits to charity and as well as donating a hell of a lot of value and products, so to charities as well"

Such comments suggest that the businesses perceive their role as being key to developing CE activities, while charities are portrayed as passive receivers of CE strategies. Nonetheless in practice the charity is providing a valuable service to the company, in terms of residue management in the clothing sector. The interviewee also recognised the role that charities can provide in terms of reducing disposal cost, while they also acknowledge their commitment to altruistic donations, which highlights their commitment to local charitable initiatives. Although, there appears to be power dynamics at play since the company plays a strong role in funding activities of charities, a more open collaborative dialogue may help to foster knowledge-sharing and better aligned CE activities, between different regional stakeholders.

There is often a strong focus on end of life issues when discussing waste management activities, which neglects other strategies such as repairing and designing to improve circular performance. This was evident in both NH and Styrian companies. However, a potential caveat to note, is that the majority of interviewees did not have direct design experience and instead were more experienced in waste management, environmental and supply chain issues, which may also explain the limited attention to design and repair during interviews. Yet still, it demonstrates that there appears to be little awareness from interviewees on the importance of involving designers at an early stage of production in order to reduce environmental impact downstream by closing loops of production. This lack of understanding in relation to CE's potential in designing out waste at an early stage in the production process has often led to waste management issues being outsourced to a third party, where waste management responsibility is transferred to an external waste provider. This suggests that some companies are unaware of circularity opportunities as they rarely consider CE activities as strategically important to their operations. Hence, waste management providers appear to have a key role in facilitating material exchanges for a CE, although it appears these activities are more suited to the national scale, as demonstrated in the following quote by the **Head of Sustainability, Company B, Hull:**

"Yeah I think it would be those people that are responsible for the waste collection, waste processing. So you have got the waste management companies themselves, but then I think you have also got to bring in major recycling companies as well, because they have the technology and the structure. So they may not be based locally, they may be national

or indeed international, but I think collaborations between the waste management companies, between your local council and then these you know, these large scale recycling companies."

Uniquely, in the port sector in NH, the governing port authority appears to play a key role for CE development and they seem to be in a unique position to foster CE collaborations between local partners. The port authority has a territorial function similar to that of local governmental agencies in terms of attracting companies to locate at their port and facilitate collaboration between these companies, which is considered in the following quote by the **Energy manager, Company, H, Hull:**

"because whenever I've had discussions about this before it's always; can we connect our customers to each other, so that one feeds into another and is there any way we could do that within the port side?"

The port authority appears to be aware of the potential of developing CE activities locally, although it does not seem that these CE initiatives have yet been activated, more work is necessary to build awareness and potential local connections needed for CE activities between regional organisations.

In Styria, there appears to be some CE awareness amongst companies, yet there is limited understanding in relation to the potential for developing and implementing CE strategies in practice. One particular company has set up a consulting and accreditation service for CE initiatives to increase education and further accelerate CE activities in the region, as explained in the following quote by the **Manager, Company C, Graz:**

"So for us, it's like we really try to focus on circular economy and getting this out to as large an audience as possible. And also using companies as multipliers. Like for example, with this digital content we also aim for similar to this eco-profit to implement some sort of certification scheme that you can say okay, if all your employees once a year take this circular economy basic courses and do a test where you can then with learn management system you can then prove that all your people know basically what it's about."

This quote shows that 'Company C, Graz' acknowledge the importance of CE knowledge when developing CE strategies. They have launched a CE consulting service to capitalise on the market opportunities for CE growth at the regional level in Styria. However, it remains to be seen if this perceived market opportunity comes to fruition in practice. That is, whether other local companies perceive a need for increased CE understanding and are

prepared to pay an external provider for it. This apparent need for a CE educational service, points to a lack of understanding surrounding CE activities in Austria, which also suggests there is likely to be a similar lack of CE knowledge amongst NH based organisations. This is evident in the following quote by a waste management company, **Regional General Manager, Company F, Hull**: *"So, part of what we do with our customers now is we encourage them to produce something that we can reuse in a form. We can reuse. So, you can see some of the work that supermarkets are doing and other people, to make material reusable."* The above quote emphasises discussions in particular with retailers in terms of educating clients in the retail sector to use materials that allow more reuse at end of life. This same interviewee went onto to emphasise the importance of quality in terms of enabling improve waste management services downstream and the need for education on this matter, as seen again in the following quote by the **Regional General Manager, Company F, Hull**: "*I keep going back to quality it is so, so important. That is part of the education with customers. If they are going to produce that type of material it is of good quality."* From this, waste management companies in NH appear to take on an educational role with customers to help develop products which can be reused at their end of life. The above analysis highlights the increased need for educational advancements to allow a regional CE to flourish, in both Styria and NH.

4.2   Policy approaches towards fostering circular economy activities

This section will explore policy visions in relation to how policymakers understand and perceive the CE and how this is likely to impact on policy development at different governmental levels. This thesis uniquely pulls multi-scalar perspectives together and offers a multi-level policy approach to building regionally CE activities in a globalised and interdependent economy. By incorporating a multi-level policy perspective on CE policy development allows for various governmental concerns to be considered, which will offer a comprehensive overview of the challenges facing regional CE development.

Similarly to companies, EU, national and regional level policymakers explain the role CE plays in helping to achieve carbon neutrality whilst maintaining economic growth within their administrative boundary, as displayed in the following EU policy report quote: "*Circularity is an essential part of a wider transformation of industry towards climate-*

neutrality and long-term competitiveness" (EU CE action plan, 2.3). Furthermore, use of language such as 'competitiveness' suggests that the EU's target audience is business; pursuing carbon neutrality is proposed as a long-term route to economic sustainability for business. The foregrounding of business suggests that policymakers at the EU level see business as key agents of CE development in society.

Policymakers at the EU level see member states and business as key enablers of CE initiatives, as exemplified in the following quote: *"Only a shared commitment from the EU, its Member States and regions, industry, SMEs and all other relevant stakeholders in a renewed partnership will allow Europe to make the most of the industrial transformation." (EU Industrial Strategy, 6).* The EU highlights the need for cross-collaboration between member states and local actors, but the role of the public is backgrounded as they are only included in the discourse if assumed to be one of 'other relevant stakeholders.' There is direct reference to 'a shared commitment' which announces the expectations of participation and highlights that actors are interdependent on one another; there is a perceived need for robust and trusting partnerships to achieve success. The EU envisions the economic potential of the CE through value chain collaboration, which can be seen in the following extract: *"It can deliver substantial material savings throughout value chains and production processes, generate extra value and unlock economic opportunities" (EU CE Action Plan, 2.3).* However, here the CE is personified as an actor ('it can deliver'); companies' value chains and production processes are foregrounded in the discussion but as passive recipients of economic benefits. The reference to 'material savings' and unlocking 'extra value' effectively encapsulates the EU's business-facing stance and vision for a CE, with an assumption of economic benefit within the EU.

At the national level, there is also evidence of a vision for resource efficiency and carbon neutrality being directly connected, as evidenced in the following English policy report example: *"making new products from recycled materials (or secondary raw materials) can cause less harm, using less water and energy, and generating lower carbon emissions" (Our Waste, Our Resources, 41).* The reference to 'making new products' suggests that national policymakers are directly speaking to the manufacturing industry, who they envision are likely to play a key role in CE development. Besides carbon reductions, a further motivation is to secure material supply. This is typified by the following comment relating to England, but is also found at the EU level: *"We will become more resilient to critical raw material shortages and less vulnerable to price*

volatility. A number of our initiatives will give businesses the confidence to invest more in resource-efficient technology and infrastructure, helping them to understand and mitigate risks in raw material supply chains and rewarding them for good product design" (Our Waste, Our Resources, 25). The first sentence in the above quote offers a personalised approach to dealing with the issue of critical raw materials, which suggests all stakeholders share an interest and are expected to help address this issue. Evidently national policymakers are focussed on growth (i.e., ensuring materials supply) and thereby focusing on business priorities, which are postulated to benefit all stakeholders. The second sentence utilises a more functional approach and references 'rewarding them' suggesting business are set to benefit in terms of financial performance by avoiding higher costs, and backgrounding potential environmental benefits.

Policymakers highlight their potential vision of the CE to improve resilience and secure resources as a support for competitiveness, as demonstrated here in the English context: *"By using resources more efficiently we can ensure they are reused, re-manufactured or recycled as much as possible. Creating and safeguarding this stream of secondary resources will boost the resilience of UK businesses and enable them to become more competitive in the face of increasing and fluctuating commodity prices." (Our Waste, Our Resources, 120).* The use of 'we' demonstrates both personal and inclusive language suggesting everyone needs to participate. The next sentence offers more passive and functionalist language, 'creating and safeguarding' resources elucidates the key role policy plays in order to enable business to become more resilient. The finer details of how these resources will be safeguarded are backgrounded in the discourse.

The concept of resource security and keeping natural capital circulating within the UK was also widely cited in policy interviews, as shown in the following quote by the **National, Statistician and Evidence Analyst Waste Management, Authority E, UK:** *"the circular economy can drive resource efficiency which in turn can support our commitment around greenhouse gas emissions. Enhancing natural capital, biodiversity. There might be an element in there of resource security as well".*

However, from survey findings in this research, it appears that UK business can be heavily reliant on global suppliers for inputs and outputs are still being distributed both nationally and internationally (see Table 8 in appendix), suggesting that the UK economy is likely to be reliant on global suppliers in future years as key materials may not be available domestically. This point of relying on global suppliers for materials was

regularly cited by interviewees, which suggests it was not always feasible to source materials from the local region, as they were tied to using global supply chains to ensure the correct materials were sourced in an efficient and timely manner.

At the national level, the UK government appears to be calling on business to act, as shown in the following quote: *"We are committed to moving towards a more circular economy – to raising productivity by using resources more efficiently, to increasing resilience by contributing to a healthier environment, and to supporting long-term growth by regenerating our natural capital" (UK Industrial Strategy, 148).* Similar to the EU approach, UK policy uses inclusive language such as 'we are committed', although businesses are implicitly cast as active players (e.g., needed to be more efficient in use of resources), without actually being mentioned in this statement. Again, the CE is portrayed as a win-win scenario for both national government and business through a growth-centric narrative to economic development. The use of terms such as, 'productivity' and 'long-term growth' also suggest the government is seeking to appeal to companies, while the language used suggests that everyone will benefit from a transition to a CE. National government attempts to appeal to citizens to follow the CE strategy in order to build '…a healthier environment'. This reference to environmental health suggests the desire to connect with citizens offering a shared non-financial benefit to the CE.

Policymakers often refer to the importance of the public in their CE visions for developing CE initiatives, but they are usually passive recipients in the policy formation process. This can be seen in the following examples at the EU and national level respectively*: "Empowering consumers to play an active role in the circular economy, through better information on products and improved consumer rights." (EU Industrial Strategy, 3.4)* and *"The role for communities throughout the country in driving productivity is a major component of our Industrial Strategy" (UK Industrial Strategy, 168).* Both at the EU and UK level words such as 'active' and 'driving' foreground the role of the public by specifying community involvement, but in practice communities are passive recipients of these CE activities and not involved in developing them. The role of the public at the EU level is as consumers – i.e., to buy the more efficient products made by companies. A 2021 UK report which addresses decarbonisation discusses the potential role of CE activities such as reuse and repair. How this departure from a rigid growth orientation develops remains to be seen. It appears to provide the public increased responsibility in developing CE activities: *"Increasing resource and material efficiency in practice means*

keeping products and materials in circulation for longer through circular economy approaches such as reuse, repair, recycling and reducing the quantity of materials used within manufacturing" (UK Industrial Decarbonisation Strategy, 64). The finer details on implementing these CE activities are not specified, the generic language creates a level of ambiguity on both the role of the public and of these approaches to slowing consumption in CE implementation.

IS and resource efficiency collaborations between companies emerge in national and regional policy and business documents, again suggesting industry is envisioned as a key actor in developing CE initiatives. National policy in England refers to IS opportunities in an informal style, potentially to appeal to business in a transparent and sympathetic way, by using personally oriented language, as displayed in the following quote: *"Creating waste or by-products during manufacturing processes cannot always be avoided. But one company's rejects can be another's raw materials and we want to incentivise businesses to do just this" (Our Waste, Our Resources, 44).* National policy appears to recognise the need to adjust the playing field to incentivise IS activities between partner companies, but there is little recognition of the challenges and prerequisites needed to initiate and develop these collaborative relationships. The strategies needed to incentivise IS still appear to be in an early stage, but the region appears likely to be involved, which can be seen in the following quote: *"To begin with we will review the results being achieved in a small number of existing LEP-led, local authority or industry-led sectoral business clusters" (Our Waste, Our Resources, 44).* As with communities, though, the local authorities are conduits for strategies devised at the national level.

Moreover at the regional level in England, there was a lack of a common vision in terms of how the CE would develop and evolve. Local authorities compete with one another to get funding from national government to develop resource efficiency initiatives, as shown in the following quote by the **Regional, Climate Change Manager, Authority A, Hull**:

"There are government funding regimes around particular projects that we compete for. So one is around electric. There's a like large programme about electric city bus to try and turn one city to fully electric buses. There's bus super routes as well. So a lot of the funding in the UK is very competitive around particular themes".

The above quote displays the wide-varied nature of what is considered part of a CE and also the competitive processes between regions to tackle CE challenges locally, which is

unlikely to lend itself to resource collaboration across administrative boundaries. At the regional level there is also an identified need for the Humber region to transition from a heavily polluting region to a location built on cleaner forms of production and the CE is portrayed as a potential way to do so, which is exemplified in the following quote:

"Hull, like the rest of the UK and the world, is at a cross roads in the journey from a place built on a fossil fuel economy to one built on renewable energy and production circularity. Our city has already chosen its direction through recent inward investment and its 2030 carbon neutral target" (Hull City Council Carbon Neutral Strategy 2030, 10).

The mention of 'a place built on fossil fuels' uses passive and functionalist language, by identifying a need for change whilst not specifying either responsibly for the present circumstance, or for changing it. There is acknowledgment the need for cleaner forms of production in the Humber region, but this is portrayed as a shared problem ('like the rest of the world'), so downplaying any local responsibility for the situation. Reference to 'Our city' illustrates both personalised and active language creating a sense of shared ownership, which may be designed to appeal to both local stakeholders (including the public) and prospective companies considering locating in the region. The council have foregrounded business' role in achieving carbon neutrality by specifying 'production circularity'.

At the regional level, the LEP clearly sees the potential of CE activities for improving the prosperity of the region, as displayed in the following quote: *"Industrial symbiosis, using the waste from one process as the raw material for another, is an opportunity to strengthen the Humber's industrial cluster whilst contributing to the development of a circular economy that supports clean growth." (Humber Clean Growth Local White Paper, 20).* The direct reference to IS as an 'opportunity' for NH illustrates the LEPs assumption of the potential economic and environmental benefits for the region of developing IS activities locally. This implies collaborations between local business actors, although the sentence refers to waste from a 'process' rather than directly mentioning business. Industry is portrayed as benefiting from the initiatives.

Local authorities in NH appear to envision the CE as key way to address climate issues and reduce carbon emissions, as displayed in the following quote by the **Regional, Climate Change Manager, Authority A, Hull:** *"So within the new 2030 carbon neutral Hull strategy that's going through the Council at the moment. So the circular economy*

is part of that and all the elements within that so one of the themes within there about how we manage resources. So it's very important for us." This lack of a common CE understanding is likely to pose challenges to the development of inclusive CE strategies which are effective and inclusive for all regional stakeholders. Additionally, it appears that local authorities do not understand which potential companies are currently part of the CE within their city, as demonstrated in the following quote by the **Regional Climate Change Manager, Authority A, Hull:**

"And also understanding as well. We don't have, I don't think the understanding of how much kind of goes on within the city. So how many businesses are already part of the circular economy. Where they define themselves being or elements of their processes just being part of that or not."

It is clear there is a need for greater integration and more transparency between business and local authorities when fostering CE activities. A lack of CE understanding was regularly visible across local councils in the NH region, this lack of knowledge on CE, also results in a lack of common understanding on the roles for developing a regional CE. Local authorities also struggled to see their role in facilitating CE exchanges, as displayed in the following quote by the **Regional, Policy and Partnership manager, Authority A, Hull:**

"I think it is intangibility; I think it is a lack of understanding of the terminology circular economy and I think it is a lack of a hub to share the opportunities and the resources that are available I would say. And as far as who would facilitate and manage it?"

Furthermore, it appears that policymakers and businesses in NH are not aware of the of their collaborative potential for a CE, hence CE strategies between these stakeholders are not well aligned, as shown in the following quote by the **Regional, Sustainability Manager, Authority D, Hull:**

"I'm just hoping when we get the opportunity to talk to businesses, circular economy will be promoted a bit more. I don't know, I've worked in manufacturing in the past and it means different things. Like there was one thing I used to work with called lean manufacturing and that was about reducing waste in the businesses."

From this, it appears there is some confusion regarding the multiplicity and evolution of CE related terms which creates challenges for CE understanding, across business and policy. The quote also represents a common commercial view that CE focus is at the

company scale rather than acknowledging potential regional CE collaboration opportunities. Moreover, even within the same local authority, a differing perspective on CE is offered, which suggests that employees within different departments have alternative perspectives on developing CE activities, although there appears to be no unified CE strategy, as displayed in the following quote by the **Regional, Strategic Planning Manager, Authority D, Hull:** *"It is in the context of, how you define the circular economy. What we look at is from a business perspective, is the, I use the word "connectivity" between different sectors to ensure that anyone who's locating into East Riding".* This quote shows that the local authority is open to building CE relations between regional stakeholders, while the authority is trying to understand the business perspective the level of collaboration is difficult to measure at present since CE initiatives are in a relatively early stage of development.

The Humber region was frequently referred to as heavily polluting and socially deprived, while concurrently being at direct risk of the impacts of climate change, such as flooding, due to being proximally located to the sea and on an estuary. These characteristics combined seemed to encourage regional CE action, in order to adapt to complex and evolving environmental conditions in the local region. These local vulnerabilities seemed to motivate local agencies to pursue CE activities, which were envisioned as a tool to help limit local environmental impact. There was regular reference to the motivation for pursuing environmental policies to help avoid repeating issues associated with climate change and the associated effects of flooding locally, which was recently felt in the NH region. This was evident in the following three quotes from a range of NH based local agencies: **Regional, Energy Manager, Authority G, Hull:** *"The biggest challenge that we have is that as a cluster we are the largest carbon producer in the UK and most of that is due to the large traditional industries".* **Regional, Sustainability Manager, Authority D, Hull:**

"That's probably what motivates the initiatives. Think probably climate change is the bigger focus for us, we have lots of flooding in the area and flooding can be caused by various things but the change in the climate, frequent thunderstorms and stuff like that as well. So it's helping, trying to reduce those environmental impacts such as flooding events and stuff like that and coastal erosion". **Regional, Managing Director, Authority H, Hull:**

"So we also feel the effects. And it will affect our communities. We would see, if we take no action we will see mass migration. We will have to. We will have to see migration of our businesses […] And the flipside of this also of course is all about the resilience and it's estuaries just like us that are also going to feel the effects of the climate change…A double edged sword. It's also what was making us a dirty region. This is our USP. So every government in the world is looking for the resolution to this problem. And we've got the assets, we've got the skills, we've got the research. We've actually got the land to make it all happen and demonstrate it."

The above quotes strongly illuminate regional agency visions for developing a CE and shifting local industry towards cleaner forms of production. Notably, the above interviewees range from diverse organisations, with regional responsibilities for topics such as; economic development, climate change, sustainability and place promotion, which encapsulates their overarching vision of a CE to boost regional development, while simultaneously reaching climate targets and protecting the environmentally vulnerable region of NH.

However, notably CE was not always seen as a key solution and it appears that local characteristics and skills of regional stakeholders are likely to play a significant role in shifting to a CE, as mentioned in the following quote by the **Regional, Energy Manager, Authority G, Hull:** *"So something like oil production and steel production and things like that is obviously a big issue for us but it is not an issue for North Yorkshire. But equally something like the circular economy is something that they play heavily on and we don't really and maybe because they have got a more rural economy. But it also comes down to the specialism of the people in the role I suppose."* This appears to suggest that there is local discrepancies in relation to the potential of the CE to solve climate challenges within the region. There still seems to be a lack of CE's potential across regions and it appears that CE strategies are reliant on regional capabilities and resources which are present locally.

4.3 Limitations in realising company expectations and policy visions for a circular economy

From the above analysis it is clear that companies and policymakers have broad and ambitious expectations and visions for a CE. However, business and policymakers face numerous hurdles which need to be overcome in order to successfully realise the potential benefits from company expectations and policy visions for a CE. The following

limitations to CE strategies will be critically analysed in both the NH and Styria context, drawing on insights from both company and policymaker perspectives.

There seems to be a re-occurring internalised company approach by businesses when exploring CE opportunities. The issues of transparency for a CE are clearly evident, business do not appear interested in engaging with other local actors which is likely to create a challenge for regional CE development, business often seem more concerned with protecting their own internal knowledge, this has been observed by regional agencies, which is demonstrated in the following quote by the **Regional, Investment Manager, Authority D, Hull:**

"I mean there are some businesses that are obviously, they don't necessarily want to engage and they just get on and do what they do. […] If you look at the caravan sector as an example, they are quite hard to engage with. They are very protective of their kind of intellectual property, their manufacturing processes and they don't, they don't always really want to open their doors".

This lack of openness to external collaboration was regularly evident amongst businesses, which suggests that businesses are focussed on carrying out their core business duties (while adhering to regulations), although they are reluctant to develop external strategic relations for developing regional CE activities. This was also observed during my participation at the HWA meetings, where there was a notable lack of inter-firm discussion for building mutually beneficial collaborative regional IS opportunities.

There appears to be limited inter-firm collaboration to tackle CE challenges in the NH region at present, although there is informal approaches to discussing local CE opportunities between local stakeholders. Hull was regularly cited as a small city, so it was postulated to be conveniently sized to develop symbiotic linkages based on trusting partnerships between companies at this scale, which is displayed in the following quote by the **Head of Procurement, Company C, Hull:** *"But in terms of collaboratively working with other Companies in our area clearly there are some discussions going on; we all talk to friends and colleagues in other Businesses but there is nothing formal that I am aware of."*

This reoccurring issue of confidentiality and the apparent lack of trust and transparency between regional actors when shifting to a regional CE, commonly featured in

discussions, which is encapsulated in the following quote by the **Energy Manger, Company H, Hull**:

"The major barriers that I see to any circular economy is the commerciality, and the confidentiality of any business interactions with each other. So, as I'm sure it's widespread in most businesses that you have a non-disclosure agreement, as soon as you enter in anything that's got any sort of confidential nature of discussions you're then going into NDAs, which then means you can't ever discuss that with anybody else, and it's that competition aspect of the commercial side of businesses that I think will be the biggest barrier to doing this."

From the above quote, it appears likely that trusting connections may act as the basis for developing open and transparent CE collaborations. Although, informal connections are difficult to translate into practical resource exchanges between companies. From observations conducted at the HWA, it seems that organisations were interested in joining a local working group to address environmental challenges locally. Yet these informal connections rarely resulted in agreements in relation to resource efficiency collaborations. It was evident over 3 years of regular observations both in person and online, that it was difficult for organisations to build trusting connections needed for a CE. There were a number of potential reasons for this; employee representatives changed on a regular basis and there were also issues associated with the Covid-19 pandemic and staying connected during unprecedented times. Notably, there was rarely senior decision makers present at the meetings so it was unlikely that an agreement could be reached between local stakeholders without consulting with company senior management, which was likely to slow and hinder any potential CE developments between regional partners.

These transparency issues in relation to collaboration was a common theme in both NH and Styria, which is likely to be a barrier when devising CE strategies between external companies. While there is likely a need for open collaboration between local CE actors at the regional level, there is also a requirement for trust to build mutually beneficial CE partnerships that are both fair and sustainable, which is demonstrated in the following quote by the **Global R&D manager, Company E, Graz:**

"And, on the other hand, of course, talking about this network, our industry is always very confidential and so, we don't want any Authorities to be involved in the development and in the supply chain. On the other hand, the Authorities more and more want to see

the entire supply chain, let's say, that it is sustainably sourced, where do all the parts come from and so on."

From this quote, it appears there needs to be robust regulatory systems in place which allow for open collaboration to foster regional CE activities, while still protecting companies' intellectual property and their supplier contracts. The issue of transparency between stakeholders was also an evident concern for many companies in NH, arguably there may be a need for the role of a trusted facilitator when exploring potential CE collaborations, in order to protect confidential data between different stakeholders.

Other common barriers in relation to behavioural and regulatory challenges were apparent in both NH and Styria, more work is needed to help better align stakeholder interests when transitioning to a regional CE. There is also a strong sentiment that there needs to be a change in culture and consumer behaviour, to create sufficient demand for CE products in the economy, which is shown in the following quote by the **Group Marketing Director, Company C, Hull:** *"I think a lot of the barriers are going to be cultural and attitude driven rather than physically driven"*.

Furthermore, from a commercial perspective, the role of packaging as a marketing and/or protective tool was commonly featured in interviews, hence CE materials must serve core functions in terms of promotion and protection, as explained in the following quote by the **Group Purchasing controller, Company C, Hull:**

"Well we have to maintain, the new packaging has to do the same, the same as the old packaging. So it has to offer shelf life, protection of the product that we put in it, you see, so we have to technically make sure that we still, we are still getting that because if we weren't it could lead to further issues like food waste."

This highlights the broad range of functions which packaging must provide, so any CE strategies must also meet strict packaging requirements and serve the primary function of protecting products. This was particularly evident in specific sectors, where product protection was vital, similarly hazardous waste creates a challenge for recycling materials, which is likely to be a barrier for developing CE activities in some sectors, which is displayed in the following quote by the **Head of Sustainability, Company A, Hull:** *"Inevitably in medical devices some parts will always be non-recyclable because they've come into contact with human tissue and blood and all sorts of things"*. Additionally, there is also negative perceptions of circular materials, particularly in

medical and food related sectors, which is highlighted in the following quote by the **Head of Sustainability, Company A, Hull:** *"if it's a certain part of a high tech sterile medical device it's difficult to use certain things unless they are perfectly clear or virgin materials"*. Similarly, in food production, packaging must initially provide strong levels of protection for the food, there is also a need for standardisation in packaging to ensure it can be recycled, this may be in conflict with marketing purposes of packaging, such as to stand out on the shelf by using eye-catching packaging colours. These strict food regulations are carefully considered in the following quote by the **Group purchasing controller, company C, Hull:**

"*So that, that is, as I said got a minimum of 71% recycled content in the tray because the other 19% or 18% is made up of brand-new material because that is the food regulations. It is governed by full regulations"*.

There is potential that this virgin-layer could also be made from recycled materials. However, from a quality perspective consumers may prefer the concept of a new virgin layer material when it is in contact with food, highlighting discrepancies between what consumers perceive as acceptable in terms of recycling with their desire for more sustainable products. A similar point was made in the work-wear sector, it seems that branding creates a challenge for CE, so marketing ambitions are in contrast with the need for standardisation in a CE, which is demonstrated in the following quote by the **Head of Sustainability, Company B, Hull:**

"What does present a problem is when garments have been pre-branded with the company's name on. So what we found for all companies that carry their brand on their garments is that we can't really donate those to charities, so if garments have been branded then they tend to get shredded and turned into another product"

It seems that the company does not want to risk their brand being worn externally outside the company, as they are likely responsible for the clothing in society from a waste management and social perspective. This is another example of branding issues and potential limitations for regional CE activities. There is thus an apparent need for greater collaboration across supply chain partners in order to develop more inclusive and standardised strategies for a CE.

There is also a need for residues to retain quality and value in the recycling system, which further emphasises the need for more CE strategies in terms of both design and at the end

of life, which is shown in the following quote by the **Waste contract Manager, Company E, Hull:** *"Quality sometimes and just some recycling, there is just some things that they just won't take because there is just no value in it for them. So it would have to go as general waste".* This point regarding commercial viability of downstream CE activities was repeatedly raised, there was also regular mention of the need for sufficient material supply for effective waste management to be possible. The need for economies of scales was also a common feature of CE discussions, which is demonstrated in the following quote by the **Head of Sustainability, Company B, Hull:**

"So within all this as well, so ignore the fact that regular, the role that regulations and directives will have in place as well, so for instance medical directives, PPE directives etc, they will all, whatever materials are produced as part of that circular economy must be the regulations to those directives as well, in terms of how pure those materials are. So there is, it is all about infrastructure and the infrastructure will only increase once there is a demand."

It is evident that many businesses in both NH and Styria feel that demand for sustainability is gradually growing, which may help to facilitate more CE activities, as displayed in the following quote by the **Sustainability Co-ordinator, Company C, Hull:**

"I think it would be very fair to say that probably if you went back even three or four years it wasn't a factor at all. Now it is a massive factor. We recently moved nearly all of our meat trays wherever possible out of mixed polymer to go to single polymer. So, the recycling infrastructure isn't really here in the UK right across the UK, when it catches up they are now in a material that will be very attractive for recyclers to use."

There is also a need for a comprehensive common approach to CE development across international locations, which was evident in NH and Styria and is considered in the following quote by the **Group Purchasing Controller, Company C, Hull:** *"so that is for the UK but then anything that is being imported, your likes of, you know, your shampoos in plastic containers, they most likely come from Europe and they have their own recycling logos".* From this, it appears that in a globalised world, with materials and resources flowing between many countries, there is a need for a collective approach to developing CE strategies, for a transition to a circular based society. This global scale of resources flows was evident in the survey findings (see Table 8 in appendix), which displayed the global reliance on inputs and outputs in value chain systems of companies based in the Humber region.

In some sectors, there are still challenges in relation to end of life management of materials, so more innovation and collaboration is evidently necessary to improve CE performance both when products are in use and at the end-of-life, which is explored in the following quote by the **Regional Innovation Manger, Company D, Hull:**

"One big topic is what do you do with wind turbine blades at end of life. In the past they either went to landfill or were ground up and used in road surfacing or building insulation, hopefully there is other uses which can be found for them in the future. They are designed for 20-25 years of operations, with some repairs needed".

This company highlighted a problem in terms of end of life CE management, although no concrete solutions were provided. There appears to be limited focus on the importance of design stage for improving end of life management, which was common across numerous businesses in multiple sectors. Although, in contrast from an engineering perspective at the same company, there appears to be a stronger focus on designing out waste at an early stage of production, which is demonstrated in the following quote by the **Health, Safety, Environment Engineer, Company D, Hull:** *"As an engineer we're not doing our job well if there are residues left over, so we would design for no waste or to eliminate or avoid waste where possible."* This elucidates the ranges of views in relation to circularity even within the same company, further emphasising the need for more clarity in terms of CE strategies.

There was repeated acknowledgement of the need for CE initiatives to make financial sense for companies, otherwise they risk being side-lined during economic downturns. Although, a minority of companies recognised the potential of collaborative CE strategies to reduce costs and protect business continuity, which is displayed in the following quote by the **Head of Procurement, Company C, Hull:**

"I guess driven by Covid-19 we have seen a little bit of that. If we talk about corrugated supply, two corrugated competitors in South Yorkshire actually got together around Covid-19 when there was a lot of high absenteeism and they started to share engineering resource, they started to share vehicle resource and they started to share raw material resource because neither of them wanted to let their customers down but they couldn't work independently."

The above quote highlights that Covid-19 acted as a CE driver out of necessity due to the unprecedented challenges caused by the pandemic and resulting lockdowns. These CE

related financial concerns were regularly evident amongst business interviewees, who seemed to describe financial issues related to a CE as a balancing act, which is considered in the following quote by the **Head of Sustainability, Company A, Hull:** *"But yes, as a sustainability professional trying to raise the profile of sustainability so that we're not necessarily buying the cheapest stuff if it's less sustainable. But it's a very fine line because we're here to make money at the end of the day. You can't deny that fact."*

The impacts of Covid-19 was a reoccurring theme from the company data in both NH and Styria (partially as the interviews were conducted during 2020/2021 when Covid-19 was very topical). There has been much discussion on the potential of a green revolution post-Covid-19, but many companies feel Covid-19 may in fact stall CE development and financially struggling companies may no longer see CE activities as a priority, as shown in the following quote by the **Head of Procurement, Company C, Hull***:*

"I do have a bit of a concern about where we find ourselves today because I do wonder whether we will lose time and pay in all this because I think how we are going to put us back and I don't know how quickly we can recover and catch up".

Thus, this demonstrates the need for future policies to economically encourage companies to accelerate CE strategies, for example through taxation, in order to make CE strategies more commercially viable and resilient in the long term. The impact of Covid-19 on CE strategies still remains to be seen and is an evolving issue as companies recover post pandemic.

As outlined above, the issue of confidentially was frequently cited amongst business as a potential barrier to co-developing CE activities amongst regional partners, it appears that more trust is needed as a foundation to building more co-operative and mutually beneficial CE strategies. Local councils in the NH region appear to have responded to the apparent need for greater trust amongst organisations for fruitful CE developments and they recognise the potential role they can play in terms of building local connections between regional partners, which is demonstrated in the following quote by the **Regional, Policy and Partnership Manager, Authority A, Hull:** *"And it is about building networks with people, Businesses and Organizations right across the city to see what we can do differently to meet the needs of the people who live here and the Businesses who operate here"*

The above quote points to the importance of cross-city collaboration for a CE and including a wide-range of stakeholders in these initiatives, however there is limited evidence of the practical implementation of the above initiatives in NH.

Similar to commercial perspectives, at the national policy level there is direct reference that CE strategies need to make financial sense, which may be initially challenging, as demonstrated in the following quote by the **National, Circular Economy Lead and Waste Specialist, Authority F, UK:** *"Okay, well, the unit of measurement we use is money; so, if it is expensive that will hold people back"*. Similar perspectives were given at the regional policy level, where CE activities were often portrayed as a secondary consideration which may become disposable during financially challenging times for companies, as outlined in the following quote by a local authority representative **Regional, Energy Manager, Authority G, Hull**:

"Well I would like to say they are one of the same thing and the reality is it is a balancing act. I think it would be interesting to see obviously after the current crisis that we are going through whether sustainability is still on the agenda because I think the reality is most Businesses treat it as a bit of a nice to have"

There is a perceived need for CE to rise in importance on company agendas going forward in order to be on the top of company and policy agendas. From this, it is clear that CE initiatives must satisfy both the financial considerations of a company, while also improving the environmental performance. There appears to be an apparent need for stricter regulations in order to increase CE importance within both policy and business. This need for policy intervention and regulation to create a level playing field is echoed in the regional Styrian context, by business who call for stricter legislation to mandate for more CE related strategies and to accelerate circular transformations in industry, which is demonstrated in the following quote by the **Reuse and Circular Economy Manager, Company A, Graz**:

"This is also a problem for my reuse activities because I try to establish a reuse management and on the other hand (international manufacturing company) buys only new products. This is a main problem of our, our laws and then taxes because maybe if we have a declaration for a period from three years then afterwards it's wasteful waste for us so I think there must be change, there must be a change in the laws and also in the taxes. We have to do something from the political side."

The above quote highlights the diverging perspectives between companies and Supranational/national policymakers when seeking to build CE activities and emphasises the importance of mutual collaboration and alignment when building regional CE activities. Similarly, in NH there appears to be a lack of a consistent and strategic CE approach when authorities are developing CE activities. Instead, it seems to be at the local authorities' discretion whether they want to pursue circularity activities, which results in a lack of a consistent overarching CE strategy across different local agencies. The NH region seems to be more focussed on broader energy initiatives, which is displayed in the following quote by the **Regional, Energy Manager, Authority G, Hull:** *"My background is more in bio fuels and industry and so I can concentrate on that sort of thing. So I guess everyone has different a specialism and the regions have a specialism as well so you are kind of free to pursue what areas interest you and are useful for the region".*

This ad-hoc approach to environmental activities is likely to result in CE development in some regions while other regions appear to focus on other areas where they have expertise and skills. It appears that NH is taking more of a low-carbon perspective, whereas nearby rural authorities in Yorkshire offer a CE focussed approach. It seems that NH is more concerned with transitioning from a heavily polluting region to one based on a low-carbon future, although it is difficult to envision and assess the role of circularity in this mission. This low carbon approach was also evident during observations at HCC, where much of the discussions amongst employees at the council focused on strategies to reach net zero emission targets. Additionally, different departments within the local authority appear to have different levels of understanding of what is involved in a CE, which may create hurdles when transitioning to a regional CE, as shown here by the **Regional, Climate Change Manager, Authority A, Hull**:

"I think the biggest challenge we face is the understanding of the scale of pace of change required. I think a number of colleagues probably aren't quite there yet in terms of understanding what that means in terms of their workload"

A regularly cited common challenge which was raised in both NH and Styria interviews was the associated legal challenges with the re-use of materials in a CE. Material reuse is often challenging with some products, so it is considered easier to use virgin materials, rather than wait for regulatory permission to produce with recycled contents, which is recognised in the following quote by the **Manager, Company D, Graz:**

"but when you are using, producing lithium batteries where the input is coming from waste, hazardous waste, oh my god. So, it is very hard to get the permission for doing that and that is the reason why many companies are saying, okay, from the ground area it makes sense but forget it, yes, I don't want to damage my image. I don't want to have problems with the neighbours. I don't want to have problems with the authorities. I want to produce it next year and not in maybe five/six years later when I'm getting the permission".

From the above quote, it seems there is a need for a shift in regulations and attitudes in relation to CE, there is also a need for greater urgency when discussing CE activities. This point also reflects the situation in NH, where hazardous waste creates added complexities when managing residues at the end of life, it also seems that there is often reputational issues and perceptions of re-used materials as being inferior, hence it is clear that CE materials need to meet high standards and also adhere to quality protocols, to ensure there is sufficient demand for re-used materials in the production system.

Moreover, there is a common appeal for increased regulations to accelerate demand for reused materials, as raw materials are often cheaper than reused materials, creating economic feasibility challenges for the adoption of circular sourcing strategies, which is acknowledged in the following quote by the **Regional, Waste and Resources Manager, Authority A, Graz**: *"what we see now with respect to plastic recycling, with still low prices for mineral oil, it is economically, it is not economic and not feasible that companies are buying recycling, recycling plastics because the primary plastic is much cheaper".* This is likely to create challenges for developing CE collaborations and closing loops of production, as virgin raw materials tend to be cheaper to procure.

Another contrasting aspect in Styria compared to NH was the sectoral approach to addressing CE challenges, through local clustering of industry. The Green Tech Cluster has strong potential for knowledge sharing and development, although the scope of the cluster is limited solely to companies operating in these designated Green Tech industries, with little openness to collaboration with other sectors, such as the automotive cluster. This narrow clustered approach is likely to create barriers for the wider systemic CE change across more companies and sectors, which is demonstrated in the following quote by the **Regional, Circular Economy Manager, Authority B, Graz:** *"And our Green Tech cluster is especially for the green environment, for green solutions. And there are not any criteria, but we are focussing more on these enterprises".* There may be potential

for the Green Tech Cluster to branch out to wider industries and share knowledge, to improve the overall CE performance of the region, in turn boosting the economic and environmental performance of the region. Transparency concerns may be one cause of concern in developing wider resource efficiency activities at the regional level. The lack of criteria needed to enter the Green Tech Cluster (as cited in the above quote) raises questions in relation to the quality control procedure and the scope of the Green Tech Cluster in accelerating CE developments versus simply acting as a place-promotion agency for the Styrian region.

4.4 Conclusions

In conclusion, CE appears to be rising on the company agenda, stemming from a rise in both political and societal pressure. Companies see the CE as a way to satisfy growing consumer demand for sustainable products and services. Businesses seem interested in capitalising on the CE as a way to incrementally adjust their strategy in order to improve financial performance in the long term. Company CE expectations are aspirational and are seen as a 'win-win' mechanism to achieve both environmental and economic targets simultaneously. However, there are also numerous limitations to implementing these approaches in practice which are overlooked. Arguably, a policy driver may be needed to alter business strategy as short-term cost reduction and profit driven motives do not appear to be working at present, policy approaches to a CE will now be explored in further detail.

Policymakers at all governance levels see the CE as a way to improve both environmental and societal performance. The various policymakers interviewed at different levels and in a variety of roles showed a common understanding of the need to shift away from heavily polluting industries and towards more circular forms of production. However, the complexities involved in governing and developing CE activities appear to require cross-sectoral and transparent collaborations, which may be difficult to achieve. At the regional level where this study was primarily focussed, there was a strong suggestion that the CE offers a way to improve the overall economic performance of the region, while also simultaneously attracting jobs to the region and supporting the locality reach environmental targets. While in Styria, regional policymakers also saw the need to shift to more circular production systems, but also lacked the resources and power to tackle environmental challenges regionally. There is an apparent lack of alignment between policy levels throughout Europe and in both England and Austria, more regional

devolution is likely needed to foster more inclusive regional CE opportunities based on each particular local economy.

Commercial expectations of companies in NH appear similarly aligned to those of companies in Styria. Many companies in both locations see the CE as a way to reduce costs and improve efficiencies through incremental changes to production systems. However, depending on sector, different companies appear to have their own particular expectations for a CE based on their own specific industry needs. Additionally, some industries, such as food production appear more suited to successfully implementing CE strategies compared to others such as the medical industry. This appears to be a result of various contingencies including proximity, embeddedness and informal connections developed in the food production value chain versus stringent regulations and formalised systems in the medical sector, which seem to hinder collaborative CE efforts. Overall, in both case study regions companies discussed CE activities from an end-of-pipe perspective. However, this was particularly evident in the wind turbine production sector in NH, where attention was on diverting turbines away from landfill when they come to the end of their use phase.

English and Austrian policy visions are quite similar in their understanding of the CE; both view it as a tool to support environmental and economic targets. Regional Styrian policymakers appear to have slightly more local control over formulating CE strategies through PPP agreements. A more hierarchal governance system in England means that NH policymakers have less local power in fostering CE activities and as a result seem content with allowing more informal approaches to CE develop in the region, as illustrated through the formation of the HWA group. Further critical analysis is needed by policymakers in both locations in order to actively engage with CE barriers and develop broader understandings of the societal consequences associated with shifting away from linear forms of production to more closed looped systems, which is likely to require cooperation across global value chains.

Overall these findings suggest that public authorities want to foster CE activities in order to boost economic/environmental performance of their jurisdiction. It is apparent that the companies analysed have common expectations for a CE, in both end of life term management terms, reducing costs, while also disregarding the potential of the design phase. Without a more holistic CE vision there is a risk that the core sustainability

aspirations of CE may be side-lined. There appears to be a lack of a common understanding on what the CE involves and the key actors involved in developing regional CE activities, which has led to various discrepancies between commercial and policy stakeholders. Business do not appear to expect strong connections to regional level CE activities; a value chain collaborative approach is their priority. There are numerous challenges to implementing CE activities regionally and a lack of a common understanding between stakeholders on developing regional CE activities. Commercial and policymaker visions when pursuing CE activities appear to be the possibility of combining environmental initiatives (carbon reduction and waste management) with economic initiatives such as competitiveness and material supply. Policymakers put more emphasis on material supply; while business interests in the CE reflect economic viability concerns. Policy priorities seem to be committed to securing material supply in their own administrative region, as a way to become more self-sufficient and also to act as a competitive advantage for their own particular region, however this strategy is likely to face numerous feasibility hurdles in terms of co-operation for resource exchange across boundaries. Business expectations for a CE were evidently driven by commercial concerns and were motivated to explore CE opportunities for perceived potential economic benefits and cost savings for their company.

Chapter 5 Multi-scalar stakeholder considerations on developing circular economy activities

The previous chapter explored policy CE visions and company expectations for a CE. The following analysis builds off this work by incorporating these visions and expectations for a CE into a multi-scalar context. This chapter examines key scalar issues in relation to developing CE activities, considering both multi-scalar policy contexts and global supply chain issues when seeking to develop collaborative regional CE activities. I will draw on multi-scalar stakeholder perspectives, notably including policymakers' views at the EU, national and regional level. This analysis also draws on company's perspectives to their value chain relations. These research findings further develop and contribute to debates in relation to multi-scalar policy challenges and global value chains (e.g., Swyngedouw, 1997; Markusen, 2002; Randles, 2007; Yeung, 2009; Leck & Simon, 2013).

5.1   Multi-level policy context and implications for a regional circular economy

This section will explore various governance levels for developing CE activities from international to regional levels of governance and how these impact on developing mutually aligned CE activities regionally. This section highlights the challenges in relation to developing and implementing regional policy in a global context, it explores the connections between different governance levels in the regional, national and supranational (EU) context.

In EU policy, there is explicit reference to levels in terms of the societal challenges that a transition to a CE could cause: *"The transition to the circular economy will be systemic, deep and transformative, in the EU and beyond. It will be disruptive at times, so it has to be fair. It will require an alignment and cooperation of all stakeholders at all levels - EU, national, regional and local, and international." (EU CE Action plan, 9).* It is evident that the EU recognises the various levels that need to be involved, in order to implement CE initiatives. There is also acknowledgement that on the path to a CE there may be disadvantages as well as benefits, notwithstanding the assumption of overall economic gain at the EU level. This does raise a question as to the potential geography of disadvantage – i.e., might some places (be they cities, regions or nations) be systematically disadvantaged; can the collaboration referred to counteract that, or simply offset the effects?

At the national English policy level, there are examples of both spatially defined and non-spatially defined references. For example, the government sees the potential role for itself to act as a facilitator between both ends of the supply chain from the design stage to the recycling phase: *"Facilitate better communication between recyclers and designers so that hazardous components are designed for easier dismantling, and destroyed to increase safe recycling operations." (Our Waste, Our Resources, 119).* Designers and recyclers are specified and foregrounded as key stakeholders and are given an active role in developing CE activities. There is no reference to place or scale – these supply/disposal chain relationships are not assumed to have a spatial dimension, or to involve a particular scale other perhaps that the implicit assumption that all parties are present within national boundaries. National policymakers also acknowledge their potential in bridging the gap between cross-sectoral partners to create CE collaborations, which is demonstrated in the following policy report extract:

"One way to support businesses to innovate and achieve such savings is by supporting clusters of them to come together to share knowledge and good ideas with counterparts – this may be on a local or regional level, on a sectoral level, or by bringing two or more sectors together. By joining forces businesses can spread the costs and leverage the benefits from economies of scale." (Our Waste, Our Resources, 44).

This quote recognises the need for economies of scales and cross sectoral collaboration between different stakeholders to improve CE development. Notably, the scale and form of collaboration is flexible – either spatially based at local to regional scale, or a more metaphorical cluster between similar companies at the national scale. 'By joining forces' offers a quasi-militaristic approach likely to create a sense of urgency, this vernacular and active language usage places a strong emphasis on the role of local business in tackling CE issues. Government appear to be calling on business to act and policy appears willing to support, however they rely on business to innovate and collaborate for the development of regionally focussed resource efficiency initiatives. National UK policymakers note the link between energy-intensive industries and deprived locations such as Humberside, which is displayed in the following quote: *"Many of the [existing high-energy] clusters are in relatively deprived regions and often act as a driver of prosperity for the surrounding area as key employers paying above the UK median wage" (UK Industrial Decarbonisation Strategy, 122).* Some caution is needed therefore that reducing carbon dependency does not increase regional inequalities.

At the regional level in England the CE is seen as a way to help the region, as distinct from and in addition to companies, to transition to cleaner forms of production whilst improving their economic performance: which is demonstrated in the following policy report quote: *"The Humber could be at the heart of an offshore turbine circular economy industry which by 2030 will see the need to decommission around 750MW of wind capacity and recycle more than 600 turbines each year – a huge economic opportunity"* *(Humber Clean Growth Local White Paper, 16).* This foregrounds the place itself, albeit indicating the importance of business – portraying the 'problem' of turbine decommissioning as an opportunity. Notwithstanding the prominence given to the relatively new (to the region) renewables sector, the council shares the national government's concern for change in what is still a carbon-intensive economy. However, the council is directly calling upon the national government to provide the enabling conditions to address local environmental issues. By implication the responsibility of regional stakeholders is backgrounded, which is demonstrated in the following quote: *"As Hull's target is to achieve carbon neutrality by 2030, 20 years earlier than the national 2050 target, the Council, together with partners, will campaign for national policy changes and additional funding to ensure Hull's carbon neutrality is delivered by 2030".* *(Hull City Council Carbon Neutral Strategy 2030, 4).* This suggests that the council sees the national government as holding the power when developing CE activities, as they are foregrounded in the carbon neutrality discussion. Regional policymakers believe more financial support is needed to tackle environmental issues locally, which suggests there may be scalar misalignment between the views of national and regional government. However, it is clear the LEP wants the benefits of the CE to remain locally, which is shown in the following quote: "*Effective collaboration will transform the skills profile of the Humber, generating new and better paid jobs, maximising training resources and propelling the ambitions of individuals, business and the public and voluntary sectors"* *(Humber Clean Growth Local White Paper, 25).* Despite the challenges of shifting to a regional CE, especially in a heavily industrialised region like NH, the LEP use broadly inclusive language to create a sense of togetherness between local actors and optimistically predict the potential for new job creation locally, while the EU heeds caution in relation to the disruptions which may occur in some locations.

Additionally, at the regional level in England, there is an apparent lack of a strategic focus regarding CE issues, which is highlighted in the following quote by the **Regional Head of Waste Management, Authority A, Hull:** *"Me and my team are more the nuts and*

bolts, as you probably gathered, of dealing with the practicalities rather than the bigger picture stuff". There also appears to be a lack of infrastructure in place for CE activities to evolve in the present 'Our Waste, Our Resources' report, as the following regional level policymaker refers to, **Regional Head of Waste Management, Authority A, Hull:** *"Same with recycling infrastructure they have not gone there for whatever reason and that was one of the biggest criticisms actually of the strategy was it stopped short of the major investment ideas and infrastructure that will be needed"*. This quote points to the tension between regional and national level policymakers and the challenges faced when developing aligned CE strategies for regional level success.

Notably, CE is currently not included in the waste management strategy at the city council level, as referenced to in the following quote by the **Regional, Policy and Partnership Manager, Authority A, Hull**:

"We have the Waste strategy and then we have the Waste Collection Policy so that is for me and my team to pull together looking at best practice across the country and then we kind of decide about how we are going to deliver our Services. So we are due for a review and perhaps the circular economy element will play a part this time".

The above point is also corroborated by observations during my secondment at HCC, where the lack of resources and skills to pursue sustainability activities was regularly cited by HCC employees. It was evidently clear that CE was not understood in the economic development department where I was based, instead discussions were focussed on developing net zero strategies, while still maintaining economic growth and competing to attract new employment opportunities to the region. There seems to be a current lack of a circularity focus in local policy, yet there is potential for CE inclusion in future policy, although from discourse analysis conducted on these policy documents this has yet to materialise in practice. Instead, there is a strong focus on recycling rates at the council which they take pride in being a leader in these activities, as evidenced here by the **Regional, Sustainability Manager, Authority D, Hull:** *"I don't know about this year but last few years, (Local Authority Council) has been the best recyclers I think it's in England. We have got a very good recycling system in place"*. This attention on recycling performance effectively portrays the way local authorities often perceive and discuss CE topics, with a primary focus on end of life management.

In the Austrian context, there are suggestions that recycling infrastructure is essential for future CE developments, as displayed here by the **Global R&D Manager, Company E,**

Graz: *"If we want to set up a recycling industry in Europe that takes the case; it is the same for infrastructure for electric vehicles of fuel cell and that is the biggest issue. It takes decades to set up the infrastructure."* This emphasises that planning ahead is required for recycling infrastructure, which may also in turn dictate the future path of CE strategies at both a commercial and policy level, based on these previous investments. Investments in recycling infrastructure is likely to further encourage more downstream CE solutions, due to substantial investments, which may be side-lined for other more effective CE solutions.

From a Styrian policy perspective, CE does not seem to be directly included in policy development, instead broader waste management issues are the main focus of policy, which may be dictated by legal waste requirements, which is explained in the following quote by the **Regional, Waste and Resource Manager, Authority A, Graz:**

"they have to call it waste management plan according to programmes of waste management; it is a plan on circular economy, to make the change to circular economy and one of the three strategies is the Green tech based on what the Green tech cluster is doing or based on the companies which are a member of the Green tech cluster to develop products, sorting technologies for waste but also fostering the re-use technologies"

This above quote suggests the authority is using their waste management strategy to promote CE activities regionally, but there are challenges with defining and communicating on the CE, which may hinder future collaborative regional CE developments.

Another multi-level policy point to consider is the challenges for developing regional CE activities, in terms of feasibility challenges in relation to sufficient quantity of materials locally. The need for economies of scale in waste management terms, creates challenges for regional level CE activities, as materials may need to be collected, transported and managed at the national scale. This need for economies of scales for waste management was also evident from a policy perspective, which highlights the need for local authorities to collaborate on waste issues to make them viable, which is demonstrated in the following quote by the **National, Statistician and Evidence Analyst Waste Management, Authority E, UK:**

"so that they don't necessarily have a situation where we need infrastructure within every single local authority which can be quite costly. So our economies of scale then can be

realised when local authorities collaborate. Even if that means waste moving across from one local authority to another".

This quote further displays the need for high quality and sufficient quantities of residues to develop effective CE strategies, although this may be a challenge at the regional scale due to a lack of local supply. Hence, there is a need for economies of scale and interest for creating sufficient demand for developing infrastructure necessary for a CE. This suggests there is a strong need for regional collaboration across administrative borders and between different governmental levels, to help facilitate management of materials in an economically viable manner. From this, it seems unlikely that the region will benefit as waste is more likely to be managed at the national level.

From the local authority perspective, it was evident the need for collaboration across authorities to deal with waste in a feasible manner by using sufficient quantities of materials, which is shown in the following quote by the **Regional Head of Waste Management, Authority A, Hull:**

"But we will need East Riding's waste, economies of scale thing where you probably wouldn't build one that was less than 80,000 tonnes a year, between Hull and East Riding we probably do about 50, 60. So jointly we haven't got enough waste, so we need someone else, so there is an efficiency thing there around economies of scale."

This shows the desire for collaboration across local authority boundaries for the successful implementation of CE activities, which also suggests that regional level CE activities are likely to be difficult to achieve due to the need for large quantities of materials needed to make them financially viable, which is more likely to be feasible at the national level, due to reliance on sufficient economies of scales in terms of managing waste.

Similarly, there seems to be recognition for successful CE change to occur there needs to be greater collaboration across regional authorities' boundaries for greater impact across the wider area, which is displayed in the following quote by the **Regional, Managing Director, Authority H, Hull:**

"So we're leading in the Northern Powerhouse for energy. So each of the regions are leading on other significant transitional sectors that we need to move in. I think we've seen progress. I think there's a long way to go you know if I'm being honest. There's a long way to go. And I think in terms of collaborations and bringing projects together at

every level, you know universities together as well, that will be important. We need to open and share information far more I think to hit the targets."

The above quote highlights the limitations of current narrow approaches to CE development and instead emphasises the need for greater relational thinking and collaboration across regional boundaries to help accelerate CE opportunities across the 'Northern Powerhouse' covering many regions in the North of England. Again, while collaboration across the north of England may support CE development, there still appears to be many challenges associated with collaborating with different stakeholders and across administrative boundaries, although questions remain in relation to the impact on regional development in NH, if larger scale strategies were to be implemented.

Notably, waste regulations are nationally focussed, so the scale of loop closing is also likely to be suited to the national level, due to the reliance on sufficient quantities of materials and economies of scales when managing residues, in order to balance supply and demand nationally, which is demonstrated in the following quote by the **Regional, Head of Waste Management, Authority A, Hull:**

"That is it and you will have an imbalance of, you know, where is the demand? Where is the demand for the product? If nobody wants it, you know, what are we going to do with it? So there is a big demand and supply thing and certainly geographically that can be challenging."

From the above, it appears that the national level is well suited to manage sufficient quantities of residues, which may result in different regions specialising in certain materials which are collected from across the country in order to make recycling efforts commercially viable in each location. Although this raises questions for the role of the region in CE development as materials and resources appear to be distributed across the country to be managed collectively. Evidently there is potential misalignment between the local authority and the national government in England, when promoting CE activities, as CE visions do not always appear to be aligned.

Similarly, the end of life focus is also evident when discussing the need for economies of scale for waste management activities, another clear end-of-pipe approach to circularity, which is discussed in the following quote by the **National, Statistician and Evidence Analyst Waste Management, Authority E, UK**: *"So our economies of scale then can be realised when local authorities collaborate. Even if that means waste moving across*

from one local authority to another". This above quote highlights both the need for cross-administrative collaboration, but also the strong focus on end of life aspects of waste management.

The role of the region also seems limited in many NH based business CE discussions, instead companies seem to follow supranational/national climate targets, as evidenced here by the **Head of Sustainability, Company A, Hull:** *"Not so much on a regional basis. [...] More of a national basis or international basis. We'd follow science based targets for example or sustainable development goals. More looking at national agreements rather than local ones."* Hence, national and international regulations appear to drive motivation for companies to pursue CE activities, which suggests that companies do not recognise the importance of regional climate targets, which may hinder the success of regional CE transitions. At the EU level there is also recognition of a need for stricter international laws to govern CE initiatives, which can be seen in the following quote by the, **International, Politician, Authority C, EU:** *"Lack of knowledge; insufficient recognition of importance of Circular Economy, and lack of binding legislation".* It seems that many companies rely on regulation to systematically develop production systems which meet international waste management standards, hence robust regulations for a CE are likely to result in more business shifting to circular forms of production, as shown in the following quote by the **Head of Sustainability, Company B, Hull:**

"So I think that you know, had a similar conversation with a national government organisation and to me what we need to do to improve the end of life processing of materials, so it is you know, making sure that more items get recycled, but rather than it be something specific that there seems to be a lot of businesses out there that can do things. I think we need to get this into the mainstream."

Business appear to call on policy at international level to develop more standardised and stringent regulations to allow for long term strategic CE planning. The responsibility is regularly passed onto policymakers to design better recycling infrastructure for a CE, as demonstrated in the following quote by the **Business Development and CE Specialist, Company G, Hull**:

"I think there's a lot of challenges around legislation and regulations. So yes, industry will change as the EU directives come in but even if we look like across the UK at how many different recycling streams like each council has different ways of working. [...]

Because it's not really the plastic that's the issue, it's the waste management and the consumer behaviour that I think causes a lot more of the issues."

Notably, plastic is not seen as an issue, but instead the lack of recycling infrastructure is seen as the problem. It appears that the company makes its own decisions and then the local authority is expected to create the system needed to manage the waste, the company in the above quote seems to be shifting responsibility to both local authorities and consumers, in terms of managing waste effectively. It is apparent that a more open and collaborative dialogue is needed between policy and business, in order to develop improved infrastructure for circularity.

Similar multi-scalar challenges were faced in Styria, issues of alignment arose between policy and business, but with added nuanced contextual complexities. There was a common trend that policy should make CE activities feasible for companies by introducing regulations to encourage circularity, which is demonstrated in the following quote by the **Circular Economy and Reuse Manager, Company A, Graz:**

"This is also a problem for my reuse activities because I try to establish a reuse management and on the other hand (international manufacturing company) buys only new products. This is a main problem of our, our laws and then taxes because maybe if we have a declaration for a period from three years then afterwards it's wasteful waste for us so I think there must be change, there must be a change in the laws and also in the taxes. We have to do something from the political side."

This quote suggests that supranational and national level policymakers are key to developing CE initiatives, as they set the rules for companies to follow. Without strong regulation there is a risk of only a small number of firms transitioning to more circular production systems, more regulation appears necessary to encourage CE developments at the regional level.

Styrian policymakers appear to have more power compared to regional authorities in Hull, when influencing regional CE developments, which is demonstrated in the following quote by the **Managing Director of Manufacturing, Company B, Graz:**

"I think the business together with the local authority because the local authority are defining the rules, and they're within new laws and regulations and the business then tries to support this and work with this, yeah. I think it's a combination because it's a

new law and new regulation which creates for sure the possibility to improve or some pressure to move on, to change and supports the business to be creative and develop."

From the above, it appears that Styrian businesses recognise the role of the local authority in Graz more so than in the case of Hull where the local authority was often overlooked. Additionally, companies in Styria appear to argue that both business and policymakers combined are responsible for fostering local CE developments.

Moreover, Public Private Partnerships (PPP) (a cooperative arrangement which is publicly funded, but privately operated, designed to tackle a common long-term challenge) are a common feature of regional strategies in Styria with many environmental initiatives starting at the council and then being incorporated by commercial providers. In Styria, it appears that some sustainability related companies have stemmed from the city council, who have shown a desire to tackle environmental issues locally, as discussed in the following quote by the **Manager, Company C, Graz**:

"let's say invented by I think the city of Graz or the region of Styria. And now it's still in Austria and in Germany and the main focus was like to argue that you could implement measures for sustainability or for environmental protection, energy saving and like have an economic effect by cost reductions and like saving money."

PPPs are common in Austria, highlighting private and public actors working collaboratively, to tackle waste management issues regionally in Styria, as demonstrated in the following quote by the **Manager, Company D, Graz**: *"we are very strong in the field of having PPP models, public private partnerships, I think we are having at the moment 23 PPP companies and one is together with the city of Graz. Nearly 20 years old".* This PPP approach is also likely to help overcome political resistance to decisions which may occur as a result of CE changes in society, which is critically considered in the following quote by the **Manager, Company C, Graz:**

"Yeah, deposit return, to implement this much more than it currently is. But there is already quite some resistance from economic or chamber of commerce and other networks because yeah, that's also something that's a main obstacle I believe in Austria. That if you want to change something that you immediately have several organisations from the economy that say that's not possible at all. So everything that comes from politics meets resistance depending on which party brings up an idea and another organisation will step up and say okay, now it doesn't make sense."

This PPP approach to developing CE initiatives in Austria appeared more frequently and dominantly than interviews based in the UK, where resource efficiency initiatives are usually approached separately from policy and business perspectives. A collaborative approach between business and policymakers is likely needed to foster more inclusive CE initiatives at the regional level in the UK. This may allow for more fruitful and mutually aligned CE activities to develop between partners at the regional level.

In Austria, there also appears to be a strong role for supranational governments when developing CE initiatives. Policymakers were regularly identified in discussions and were called on to adjust taxation in favour of material reuse, as shown in the following quote by the **Manager, Company D, Graz:**

"one possibility is to make the raw oil more expensive with tax or something else, the second possibility is to make it cheaper, the raw material which is coming from waste, yes, and the third possibility is, and it is what the European Union is now saying that when you are producing a bad bottle there must be twenty-five percent of the input material coming from the waste side."

From this quote it is clear that many companies feel the need for greater financial incentives to encourage more systemic change in terms of CE developments. Additionally, there is an important role for supranational policy in order to create a level playing field in terms of tackling sustainability issues, otherwise CE strategies are unlikely to be possible for companies competing with lower cost providers, as demonstrated in the following quote by the **Manager, Company D, Graz:**

"So the problem is to bring the target on the street and that is only possible when, when from the economic parameters it makes sense, otherwise we as a company, it is very hard for us to make an investment in that direction when at the end the costs are much higher than before because we are fighting on the market with other companies which are not doing that and the possibility is that we are losing the track because our costs are too high."

Similarly to the above cost related concerns, there was a strong recognition of the need for coherent multi-level policy to facilitate CE developments, which requires economically viable solutions, which is exemplified in the following quote by the **Regional, Economic Development Manager, Authority C, Graz:**

"systemic things around this economy, green deal economy only works if it is really a tough business case on the end of the day. So, the business case means sustainable workplaces, sustainable companies, economic sustainable I mean and this together with the green, green economy works, that is the intention we wanted."

Business in Styria appear to recognise the importance of legislation in driving circularity and accelerating CE progress across industry. There are many calls from business to government to introduce more robust legislation when developing CE activities, in order to encourage more widespread CE development, as displayed in the following quote by the **Global R&D Manager, Company E, Graz:**

"Yeah, so, there is a shift towards sustainability which started some years ago really and now this new topic, also on EU level, circular economy comes up. [...] the drive is always the legislation."

While the local region has funding for developing CE initiatives in Austria, this appears to be somewhat constrained by national regulations. Although, the local authority seems to have more power over regional CE initiatives, compared to the UK. National and EU CE initiatives are fundamental to fostering systemic CE developments throughout society, as they have significantly larger budgets and power to promote CE activities at a larger political level (according to the response of the **Regional, Economic Development Manager, Authority C, Graz**).

In conclusion there is evidently a lack of alignment between policymakers at different levels which creates challenges for developing and fostering regional CE activities. In England there is a more national approach to managing waste due to the need for economies of scales when managing residues. Conversely, in Austria there appears to be a more PPP approach to addressing CE issues at the regional level, which involves developing CE strategies in conjunction with both commercial stakeholders and policymakers. Common in both England and Austria it is clearly apparent the central role that policy plays in terms of setting benchmarks for companies to follow when pursuing CE strategies.

5.2   Company commitments to global value chains and implications for a regional circular economy

Companies display commitments to global supply chain actors in terms of sourcing materials as inputs to their production processes, which may hinder potential regional CE

collaborations. The following section will explore these connections to global value chain partners and how these were discussed amongst companies. Business often focus on optimising value chains, which is done through collaborations across different global locations, resulting in a lack of regional focus, in turn having implications on developing local collaborative CE activities. Company thinking is explored in relation to developing regional CE activities in a globalised economy. This analysis draws predominantly on business interviews and discourses analysis in the English context and business interviews in Styria. The survey results also highlights the global distribution of companies and their value chain configuration in term of inputs and outputs and the lack of current interest in exploring regional level CE activities.

The configuration of international value chain systems introduces complexities to developing regional CE activities. Many companies highlighted how supply chains are organised to capitalise on the local differences in each country, however it is difficult to envision how these international supply chains can facilitate more regionally based CE activities, as displayed in the following quote by the **Global R&D manager, Company E, Graz:**

 "Raw materials, then you have the forging, then you have another process and then it crosses the channel four times until the engine is readily assembled and ready for mounting into the vehicle. So, that is an incredible global network of logistics and that is part of our effort."

The above quote illustrates the clear focus on organising value chain activities in order to take advantage of expertise and nuances in different locations, although the environmental impact of transporting goods back and forward seems to be overlooked. There is a lack of attention given to the potential of developing regional CE initiatives between local partners and the focus still appears to be on utilising international suppliers to deliver products in a cost effective and timely manner, which may hinder regional CE collaborations, unless they offer competitively priced alternatives. The international approach to managing inputs and outputs was further evidenced by the survey findings (see Table 8 in appendix), which showed the global focus and arrangement of international supply and disposal chains of inputs and outputs, raising questions for the potential of evolving regional CE opportunities locally.

The role of international value chains in a globalised economy appears to create added complexity for regional CE ambitions, which was particularly evident in intermediary

companies (which are not consumer facing), suggesting these may have less motivation for exploring CE collaboration, due to the lack of public pressure on them. From this, the responsibility and influence appears to lay with the producer of the products, to ensure materials are designed for circularity in order to boost CE performance throughout the production process, as displayed in the following quote by the **Health, Safety and Environment Engineer, Company D, Hull:** *"But when it comes to B2B I think the whole concept can become more blurred as the impacts of the problem may be less clear, as the intermediary business may not really care about getting materials back".* This quote points to the importance of comprehensive Extended Producer Responsibility regulations, while there is also a need for greater incentives for intermediary firms to pursue CE activities in order to increase the take-back of materials and extend product life-times.

There is an apparent lack of alignment between business and policymakers, there seems to be some blame between who is responsible for waste management and developing CE opportunities regionally. The council often enter long term contracts with waste management providers, which may stall potential CE initiatives, as they are locked into using providers for a long period, making it difficult to implement changes needed for a CE, as displayed in the following quote by the **Group Purchasing Controller, Company C, Hull:** *"It is going to be a long process because, as I said before, the councils will have contracts in place which limits them at this point".* This quote arguably suggests that the council may in-fact hinder CE activities due to the lack of infrastructure in place for developing a CE.

It was repeatedly acknowledged that businesses in both NH and Styria have a broad supply chain focus which they are committed to serving, further increasing regional CE challenges, as shown in the following quote by the **Regional, Energy Manager, Authority G, Hull:**

"One of the problems we have is that a lot of the time you get someone like (offshore windfarm company) are obviously European based Firms come and build the wind farms but they use the supply chains that they have already got established in whichever country it is rather than using localized Engineers or a localized Company that might supply the nuts and bolts for attaching their wind farm together. That is one of the problems we have because it is all very well and building a wind farm in our region but if local Businesses don't benefit from it we are not supplying local jobs and it doesn't trickle down then that is an issue."

This is further emphasised in the company reports studied which displayed the global nature of supply chain configurations and the survey findings (See Table 8 in appendix) highlighting the strong reliance on global suppliers to create products in a timely and cost-efficient manner.

Company reports also highlight the value chain approaches to managing CE performance and the need to use a life cycle approach to circularity, with upstream and downstream partners, as displayed in the following company report: *"Increasing our Right First Time production rates, improving customer experience and reducing our carbon footprint. Conducting full life cycle assessments of our top 100 ingredients to help our customers to move towards a circular economy and reduce potential chemical hazards." (Croda, 103).* They are located at an early stage in the value chain and want their chemicals to be produced in a way that allows customers to close their loops of production downstream. The inclusion of 'customer experience' suggests that both upstream and downstream value chain partnerships are key to circularity success at the company level. Similarly, Cranswick's CE ambitions are also portrayed through supply chain initiatives, which is displayed in the following company report quote: *"We will also support a UK circular economy by purchasing plastic trays with a minimum of 70 per cent recycled content." (Cranswick, 35).* This quote shows that Cranswick foreground national level collaboration in terms of CE implementation, while regional collaborations are not mentioned. Siemens Gamesa emphasize the need for increasing the recyclability of wind turbines, which requires collaboration with upstream and downstream value chain partners, this is responding to an environmental handicap of what is by definition a product for reducing carbon emissions. The dual aim of economic and carbon advantage are closely entwined here in the following company report quote: *"Increasing the recyclability of turbine components is high on our agenda and we continuously take part in projects to support the development of a circular economy." (Siemens Gamesa, 66).* This quote foregrounds the company's own role in addressing change, the use of 'we' and 'our' emphasising their active role, albeit there is a suggestion of this as a future activity. The phrase 'take part in' suggests collaboration with other actors, but who they are and what form that might take is unspecified; the company is representing its own willingness to engage with CE, whilst backgrounding value chain partners with whom it may need to collaborate to achieve its ambitions.

Limited attention is given to the role of the region when developing CE initiatives in both NH and Styria. In general, business reports focus on optimising their supply chain

systems, which is often done through collaborations across different locations, which is exemplified in the following company report extract: *"Siemens Gamesa has a strong history of supplier excellence, built up over the years through sustainable relationships with our supplier and contractor base." (Siemens Gamesa, 68)*. The word 'sustainable' here appears to suggest they have long term agreements with these trusted suppliers. The company also references the importance of local suppliers and creating value for the local region, as displayed in the following quote*: "Development of the local supply base adding highly technologically prepared and competitive competitors, while contributing to local wealth creation." (Siemens Gamesa, 68)*. This implies that the wealth creation is shared by all stakeholders, which implicitly benefits the local community, although this is not explicitly claimed. The emphasis, however, is on traditional supply chain relationships rather than CE collaborations. Furthermore, despite directly referring to the importance of choosing local suppliers, the document goes on to highlight directly using the following Tier 1 suppliers in 2019: 11, 340 suppliers in Europe the Middle East and Africa, 3,542 suppliers in Americas and 3,571 suppliers in Asia/Australia (69). There seems to be disparity between their ambitions to source locally but their dependence on a globally distributed supply chain, which may create challenges for developing regional CE collaborations. Moreover, it can be seen that Siemens Gamesa primarily discuss CE collaborations through supply chain partners who are actively considered in the document, rather than local connections.

The construction of a regional CE implies companies not only being prepared to reconsider what they do with residues, but also to rethink their entire value chain system and connections with both upstream and downstream partners. The majority of interviewed companies showed a reluctance to consider changing value chain partners, since they have built up a long-term relationship with them. Several companies indicated that they do not routinely search for new suppliers, and might have used the existing value chain partner for a considerable period of time. Companies may be initially open to choosing local suppliers, but in practice they are often constrained by their global sourcing strategies and rely on materials from many international locations. Many companies have limited scope to pursue regional sourcing strategies as all the materials they need may not be available in the region, however a regional CE could help overcome this and develop resilient local supply chains with localised closed loop systems. This global reliance on international locations for sourcing materials was particularly evident

in survey findings, which corroborates this globally distributed focus for supply chain operations (see Table 8 in appendix).

It was regularly cited that suppliers have to pass an audit to confirm they meet company standards when selecting new suppliers. Companies therefore are not inclined to change suppliers regularly, preferring to remain with an existing supplier. This recurring theme was evident in various companies and industries, suggesting that shifting to suppliers who may offer more circular possibilities is difficult to implement, as shown in the following quote by the **Head of Sustainability, Company B, Hull:** *"looking at the top 50 suppliers for instance, the top 50 suppliers by spend, we have been with those companies for many, many years".* This above point regarding sticking with suppliers was echoed by most companies in a variety of different industries, which can again be seen here by the **Head of Procurement, Company C, Hull**: *"We don't change suppliers that often; we will maybe introduce a secondary source or we may de-list a supplier but consolidate to another. Introducing a new supplier would tend to come when we were introducing a completely new product which wasn't available with an existing Supplier."*

The above quote foregrounds the active role that suppliers play in dictating procurement strategies. It seems that new supplier decisions are driven by specific new product development, with less attention given to shifts towards more CE related sourcing strategies, this may limit the potential to foster more regionally collaborative CE activities, unless there was a new product being introduced, which is exemplified in the following quote by the **Business Development and CE Specialist, Company G, Hull:**

"If it's a good supplier no, you'd prefer to stick with them. You'd only tend to change supplier if it's for a new spec or for a new product. As I mentioned before, obviously they've got to tick all the different boxes of human rights kind of covers everything but we've got different like anti-slavery within the supply chain."

This apparent aversion to changing suppliers who have to meet stringent selection criteria, suggests that companies would struggle to build new local CE connections, since they are tied to long term commitments with existing suppliers. However, companies still show interest in joining the HWA group, but discussions are focussed around improving the local environment through activities such as litter-picking and running educational and promotional events for local stakeholders. This suggests there may also be challenges for more sustainable suppliers to break into developed markets which have strong value chain agreements set up. Additionally, it seems that human rights issues take higher levels of

importance compared to sustainability concerns. Companies appear to follow stringent measures to ensure labour rights are protected and this seems to be the main concern, so sustainable suppliers also need to meet high levels of ethical obligations. This was a re-occurring theme which emerged that companies need suppliers to meet a range of criteria to work with the company, so CE oriented suppliers must meet the same standards of price and quality to win new customers, which is likely to be challenging, as described in the following quote by the **Head of Procurement, Company C, Hull:** *"But clearly particularly at the moment their P&L [profit and loss] position, their balance position, clearly is very important, as is sustainability, as is the quality that they are producing, as is the capacity. So it is a balance across the factors."*

However, on a more positive note for potential CE developments, there appears to be a rise in many companies actively seeking more information from upstream and downstream partners in the value chain, in order to increase transparency and to be able to produce and dispose of materials using CE principles, as displayed in the following quote by the **Head of Sustainability, Company A, Hull:** *"But I think many years ago people would just look at their factory and think what's coming in, what's going out. But now it's much more looking back two or three stages or more in your supply chain."* While there was a common increase in awareness of the need for open supply chain collaboration, questions still remain about the potential for regional supply chains and developing local CE initiatives.

The dependence on particular suppliers when sourcing niche raw materials, also raises questions for the potential of developing regional CE initiatives between local business partners, as it is unlikely that the required resources are available in the region, they are often dependent on using one particular supplier who could be located anywhere, as highlighted in the following quote by the **Head of Sustainability, Company A, Hull:** *"But if you're buying in a very niche raw material it could simply come from anywhere in the world"*. Moreover, international companies often produce a wide range of products which follow global sourcing strategies for inputs from across the globe, with little recognition of the potential of local suppliers, as shown in the following quote by the **Head of Sustainability, Company A, Hull:** *"And because we're not just making one item. If we were just making TV's or something or one widget it wouldn't be too difficult. But we're making many, many different products. Not just in Hull but all over the world."* From this, we see that companies appear to be tied to their existing sourcing structures and have relative limited potential to work with regional suppliers, even if they can meet

their sourcing criteria, due to their existing global commitments. Again, this re-occurring global and complex production system was evident across various different sectors as highlighted by the survey findings (see Table 8 in appendix).

The majority of companies in both NH and Styria appear to follow global strategies to sourcing products, as can be seen in the following quote by the **Regional Innovation Manager, Company D, Hull:** *"we have global supply chains and our global procurement teams are setting up contracts with global suppliers, they are setting up strategic relationships with our international suppliers."* This further illustrates the common commercial long-term approach to sourcing inputs, it seems that many companies have set up long term agreements with suppliers in order to secure stock at a competitive price for the coming years, although the potential of developing local supply chains is overlooked. Thus, it is likely to be difficult to foster informal CE connections at the regional level as companies have strict global commitments to suppliers, which is unlikely to be suited to regional CE collaborations.

On the other hand, there was some recognition of the potential of regional sourcing strategies, as there is also a need to have autonomy to make change based on the regional environment, which only seems to be the case for a small number companies, as mentioned in the following quote by the **Regional Innovation Manager, Company D, Hull:** *"It's a global business with many functions in technology, supply chain and management, which set strategy and policy, while each region have considerations which they need to take, so there's always a balance between global and regional requirements. Local sites have the power to make change*". Some companies appear to show an apparent interest in using regional suppliers, although many companies are constrained to pre-determined globally designed sourcing strategies, which limits the potential for regional collaboration, which is typified in the following quote by the **Sustainability Co-ordinator, Company C, Hull:** *"In an ideal world it would be lovely to use local suppliers but a lot of the time it isn't necessarily practical".* This quote effectively encapsulates the general sentiment from business, they appear to consider the potential of regional sourcing, but in practice they rely on global systems to sufficiently source a range of inputs.

Another challenge for developing a regional CE, is that companies often use globally dispersed supply chains to source materials and they do not appear to be vertically integrated. Companies are therefore unlikely to have control over setting requirements

for their suppliers to meet in terms of pursuing closed loop production systems which depends on complex supply chain collaboration, which is displayed in the following quote by the **Head of Sustainability, Company B:** *"we roughly have around about 130 factories that are producing those product ranges for us, we don't own many of them, you know, they are factories that supply those products. And the vast majority of that is based in China".* This shows the diverse and globally distributed suppliers companies use in order to source inputs in an efficient and timely manner, this global approach to working with suppliers is likely to limit the potential for local sourcing opportunities. Moreover, this broad approach to sourcing the same type of material creates further complexity when attempting to develop more closed loop production systems, as numerous suppliers are involved in supplying similar input materials, which requires more complexities for a CE. This reliance on internationally distributed suppliers is further corroborated by the survey findings (See Table 8 in appendix), which highlights the extent of global reliance on international partners to produce products across a range of sectors, again which will likely limit the potential of fostering regional CE activities.

Another complexity for regional collaborations is that companies in the region may not be producing products at their site, but simply act as an intermediary agency in the supply chain, as explained in the following quote by the **Head of Sustainability, Company B, Hull:** *"what you have to be aware of as well is sometimes the local suppliers, depends what you mean by local suppliers, so local agent or actually a local manufacturing company".* So, a company could be using a local company thinking they are sourcing from a local supplier, but instead they are just acting as an agent in a complex international supply chain, so still the materials are not originating in the local region, which is unlikely to lend itself to regional CE development.

Companies in both NH and Styria appear to simply find it more convenient to collaborate with supply chain partners who understand the specific details of their firm, instead of seeking to build new relationships with potential local suppliers**,** which is displayed in the following quote by the **Group Purchasing Controller, Company C, Hull***: "We've also tried to link up on the circular economy with our suppliers so that if we can recycle our plastic we could get our plastic recycled back into our products, again this is at early stages."* This point was evidently clear amongst many large companies, who often have complex existing production systems, so there is little desire to collaborate with regional

organisations, despite potential CE opportunities, as shown in the following quote by the **Sustainability Co-ordinator, Company C, Hull:**

"We are a one and a half billion-pound PLC so putting together our requirements for manufacturing is quite energy intensive. We are a big user. We personally wouldn't gain much from trying to collaborate with other people on that. People would probably gain more from trying to collaborate with us. But it is already pretty complex just for us. Trying to pull together with so many different sites."

From the above quote it appears that the main focus of the vast majority of companies in NH and Styria is establishing value chain collaborative relations which will boost business performance and if local suppliers do not offer this potential then they will not be considered. It seems that companies do not acknowledge the potential for local CE capabilities, as displayed in the following quote by the **Business Development and CE Specialist, Company G, Hull:** *"Normally we would talk to them, offer what solutions we have and then help work down their supply chain and we wouldn't necessarily say okay, who is based in Hull that we can work with."* So it seems that regionally based companies do not receive collaborative considerations, unless they fit the criteria needed to solve a particular issue. There appears to be very little dialogue between regionally based firms in tackling sourcing issues, despite there likely being numerous cost and environmental benefits of sourcing from local suppliers. Large companies also hold significant power and act as a key driver in developing CE activities throughout the value chain by increasing the sustainability criteria for prospective suppliers, as highlighted in the following quote by the **Sustainability Co-ordinator, Company C, Hull:**

"But we are moving on to phase two a little bit in that it is now time to start talking to our suppliers about what are they doing? And starting to make it a condition of working with us that they need to come on this journey with us. And I think in terms of inter firm activity that is where you are going to see it. It is going to come from bigger companies and from customers pushing companies to do the right thing and get involved."

Moreover, the strong role which retailers play in dictating upstream production system decisions was also evident in consumer focussed sectors, which is explained in the following quote by the **Group Purchasing Controller, Company C, Hull:** *"we aren't an own branded company, we are retailer led, it can sometimes be a battle with the retailers to get our ideas into their products"*. Retailers are foregrounded and given an active role in setting the agenda, they are driven by sales targets, it appears that marketing

considerations trumps sustainability issues, which is mentioned here by the **Group Purchasing Controller, Company C, Hull:** *"we have changed all our, all our customers onto clear [Plastic], away from coloured except for [Leading International Retailer], they are insistent on a grey for their [premium brand range]"*. Again, this shows marketing functions take more importance over sustainability issues, as retailers want products to stand out on shelf, through eye-catching packaging, as opposed to using materials which are more favourable for a CE throughout the value chain process.

There is an apparent need for greater transparency and collaboration between organisations in both NH and Styria, to help foster regional circular supply chains. There was regular evidence of a lack of open collaboration between local actors, due to confidentiality concerns when sharing information, which may also stall local inter-firm CE initiatives, due to the lack of potential for knowledge sharing between companies, which was evident amongst businesses, as displayed in the following quote by the **Energy Manager, Company H, Hull:**

"The major barriers that I see to any circular economy is the commerciality, and the confidentiality of any business interactions with each other. So, as I'm sure it's widespread in most businesses that you have a non-disclosure agreement, as soon as you enter in anything that's got any sort of confidential nature of discussions you're then going into NDAs, which then means you can't ever discuss that with anybody else, and it's that competition aspect of the commercial side of businesses that I think will be the biggest barrier to doing this."

From this it is clear that commercial sensitivity is a key issue for firms and they must preserve their knowledge as a matter of priority, therefore any regional sourcing and CE initiatives must either adhere to these strict procedures or find a way to build openness and trust between regional partners. If companies cannot overcome these confidentiality issues locally then they will struggle fostering open collaboration and building regional CE strategies. Pre-existing global supply chain agreements appear to allow for more open and fruitful collaborations, since they are well-established and legally protected.

The issue of confidentiality in fostering CE was also evident in the CE discussions in Styria, as displayed in the following quote by the **Global R&D Manager, Company E, Graz:**

"And, on the other hand, of course, talking about this network, our industry is always very confidential and so, we don't want any Authorities to be involved in the development and in the supply chain. On the other hand, the Authorities more and more want to see the entire supply chain, let's say, that it is sustainably sourced, where do all the parts come from and so on."

This quote also highlights the lack of openness even between business and policymakers, which suggests companies are also weary of sharing information with authorities who have no competing interests, which further highlights potential hurdles to open regional collaboration for the development of a CE.

Downstream in the value chain, end of life management was another persistent theme, which was regularly evident in company interviews in both NH and Styria. Waste is rarely considered of strategic importance for many companies, so it tends to be outsourced to a waste management service provider, who they pass over responsibility to manage their waste streams, as shown in the following quote by the **Sustainability Co-ordinator, Company C, Hull:**

"We can't be an expert at everything so we need a waste disposal partner who will keep an eye on what is going on in the market. And as new technologies come along make us aware that something that is currently going into our compacter could go into a recycle route."

The waste management provider has been clearly foregrounded and given and active role in tackling downstream waste production. Additionally, from the survey (see Table 8 in appendix) it was evidently visible that the majority of outputs from companies in Hull were sent to national and international locations, raising challenges for potentially building regional resource exchanges and also limiting commercial control over where materials eventually end up after leaving their premises.

Since waste management is outsourced, it is difficult to accurately record the amount of materials remaining in the local region, as it is no longer managed by the company itself. From this, it could be argued that waste management providers are well positioned in the value chain to act as a facilitator in developing CE exchanges, although unlikely at a regional level. Commercial and local authority waste providers are likely to be key collaborators in terms of receiving and distributing materials for evolving regional CE

resource exchange activities. However, the role of the regional suppliers in local waste management and CE activities is difficult to envision. Instead, economies of scale were often referred to as the driving force behind waste management decisions, which results in waste being separated, distributed and managed at a national level. Hence, waste does not remain locally, potentially creating a barrier to fostering local CE exchanges, as shown in the following quote by the **Regional General Manager, Company F, Hull:** *"Some strategies are more local. It will improve as infrastructure improves because at the moment the specialist plants, there are only so many in the country so that has to be at a national level."* This shows the current national perspective to waste management separation and management and the need for improved infrastructure and economies of scales to be able to effectively manage waste locally.

Additionally, established certified providers appear to be the desired choice of waste disposal, as they offer a highly reputable nationwide service, which is appealing to companies seeking to efficiently manage waste in a robust and transparent manner, again pointing to the national level scale for optimal management of waste, as highlighted in the following quote by the **Regional Innovation Manager, Company D, Hull:**

"The choice of waste disposal is managed by procurement, who have vendor requirements. So waste contractors have to fulfil certain requirements, they have to meet the standards and international regulations, we're not going to use a local scrap merchant who we don't know what they're going to do with it".

This concern regarding where waste ends up stems from the duty of care principle, which means companies have a legal obligation to ensure waste is managed responsibly after it leaves their control. From this, it is clear that any local CE initiatives which deal with end of life management of waste must also strictly adhere to regulations, potentially hampering informal resource exchanges locally. This need for accreditations was evident amongst a number of companies when choosing a waste provider, which is mentioned in the following quote by the **Energy Manager, Company H, Hull:** *"The waste contractors are chosen again, in the same criteria that I spoke about with the other suppliers. So, we're talking about making sure everybody's got the right licenses, and the right accreditations to do what they're meant to be doing, that they're financially the best option".* This raises questions for the potential development of local informal CE connections, it seems more likely there is a need for legally binding connections between companies, when forming regional resource exchange relationships, which was also the

case in the upstream value chain when dealing with suppliers. From a waste management perspective there still seems to be end of life challenges associated with dealing with specific materials in certain sectors, which shows the need for improved sourcing strategies and design for circularity upstream, to reduce the downstream burden of excess redundant materials, as displayed in the following quote by the **Waste Contract Manager, Company E, Hull:**

"as a company they are looking into that because I know there is, around the world I think there is one in Texas, there is somewhere that takes old turbines and cuts them down [...] there is no plan for what happens at the end of their lifespan."

These end of life management issues were common in most firms. They were overly focussed on dealing with waste at the end of life, yet they still did not have a strong plan in place for how to deal with materials at the end of life. Furthermore, there was a lack of discussion on the potential for other CE activities such as choosing more sustainably appropriate materials in the upstream to facilitate CE opportunities downstream.

In both NH and Styria there is an apparent recognition of the potential for closing production loops, although there is a lack of significant acknowledgment of the influence of early stage CE activities. It also appears that the early design phase is primarily focussed on making products which are recyclable in post-consumer waste, as opposed to improving materials used in the production phase, as evidenced here by the **Business Development and CE Specialist, Company G, Hull:** *"So I think circular economy is obviously focusing on the end of life of a material and just making sure any product is designed that at end of life it becomes a resource for the next product".* This end of life focus was a re-occurring theme amongst businesses, as shown in the following quote by the **Head of Sustainability, Company B, Hull:** *"I like to call it cradle to cradle or circular economy, but it's ensuring that the product after the end of its useful life gets reused, so the components of that product get recycled into another product."*

While with regards to pre-consumer waste, there is an apparent focus on waste management activities in a CE, which most likely stems from their legal obligation to responsibly manage waste at the production level, as displayed in the following quote by the **Head of Sustainability, Company A, Hull:** *"All of the waste is our problem from the moment it leaves the factory until its final fate. So we have a duty of care for our waste. We acknowledge that from as soon as we make the waste to where it ends up".* Companies acknowledge their responsibility for waste management, but more upstream

potential CE solutions are overlooked. Interviewees suggest that waste is separated by local authorities and waste service providers, then dealt with at the national level, raising potential challenges for developing regionally focussed CE activities. Moreover, waste management tends to be outsourced, so companies have less control over where exactly their waste ends up, suggesting it is only a peripheral concern for the company.

There is an apparent desire to enable locally operating business improve their waste management performance, although this could also be seen as a way to generate more clients, which is illustrated in the following quote in relation to waste management **Regional General Manager, Company F, Hull:** *"we are there as an aid to all whether they are our customer or not. We are there to support the environment on Humberside. So, some of them are our customers others are not but we treat them no differently."*

The above company foregrounds themselves as a key player in terms of managing waste, yet there is a lack of attention given to more upstream issues which may help reduce downstream waste. From observations at the HWA group, this forum acted as a way to generate business for the waste management firm, they were unlikely to be offering their services without a fee. HWA members were locally embedded and appeared committed to fostering regional environmental initiatives, yet the mixture of public, private and third sector organisations involved created complexities for building mutually aligned strategies. The motivations for taking part in the group varied between public and private organisations and different sectors have their own motivations and interests for being involved in the group.

However, an engineer's perspective offered a more design-based approach to reduce pre-consumer waste, as cited in the following quote by the **Health, Safety and Environment Engineer, Company D, Hull***: "so we would design for no waste or to eliminate or avoid waste where possible."* Similarly, waste management providers have moved away from solely offering a waste disposal service to providing a more consultation role in terms of CE development, which is highlighted in the following quote by the **Regional General Manager, Company F, Hull:** "*Yes they are cost saving but there is also a saving through the process so if we can engineer waste out further up the process or suggest a different way of doing it then there is no cost. And we are a consultative service rather than a physical service".* This appears to recognise the importance of upstream production processes in order to effectively manage waste downstream.

In the Austrian context, similar to company findings in Hull, low cost proximally located economies offer raw materials at prices that are difficult to resist. In an interdependent global economy low-cost producers are driving down raw material prices, as a result other suppliers need to be able to match these prices to compete. These low-cost virgin material prices represent a challenge for regional CE development, as there is little incentive for material re-use or choosing a regional but most likely more costly sustainable supplier. So residue exchanges need to make more financial sense to encourage efforts to explore re-use of materials versus using mass produced low cost virgin inputs, which is described in the following quote by the **Circular Economy and Reuse Manager, Company A, Graz:**

"We need a mixture because we are an international business and China is our main competitor on the world market for all these rolling stock product, so we know this is very hard this business and we have to look on the price this is the problem, but also on the quality."

The value chain focus to sourcing was also clear in Styria but with nuanced contextual issues based on the Austrian economy and lower cost neighbouring Eastern European countries, who were regularly foregrounded suggesting they have a strong influence in sourcing decisions. These countries offer low cost material inputs for Styrian based manufacturing companies, which is highlighted in the following quote by the **Circular Economy and Reuse Manager, Company A, Graz:**

"Yes but the globalisation of the supply chain it is a long process, it starts 10 or more years ago with the, with the cheap product in China, you know this, but now I would say it is more a mixture now, we have Eastern European suppliers also in our low cost countries".

This may suggest there is greater potential for CE collaboration with low cost suppliers in geographically neighbouring countries, which is not possible in the English context. This proximal relationship with Eastern European suppliers is likely to be more environmentally beneficial than sourcing from Asian nations due to the shorter geographic distances involved at this scale. However, this cross-border collaboration between Styrian based companies and low cost neighbouring countries is likely to be complex and it may be difficult to close regional production loops and in turn capture the value of resources retained in the local economy, once they leave the administrative region. While these Eastern European economies may offer good value for raw materials,

they may also act as a risk to the regional economy, since they are likely to have lower costs and different waste management procedures to Styria.

In both Austria and England there is an apparent commitment to developing existing supplier relations, once they have passed initial supplier selection hurdles, as discussed in the following quote by the **Managing Director of Manufacturing, Company B, Graz:**

"We check if we see the audit, we do an audit when we do the onboarding, he has to do a self-audit and we do the external audit. We check all the financial figures; we check the quality issues. Also, his capabilities, capacities and so on, and then we try to develop the supplier and also to build up a partnership with him."

The above reluctance to change supplier was a common feature of companies. Additionally, as highlighted above, financial and quality factors were a common key consideration when choosing a supplier, this is likely to create challenges for regional CE activities, as re-used materials need to meet stringent supplier criteria. This commitment to supply chain partners was a regular feature in both Styrian and NH interviews and companies appear interested in pursuing more circular supply chain management systems with these organisations, which is shown in the following quote by the: **Circular Economy and Reuse Manager, Company A, Graz:** *"So, we are now in a new phase of development regarding circular economy topics in the, within the supply chain management, but I make a lot of pressure to create a new supply chain management organisational set up to the, in the direction of circular supply chain management."*

However, it is unlikely that these supply chain partners are located all within the same region, creating regional challenges for fostering CE activities and shifting to closing loops of production at the regional level.

5.3   Conclusions

In conclusion, the findings suggest that all companies studied, in NH and Styria, show an interest in improving the regional economy where they are located, yet in practice these companies are tied to global company strategies in term of how they operate locally and where they source material. Moreover, even companies with strong apparent ties to a particular region were driven by what was often cost-focussed decisions in term of supply chain operations, which provided little potential to negotiate more regionally oriented closed loop production systems, which will be explored below.

Companies in NH and Styria exhibited strong global ties to their value chain partners, which raised questions for the ability to foster CE activities in both regions, although the Green Tech Cluster in Styria displayed more promising potential for building local CE commitments in that region. Similarly, in both locations companies regularly cite their strong connections to the locality where they are based. In practice, though, this thesis has uncovered a strong value chain dependency to production, which may come at the expense of developing regionally oriented CE activities with proximally located stakeholders. Increased regional attention from companies would allow for greater embeddedness to be built with local partners, in turn improving the potential of developing more resilient CE activities between regional stakeholders.

Multi-level policy approaches to CE-development in England has resulted in limited regional empowerment to effectively develop collaborative and resilient supply chain activities. By comparison, Austria's approach shows slightly more promise in enabling CE activities through PPP agreements with regionally engaged stakeholders. However, regional policy in both locations are evidently obliged to follow hierarchal governmental policy which is passed down from international/national authorities, offering less potential to develop regionally nuanced CE strategies. There is potential for learnings to be shared between the two regions. For example, the PPP approach utilised in Austria could be incorporated into the English context to further bolster informal CE connections over the long term. Conversely the informal English approach could be used as a starting point for CE discussions in Austria to explore potential collaborations, without the barriers of formal structures, as seems to be the case with PPP systems.

Thus, key contingences to emerge for regional CE-development are the financial and policy tools available to public authorities at that scale and the ability that companies might have to meet their material needs through local collaborations (tempered by their flexibility in being prepared to reconsider how they define their needs).

Chapter 6 Connections to places and implications for fostering circular economy activities

This chapter explores business and policy connections to places and how this is likely to impact on developing regional CE activities. The following subsections will explore how policy uses the CE as a way to improve the overall economic development of their region. This will be contrasted with the commercial approach to developing CE opportunities, by exploring companies' embeddedness in the region in the context of global value chain networks. While companies are situated in different regions globally, the level of commitment to each of these regions and their respective local stakeholders is likely of relevance to building regionally nuanced and resilient supply chain systems. I will further explore whether embeddedness in a region is likely to impact on potential CE opportunities regionally.

Overall this chapter will explore policy and commercial commitments to the region in terms of fostering regionally inclusive CE opportunities. This chapter builds on key literature in relation to place promotion (Gold & Ward, 1994), regional development (Kotler & Gertner, 2002), IS (Chertow, 2000) and IE (Schiller et al., 2014a), and business concepts in relation to embeddedness and multi-national organisations (Harzing, 2000; Shahmehr et al., 2015; Goldstein & Newell, 2019).

6.1 Policy for regional economic development through circular economy activities

This section explores policy approaches to regional development involving CE initiatives acting as a way to improve the economic performance of an administrative region. This section will incorporate the viewpoints of supranational authorities (EU), national and regional administrations in both the English and Austrian context. Building on policy understandings of CE, this section aims to examine how various policymakers envision the CE's role in terms of creating economic development opportunities for their administrative region.

Local agencies in both NH and Styria appeared to show collaborative approaches to tackling regional issues and promoting CE initiatives. Different actors have varied understandings on what exactly was involved in developing a CE and questions remain regarding the level of governance which is best suited to developing regional CE

activities. Economically driven local agencies discuss the CE in terms of developing local job creation and economic growth in their administrative region, which is shown in the following quote by the **Regional, Managing Director, Authority H, Hull:**

"*So we do place promotion for investment to bring business and investment here. And obviously what we've seen in that opportunity that for the Humber this is a massive opportunity in terms of economic growth. With every challenge comes that opportunity. So really make sure that we adapt the companies who continue to play such a key part in the UK but then also of course skills, talent, economic prospects for everybody.*"

From this, it is evident that the CE is postulated as way to promote the region and simultaneously shift away from traditional industries into more CE based roles for the future. The above interviewee also recognised the major task of re-skilling the local workforce in order to attempt to keep the value of these CE opportunities locally. Even if the region does attract investment then they are still limited in local agency over managing CE resources regionally, they do not appear to possess significant power when implementing regional CE activities within their administrative boundaries, which is displayed in the following quote by the **Regional, Climate Change Manager, Authority A, Hull:** "*I think at the moment to be honest it's quite limited. Because we haven't had the resources to focus on it. I don't think it really is promoted that effectively within the region as a coherent thing.*" This lack of local power to make change was echoed across regional agencies, as displayed here by the **Regional, External Affairs Manager, Authority B, Hull:** "*we don't have the power to directly influence, but we could always express that we would think it would be a good idea and we have done that with various things*". This lack of perceived ability to create regional change likely stems from the hierarchal policy development systems which are usually dictated from the national level and passed down to regional authorities. From the above, it appears that regional authorities appear to have a passive role in developing CE opportunities, although it is apparent that the region does not possess the local power to directly create regional CE change.

In a post-Brexit Britain, EU regulations still appear to play a crucial role in developing CE activities nationally. Despite no longer being bound to EU regulations, these policies still act as driving-force in CE development in the UK, which is explained in the following quote by the **National, Circular Economy Lead and Waste Specialist, Authority F, UK:** "*The circular economy package has been brought into EU Law and that was coming*

in ages ago so, that is happening now. And the Resource & Waste Strategy is supposed to be a step beyond the [EU] circular economy package but, actually it has got a lot of similarities in there and policies just followed very naturally. Some, a little bit more ambitious but basically it is all very familiar".

The above quote points to EU regulations setting a foundation for UK based CE policy, more recently there has been an introduction of the 'Environmental Act' in the UK in late 2021, which has set various waste and recycling targets for the UK, designed to accelerate a CE transition. Furthermore, the EUs 'Committee on Regional Development' (REGI), which acts as a supranational body for subnational development appears to support CE activities, although they need to be implemented at the member state level, so need national buy-in, which may be a challenge, which is critically considered in the following quote by the **International, Politician, Authority C, EU**: *"REGI is supportive of circular economy, but there is a need to mainstream such measures and hardwire them into Operational Programmes at a Member State level."* However, the power of local regions appears limited when tackling CE challenges locally. From this interviewee, who is directly involved in the REGI committee, it seems that national governments are expected to take on a key role for CE implementation, with national CE strategies designed to trickle down to local authorities. However, the lack of regional input restricts the potential for developing CE activities tailored to the local contextual situation, which is shown in the following quote by the **Regional, Head of Waste Management, Authority A, Hull:** *"Honestly, it is not at a local level. So, that is more of a national level debate. So we are members of LARC which is local authority recycling committee. Nationally we are members of NAWDO, which is national association of waste disposal officer".* This perspective appears to be in conflict with the national strategy portrayed in the 'Our Waste, Our Resources Strategy', which suggests that local authority's voice is actively considered in CE development at the national level, but in practice it seems that local authorities are passive recipients of nationally devised CE strategies, which may lead to regional challenges across the country. The above quote foregrounds the national authorities' role in developing CE activities, suggesting national authorities play a key role in fostering CE activities at the regional level.

It appears that national policy is the driving-force behind CE development across England, which reduces the potential for locally devised and regionally focussed CE strategies, as regions are required to follow pre-determined national strategies. National government is setting the agenda for CE development through their waste and resources

strategy, which is explained in the following quote by the **National, Statistician and Evidence Analyst Waste Management, Authority E, UK** *"we did just under two years ago publish our Resource and Waste Strategy. And that's really setting the tone for a lot of the how Waste and Resource Policy will develop over the coming months and years. Going out probably 20 years at least."*

This above quote displays national government's perceived active role in developing CE activities, which appears to suggest in UK the national authority has responsibility for tackling CE issues at the regional level. However, the local input to influence this policy strategy appears to be minimal, suggesting that national scale policy is crucial for promoting circularity, while the region is expected to support implementation locally.

Moreover, the role which citizens play in fostering local CE activities also appear to be overlooked. The national government appear to be foregrounded in developing CE activities, which is displayed in the following quote by the **Regional, Investment Manager, Authority D, Hull:** *"if it becomes higher upon the priorities of Government to drive that as a kind of, you know, I don't know, incentivised or whatever within business, whether it is tax break or whether it is, whatever I don't know, those kind of things tend, you know, businesses do pick up and start to look and listen".* From this, it seems that the regional authorities have foregrounded the role of national government in setting the agenda for transitioning to a CE at the regional level, however this appears to partially neglect local contextual issues.

Notably, waste management is not considered of strategic importance at the national English level as it is outsourced to the devolved nations, which now appear to be more ambitious in terms of waste management performance, while English regions appear to be lagging behind. Moreover, differing waste management systems across various local authorities create increased complexity for waste management, which is illustrated in the following quote by the **National, Circular Economy Lead and Waste Specialist, Authority F, UK:**

"I think it was devolved because they [devolved nations] had heard it was one of the few powers that the UK Government wasn't particularly bothered about. I thought, well, we will let them do that small area and as a result they got very ambitious and it is why they are doing well. But, there were some issues with the boundaries".

There are further challenges across devolved nations when initiatives developed in Scotland by the organisation 'Zero Waste Scotland' seek to accelerate CE activities, but not in conjunction with English authorities, which is recognised in the following quote by the **National, Circular Economy Lead and Waste Specialist, Authority F, UK:**

"And, with the deposit return scheme Scotland are pushing very hard to introduce that ahead of England and the chances are if they do that there will be some strange movement in materials one way or the other and the whole thing will be pretty uneven"

The above quote highlights the need for alignment across the UK and for regions to pursue to CE activities in terms of deposit return initiatives, suggesting there is a need for strategic vision from national UK level for alignment across devolved administrations and local regions. From this, it can be argued that more national standardised approaches are needed to tackle CE challenges across nations and communities, in order to streamline strategies and reduce waste management complexities between regions.

Regional CE concerns were often not considered by national policymakers, which may have a negative impact on the local economy. One such example is the proposed deposit return scheme, which may improve national recycling rates but diminishes a lucrative waste management stream for the local authority, which is displayed in the following quote by the **National, Circular Economy Lead and Waste Specialist, Authority F, UK:** *"but, the deposit return is going to be quite difficult for Local Authorities to manage because that is where the value is in their waste management. Waste Management is a very expensive system and Local Authorities get a bit back from cans and the material that they sell on"*. Thus, there is a need for the voice and perspective of local authorities to be more actively considered at the national level, in order to develop more inclusive policies which are also beneficial to regional stakeholders. This lack of alignment between policymakers was also seen in policy discourse on CE discussions, with a lack of alignment between the two scales evident between policy reports at the national and regional level.

Further complexity is created when different agencies are responsible for development of CE policies, while other agencies are responsible for regulation and implementation of these policies, which is explained in the following quote by the **National, Circular Economy Lead and Waste Specialist, Authority F, UK:** *"Defra don't do the policy implementation they set the policy and the implementation comes from the Environment Agencies and the Regulators and all the sister Organizations and there are a whole lot of*

different parties who have to deliver the actions". This reveals the multi-scalar governance complexities involved in developing CE activities at the regional level. It is apparent the local authority isn't actively involved from an early stage in developing CE activities, but they are involved in giving feedback in the latter phases, which is described in the following quote by the **National, Statistician and Evidence Analyst Waste Management, Authority E, UK:** *"if Humberside have got a particular concern about the Resource and Waste Strategy they would have, or indeed bits of it such as consistency, they can have an opportunity to feedback as much as they want to the centre here in Defra"*.

The above quote gives a passive role to regional authorities in terms of developing CE strategies, it suggests that local authorities are backgrounded in discussions on CE development at the national level. This simultaneously suggests that there are opportunities for local authority feedback. However, while feedback seems to be considered at the national level, local authorities still only seem to play a marginal role in terms of waste strategy development. More collaborative early stage local authority involvement in the strategy development process may result in more inclusive and regionally sensitive CE activities.

At the regional level, complexities of governance are further increased when working with multi-national companies, who have commitments to various international regions. It is apparent that when senior management teams are physically located in the region, this results in more efficient CE discussions at the regional level, which is shown in the following quote by the **Regional, Managing Director, Authority H:** *"So obviously if the whole control and the board are sat here in the region it's sometimes easier to mobilise projects and campaigns and you know because you've got the decision-makers all sat regionally"*.

The above quote elucidates commitments to global value chain concerns, raising challenges for in terms of fostering nuanced regional CE activities in the local region, due to prior company obligations to top-down company strategies. Thus, it appears that regional CE activities are difficult to govern since many companies in the region are globally distributed with multiple ties to international locations. Other local boundary issues arise in Hull and East Riding due to boundary issues between the local city and neighbouring rural authority. There is a clear need for greater local authority collaboration in the wider region, more work is clearly needed to improve regional CE opportunities,

which is displayed in the following quote by the **Regional, Sustainability Manager, Authority D, Hull:** *"I'm just hoping with devolution, any boundary issues and they can be resolved. Obviously, Hull city council want to attract businesses to their area to create jobs and at the end of the day, because we're so close together, there's a lot of people who live in Hull, lot of people live in the east riding and go across to Hull for work. So there's always been that connection".*

The powers of local authorities in NH are limited when developing CE activities, while national policymakers are foregrounded in CE discussions and appear to take the prominent role when devising CE strategies across the country, which is reflected on in the following quote by the **Regional, Sustainability Manager, Authority D, Hull:** *"I think probably to be honest government targets are probably the key role. Yeah, so I think it's more the government than local authorities. We can do best on a local level but when I'm thinking about setting legislation so that an organisation can do things better."* Statutory responsibilities in the UK are passed down from the national level, so this raises questions in relation to the power the local authority possesses when implementing regional strategies to reach climate targets, for example, the City of Hull's plan to be carbon neutral by 2030. This may suggest that further devolution is needed, in order to give city councils greater authority to develop locally focussed CE policies. While this has happened in some UK regions, for example, the Greater Manchester region, there is currently tensions between a historically labour-party (recently elected liberal democrat party in 2022) oriented City of Hull, with more affluent neighbours and a conservative dominated East Riding of Yorkshire.

In Austria, Styria appears to have more local power and use a more participatory approach to CE development, compared to England where strategies are passed down from national level policymakers. The Styrian government appears to have more CE capabilities and power to develop regional CE initiatives compared to their English counterparts, which is discussed in the following quote by the **Regional, Waste and Resource Manager, Authority A, Graz:**

 "the different stakeholders have to, have to be involved in the making of the waste management plan. That is laid down in our regional waste management, which parties have the right to give their opinion on the draft of the waste management plans and of course in the making of the waste management plans they are involved".

The local region also appears to have more of an active contribution to the development national policies, which is exemplified in the following quote by the **Regional, Waste and Resource Manager, Authority A, Graz:**

"waste prevention, waste separation training for the people, for more people, so more or less, yes, it is of course also contributing to the national level working groups also. So we have some impact on the national waste management, on the national – how do I say, processes of developing further the framework, the legal frameworks".

Regulations also appear to be more tailored to the local region, compared to England where waste management has more of a national focus, which is mentioned in the following quote by the **Regional, Waste and Resource Manager, Authority A, Graz:** *"This is also regional waste management law and the city of Graz also fulfils the duties of the waste management associations".* This illustrates the potential of more regionally tailored policies in Austria, which could lead to more locally focussed and regionally driven CE activities, which may result in more inclusive CE opportunities for all stakeholders.

Despite this perceived local power, state and EU level regulations still appear to be the key actors involved due to their power in creating more systematic change in terms of CE development, which is explained in the following quote by the **Regional, Economic Development Manager, Authority C, Graz:**

"the Austrian sites have much higher fundings, of course we are, it is not, the minimum support, this means up to two hundred thousand euros per, for three years, it is the level, maximum level we can support the company. We don't, we have no, EU programmes that are, that need to be allowed by the EU that is not our business because this province of Styria of course and the government, state government".

Furthermore, in Styria PPPs represent a common organisational waste management strategy for managing waste issues locally, which is explained in the following quote by the **Regional, Circular Economy Manager, Authority B, Graz**:

"We do have a connection to the government. To the political area, yes of course. Because they have other like the Green Deal and stuff like that. Areas are also supporting or have maybe events with them together. But we are not really working with really the locals in the area."

There is direct reference to EU's Green Deal, suggesting international policy plays a key role in developing CE activities, although there appears to be a lack of a role for local citizens. Contrastingly, in England waste management is managed separately by authorities for residential waste and by commercial waste providers for industrial waste, a PPP approach similar to that in Styria, could further boost CE opportunities at the regional level in England and offer more long term stability.

Styria finds itself located in a particular geographic position, which borders many lower cost Eastern European economies, which blurs the boundaries of the region and increases complexity for managing CE activities. There are likely to be added complexities when collaborating across national borders, creating a potential barrier to developing regional CE activities, which is highlighted in the following quote by the **Regional, Waste and Resource Manager, Authority A, Graz:**

"So the most important, the largest border we have together with Slovenia, it is not, so companies from outside Austria are not a partner in the cluster, of course it is, for certain projects of course there can be also some collaboration with neighbouring regions outside of Austria but on a project basis".

These national proximal borders are likely to add increased complexity for end of life management of waste, as they are likely to have differing systems for waste management, in turn making it more challenging to recover the value of residues and close-loops of production between regional partners. This is somewhat similar to the English context where regional borders create complexity in terms of different waste management systems, in turn likely creating challenges for managing CE opportunities across regional administrative boundaries. This is important to consider from a regional CE development perspective, as there may be potential for improved cross-border CE collaboration, both at the regional and national level.

At the EU level, the CE is seen as a key driver of economic growth and prosperity across Europe, which is displayed in the following quote by the **International, Politician, Authority C, EU:** *It can be a huge selling-point in an increasingly competitive Europe, and indeed a globalised world, where green credentials can be prioritised in procurement"*.

The above also displays the EU's viewpoint on the CE as a tool for the bloc of countries to remain competitive, in terms of retaining resources within their economies, in turn

making them less reliant on other international national for vital materials, however how this will impact on different EU nations and their respective regions is less clear, similarly how post-Brexit collaboration between the UK and the EU is likely to face increased bureaucratic challenges. This is reinforced by the EU Green Deal, which cites resource security, job creation and economic growth as strategic motivators for member states to adopt more circular practices.

At the national level, the CE appears to be seen as a way to improve resource security for the UK economy in a post-Brexit economy. Resource self-sufficiency would reduce reliance on other countries for crucial, but rare raw materials, which is likely to create knock-on job creation opportunities. This is shown in the following quote by the **National, Statistician and Evidence Analyst Waste Management, Authority E, UK:** *"it's really an acknowledgement that we need to tackle, develop more circularity because for example extracting material out of the ground in other countries we can hear often that we can start to develop natural capital for example so it's really good to limit as much as we possibly can the use of raw materials".* There was multiple references to both Brexit and Covid-19, which have further encouraged national CE development opportunities within the UK, which can be seen here by the **National, Circular Economy Lead and Waste Specialist, Authority F, UK:** *"First Brexit and now Covid-19 has woken people up to being able to get hold of raw materials, not from the ground, but retaining what we have got".* National level policymakers appear to discuss CE as an opportunity for the UK to further increase economic growth at the national level. However, there is a lack of attention on the role of the region and local actors in fostering inclusive CE activities. There is a strong and reoccurring recognition that the CE needs to make financial sense in order for take up by the business community. Hence, policy may need to incentivise business to pursue CE activities to make circularity commercially viable, as evidenced here by the **Regional, Managing Director, Authority H, Hull**: *"So big companies in our region have got such a part to play in terms of their industry. Because obviously for them everything comes down to economy and money."* The apparent dominant role for business highlights an apparent dialogue between policymakers and business, while citizens are often overlooked in CE discussions.

The above quote gives an active role to large companies in particular and foregrounds their role. 'Authority H, Hull', works for the overall place promotion of the Humberside region, it appears that they see large scale business as a key role in addressing climate issues locally, in turn improving economic and regional growth opportunities.

At the regional level the CE is seen as a way to improve economic growth by shifting away from heavily polluting industries to cleaner forms of production. Humberside was regularly cited by interviewees, as having the heaviest polluting industrial cluster in the UK, which is typified in the following quote by the **Regional, Energy Manager, Authority G, Hull:** *"The biggest challenge that we have is that as a cluster we are the largest carbon producer in the UK and most of that is due to the large traditional industries".* However, this was not seen as a barrier for CE development but instead an opportunity for job-creation and growth. Local authorities recognise the importance of training and re-skilling citizens in order to develop regional CE activities, which is shown in the following quote by the **Regional, Climate Change Manager, Authority A, Hull:** *"I think an important thing is to have the right skills within the local economy. So there are enough availability of employees with the right skills. And that that's ongoing training resources are available as well".* While there are ambitions to improve local skills for a CE, there is no concrete strategies in place yet to re-skill the local workforce away from heavily polluting industries, which is illustrated in the following quote by the **Regional, Climate Change Manager, Authority A, Hull:** *"Employees will be left behind. And so we need to get ahead of the curve in that sense and make sure that businesses understand what the changes are that are coming. How they need to evolve and change. How their staff need to be skilled to do that".*

This above quote acknowledges the importance of re-skilling the local workforce on the journey to achieving net-zero emissions, although there is limited attention and pathways in place to implement regional CE changes, employees' viewpoints appear to be backgrounded in the above, while businesses themselves are foregrounded suggesting that local authorities see business as being well placed to tackle these challenges and in turn improving the economic and environmental resilience of the region.

The NH region has been successful in attracting companies in the green energy sector to locate in the region, which is highlighted in the following quote by the **Regional, Climate Change Manager, Authority A, Hull:** *"But particularly around the offshore industry there were strong competitors not just nationally but internationally. And so because of that we attract businesses and investments around an agenda obviously linked to the port site".* The offshore wind energy and renewable energy sectors are seen as key selling points for the future Humber economy, it appears that a CE may help to bolster the image of the wider region as a strong location to do business. Moreover, social aspects such as cost of living and lifestyle benefits were another common theme which emerged from

interviews, as shown in the following quote by the **Regional, External Affairs Manager, Authority B, Hull:**

"I suppose as a general point, a lot of ours is about promoting the place, because the land in East Yorkshire is relatively cheap, compared to the bigger cities around Leeds for example. So land is cheaper. They have got the space to build parks, so you know, a lot of it is just promoting the area".

Similarly, it can be seen that broader social and soft factors are important for attracting firms to the region, as displayed in the following quote by the **Strategic Planning Manager, Authority D, Hull**:

"it's transport links are important, the workforce is important, and a place, and a pleasant environment in which the, you know because a lot of times you've got the senior management team of these firms are moving over from various places, they want somewhere where you've got good environment, nice schools, a good place for the kids, a safe environment".

Another key driver for business locating in the region was for access to the Humber ports and in turn European market, suggesting that geographical factors play a key role in the development of the region, which is explained in the following quote by the **Regional, External Affairs Manager, Authority B, Hull,** *"a lot of people say Hull is the end of the line, but a lot of other people say it's the gateway to Europe".* This access to Europe is also regularly cited in regional development strategies, however access to continental Europe from Humber ports may be dented due to the increased bureaucracies and complexities when exporting to the EU post-Brexit.

Local authorities appear interested in CE activities, if they act as a way to promote economic development in the region, which is considered in the following quote by the **Regional, Investment Manager, Authority D, Hull**:

"My challenge is to grow the local economy and support that local, that growth in the local economy and through supporting businesses and making sure we kind of keep our knowledge up-to-date, then you know, that is our role really. It is about being able to support businesses to be, to reduce their carbon footprint, to buy locally, to grow jobs in the local economy, that is our role."

From the above quote, it is apparent that economic development is a primary motivator for pursuing CE activities and there appears to be a strong role for business to play in fostering CE activities, while other actors including, local citizens are excluded from the agenda.

It is also evident that the city of Hull faces a negative external image, so local agencies recognise the need to put in significant effort to improve the city image in order to compete with other cities and attract companies to the region, which is shown in the following quote by the **Regional, Managing Director, Authority H, Hull**:

"So it originated from a group of business leaders. It came under the name City Image and it was exactly that. It was based around the city of Hull. And it was because we suffered as I'm afraid we still do around misconceptions of the image of our city. And of course that has as knock-on effect".

The 'UK City of Culture' award acted as a catalyst for economic development initiatives, to ensure Hull would continue to prosper in the long run, as discussed here by the **Regional, Managing Director, Authority H, Hull:**

"So much as we could see the output an what was happening through City of Culture, it was okay how do we now move that into the business arena, the economic arena and use that as a springboard to really continue that growth not only in the pride in the region but actually put this into tangible investment so that we can start to change the economic prosperity of the region".

The City of Hull ambitiously views the CE as a way to boost and develop the external image of the wider Humber region, although this is likely to be challenging due to the reliance on heavily polluting industries. The region of Styria, does not appear to have the same reputational issues as Hull, instead they use extensive promotional techniques to obtain positive external perceptions from various stakeholders, as illustrated by the 'Green-Tech Valley' which claims to be the number one 'Climate and Circular solutions' cluster worldwide, which I observed first-hand on a visit to the cluster head-office in April 2019.

National government have a central role to play in promoting regional development opportunities, by offering incentives to locate in specific regions, however local councils can't offer added perks to locate in their particular region. Thus, national government

appear to hold significant power when promoting regions, which is explained in the following quote by the **Strategic Planning Manager, Authority D, Hull**:

"So, there are national incentives to our sites. There are, there are no, what you call, use the word "sweeteners" from our point of view. We can't do that you know. We don't have the, but what we can do is to, what we can do is to actually provide a site that's got the infrastructure in place to allow a developer to develop"

In 2021 the Humber-wide free port was announced, which is a designated area set for industrial development, particularly targeted at the decarbonisation economy with incentives such as tariff free trading and tax breaks offered to attract companies to the area, in order to boost regional development and job creation, while concurrently shifting away from traditionally heavy industry in the Humber region.

There is also a strong recognition of the importance of boosting local job creation, through attracting companies to the region and the CE represents one such way to develop the Humber region, which is shown in the following quote by the **Regional, Managing Director, Authority H, Hull:**

"So we do place promotion for investment to bring business and investment here. And obviously what we've seen in that opportunity that for the Humber this is a massive opportunity in terms of economic growth. With every challenge comes that opportunity. So really make sure that we adapt the companies who continue to play such a key part in the UK but then also of course skills, talent, economic prospects for everybody. You know it's all tied in".

Interestingly, transitioning from a highly polluting industrial region to cleaner production sectors is seen as key economic growth opportunity for the region. There is a recognition of the need for re-skilling, however wider challenges and negative consequences of shifting away from the current industrial base are backgrounded, despite the EU's Green Deal specifically highlighting the challenges facing industrial regions when shifting to circular forms of production.

It seems that some companies are more inclined to locating in the Humber region, primarily due to historical ties to the region and access to ports and infrastructure. Local authorities appear to actively seek to attract companies in the logistics and manufacturing sector to the region, which may lend well to developing local CE activities, as displayed in the following quote by the **Strategic Planning Manager, Authority D, Hull**:

"I think there's a recognition that we are in a completely different market to Leeds, and to Sheffield, and to Manchester and so on and so forth. I mean the whole, the Humber region, including the East Riding, is, is more basically, its normally agriculture, logistics, warehouse and manufacturing, renewable energy, and energy."

Moreover, it is clear from regional authorities that Hull isn't competing with neighbouring cities, but instead with other port cities, which is highlighted in the following quote by the **Regional, Energy Manager, Authority G, Hull:** *"We come up against Teesside a lot so it tends to be us and Teesside competing on the East Coast and we don't tend to compete that much with Merseyside and the West Coast that much but Teesside quite regularly"*. However, others note that a wider collaborative focus on the Northern region should be utilised in order to improve the prosperity of the North of England, while simultaneously creating broader CE opportunities across the North, as cited here by the **Regional, Energy Manager, Authority G, Hull:** *"try and promote the entire region and then we work together as what is called the NP11 which is the eleven local enterprise partnerships that cover the North and basically the Northern Power House and so we sit on that as well"*. This point is echoed in the following quote by the **Regional, Managing Director, Authority H, Hull:** *"What I really hope happens is that of course that we stop competing over it and that we all work together which is really where it comes together in the Northern Powerhouse"*.

It seems that the UK government have created local competition across regions in terms of developing local sustainability activities, it appears that some may win while others will lose, when developing regional CE strategies. It could be argued that the national government are only interested in a limited number of regions to improve resource efficiency performance, as they are likely constrained in the amount of funding which can be offered to help accelerate CE activities regionally, in turn potentially creating competition across traditionally deprived regions. Although, local agencies recognise the importance of collaborating across the North of England to improve the overall wider region, yet it is likely to be challenging to build mutual alignment and agreement between stakeholders, based on strong competition between these places.

Regionally there is a need for greater collaboration and standardisation across local authorities in England, in particular in relation to waste management, which may allow for CE activities to evolve more effectively, as explained here by the **Regional, Policy and Partnership Manager, Authority A, Hull:**

"Yeah we have different bin colours which isn't helpful but so does the rest of the country so it is what it is. But yeah I think we work well and we work closely with East Riding and I know my colleagues who are managing the contract work very closely with them and have a good working relationship so I think it works well."

There is also a common environmental ambition which appears alongside the economic growth visions for a CE. The Humber is often referred to a heavily polluting region, but the CE is portrayed as a growth opportunity for the region, however this is likely to be challenging, due to the lack of CE experience locally, which is shown in the following quote by the **Regional, Managing Director, Authority H, Hull**: *"And (Leading International Bank) Sustainable Financing Team are interested in the Humber because: "The Humber is the perfect demonstration of an industrial cluster with multiple solutions across every area that is significant to the contribution to climate change". And you know that is our USP"*. The CE is repeatedly seen as a tool to grow the economy, whilst still reducing carbon emissions, but the concrete strategies in place to reach carbon neutrality are less clear, which is highlighted in the following quote by the **Regional, Climate Change Manager, Authority A, Hull:** *"So within the new 2030 carbon neutral Hull strategy that's going through the Council at the moment. So the circular economy is part of that and all the elements within that so one of the themes within there about how we manage resources. So it's very important for us."* Hence, the CE is envisioned as strategy to reach climate targets and grow the economy, although the broader challenges of reaching carbon neutrality within the city are backgrounded. As outlined above, a common reoccurring motivator for pursuing CE activities, was to reduce carbon emissions since the region is at risk of climate change effects, such as flooding, which the Humber region is particularly susceptible to, which is critically considered in the following quote by the **Regional, Managing Director, Authority H, Hull:**

"And the flipside of this also of course is all about the resilience and it's estuaries just like us that are also going to feel the effects of the climate change. So the actual climate warming that will then create water rises as we know. And we already know we're on a path. We're not going to avoid this."

This above quote suggests that since the low-lying estuarine Humber region is vulnerable to the risks of climate change they have more of an incentive to pursue CE activities, but a comprehensive global effort is likely needed, in order to protect coastal and estuarine regions worldwide.

In conclusion, policymakers refer to the CE as a way to improve the economic development of their own administrative region. The mechanism for the implementation of a CE tends to rely on business to take action locally, with assumed positive knock-on impact on the regional economic and environmental performance. However, companies' have their own interests, which may not necessarily be in line with regional authorities and their local economic development ambitions. These are addressed in the following section.

6.2 Company embeddedness in the region and the implications for building a regional circular economy

This section will explore concepts in relation to company embeddedness and how regional connections may impact on the ability for companies to foster regionally nuanced and resilient CE activities with local stakeholders in a globalised economy.

The majority of the companies studied showed a strong local connection to the region where they operate, which at first, might seem to suggest they would be invested in developing regional CE activities for the overall prosperity of both the NH and Styrian regions. Many of these companies had regionally entwined ties due to a long-term historical connection, such as through family history and not for economically driven reasons. The family based tie to the region is evident in a number of companies, as highlighted by the following quote: **Head of Sustainability, Company B, Hull:** *"I think the overriding factor in keeping it in Hull was the fact that the family is based in Hull and the ease of access to the road network".* This family-oriented approach suggests they have some sentimental connections to the region, which may support a collaborative regional CE approach, although it is apparent these connections have yet to come to fruition in terms of building a regionally resilient and sustainable CE. Conversely, for companies without a personal connection, infrastructure and international transport links were regularly cited as a key motivator for choosing to locate in a particular region, however these are economically driven criteria, which may not lend itself to regional collaboration.

The access to the Humber ports and transport links in the region was often described as a priority for companies, particularly those in the logistics and manufacturing sectors,

which is displayed in the following quote by the **Regional Innovation Manager, Company D, Hull:** *"Geographic location is important, you want to be close to the offshore windfarms, the Humber is close to these in the southern and north, north sea. So the Humber is well situated for these offshore windfarms".* From this quote, it seems that locating in the region for strategic access to offshore sites may result in reduced capabilities and interest in regional CE collaboration.

Overall there appeared to be correlation between firms historically embedded in the region and their desire to choose local suppliers for regional CE purposes, this may suggest those with a tie to the region are more likely to be involved in regional CE exchanges. However, while there may be a desire to choose locally sourced materials this may not always be possible, due to feasibility issues and material constraints in the region and companies' reliance on global suppliers for niche materials. The formation and active participation rates observed at working groups in the region (e.g. HWA and Yorkshire LEP) on co-creating collaborative environmental initiatives to tackle local CE issues, effectively displays the apparent interest and desire in addressing CE challenges. Survey responses also pointed at companies being open to exploring regional CE exchange opportunities. There appears to be some interest in developing regional CE initiatives, although the feasibility for resource exchanges to occur locally is difficult to determine, as this interest hasn't materialised in practical IS terms.

In Styria companies appear to have a long-term tie to region and this is still a key reason for companies being located in the Styrian region today, which is highlighted in the following quote by the **Global R&D Manager, Company E, Graz:** *"the former founder he was living here and he started right after the Second World War".* This was echoed by other companies, who also referenced the importance of innovation stemming from the Universities, which is shown in the following quote by the **Managing Director of Manufacturing, Company B, Graz:** *"one hundred sixty years ago which started to build their own electricity power plants and so on. I think it was coming out of the university, which is also located in Graz, I think there were a lot of clever guys at the time, which formed a lot of companies and which you can still find also today".* Additionally, commercial waste management providers do not tend to locate in major cities but secondary cities, where it is easier to develop connections with local companies, as was suggested here by the **Manager, Company D, Graz:**

"We are placed here because the founder is coming from here but also other companies are placed in let's say more in the region and not in the big cities. The reason is, I don't know a big waste company which is placed in Vienna for instance because Vienna is doing everything by the City of Vienna and they are having a special law which is saying that also the industrial and the commercial, industry and commercial waste is only the City of Vienna".

This policy versus private tension is significant and offers insights from a waste management provider on why commercial waste companies focus on secondary regions in the Austrian context. In the UK context, waste management providers appear to pursue a more national-level commercial focus which offers improved economies of scale potential, while residential waste is directly managed by the local council in a narrow majority of cases, which is corroborated in a report titled 'Government Outsourcing'[2] by the Institute for Government in 2020. In both NH and Styria, companies seem to have located in the region based on historical, access and proximity reasons. Companies place emphasis on good access to infrastructure and transportation links, while waste management providers need to be located in close proximity to the companies in order to manage waste efficiently, so they require national efficiency but with numerous regionally nimble sites to cater for nuanced regional markets. This suggests that the waste management provider is likely to play a key role in fostering IS activities between businesses in the region, as they are the actors who are located at the end of the production system and have the capabilities to create regional resource exchanges. However, manufacturing companies' supply chains can span across national and international scales, which is shown in the following quote by the **Reuse and Circular Economy Manager, Company A, Graz:**

"I would say it is more a mixture now, we have Eastern European suppliers also in our low-cost countries set up and we use Asian suppliers. And we are more mixture now not, we are not, dependency from Asia is only in some, some products that are relatively high, but mainly for rolling stock we buy parts internally but also in Turkey and Eastern European countries"

This low-cost driven approach to supplier recruitment decisions is likely to make regional CE activities more difficult to promote and maintain, as the most economically

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[2] https://www.instituteforgovernment.org.uk/sites/default/files/publications/government-outsourcing-public-services-government-hands.pdf

competitive suppliers tend to be globally distributed in lower cost nations, which suggests a lack of connectedness and embeddedness in the region. However, specifically evident in the food industry in the UK, there was a theme of sourcing regionally due to the perishable nature of inputs, which is displayed in the following quote by the **Head of Procurement, Company C, Hull:** *"the majority is part of our integrated supply chain and so clearly the nearer you have got your abattoirs to the pigs the more cost effective it is".* The above quote foregrounds the role of supply chain partners, who due to the perishable nature of the food industry are proximally located in this instance, but this tends not to be the case with other industries, who can freely source from international locations. This suggests that some resources and sectors are more open to regional sourcing structures due to the priority of efficient delivery and reliable service from regional providers, while other sectors are less tied to the region and can utilise a more globalised approach to supply chain decisions. From interviews it was evident that companies were attracted to the NH and Styrian regions based on the potential for business growth and development, while policy promotional visions for developing regional CE activities were not cited as a key driver for locating in the region. Moreover, there was an overarching theme of ensuring business decisions made financial sense for the company, which suggests that some of the foot-loose companies may relocate away from NH/Styria if new opportunities arose elsewhere. This is a point of concern for future regional CE collaborations, as if one company leaves the region this may have a detrimental knock on effect for regional resource efficiency activities. There is an apparent need to improve companies' long-term commitment to the region in order to bolster long term local CE development opportunities, which may be assisted and facilitated by local actors, such as the local authority who are often well-placed to facilitate regional CE activities.

In Styria, the Green Tech Cluster takes on a prominent role for economic growth, while also acting as a place promotion agency and facilitator of knowledge exchange, specifically in green-tech industries, which is discussed in the following quote by the **Regional, Circular Economy Manager, Authority B, Graz**:

"a network of different companies in the area of environmental technology. So, we are just not like an enterprise we are trying to connect our partners together to get new standards, new innovations, new solutions and yes that is our goal. To help our partners to have a membership at the GreenTech cluster to help them to get involved to each other, to network, to have workshops together. To find new solutions".

The Green-Tech Cluster is funded through a combination of commercial memberships and a PPP agreement with the city council and regional government. The cluster has a strong business development focus, with an ambition for the CE to act as a technologically driven tool to support the regional development of the Styrian region. There also appears to be a local common desire to foster regional supply chains, in turn accelerating potential CE developments between regional actors and further bolstering local economic development, which is displayed in the following quote by the **Regional, Circular Economy Manager, Authority B, Graz**: *"And although when you do the circle economy process you have to look at the whole supply chain and yes you want to have improvements and to support the locals especially the area of circle economy it is really important"*.

The HWA is a group of proximally located sustainability professionals in NH, where waste management issues are discussed in an informal setting, further suggesting that trust is needed to accelerate open resource efficiency collaborations. It seems that organic and informal approaches to developing CE connections are most promising, if they make commercial sense, which is shown in the following quote by the **Energy Manager, Company H, Hull:** *"these things happen on a day to day basis anyway for a business, generally if someone's in need of something and somebody else knows somebody that can do it, then they will make that connection and create that business relationship between the two parties."* Another example of this informal attitude to developing CE activities, is the following approach to material exchanges, which is highlighted in the following quote by the **Business Development and CE Specialist, Company G, Hull:**

"So yes, we use like waste material from another process so we do always look at ensuring that we can use, if someone is throwing something away and we can use it as a raw material, we would use that. But on a standard definition, I wouldn't call that recycled".

As evidenced in the previous quote, there appears to be a lack of understanding about IS concepts and what exactly can be defined as being included in the CE. Questions remain in relation to organising for a CE and whether it is best to allow CE activities to occur organically versus strategically developing relationships to optimally facilitate resource exchanges. There was an overall sentiment from business that they were capable of developing resource efficiency initiatives without the support of local authorities. The relationship between business and policy are not always aligned. Business rarely

acknowledged the role of local authorities in developing CE activities, with more focus given to supply chain collaboration, although they were often open to support from the local authority, which is reflected on in the following quote by the **Business Development and CE Specialist, Company G, Hull**: *"I hadn't really thought of the local authorities being able to help there, I'd always assumed it's company to company. It would be great if there could be an initiative that the local authorities link up the correct people".* The above quote initially shows openness towards local authority involvement in enabling CE activities between businesses, yet in practice commercial interviewees regularly appeared driven by cost savings and efficiencies, which seemed to be a foundational requirement in any collaborative CE activities. Businesses see CE activities occurring organically, which is discussed in the following quote by the **Sustainability Co-ordinator, Company C, Hull:** *"I think it would almost happen organically. I don't necessarily see that making it a particular body's responsibility to try and drive it necessarily works".*

Although, from observations made at HCC, HWA and Yorkshire LEP events, it seems there is often a struggle when attempting to convert from initial discussions on circularity opportunities to concrete agreements on exchanging resources between firms. While there seems to be initial interest between businesses in developing CE initiatives, it appears difficult to form binding agreements, unless as the above interviewee suggests it happens organically and there is a mutual desire to collaborate from both organisations.

Furthermore, it is clear that local to regional policies are less important to business, as they are unlikely to be able to take action over local production issues, so it appears that national/international agencies have a greater role in addressing CE challenges. This lack of a regional focus is displayed in the following quote by the **Head of Sustainability, Company B, Hull:** *"but at the moment for our production side of our business, then I think that is not really something the council would help with".* Additionally, companies often assume local authorities simply have a planning role when interacting with business, which is typified in the following quote by the **Group Marketing Director, Company C, Hull:** *"I'm not 100% sure how much we have to do with local authorities if I'm honest. We certainly do from a planning and an operational point of view but I know certainly when we go through some of the planning applications".*

The above quote backgrounds the local authority and gives them a passive role in fostering regional CE activities. Local authorities appear to be side-lined in terms of their

importance for developing CE initiatives, they appear to be discussed in planning terms, which is described in the following quote by the **Regional Innovation Manager, Company D, Hull:** *"Like any big employer in a region, we work very closely with local authorities for planning and regulation issues, both because we have to and because we're part of the local community".*

Similarly, from observations at HWA this apparent tie to the region was regularly cited as a motivating factor to improve regional environmental performance, however this embeddedness and connection to the local region rarely resulted in improved CE performance between regional stakeholders.

From the policy side, local authorities appear to be happy to let business take a lead on developing CE initiatives, which suggests some level of agreement between these actors. Local agencies seem open to allowing business to tackle CE issues for themselves, which is discussed in the following quote by the **Regional, External Affairs Manager, Authority B, Hull**: *"I think business does business, you know, if there is something that someone else needs, then they will sort it out between them".* There is a common attitude from policy that business will address CE challenges, if there is a business case to do so, as described in the following quote by the **Regional, Head of Waste Management, Authority A, Hull:** *"But on the whole we tend to find that businesses will go about that themselves, you know and certainly in today's age where you can google something or just look for waste companies in Hull and see what is out there, have a chat".* Moreover, there is a lack of designated roles when facilitating CE exchanges from the policy perspective, which is considered in the following quote by the **Regional, Policy and Partnership Manager, Authority A, Hull:** *"It is a facilitation role I think that is lacking; who is the facilitator here? Where is that network and how do we make it happen? Someone needs to grab it and make it happen because I have not seen it".* This above quote suggests that the local council do not realise the potential of their own power in promoting and facilitating regional CE exchanges.

6.3 Conclusions

To conclude, strong company embeddedness in the region was regularly evident in both NH and Styria, however whether these connections translate to building regionally resilient CE collaborations remains unclear, as companies are predominantly committed to global locations through their value chains, despite also having local ties to a particular region.

Policymakers in NH and Styria ambitiously refer to the CE as a way to improve the economic and environmental performance of their administrative region, while also adhering to environmental regulations and potentially even attracting new organisations to the region. In both NH and Styria, regional authorities have incorporated the CE into a wider economic and environmental agenda; evidently both regions have strong aspirations for the CE in transitioning towards cleaner forms of production and fostering local prosperity. However, this thesis has illuminated numerous barriers which still have to be overcome in order to successfully transition towards a more socially just and fair CE for all stakeholders in society.

Commercial commitment to the region through local embeddedness was witnessed amongst organisations in both NH and Styria, with some businesses being more inherently tied to region over the long term. This was observed in the offshore wind industry in order to facilitate repair of turbines in the North Sea and also in food production in NH, due to perishability concerns. In contrast, other companies are more transient and may re-locate at short notice to regions which offer more commercially attractive arrangements, which is likely to have negative consequences in building regional CE collaborations. Hence, more open transparency is needed in order to translate apparent commercial embeddedness into practical CE implementation at the region scale for the benefit of stakeholders in the long term. Local authorities in both regions seem well positioned to facilitate improved circular cooperation between organisations and could act as a bridge to overcome transparency/trust issues between companies when exploring CE collaborations, which may help to increase companies' commitments to the region.

Thus, the likely success of regional CE depends on the following contingencies; the nature of businesses operating in the region, as well as the level of engagement of specific companies. Companies whose activities are related specifically to the geography of the region (such as offshore wind in NH), may present an effective starting point for CE activity given their (at least relative) limited potential to relocate, due to prior financial and infrastructural commitments to the region.

Overall Summary of Findings Chapters

Both business and policy findings suggest that there are discrepancies both within and between business and policy actors when seeking to develop regional level CE activities between regional partners in a global world. It appears that companies are often embedded in multiple regions globally, which may reduce their ability to foster collaborative initiatives between regional stakeholders. It is clear that both business and policymakers see the CE as both an economic development and sustainable development opportunity, this is common to both NH and Styria. Notably, policymakers in both regions see CE as a way to shift away from traditionally heavily producing industries to an economy built on cleaner forms of production. However, significant hurdles (as outlined above) remain in place which are currently preventing a shift towards more circular forms of production.

In both NH and Styria, the main barriers to developing CE activities at the regional scale, from both a business and policymaker perspective, appear to be associated with legal, confidentially, cost effectiveness, feasibility concerns, global supplier commitments and issues surrounding hazardous residues in a CE. There are also sector by sector challenges associated with different industries and product types, for example the medical sector particularly struggled with managing waste which has come into contact with patients. Moreover, it appears that these challenges in relation to a CE are similarly felt in both NH and Styria. There are multi-level governance issues when developing CE activities in England between national and local governmental authorities. While in Styria, the model of PPPs appear to offer a promising solution, allowing more collaborative and inclusive local CE systems to evolve, which may also be suited to potential regional CE development strategies in England. However, as a point of caution, some companies may also resist greater authority involvement, so each local region needs to carefully consider how best to co-operate between local government and business for the optimal implementation of CE activities regionally. In both NH and Styria, the CE is repeatedly considered an effective way to achieve both local environmental and economic targets. Moreover, it appears that industry and policymakers are the two prominent actors who are considered vital for developing CE activities, while the role of local citizens are rarely considered of strategic importance. In the English context in particular, there is a need for greater integration and collaboration between various governance levels, as regional policymakers have limited power over developing local CE initiatives, compared to their Austrian counterparts.

Another main takeaway point from the above analysis is that companies often locate in a region due to historical ties to the area, yet they also have globally structured value chains which are designed to capitalise on low costs of production in developing nations. These profit driven decisions to pursue suppliers in low cost locations is likely to create complex regional CE challenges, due to existing international value chain commitments. Moreover, if companies seek to foster globally oriented CE collaborations, this is likely to result in challenges for governance at this scale due to the multiple stakeholders involved. Business view CE opportunities through value chain collaborations. However, since suppliers tend to be globally distributed there is a need for a re-focus to exploring the potential of regional CE activities. Local authorities and waste management providers both appear well situated to foster regionally focussed CE activities. Further examination on the potential of developing regional CE activities is required, considering the insights of this research project, greater attention to regional differences are needed to understand how best to facilitate and govern regional CE opportunities. Moreover, there is a need to examine the relevance of my research findings in other geographic locations, where different government structures and companies are located.

There are also some common perspectives and shared understandings between business and policymakers, on building a regional CE. From a policy perspective there is a clear agenda for fostering CE in terms of increasing the economic and environmental performance of their specific administrative area. From a business perspective, CE is discussed as a way to reduce costs, while simultaneously meeting environmental targets for the company. The potential for the region to benefit is often overlooked by both policymakers and business, with a more global value chain approach given priority, which raises questions for the potential to capture the benefits of a CE locally. The overall findings point to a lack of alignment between local agencies and companies when fostering regional CE activities. This misalignment and conflict of local interests suggests there may be a lack of potential to capture and retain the benefits of CE activities at the regional level, due to the lack of stakeholder alignment locally. There is often diverging perspectives when developing CE activities, depending on the local actors involved and their ambitions for a CE. In sum, policymakers appear to envision the CE as a way to help reach environmental targets, while also creating local employment opportunities. From the business point of view, there is an ambitious expectation of the CE as a way to improve financial performance through reduced costs and more efficient production systems, which they believe will have a positive knock-on environmental effect.

Chapter 7 Discussion

This chapter starts by addressing the three core research questions of this project and how my findings relate to previous research. In section (7.1) common barriers which emerged from the research will then be examined, followed by section (7.2) which involves comparing policy versus business perspectives on developing a regional CE. In section (7.3) a comparison between NH and Styria findings will be conducted. In the final section of the discussion (7.4) interview and discourse analysis findings will be compared.

Research Question 1:

-How do policymakers envision the CE and what are company expectations for a CE?

This research question explores both policymakers' visions and company expectations in relation to their current understandings and underlying motivations for pursuing CE strategies. Additionally, it highlights a number of constraints in relation to current CE concepts and the hurdles that may constrain a transition to a CE.

From my findings, all the stakeholders studied identify the CE as a significant mechanism for reducing carbon emissions whilst providing opportunities for economic growth. There were a number of reoccurring themes which were evident amongst policy visions and company expectations in both NH and Styria. The identification of the CE as primarily an end of life strategy, rather than a guide for re-imagining production and consumption is also shared between them, notwithstanding passing references to remanufacturing, repair and re-use as CE strategies primarily at the national level. In both interviews and documents references are made to product design, but these are scarcer and less specific than references to end of life CE strategies. As observed by Springett (2003), the companies studied are keeping to comfortable ground, and still not engaging with the environmental potential of design (Deutz et al., 2013; Diaz et al., 2021). Policymakers' CE visions are focusing on the relatively familiar and straightforward short-term measures, rather than seeking a more strategic approach to the CE with potentially more disruptive short-term implications. This may be self-defeating as the environmental benefits expected from the CE may not be fulfilled without more significant changes (Cullen, 2017). The level of challenge to more radical visions of the CE is indicated by the policymakers' recognition of business as the primary driver for a CE, whilst also excluding the role of the public from strategic CE development discussions. Additionally, there are significant issues for implementing CE ambitions, given that business

stakeholders rarely include regional policymakers or the 'region' as part of commercial framing of relevant CE stakeholders.

The potential of CE strategies appears to be rising on companies' agendas with the majority of companies studied showing a desire to increase and improve their CE performance. Commercial CE motivations are driven by reducing material and energy costs in terms of production, which has a positive knock on effect in terms of environmental performance, although potentially having less impact than pursuing other more ambitious CE strategies. While policymakers and business share some common understandings of a CE, they have both yet to fully comprehend and define what is exactly involved in their CE plans, which has led to inconsistences between stakeholders.

Policymakers' visions agree on the benefits of a CE, but there is divergence of opinion on specific roles for CE implementation at the regional level. Supranational and national policymakers envision the CE as a way to help secure vital resources, in turn creating a competitive advantage for their particular administrative territory, although the role for particular regions is unclear. Regional authorities in NH have a similarly ambitious vision, and seek economic as well as environmental benefits from a CE. Notably, at the EU and national level in England I have found that CE is seen as a resource security mechanism for retaining rare and valuable material supply in their respective locations, which was not evident amongst regional policymaker concerns. This policy vision of securing post-consumer waste containing potentially valuable components is driven by economic motivations (such as retaining rare earth metals in circulation in their own jurisdiction) as opposed to environmental concerns, in turn raising questions for the overall policy agenda of a CE. However, if the driving force for policy in pursuing a CE agenda is for economic gains, there is a risk of environmental issues being side-lined and unmet without direct attention given to these matters. Other scholars have noted similar resource security considerations in a variety of sectors and international locations, in order to build more resilient supply chains and retain critical materials within companies' value chain systems (O'Connor et al., 2016; Gaustad et al., 2018).

Policymakers in NH envision the CE as contributing to a shift away from being a politically under-served, socially deprived location to a more prosperous region based on renewable and regenerative production practices. Regional CE policy strategies in both NH and Styria are positioned as a way to achieve regional economic growth and to attract both companies and people to their region, mirroring the findings of Garcia-Lamarca et

al. (2021) in relation to the concept of 'regional boosterism', which explains how regions often overly promote themselves in order to attract investment to their location. The CE is envisioned as a way to achieve both environmental and economic targets, while simultaneously creating local employment opportunities. These ambitions are particularly lucrative to NH, which is regularly considered a 'structurally disadvantaged' (Jonas et al., 2017) and socially deprived location. In NH, CE initiatives also are postulated as a tool to enable a shift away from heavily polluting forms of production to more regenerative production systems, in turn improving regional development opportunities locally. Moreover, there is an apparent need to invest in re-skilling the local workforce to ensure equitable regional employment opportunities in CE related industries. While Styria sees CE as a way to both grow the 'Green-Tech' oriented approach to regional development, while also attracting new business and workers to the region. This reflects previous place promotion literature, which attempts to paint an appealing picture of a particular location (Boisen et al., 2018), in this case based on the green credentials of Styria.

Overall in both case study locations, business and policymakers perceive CE activities as a 'win-win' for both economic and environmental opportunities and the CE is seen as a key tool to secure a supply of vital resources for both companies and policymakers. Policy appears to be calling on business to take action in terms of CE developments. Businesses are considering CE action, but through exploring potential CE strategies with value chain partners. This lack of alignment has been previously highlighted in the case of building territorially sensitive CE initiatives (Tapia et al., 2021). There appears to be an increased need for open and collaborative CE discussions between business and policymakers, in order to develop nationally aligned and regionally sensitive strategies, which support local stakeholders in collaborating for CE developments, this was particularly evident in NH.

My findings suggest there is still inconsistent preferences of what exactly is involved in a CE, reflecting the findings of Walker et al. (2021), which is likely to constrain successful CE implementation. This lack of clarity of vision within and between business and policymakers as observed in this thesis is also noted in previous academic work (e.g., Kirchherr et al., 2017), it seems that the lack of agreement on what is involved in a CE transcends various disciplines and sectors. Notably, in the manufacturing sector over 70 percent of survey respondents were aware of the CE (Liakos et al., 2019), yet this thesis argues that companies struggle to move from awareness of the concept to practical implementation of CE solutions. My research evidences that constraints remain in relation

to developing a consistent CE vision amongst business and policymakers in both England and Austria. From these findings it seems that different stakeholders have varied visions and expectations for a CE, based on their own economic interests. Hence, it is clear that there is a need for reconciling these understandings through negotiations, potentially supported by supranational/national level policies and regulations, to help ensure all parties are working collaboratively towards an inclusive regional CE.

To conclude, there is an apparent overarching expectation for the CE to be an opportunity for business to reduce cost through improved efficiency in production processes. Circularity is seen as a commercial tool to help meet environmental targets, for waste reduction and emissions, which in turn allows the company to mostly continue business-as-usual strategies. Thus, they comply with environmental regulations without making any significant changes to product organisation. From the policy side, CE visions appear to be centred around the potential to secure resource supply at the international and national level, while regionally a CE is used as an economic development and place promotion tool, despite the numerous constraints facing a CE transition. Overall, it appears that both business and policymakers have relatively consistent unambitious understandings of a CE, with both parties seeing the CE as an environmental mechanism to improve their respective economic performance, with business being foregrounded as taking the leading role in driving a CE transition.

Research Question 2:

-How do multi-level policy strategies and global value chains impact on the ability to develop a regional CE?

This section explores the complexities of multi-level policies and how these are likely to impact on the ability to foster regional level CE policies, considering the emerging conflicting interests between various policy levels and simultaneously in contrast with commercial value chain interests.

Multi-level policymakers at the EU, national and regional level appear to have different understandings of CE activities. The role and responsibility of each governmental level in terms of implementation of CE practices is currently ambiguous, in turn creating regional CE implementation challenges. These multi-level issues in terms of CE implementation are likely to create numerous challenges when seeking to foster

regionally aligned CE activities between local partners, as previously witnessed at the regional level (Nogueira et al., 2020) and throughout austerity hit local London authorities (Turcu & Gillie, 2020). Findings in both NH and Styria, suggest that regional agencies are seeking more power from national level authorities, in order to develop regionally focussed CE strategies locally. Hence, more open dialogue is needed between multi-level stakeholders to ensure that policymakers are working collaboratively for the successful implementation of regional CE activities.

The spatial and scalar aspects of CE are under-defined in policy and business discussions. The assumption of economic advantage from the CE is shared by all stakeholders, but the EU and national level policy are silent on the spatial distribution of benefits within their territories. Those benefits tend to be assumed future 'opportunities' for enhanced competitiveness rather than more immediate or tangible matters. For the EU and even at the national level there can be some expectation that the 'disruptions' referred to by the EU are outweighed by the benefits, although this remains to be seen. Additionally, EU policymakers heed caution in terms of the challenges which are likely to occur when regions shift towards more circular production systems. Conversely, at the regional level concrete benefits are needed; the NH stakeholders indicate an expectation of benefit from the CE which is likely to be challenging. This has also been explored in the Italian context where CE has shown some potential as a tool to revitalise declining industrial districts, with the vital support of regional actors through local policies and funding strategies (Bressanelli et al., 2022). The heavy industries present in both locations provide a need for change (given the carbon-intensiveness of industry in both NH and Styria), which suggests potential role for measures such as IS. To take advantage of apparent CE possibilities, regional policymakers call for more national government support including more funding to address regional issues. This echoes the findings of Farrelly (2010) that rhetoric and support from the UK government for regional action may diverge, and also supports the findings of Vanhamäki et al. (2020) in Finland. Thus, although regional level of governance might relish the potential of a CE, they cannot make it happen without national level support. Furthermore, capturing local advantage from a regional CE needs the cooperation of business, who tend to have more globally focussed commitments to value chain partners. Although, regions are competing with one another to retain the potential benefits of a CE within their own administrative boundary, so this is likely to result in a competition across regions when seeking national funding to accelerate

regional CE activities, reflecting and extending the work of Kębłowski et al. (2020) in relation to policy tensions and CE development at the city level.

On the commercial side, there was evidently a value chain approach to developing CE activities in both NH and Styria. Rather than referring to collaboration with local public bodies, business interactions take a strong business-centric view. Many companies discuss resource efficiency collaboration with value chain partners including suppliers and customers, who are considered key actors when tackling sustainability issues, mirroring and corroborating the findings of Noya et al. (2017); Whalen (2019) and van Keulen & Kirchherr (2020). Arguably, companies are seeking to emphasise their own strengths and ability to take action (Hahn & Lülfs, 2014), and therefore background the potential for engagement with other companies and stakeholders (as observed by Banerjee (2008)). If this rhetoric of prioritising value chain relationships, is translated into company strategy, there are clear operational challenges to enabling regional CE collaborations. From my research findings, companies predominantly pursue CE activities through collaborating with global supply chain partners in order to improve efficiency and reduce costs from a commercial driven perspective. Value chains were regularly referred to as the main form of collaboration, although these value chain partners are globally distributed between upstream suppliers and downstream waste disposal companies, which raises questions for the feasibility of pursuing regional level CE efforts. Thus the business-centric approach to the CE may generate economic opportunities that are not necessarily based within a given place, but more likely globally distributed amongst value chain partners, reflecting the IE related work of Goldstein & Newell (2019). Additionally, CE implementation challenges are backgrounded and barriers in relation to other partners willingness to collaborate especially when this may increase complexities for suppliers are regularly overlooked, echoing the findings of Randles (2007) in an IS context.

Evidently, some companies are tied to following existing pre-existing sourcing and disposal procedures, as a result there appears to be a lack of openness and attention to working collaboratively with regional partners in terms of CE activities. Both NH and Styrian companies often had a commitment to source from a pre-defined approved suppliers list. Sustainable supply chain research often focuses on the ability to collaborate with suppliers for the success of CE activities (Berardi & de Brito, 2021), with limited attention given to potential sourcing from local suppliers for a CE. These concepts are corroborated in this thesis in a regional empirical setting, with companies in both England

and Austria overlooking the collaborative opportunities from geographic proximity. From my research it is apparent that CE collaborations across value chains are foregrounded by companies, which may lend itself to reverse logistics activities (Bernon et al., 2018; Julianelli et al., 2020). Although, reverse logistics strategies for a CE are likely to be difficult to implement across global supply chains due to efficiency concerns, but may be more practical with regionally based local partners.

Research by Hultberg and Pal (2021) has attempted to theorise the potential for CE value chain collaborations in the fashion sector, although there is little empirical evidence on the success of value chain collaboration in previous collaborative IE efforts (Goldstein & Newell, 2019). This thesis has developed these previous debates, by highlighting the complexities and practical feasibility challenges to implementing CE efforts across the value chain, while simultaneously displaying the lack of a role for regional stakeholders, suggesting that potential CE benefits are unlikely to remain locally. Policymakers are interested in retaining the potential benefits of a CE locally (Bolger & Doyon, 2019), although it appears that companies have little incentive to work with proximal organisations to improve regional CE performance. More work is evidently needed to encourage collaborations between regional partners in terms of fostering regional level CE activities.

In conclusion, policymakers distributed across different governmental levels often struggle to form strategically aligned policies for promoting regional CE collaborations. EU policy sets an overarching agenda in terms of reaching environmental targets in the coming years and the UK appears committed to following EU environmental policy. As political and governmental landscapes evolve, there is likely to be regulatory divergence. This might be a barrier both to trade and to fostering international-scale CE activities involving the EU and the UK. Furthermore, at the English and Austrian regional level, local bodies do not have the required support and funding from national level policymakers to effectively implement change locally. From a commercial perspective, global value chains are the dominant concern for companies when seeking to form CE collaborations, in turn creating challenges for fostering regional level CE strategies. This thesis has illuminated numerous complexities which need to be overcome in order to capture the benefits of the CE at the regional level.

Research Question 3:

-How do regional development initiatives and company embeddedness impact on the ability to develop regional CE opportunities?

This research question has extended existing spatially focussed resource efficiency literature (e.g., Schulz et al., 2019) by providing regional empirical insights and incorporating both a policy and value chain perspective on the topic. Regional policymakers are interested in improving the economic, social and environmental wellbeing of local stakeholders. CE strategies are seen as a viable tool at the regional level to address these broad policy concerns, through creating sustainable and highly skilled employment opportunities, while simultaneously improving local environmental and social conditions. On the commercial side, companies are situated in various global locations, in order to capitalise on competitive advantages in each region. This section further investigates the relationship between company embeddedness and their commercial interests in pursuing regional CE activities with local CE partners.

Businesses indicate a willingness to be active in the CE, yet commercial documents are largely silent on potential regional CE initiatives. The companies studied regularly foregrounded themselves as key players in CE implementation, in alignment with policy perspectives at all scales. Notably, though, the regional scale is regularly backgrounded in business discussions in both companies historically tied to the region as well of those for whom NH/Styria is a relatively recent location of operations. In both NH and Styria there appeared to be a strong connection to the region which was often linked to a historic family commitment to the region, akin to the findings of Dicken (2002), who explain how firms are rooted in various social and cultural contexts locally. This could suggest that businesses are also likely to be motivated to work collaboratively with proximal partners to accelerate regionally focussed CE activities and improve local prosperity. However, from interviews, discourse analysis, observations and survey results, it is clear that companies are globally distributed with various international sites and connections to suppliers and customers in many international locations. This may create feasibility challenges in terms of implementing successful regionally embedded CE activities, since resource exchanges are unlikely to be pursued with proximally located regional stakeholders but instead with global value chain partners. Companies showed encouraging and enthusiastic ambitions for the local region (particularly evident amongst

members at the HWA in NH and the Green Tech Cluster in Styria), although in practice this thesis found the level of practical CE collaboration and implementation was minimal due to various barriers including; costs involved, feasibility issues and confidentiality concerns.

Similarly, previous insights in relation to eco-industrial parks (Ashton, 2008; Ashton & Bain, 2012) and IS (Chertow & Ashton, 2009) highlighted the need for strong levels of trust, social embeddedness and social capital for successful implementation of resource efficiency activities. Trust was regularly cited in both business and policy interviews as a key issue when exploring collaborative CE opportunities between regional stakeholders in this project. These issues in relation to building trust were also found in previous IE (Deutz & Gibbs, 2008), IS (Bacudio et al., 2016) and CE research (Stahel & MacArthur, 2019), this thesis further develops and corroborates this resource efficiency literature by using a CE lens of analysis in both NH and Styria. I argue that these challenges with developing trusting partnerships for regionally focussed CE activities, are likely to remain until greater levels of trust can be built between organisations to develop mutually beneficial CE activities. This apparent lack of trust supports previous work on trust as a prerequisite for successful CE implementation (e.g., Fischer & Pascucci, 2017) and provides contextual empirical regional insights to further advance the work of Webster (2021) who points to challenges in building the diverse stakeholder commitment needed for a CE.

From my research insights it appears that trust is both limited within and between business and policymakers, reducing the potential for fostering open collaborative regional CE connections. For example, when discussing CE collaborations, there was often reference to the underlying need for confidentiality agreements to be in place, before externally discussing commercial matters, which is likely to hinder ad-hoc CE discussions and developments at the regional level. The commonly cited successful case of an IS project in Kalundborg was built on long-established locally embedded connections between proximal organisations (Ehrenfeld & Chertow, 2002), suggesting strong levels of embeddedness is likely to be essential for fostering and sustaining regional CE activities in the long term. The formation of the HWA group in NH has helped to bridge the gap between organisations and build informal connections between companies, which may result in more fruitful and trusting CE collaborations forming, although based on previous IS evidence this is likely to take time (Ehrenfeld & Chertow, 2002). Despite steps being taken in terms of forming trusting collaborations regionally (for example, the formation

of HWA in NH and Green Tech Cluster in Styria) which may result in enhanced local embeddedness and foundational trust building opportunities amongst local stakeholders. However, after over 3 years of regular observations, HWA meetings still focus on relatively minor issues in term of waste management in offices and addressing waste management through litter-picking events, while discussions rarely explored more complex implementation issues, such as the potential for regional collaboration for a CE.

Previous IE and IS research has illuminated the need for locally embedded trusting connections to develop regional resource efficiency initiatives (e.g., Deutz & Gibbs, 2008; Chertow & Ashton, 2009), which also appears to be the case for regional CE developments, yet this thesis has uncovered the lack of local embeddedness amongst regional stakeholders, instead company commitments are tailored towards globally distributed value chain partners. Additionally, MNC strategy is regularly passed down from headquarters through intra-corporate strategies (Gupta & Govindarajan, 2000), resulting in regional company sites (such as those studied in NH and Styria) following globally determined sourcing decisions for inputs, leaving limited potential to foster regionally embedded closed loop production systems, which appears to be the case in this thesis.

My research elucidates the need for improved levels of regional embeddedness of companies to ensure that they remain in the locality in the long term. Without this regional commitment there are significant limitations to developing regional CE opportunities, due to the risk of companies re-locating, extending the work of Porter (2000a) on the dominant role companies play in regional development by offering new CE insights on the issue. My findings also further develop the seminal work of Markusen (2002) and what they coin as 'slippery spaces', which encapsulates the transient nature of companies and is evidently still relevant today, as companies seek out global competitive advantages when deciding where to locate operations. The Green Tech Cluster's PPP approach seems to offer a more stable and promising approach to sustaining regional CE activities in the long term based on its formal structure, compared to the informal nature of the HWA group, which relies on the goodwill of members to participate. I argue strongly in favour of the increased need for local authorities to foster deeper company connections to the local place for the success of regional CE activities in the long term, reflecting previous IE work suggesting the need for municipalities to acts as 'institutional anchor tenants' (Burström & Korhonen, 2001) when building resource efficiency collaborations. Another strategy for improving embeddedness could be to better integrate local citizens into

regional CE strategies, this thesis has displayed how local citizens are regularly overlooked in current CE discussions. Arguably, these people have an inherent commitment to the region and are likely to be well placed to build social capital between stakeholders, which may result in more trusting, mutually aligned and sustainable regional CE strategies for the long term. Although, as a cautionary note, the role of citizen engagement in a CE was not the core focus of this thesis, so this concept would require further empirical investigation.

In conclusion, despite informal regional connections between stakeholders there appears to be a lack of trust between proximal commercial entities when exploring the potential to form strategic regional CE partnerships, instead more formal arrangements with value chain actors represent the focus of collaboration. Thus, there are limited capabilities for CE initiatives to act as a regional economic development tool, due to transient nature of companies and their lack of long term commitment to the regions where they operate. It appears that stronger levels of local company embeddedness underpins the long-term success of a regional CE and acts as a prerequisite to enable resilient regional development opportunities. Finally, throughout this research project, a number of common barriers regularly emerged in relation to implementing CE activities, which may affect the potential to capture the benefits of a regional CE, these issues will now be explored in further detail.

7.1 Overall barriers to developing regional CE initiatives

From findings in both NH and Styria, a number of common barriers that were regularly evident emerged amongst stakeholders. These challenges are relevant to both businesses and policymakers who appeared to encounter similar issues when developing regional CE activities. These barriers varied significantly based on sectoral challenges, such as hazardous waste and issues with sufficient quantities of materials to make CE activities feasible at the regional level. This thesis further develops the findings of De Jesus and Mendonça (2018), which summarises CE barriers as: 'Technical, Economic, Institutional and Social' at both the EU and national level in Portugal. This thesis also extends the work of Kirchherr et al. (2018) who find core barriers to the CE in the EU are primarily related to 'Cultural, Regulatory, Legal and Technological' issues. My research findings offer a more regionally nuanced perspective on this topic by drawing on empirical insights from the NH and Styrian regions. The following analysis will highlight the main barriers when transitioning to a regional CE that were uncovered in this research project.

7.1.1   Cost as a barrier for a circular economy

The cost of adjusting to circular forms of production regularly emerged in this project, which was especially relevant when attempting to get senior management on board with shifting towards more CE related activities. The findings of this research suggest that the up-front costs associated with shifting to CE forms of production act as a challenge for CE developments in large companies in the manufacturing sector. This extends the findings of García-Quevedo et al. (2020) who found corresponding results in small and medium sized enterprises in the European context. It is evident that for business cost is still the primary driver when considering to pursue CE initiatives; there must be a clear economic case for shifting away from traditional production systems and a clear strategy for how CE strategies can be cost effective. Arguably, more education and skills are needed to transition to closed loop systems and to demonstrate how CE activities can be both cost effective and have a positive effect on environmental performance, but this is not necessarily always the case.

Policymakers' agendas are also constrained by cost barriers for a CE, which was made clear by observations at the local authority and the ongoing rhetoric of the need for seeking the lowest cost option in local public procurement and in waste management matters. For example, some residues are of value to the local authority and therefore it would be difficult to switch to more CE oriented systems. This was illustrated with lucrative high value bottles in local authority waste management operations, which appears to be stalling 'Deposit Return Scheme' advancements in England, as highlighted in local authority discussions. National policymakers have a key role to play in terms of lowering commercial costs to explore CE opportunities, through either reduced taxation or nationally funded grants which are distributed locally to aid the transition to a regional CE.

It is clear that both business and policymakers require potential CE strategies to make strong economic sense. The potential environmental and economic benefits by closing resource loops at the regional level for both business and policymakers needs investigation for specific circumstances, but there is a political decision as to the distribution of costs and benefits. There was regular reference by interviewees (in both England and Austria) to the perceived reputational and legal challenges in relation to utilising residues in another production system, mirroring the work of Farrelly et al.

(2020) who elucidate the perceived complexities involved in getting permission to reuse residues in a CE plastics context in England.

7.1.2 Feasibility concerns with circular economy activities

Both companies and policymakers faced numerous practical and logistical challenges when seeking to implement CE activities in both case study locations. The issue of hazardous waste was particular evident in the food and medical industries. In both of these sectors safety was seen as the core priority for the firm and they regularly perceived CE materials as inferior and a compromise to quality. CE packaging (i.e., re-usable, recyclable or made from recycled material) needs to meet equivalent levels of quality to standard versions, particularly in sensitive industries, such as medical, hygiene, food and drinks sectors.

Thus, my research highlights that particularly sensitive sectors such as food and medical, place greater level of emphasis on the need for virgin material usage in packaging to manage reputational concerns and perceived hygiene issues,. This extends previous research by Bodar et al., (2018) on the need for high quality packaging for hazardous waste. Notably, packaging does not simply serve as a protective material, it is also vitally important for marketing purposes, particularly in the food industry (Rundh, 2016), which may not always align with CE principles. This was also evidenced in my thesis through interviews with food sector representatives, who explained that retailers often demanded different colours to be used in packaging, in order to stand out on shelf, which in particular hinders recycling opportunities. My findings elucidate the powerful role retailers' play in dictating supplier strategies, which may impact on CE potential throughout the value chain process, this further supports the work of Lopes et al. (2021) who call on food and beverage value chain actors to co-create a roadmap in order to effectively manage packaging for a CE in the Portuguese context.

Local authorities in NH faced logistical challenges in terms of waste management and were reliant economies of scales when attempting to manage waste in a cost-effective manner. This results in waste being collected by local authorities then being segregated, distributed and managed at the international/national level due to commercial viability concerns. My findings support and develop the work of Llanquileo-Melgarejo & Molinos-Senante (2021) in the Chilean Municipality context, who found that local

authorities struggle to manage waste at the regional level due to cost concerns with small quantities of waste, which directly reflects my research findings, in turn raising important questions for the practical potential to keep resources in circulation at the regional level. The above analysis demonstrates how some CE issues are commonly felt across international places and transcend locality. While at the same time, each region is likely to face their own specific challenges, hence the need for a nuanced and flexible approach to CE development at the regional level.

7.1.3   End-of-pipe focus in a circular economy

It appears that CE activities have primarily an end-of-pipe focus with both business and policymakers regularly referring to CE activities using end-of-pipe terms. This was evidenced by business referencing the need to improve recycling rates through their waste management activities and a focus on further developing waste management infrastructure, which is intended to improve recycling performance downstream in the value chain. There was limited reference to the potential of improving sourcing criteria, design and durability issues or repair potential-to extend products' life, close loops of production and reduce waste generation at an early stage of production. Similarly, there was limited interest in seeking out innovative IS connections with regional partners to reduce waste, instead the focus was on reducing waste ending up in landfill, improving recycling rates and minimising plastic waste ending up in the environment, which was regularly referred to as the 'Blue Planet' effect in England. These end-of-pipe findings reflect and corroborate the results of previous CE work in similar industrial settings (Clark et al., 2016).

Policymakers at all levels appear to focus attention on end-of-pipe activities, with policy documents and interviews primarily referencing such activities as part of their CE engagement, with less attention given to upstream activities in relation to design and the role of early stage value chain activities on the outcome of downstream CE strategies. My findings agree with the work of Hartley et al. (2020) and Calisto Friant et al. (2021) at the EU level, further extending this previous research to highlight the end-of-pipe policy focus at the national English level and at the regional level in both NH and Styria.

7.2   Contrasting perspectives between policymakers and business

Policymakers and business seem to share some common understandings for a CE, however there is a general lack of alignment between stakeholder groups when attempting to enable regional level CE activities.

Policymakers at all levels seem to be relying on business to implement CE change in order to tackle both environmental and economic challenges. Conversely, business appear to be discussing CE as an internal tool to reduce cost and increase efficiency across their value chain, with environmental targets being more of a secondary consideration. It is evident there is a lack of direct alignment between various levels of governance and also between business and policymakers when fostering CE activities. Moreover, the role of regional collaboration is also overlooked from a business perspective, despite local authorities making efforts to instigate CE activities within their administrative region. This misalignment between policymakers and business may result in challenges when seeking to build a resilient regional CE between local stakeholders.

It is widely acknowledged that local authorities are responsible for improving the prosperity of their local region and they envision the CE as a way to do this, although as noted by Deutz and Kildunne (2021) local authorities in England have a legally binding household waste management obligation but without the means to influence the composition of the waste stream (Deutz et al., 2010). However, as my research highlights, due to the need for economies of scale to make commercial waste management sense, residues are separated and distributed across the country where they are collected and managed at the national level, which is unlikely to offer any potential CE benefits to the local region. This thesis has illuminated the regional feasibility challenges to shifting to more local closed loop production systems when managing waste at the end of life.

In both NH and Styria, companies appear tied to following their pre-defined sourcing systems which are often reliant on global supply chains. As Massey (1995) explained in her seminal work regarding supply chain configuration, companies tend to locate in specific regions in order to capitalise on locational advantages. This may indeed hinder any potential regional CE collaborations, as companies are following internationally configured operational structures, with little potential for regional collaboration. My findings echoed this work and indicated that companies are still regularly reliant on global value chains and are less interested in exploring regional sourcing strategies. Arguably, Covid-19 and other recent geo-political events may support reshoring of supply chains to

proximal locations closer to company headquarters, as the over-reliance on low cost locations for supply inputs has been highlighted by the pandemic (Javorcik, 2020), which may lend itself to exploring the potential for fostering regional CE activities. Ideally, CE opportunities might come to be seen as offering location advantages, as policymakers are already hoping, but this remains for the future and may require a combination of changes to national policy and the level of urgency in which environmental issues are held by companies.

Finally, it seems that national level government in the UK hold significant power when devising CE strategies. The city level has previously been promoted as a key scale for action in a climate change context (Bulkeley et al., 2012), yet the mechanisms do not appear to be in place to foster local CE activities at present in England due to a lack of regional empowerment. While in the Austrian context, regional authorities must still follow national regulations, they appear to have more control over developing regionally nuanced CE strategies. There also seems to be a more collaborative approach between local policymakers and business, with PPPs a common form of regional policy implementation, in the Styrian context. In both NH and Styria, there is a greater need for both business and policymakers to be better aligned to build more collaborative, and inclusive regional CE activities. It seems like the PPP approach in Styria could also be successfully adopted in the NH context, which may offer more long-term stability for CE initiatives.

7.3   Overall comparison between North Humberside and Styria findings

By comparing research findings between the two case study locations of NH and Styria offers unique insights and the potential for knowledge sharing opportunities for stakeholders in both regions. The regional similarities and differences when developing CE activities will now be explored.

Common perspectives between the regions in a circular economy context:

There were many similar points between NH and Styria. Both regions appear to have limited power when attempting to implement regional CE activities. Policymakers in both NH and Styria call for more regional devolution and resources so they can act locally on CE initiatives and devise strategies based on their unique regional situation.

Business actors in both NH and Styria discuss CE activities through value chain collaborations, with varying limited levels of attention given to the potential of regional partnerships for a CE. It also appears that CE activities in both Styria and NH are relatively limited to date in practice, with a current strong reliance on traditional heavy industries in both locations, extending previous findings of Gibbs (2018) in England and Styria, in a sustainability transitions context. While in both locations there is evidence of shifts towards more sustainable practices (for example, Green Tech Cluster in Styria and HWA in England). However, there is little evidence in terms of collaborative regional CE connections coming to fruition from these networks, which suggests the Green Tech Cluster approach acted primarily as a place-promotion service for the region of Styria, similar to the current regional promotional activities of the HWA.

From evidence in both case study locations, this thesis suggests that regions are unlikely to be considered by companies as a key scale for implementation of CE activities, instead CE discussions tend to be an internal company matter and/or with company value chain partners. This is likely to raise concerns for regional level authorities and their ambitions to promote and capture potential CE benefits in economic and environmental terms locally, this was evident in both NH and Styria. Additionally, in both case settings of this study it appears that both business and policymakers are only discussing minor incremental changes and the CE acts as 'business as usual' approach to environmental concerns, while still allowing for both commercial and economic growth.

Both locations have similar industrial histories, NH is a place built on traditionally energy intensive sectors, while Styria is a place reliant on automotive industries, they both recognise the challenges these sectors face in terms of reaching climate targets and see the CE as a way to shift to more sustainable forms of production. Both Styrian and NH regional authorities envision the CE as a way to promote their regions as a place to conduct business in order to attract new firms to the region and build an economy based on circular based production systems. However, there is a lack of awareness in both NH and Styria in terms of acknowledging the challenges in relation to developing the skills needed for a CE to flourish at the regional level, this was evident amongst business and policymakers. Supranational bodies such as the EU appear to caution the regional challenges in relation to shifting to a CE, yet both NH and Styria optimistically see themselves as winners in a CE transition.

Contrasting perspectives between the regions in a circular economy context:

NH appears to call for increased devolution over developing regionally sensitive and tailored CE strategies based on local needs in their region, where there is a more hierarchal policy system in practice in England. However, to date, there is a lack of ability to make regional changes to CE strategies locally, as regional agencies must follow the regulations set by national/international policymakers. At the national level aspirations and ambitions for a CE tend to be focused on securing resource supply and there is little concern for individual regions, hence there is a more holistic approach to CE development across the nation, which may indeed result in some traditionally economically disadvantaged regions such as NH being left behind in a CE transition. CE development in NH appears to be tied by both national and international regulations in relation to the governance of waste related issues locally. Tension is clear between regional policymakers and national level authorities; regional level authorities are calling for more empowerment locally to make nuanced decisions in relation to economic and environmental matters for their regional communities. There was little recognition of the potential for business and policymakers to work together to foster regional CE activities, companies overlooked the role that policymakers could play in acting as a facilitator for CE activities locally, while policymakers called on business to act. However, business were evidently committed to global value chain partners, which raises questions on the future potential of developing a regionally resilient CE, based on evidence from NH in England.

Contrastingly, regional Austrian authorities appear to have more power over developing CE activities through PPP agreements, in comparison to their English counterparts, although they still must follow national and EU regulations in terms of waste management and emissions targets. This local empowerment over developing CE activities based on their regional capabilities is likely to offer the ability to devise more resilient and sustainable CE strategies. More collaborative approaches and PPPs were common in Styria, while in NH it was divided into more segregated business versus policy-focused approaches. This Styrian PPP method offers a more collaborative approach to CE development and is similar to other previous approaches observed in both Swedish and Australian cities (Bolger & Doyon, 2019), which display potential for success, notwithstanding the various common CE implementation barriers as outline above. The

region of Styria appears to be further along in their CE journey, compared to NH and have excelled in promoting themselves externally as world leader in broader green economy activities, echoing the conclusions of Gibbs (2018). Similar to the findings of Sedlacek et al. (2020) in the energy industry, this research elucidates the greater levels of regional power in the Austrian context compared to England, when developing regionally nuanced policies.

It appears that CE activities are still at a relatively low-level development stage, with a lack of alignment between business and policymakers. Through observations at local stakeholder groups in NH over the past 3 years, I have witnessed little movement away from discussions in business surrounding office related waste; a lack of acknowledgement on the potential role the local authority can play in enabling a CE and a reluctance from companies to explore collaborative regional CE initiatives. On the other side, business appear to pursue a more clustered approach in Styria, partly led by the Green Tech Cluster based in Graz which is a formal organisation designed to promote regional sustainability activities between members, unlike in NH where sustainability activities are discussed through more informal working groups. The Green Tech Cluster approach seems more sustainable in the long-run as they can act as an 'institutional anchor tenant' for future CE collaborations, also observed in previous IE contexts at the municipality level (e.g., Burström & Korhonen, 2001), whereas in NH there is a risk that overtime informal working groups may dissolve since they are voluntarily run. Additionally, the Green Tech Cluster are more concentrated on CE collaborations between business and policymakers through their PPP organisational structure, while in NH there is less evidence of cross-sectoral alignment, which may hamper developing inclusive regional CE activities.

To conclude, there appears to be opportunities for knowledge exchange between Austria and England in terms of fostering more effective CE collaborations and to help build more regionally resilient and inclusive CE activities. However, a potential caveat to consider is that despite similar characteristics in NH and Styria, they both still have local nuances and contextual factors at play, so what works in one location is not guaranteed to be successful in the other, but it is worth further exploration to examine the potential of regional CE knowledge sharing internationally.

7.4   Comparison between Discourse Analysis and Interview findings

In the English context, I used both discourse analysis and semi-structured interviews as primary data collection methods, this section will discuss how company/policy writing in reports differs to interview discussions with business and policymakers in that context. The following will compare and contrast business/policy reports with interviews, this will help to cross-check and corroborate my research findings and elucidate potential discrepancies between official reports and interview conversations.

Business Reports versus Business Interviews:

Business discourses discussed CE activities under broader environmental and sustainability topics. There is limited specific discussion on the CE itself and the term is often used interchangeably with other sustainability-oriented initiatives. There is little formal requirement for companies to report on CE issues in sustainability reports (Opferkuch et al., 2021) and as a result companies currently have a free reign as to what to discuss and how to interpret CE activities for their own interest in externally facing company reports, this was also witnessed in this thesis. These sustainability reports are usually designed with potential investors and customers as the intended audience (Searcy & Buslovich, 2014) and as a result they discuss sustainability related topics in terms of the potential financial and economic benefits, with little attention given to overall complex societal and environmental issues, which was also corroborated in this research project. Conversely, in the interviews, respondents were asked directly about CE topics, which resulted in a more open conversation on complex CE challenges facing the company, compared to the overly positive narrative portrayed in company reports.

This research found that company reports regularly referenced the desire to source locally, although interviewees acknowledged reliance on pre-defined global supply chain systems when sourcing inputs, despite an apparent interest to work collaboratively with local suppliers. Upon further investigation in reports it was clear that companies relied on global supply chain systems to source materials in a cost effective and time efficient manner. This thesis argues that companies portray in externally facing reports that they are interested in pursuing regional CE related projects, although when it comes to finer feasibility issues they often struggle to implement these apparent CE ambitions in practice. I argue that more honesty and transparency is needed between cross-sectoral

stakeholders in order to initially recognise CE challenges then work collaboratively to overcome these CE issues locally, as opposed to using the CE as a promotional tool for their commercial external communications.

From company reports there appeared to be a strong understanding and confidence of what is involved in a CE and how business can implement CE strategies. Yet in interviews there was more open reflection on the lack of comprehension of various CE concepts and the struggles in relation to implementing CE strategies, this is likely due to official external reports being unlikely to admit to a lack of understanding. This lack of knowledge on CE is referenced in previous literature (e.g., Ritzén & Sandström, 2017), therefore more educational work is needed to clearly and openly communicate on CE topics to a range of stakeholders. Interviewees admitted the need for increased knowledge in relation to practical aspects of a CE and how to implement CE practices. From this, it seems that companies portray an external image of understanding CE activities, but in practice more open collaboration and support is needed to implement CE initiatives at the company level.

Both business reports and interviews showed interest in CE initiatives for the perceived win-win potential of a CE to both reduce costs and improve environmental performance in their production system. Overall, this thesis finds that companies give little attention to the role of the region in terms of fostering proximal CE developments; despite previous advancements in relation to the promising potential of IS opportunities at the regional level (Ehrenfeld & Chertow, 2002; Chertow et al., 2008).

Policy Reports versus Policy Interviews:

At the regional level policymakers are generally optimistic about the potential for the CE in allowing the NH region transition from a heavily polluting region to a region built on cleaner forms of production. Regional reports highlight the potential for the region to shift away from heavily polluting activities to what is portrayed as a smooth switch to more CE based activities. However, there is more caution amongst interviewees who recognise the vast range of challenges for adopting more CE based practices in the region and the need for re-skilling the local workforce to tackle these issues regionally.

Regional policy reports do not appear to be engage with challenges facing regional CE transitions and how this may influence the local workforce in the Humber region. International and national policymakers appear to recognise the potential of CE activities

in terms of securing resource supply but interviewees neglected the role of specific regions and the challenges that are likely to be faced within different locations based on local contextual challenges. Policy reports at international and national levels painted a picture of CE activities being implemented at the regional level, however, regional level reports and interviewees appeared to call for increased devolution over CE issues in order to manage resources at the regional level, (c.f., (Farrelly, 2010).

Interviewees were more open about the challenges and recognition for improved training needs in terms of developing the skills needed for a CE transition at the regional level. Also, in interviews there was open recognition of the challenges facing the region in terms of flooding and climate change, which in reports these threats were discussed in less detail, potentially as it may cause alarm to prospective investors in the region. Interviews with regional policymakers regularly cited the severe impact of flooding which has been felt by local stakeholders recently. This was often mentioned as a driving force to tackle CE issues at the regional level in NH as they are aware of the potential devastating local social and economic consequences of climate change.

On a common note, both policy reports and interviews referenced the relaxed and friendly lifestyle in the NH region and cited affordability factors for both business and people to live and work in the region, when compared to other English locations. These social factors are likely to build a positive reputation for the region and improve the image of NH as a place to both live and work, in turn potentially attracting environmentally conscious investment to the region who are aligned with the vision of the region.

Overall comparison between business/policy interviews and reports:

Both business and policy reports appear to be overly optimistic with regards to CE potential in their organisation. From a business perspective, this may be to boost consumer perceptions of the company while from a policy perspective it may be used to attract companies to locate in their administrative region. Regional policymakers are portraying NH as a future-proof location built on regenerative forms of production with associated highly skilled jobs and a comfortable place to live. While both policy and business interviewees, openly displayed more caution in relation to challenges of shifting towards a regional CE and the vulnerability of NH to the impacts of climate change.

Similarly, both business and policy reports painted CE opportunities in a positive light and often neglected to address the challenges associated with CE activities. This is likely

because business and policymakers at all scales are attempting to display a strong knowledge of CE related activities and want to portray this in their external communications. While during interviews there was more of an honest personal account that both companies and policymakers struggled to comprehend CE issues and often lacked the resources needed to implement CE activities at the regional scale.

Finally, both business and policy reports were in discussion with one another and gave the public a passive role in CE implementation, despite these stakeholders likely playing a critical role in developing regional CE activities, further echoing the findings of previous CE research by Jones & Comfort (2017), Kirchherr et al. (2017) and Stewart & Niero (2018). Similarly, in interviews, there was little mention of the role for citizens to play in a regional CE transition, from this it appears that the public was backgrounded in both documents and interviews. More radical visions of a CE are excluded in business and policy discussions, with commercial business strategies being implicitly accepted as the way forward for developing CE activities, while other societal stakeholder views and concerns are overlooked.

As outlined above, there was often discrepancies between business and policymakers on the role of the region in terms of implementing CE activities. In various policy reports it seemed that the region played an important role, while during interviews it was clear that more local empowerment was needed to tackle regional CE challenges. On the business side, reports often cited regional collaboration potential for the CE, while interviewees commonly referenced the reliance on global value chain systems, suggesting major challenges for developing a mutually aligned regional CE.

Chapter 8 Conclusions

This section of the thesis will reflect on the key findings of this research project and summarize the significance and implications for both theory and practice. I will offer potential future research directions, which could be explored based on the findings of this thesis and then will finally provide recommendations to both policymakers and companies for how they could more effectively foster and accelerate regional CE opportunities.

The main aim of this thesis was to explore the extent to which the economic and social benefits postulated for a CE can be captured in a specific location. This research has used a novel and comprehensive approach to examine the potential for building diverse collaborations to promote a CE at the regional scale. It analyses the relationships between companies and local agencies, as well as the national context, in order to understand the multi-scalar influences on transitioning to a CE within a particular region. Previous CE research has predominantly narrowly studied a singular context, for example, national level policies, which is limited to studying the perspective of one particular stakeholder. This thesis uniquely recognises the need for incorporating varied perspectives to delve deeper and uncover regional CE issues in an interconnected multi-level policy and value chain context.

An innovative interdisciplinary and CR research approach drew on broad academic disciplines including; Human Geography, Supply Chain Management and Industrial Ecology to study the underlying issues at play when transitioning to a CE. The methods used in this project have offered unique empirical insights within two international case study regions in relation to their CE journey and has also offered knowledge sharing contributions for both business and policymakers in practice. Moreover, by drawing on interviews with senior commercial managers and experienced policymakers, discourse analysis of multi-level policy documents, observations with relevant stakeholder groups and a survey with manufacturing companies allowed for a robust analysis of multi-faceted CE issues. Findings indicate divergent views on developing CE activities between various stakeholders. In both case study regions, local policymakers see the CE as a way to improve the economic and environmental performance of the region. Additionally, different levels of government have their own interests. National-level policymakers appear supportive of regional CE initiatives, yet local authorities are competing with each other to secure investment and retain potential benefits locally. Conversely, companies

seek to foster CE initiatives between value chain partners, who tend to be globally distributed. Thus, this research concludes that under current circumstances the regional level appears to struggle to capture CE benefits locally. The following section will expand on these matters and highlight the specific contributions of this research to academic theory.

8.1   Contributions to Theory

My research has uncovered a distinct conflict of interest between business and policymakers in terms of regional CE development. This lack of stakeholder alignment is likely to raise challenges for developing regional level CE collaborations, which previous studies have assumed can be overcome through holding stakeholder workshops and discussing their respective perspectives, although this did not seem to be the case from my observations during this research project. By utilising a CR approach this thesis has unpacked underlying challenges, which are likely to require overarching cross-sectoral changes and significantly more; investment, trust, transparency and openness to facilitate regional CE initiatives.

By considering both policymakers and company perspectives on CE development in two case study regions, this thesis has identified significant mis-matches of ambition, perceived (and actual) power issues and strategies for implementation of a CE. These mis-matches comprise a double-disjuncture. The first disjuncture relates to the contradictory positions between the different spatial policy levels– characterised by an expectation of regional level CE engagement but with local government identifying a shortfall in policy support from national government in both the English and Austrian context. Related to this, the region needs to ensure a specific benefit, whereas the policymakers operating at higher levels can be content with the expectation that overall there will be economic benefits from a CE, without requiring those benefits to be evenly distributed either socially or spatially. At the regional level in both NH and Styria, the CE is not only discussed as a broad environmental and economic initiative, but is ambitiously envisioned as a mechanism to enable the region to successfully transition from energy-intensive to cleaner forms of production, in turn gaining local environmental benefits and addressing climate targets. There is a tacit assumption that these regions should be one of the economic beneficiaries of a transition to a CE, notwithstanding the ambiguity of the spatial distribution of the impacts of that transition. Notably, however, even in regions fortunate to be the CE economic winners, that circular beneficence is not necessarily to

be shared by all social groups. A nimbleness of skills may be required, which may only benefit some local stakeholders, while others may lose out.

The second disjuncture refers to differing understandings of policymakers and business relating to each others' roles and relationship to places (in both NH and Styria). Companies indeed are responding to concepts relating to a CE, but rarely engage with the regional level, or indeed acknowledge either the places they are located or the multi-scalar contexts in which they operate. A commercial view is emphasised above spatial embeddedness. Business view CE activities as opportunities for value chain collaborations, or internal initiatives. However, they may be making a similar miscalculation as policymakers, by assuming that the partners they envisage (their suppliers and customers) would be willing to collaborate in CE initiatives. Power dynamics and contrasting priorities within individual value chains may create complexities for collaborations, especially if collaboration may negatively impact the current economic performance of companies critical for the collaboration.

Thus, the double-disjuncture is focused on the regional level, where the expectations of policymakers are out of line with both the national policymakers and local business. Action from national government (or in the case of Styria a higher EU level) is needed to tackle both sides of the disjuncture. This would involve support for local authorities as coalition-builders, given they are committed to developing links with and between business in their region. But equally important is setting a robust regulatory context for companies conducive to more transformative approaches to the CE, including incentivising the development of local connections. This could involve setting requirements and expectations relating to CE matters within sustainability reporting. However, this thesis finds that both policymakers and businesses have yet to make a break from the end-of-pipe approach to resource management that has evolved in the EU and still strongly influences policy in England. Contrastingly, findings in Austria differ to the English context, particularly in relation to organisational approaches for fostering CE activities. In Austria, PPPs were observed as key to developing CE activities, which involved a more collaborative approach to a CE transition, compared to actions in the English context which tended to be segregated in terms of narrow business strategies versus policy approaches to developing CE activities.

This thesis has highlighted three main CE barriers (cost issues, feasibility concerns and an end-of-pipe waste focus) in transitioning towards a regional CE, which were common

across a range of international stakeholders studied. More open and transparent discussions between cross-sectoral stakeholders is needed, in order to share interdisciplinary perspectives on these complex issues and build mutually aligned solutions. These barriers need to be openly addressed, before regional CE activities can be implemented successfully and sustainably, further critical analysis is needed in future research, to gain a deeper understanding of these multi-faceted CE issues. I urge researchers (and practitioners) to carefully consider these barriers when seeking to develop regional CE projects.

Finally, greater alignment between business and policymakers is needed, in order to pursue mutually beneficial and resilient CE strategies at the regional level in order to foster inclusive CE initiatives between stakeholders. Policymakers need a better understanding of business requirements when shifting towards a CE in order to develop more commercially appealing initiatives which encourage regional CE collaboration. Arguably, stronger regulatory forces specifically tailored to the contextual context of local regions are needed to create a level playing field for industry and to accelerate a CE transition. However, this research has elucidated the difficulties in designing mutually beneficial CE strategies and explains that there are likely to be winners and losers in a CE. Business and policy CE discourses largely exclude the role of the public, which may be short sighted in terms of developing and implementing sustainable and resilient CE initiatives. Hence, there appears to be potential for greater recognition of the role of citizens in developing CE activities, as these stakeholders are embedded in their region and are likely well-placed to play a role in fostering and sustaining inclusive regional CE initiatives in the long term. Currently commercial CE matters dominate discussions, which is likely to set a pathway for pursuing business priorities for a CE, while more radical CE visions risk being side-lined, with less powerful stakeholders (e.g. citizens) being excluded and their interests not being considered in future CE developments. My research has shed light on the need for education and re-skilling the local workforce in industrial regions, which was evident in both NH and Styria, to protect vulnerable workers and to help enable a fair and just transition to a CE. This is crucial in order to foster more regionally capable places, which can be agile and open to shifting towards more CE production systems, in turn improving the overall resilience and prosperity of the region.

This thesis has illuminated the need for bridging the gap between academic and practical understandings of CE related concepts, with a particular focus on the regional level. Academic debates on the CE and its potential have out-paced the understandings shown

by policymakers and business in practice. There has been a rapid rise in CE interest over recent years by academics, with CE definitions offering numerous aspirational visions, which are overly ambitious and out of touch with the current issues facing companies and policymakers on their CE transition journeys in practice. Policymakers and business must work cooperatively to overcome fundamental challenges when pursuing CE activities, before more successful CE developments can be realised. Theorisations of the CE need to engage with the critical discrepancies discussed in this thesis in order to help overcome barriers and better develop pathways forward in a CE context. This would also support the devising of more transparent and mutually beneficial cooperation between organisations that is likely necessary for regional CE development, and indeed the support/influence needed from other policy levels.

8.2   Future Research Directions

Future research should consider the impact of Covid-19, Brexit and geo-political tensions– which might all point to the vulnerability of international value chains. The ability of CE practitioners (whether company or public-sector based) to respond to evolving contextual dynamics and how these may affect regional CE strategies need to be examined.

The future directions of supply chain management in the wake of Covid-19 are still evolving. The potential for reshoring supply chains could be an opportunity for developing more regionally resilient CE activities. Moreover, the post-Brexit impact on developing CE activities are difficult to envision, the above analysis notes the need to improve the security of resource supply, which may see the UK and EU compete to keep resources in circulation in their own jurisdiction. The UK government also references using the EU Green Deal as a benchmark for developing future CE strategies in the UK. The 'Environment Act' being enacted into law in 2021 is a positive step forward for the CE in the UK. However, it is difficult to predict the future of UK environmental policies and their level of commitment to a CE in the years to come, in a rapidly evolving political landscape, displaying the importance of continued academic research on this topic to reflect the contextual issues in practice at that particular time.

Moreover, there has been recent discussion surrounding a 'Green Revolution' in the UK, which is likely to have a strong focus on the NH region, but the need for re-skilling the local workforce is regularly overlooked and is likely to remain a significant challenge. While the UK government often portray their commitment to 'levelling up', the political actions to date have had little impact on socially deprived regions such as NH. The future scenarios for the CE are difficult to predict despite the current ambitions for fostering CE initiatives, hence there is a need for ongoing and timely research on this topic to continue, based on regularly evolving political and commercial landscapes. Future academic research should look to develop this thesis by testing some of the emerging concepts in different international settings. This study was focussed on two locations, NH (England) and Styria (Austria). By conducting a similar investigation in a different geographic context would help to corroborate findings and/or lead to new insights and potentially generate alternative perspectives on regional CE development. Further studies in regions with heterogeneous characteristics may yield different results, so this is worth the attention of future research. For example, in larger-sized cities, there is likely to be a different relationship between the local authority and companies, since there are more stakeholders present in the region. While in more serviced based economies, these types of companies have different value chain configurations, with more of a focus on digitally enabled transactions, such as in the finance sector. From this, other locations are likely to have nuanced perspectives and face different barriers and opportunities to developing regional CE activities. Also, more quantitative approaches could help to complement the findings of this research to help gain more numerical insights, into areas such as material flows and life cycle assessments within case study regions.

There was an opportunity to share findings and gain feedback from participants of this research project at a Yorkshire LEP event in October 2021 (online), which was an opportunity for knowledge exchange and allowed to effectively disseminate findings to engaged local stakeholders. Additionally, the final Cresting London conference (Hybrid, December 2021) provided an opportunity to share my findings with national and international level stakeholders. These events may also act as a starting point for future interdisciplinary research work with regional, national and international stakeholders. I am still in contact with relevant stakeholders e.g. DEFRA and intend to maintain and expand my international research network, to further explore future research opportunities on the rapidly evolving concept of the CE.

8.3   Recommendations to Policymakers and Business

This research project has uncovered numerous challenges in relation to developing regional CE activities, which has further extended academic understandings of CE related concepts. Additionally, this thesis has drawn on interdisciplinary methods with multi-scalar stakeholders and has allowed for practical research-led insights to be developed, which are likely to be of significant value to both policymakers and business in terms of fostering regionally aligned and sustainable CE initiatives. The below recommendations are specifically designed for policymakers and businesses in England and Austria based on the findings from the research conducted in these locations. However, these recommendations are also likely to offer useful learnings for stakeholders across the EU and to some extent globally, whilst still taking into careful consideration local contextual issues at play in each particular region. These recommendations may initially seem daunting and difficult to implement, I urge both business and policymakers to actively engage with these insights and critically consider how they can take necessary steps to address and further develop these interventions in their own particular setting. Key recommendations based on the findings from this thesis include the following:

Recommendations for Policymakers:

-At the supranational and national level, incentivise companies to prioritise local sourcing and disposal of materials, to help promote resources remaining in regional circulation and to encourage any associated potential benefits to remain locally. Examine the potential to transform national waste regulations and taxation systems to discourage waste generation in the first instance, while also encouraging organisations to investigate alternative CE methods to close production loops within the region. At the local level, make companies aware of how you might be able to assist them, for example, in terms of making introductory connections between local organisations or signposting them towards educational resources, in order to help develop and accelerate regional CE initiatives locally. Explore how you can collaborate with companies for better aligned and more inclusive regional circular strategies (England and Austria).

-National policymakers should investigate the potential to devolve more power, funding and resources to regional policymakers so they are capable and responsible for making locally nuanced decisions in relation to developing regional CE initiatives, which are

tailored to their local region. While Styrian policymakers have more empowerment than their NH counterparts (e.g. through PPP agreements), both locations would benefit from the ability to set regional CE agendas and make locally targeted decisions based on their specific circumstances and the contextual issues impacting local stakeholders. Further devolution of resources may also shift local authorities away from competing with each-other to secure national funding in order to develop regionally oriented CE initiatives. Instead they would have increased responsibility to focus on implementing nuanced CE initiatives, which may also encourage collaboration across administrative boundaries to share these resources for the overall prosperity of the wider region (England and Austria).

-Local authorities are well-placed to help regional CE activities evolve based on nuanced knowledge of their administrative region, they should explore the potential to act as a broker for commercial CE exchanges at the regional level, which has seen some success in the past in relation to IS activities. This would require investment and resources, which could take the form of a membership charge for industrial participants, who are likely to benefit from reduced waste management charges, which would also act as replacement for the loss of local authority income due to the reduction in waste management fees received as a result of these CE activities being implemented (England and Austria).

-Incorporate public consultation and involvement in developing CE strategies as these are the citizens who are inherently embedded in the region and likely committed to sustaining regional CE initiatives in the long run. Civil society actors are likely well placed to contribute to regional CE policy discussions. Open public stakeholder meetings with a broad range of societal actors could be an effective method for incorporating more diverse and holistic perspectives on the matters studied in this thesis. Regional civil society actors are likely to be inherently committed to the long term interest of their own region and therefore may be well suited to developing inclusive local CE initiatives (England and Austria).

-Invest in education and training services to help re-skill the local workforce away from heavy industry towards cleaner production based jobs, this will also help to ensure that investment remains within the region and local citizens benefit from taking up these highly skilled jobs in the region (England and Austria).

Recommendations for Companies:

-Explore the potential of shifting to regional suppliers in order to foster more resilient and circular supply chains. Additionally, carefully consider the environmental, societal and human rights implications of reshoring aspects of your supply chain and take steps to safeguard and protect vulnerable stakeholders who may be consequently negatively impacted along your value chain (England and Austria).

-Critically examine your duty of care to waste and how your waste management service provider deals with waste after it leaves your premises, ask where it physically ends up and consider which methods they use to manage hazardous waste. Actively negotiate with waste management companies to explore potential innovative solutions to exchanging residues between proximally located organisations. Similarly, critically engage with policymakers to discuss regulations with regards to the management of waste and how policy can encourage and facilitate more innovative approaches to regional resource exchanges, potentially through financial incentives for collaboration and keeping resources in circulation locally (England and Austria).

-Commit to working on improving trust with local stakeholders in order to foster greater transparency and open connections between businesses, which may increase the potential for mutually beneficial regional IS exchanges (England and Austria).

-Consider the components of materials used in the early sourcing stages of production and how these materials can be most effectively managed downstream, in order to better facilitate closed loop production systems at the regional level (England and Austria).

-Take part in sustainability initiatives in the regions where you operate, share knowledge locally, openly participate and act as a responsible business by showing commitment and action to improving the environmental performance of the region (England and Austria).

-Implement more long-term thinking in relation to making CE related decisions, while at first CE activities may appear costly, in the long run there are likely to be savings through increased efficiency/durability and reduced production and waste management costs (England and Austria).

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Appendix

Table 8: Survey Data

Company Number	Sector	Size of company	Turnover last year	# of suppliers	Time in Hull	Headquarters	WRR	SRO	UOR	CF
Company 1	Manufacturing	Large > 250 employees	> £50 million	> 1000	> 20 years	Hull	Yes	Yes	Don't know	Yes

Supplier location									
Hull	**Wider Yorkshire / Humber**	**Elsewhere UK**	**Other EU countries**	**Elsewhere in Europe**	**North America**	**South America**	**Asia**	**Africa**	**Oceania**

Customer location									
Hull	**Wider Yorkshire / Humber**	**Elsewhere UK**	**Other EU countries**	**Elsewhere in Europe**	**North America**	**South America**	**Asia**	**Africa**	**Oceania**

Company Number	Sector	Size of company	Turnover last year	# of suppliers	Time in Hull	Headquarters	WRR	SRO	UOR	CF
Company 2	Wholesale and retail trade	Large > 250 employees	> £50 million	500-999	> 20 years	Hull	Yes	No	No	Yes

Supplier location									
Hull	**Wider Yorkshire / Humber**	**Elsewhere UK**	**Other EU countries**	**Elsewhere in Europe**	**North America**	**South America**	**Asia**	**Africa**	**Oceania**

Customer location									
Hull	**Wider Yorkshire / Humber**	**Elsewhere UK**	**Other EU countries**	**Elsewhere in Europe**	**North America**	**South America**	**Asia**	**Africa**	**Oceania**

Company Number	Sector	Size of company	Turnover last year	# of suppliers	Time in Hull	Headquarters	WRR	SRO	UOR	CF
Company 3	Manufacturing	Large > 250 employees	> £50 million	Don't know	> 20 years	Goole, UK	Don't know	Yes	Yes	Yes

Supplier location									
Hull	**Wider Yorkshire / Humber**	**Elsewhere UK**	**Other EU countries**	**Elsewhere in Europe**	**North America**	**South America**	**Asia**	**Africa**	**Oceania**

Customer location									

Hull	Wider Yorkshire / Humber	Elsewhere UK	Other EU countries	Elsewhere in Europe	North America	South America	Asia	Africa	Oceania

Company Number	Sector	Size of company	Turnover last year	# of suppliers	Time in Hull	Headquarters	WRR	SRO	UOR	CF
Company 4	Wholesale and retail trade	Micro 1-9 employees	< £2 million	100-499	> 20 years	Hull	Yes	No	No	It depends

Supplier location									
Hull	Wider Yorkshire / Humber	Elsewhere UK	Other EU countries	Elsewhere in Europe	North America	South America	Asia	Africa	Oceania

Customer location									
Hull	Wider Yorkshire / Humber	Elsewhere UK	Other EU countries	Elsewhere in Europe	North America	South America	Asia	Africa	Oceania

Company Number	Sector	Size of company	Turnover last year	# of suppliers	Time in Hull	Headquarters	WRR	SRO	UOR	CF
Company 5	Port authority	Large > 250 employees	> £50 million	> 1000	> 20 years	London	Yes	No	No	Yes

Supplier location									
Hull	Wider Yorkshire / Humber	Elsewhere UK	Other EU countries	Elsewhere in Europe	North America	South America	Asia	Africa	Oceania

Customer location									
Hull	Wider Yorkshire / Humber	Elsewhere UK	Other EU countries	Elsewhere in Europe	North America	South America	Asia	Africa	Oceania

Company Number	Sector	Size of company	Turnover last year	# of suppliers	Time in Hull	Headquarters	WRR	SRO	UOR	CF
Company 6	Manufacturing	Small 10-49 employees	£2 million - £10 million	50-99	> 20 years	Hull	Yes	Yes	No	Yes

Supplier location									
Hull	Wider Yorkshire / Humber	Elsewhere UK	Other EU countries	Elsewhere in Europe	North America	South America	Asia	Africa	Oceania

Customer location									

Company Number	Sector	Size of company	Turnover last year	# of suppliers	Time in Hull	Headquarters	WRR	SRO	UOR	CF
Company 7	Manufacturing	Large > 250 employees	> £50 million	> 1000	2-5 years	Zamudio, Spain	Yes	Don't know	No	Yes

Supplier location									
Hull	Wider Yorkshire / Humber	Elsewhere UK	Other EU countries	Elsewhere in Europe	North America	South America	Asia	Africa	Oceania

Customer location									
Hull	Wider Yorkshire / Humber	Elsewhere UK	Other EU countries	Elsewhere in Europe	North America	South America	Asia	Africa	Oceania

Company Number	Sector	Size of company	Turnover last year	# of suppliers	Time in Hull	Headquarters	WRR	SRO	UOR	CF
Company 8	Manufacturing	Large > 250 employees	> £50 million	100-499	> 20 years	Hull	Don't know	Don't know	No	Don't know

Supplier location									
Hull	Wider Yorkshire / Humber	Elsewhere UK	Other EU countries	Elsewhere in Europe	North America	South America	Asia	Africa	Oceania

Customer location									
Hull	Wider Yorkshire / Humber	Elsewhere UK	Other EU countries	Elsewhere in Europe	North America	South America	Asia	Africa	Oceania

Company Number	Sector	Size of company	Turnover last year	# of suppliers	Time in Hull	Headquarters	WRR	SRO	UOR	CF
Company 9	Manufacturing	Large > 250 employees	> £50 million	>1000	> 20 years	Velvety, Switzerland	Yes	Don't know	No	Yes

Supplier location									

Hull	Wider Yorkshire / Humber	Elsewhere UK	Other EU countries	Elsewhere in Europe	North America	South America	Asia	Africa	Oceania

Customer location									
Hull	Wider Yorkshire / Humber	Elsewhere UK	Other EU countries	Elsewhere in Europe	North America	South America	Asia	Africa	Oceania

Company Number	Sector	Size of company	Turnover last year	# of suppliers	Time in Hull	Headquarters	WRR	SRO	UOR	CF
Company 10	Manufacturing	Large > 250 employees	£10 million - £50 million	>1000	> 20 years	London, UK	Yes	Don't know	Don't know	No

Supplier location									
Hull	Wider Yorkshire / Humber	Elsewhere UK	Other EU countries	Elsewhere in Europe	North America	South America	Asia	Africa	Oceania

Customer location									
Hull	Wider Yorkshire / Humber	Elsewhere UK	Other EU countries	Elsewhere in Europe	North America	South America	Asia	Africa	Oceania

Key:

CF = Collaborate with firms in the region to improve resource efficiency

UOR = Use other companies' residues within own production system

SRO = Sell residues to other companies in region

WRR = Working to reduce residues

Red = No, not located in this region

Green = Yes, located in this region

Table 9: Interview Questions

Business questions: *(Designed for firms who are located in the wider Hull/Graz region.*

Company Requirements: Operating in the manufacturing sector, Have national/International supply chain partners)

General questions

1. What is your role in the organisation?

2. What do you understand by the 'circular economy' and what does it mean for your firm?

   Place questions – if interviewee has any experience/insight to this

3. How did your organisation decide to locate in Hull?

4. How long has your organisation been located in Hull and how tied is your organisation to Hull?

5. What are the most important factors to your company when choosing where to locate?

   Source questions (inputs here defined as the materials/energy used in production, which might be 'raw' materials, but could be secondary)

6. What factors are considered in selecting sources of inputs?

7. How important are sustainability credentials when choosing a supplier?

8. To what extent does location of supplier matter?

   a. Do you have a policy of prioritising local suppliers where possible?
   b. Do you consider human rights, ethical issues, eg wages and working conditions especially for overseas suppliers/

9. Do you currently include any used/recycled materials as inputs?
   a. Why/not?
10. What challenges do you face when changing to a new supplier?

11. Does anyone at your company have an overview of both inputs and residues?

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12. How do you try to increase efficiency of resource use?

Waste questions

13. What factors affect your decisions when disposing of waste?

14. How do you choose a waste disposal firm?

15. Does the waste contractor have any role in finding uses for wastes?

   a. Do they offer any advice on alternative means of disposal?
   b. Do you have any control over where your wastes are taken?

16. Are there any restrictions in your contract?
   a. Minimum quantity of material to supply?
   b. Specify the composition of waste?
   c. Would you need to renegotiate the contract if you found alternative routes for some materials?

By-products questions

17. Do you currently pass any residues from your production processes to other companies?
   a. How did this connection come about?
   b. Where are the other company/ies located?

Business questions

18. How independent are your decisions of the head office? (if this isn't the head office)

19. How does your firm's previous investment decisions impact on your ability to make future change within your organisation?

20. Does your company own other firms in your value chain?

21. How do you envisage both senior management and employees will engage in circular economy activities within your firm?

CE-strategy questions

22. Do you collaborate with local stakeholders to improve resource efficiency?
    a) If so, how do you do this?

23. What initiatives might enable your firm to collaborate with local stakeholders in terms of resource efficiency?

24. Would you consider sending residues to other firms, if there was no financial incentive to do so?
    a. Would the location of the other firm(s) make a difference to your consideration?

25. Who do you think is responsible for developing inter-firm resource efficiency initiatives in a region/city?

26. How important is the circular economy to your company's strategy going forward?

27. What are the main barriers to implementing circular economy initiatives within your organisation?

28. How do you envisage your organisation will develop its circular economy strategy over the next 5-10 years?

………

Local authority questions: *(Designed for: Hull city council/Humber LEP/Hull and Humber chamber of commerce/ Humber Bondholders. Graz: Green tech cluster, Graz city council, Government of Styria)*

CE and the local authority questions

1. What does the circular economy mean to your organisation and what is the role of the circular economy within the region?

2. How do you promote the circular economy within the region?

3. Do you have any environmental targets/aspirations? (eg to be carbon neutral by 20XX)?

4. Which departments are involved in developing circular economy activities in the region, is there cross-departmental collaboration or is it the responsibility of one department?

5. Have you experienced conflicts of interests between departments when promoting sustainability initiatives in the region?

Local authorities and companies questions

6. How do you attract and retain firms to the region?

7. How do you work with other local authorities to attract firms and other investments to the region?

8. What do you think are the most important factors to firms when choosing where to locate?

9. What incentives can you offer firms to attract them to Hull? How have these incentives been determined?

10. To what extent do sustainability issues play a role in promotion of the region? (e.g., the Energy Estuary/GTC).

     a. Do companies show an interest?

     b. Is there help for new companies moving to the region?

Relational places and local authority questions

11. How do you compete with larger cities when seeking to attract firms to Hull?

12. How do you work with neighbouring local authorities to implement sustainability initiatives across wider regions?

Local sustainability initiatives questions

13. How do you encourage firms to take part in local sustainability initiatives?

14. How do sustainability initiatives compare in terms of importance with other initiatives such as employment and economic growth within the region? (for example, if a new company comes to the region and creates jobs, but isn't aligned with local sustainability initiatives, how do you balance this potential dilemma?)

15. What power and funding do you have over local governance of sustainability initiatives in the region?

Local collaboration questions

16. How do you encourage firms to work towards sustainability targets, what control do you have over getting firms to work towards the regions' sustainability objectives?

     a. How do you engage with firms, or try to influence them, in regards to taking part in sustainability initiatives?

b. Do you think it should be part of the local authority's role to help foster sustainability initiatives in the region?

c. Do you have any statutory requirements to promote sustainable activities amongst firms?

d. Why do you promote sustainability initiatives within the region or why do you not do this?

17. What have you done, or do you think you could do, to help foster circular economy collaborations between stakeholders in your region?

Barriers to CE questions

18. What challenges do you face when promoting the circular economy within the region?

19. What challenges do you face when promoting inter-firm resource efficiency collaborations within your region?

20. How do you envisage the circular economy developing within the region over the next 5-10 years?

Note: Adapt questions: Change 'Hull' to 'Graz' accordingly

Additional specific Graz questions:

1. How did the green tech cluster develop?
2. What is its role in promoting economic development across Styria?
3. What is the GTC's role in promoting sustainability in the region?
4. What are the criteria to be accepted to the green tech cluster?