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## **Towards a territorialisation of the circular economy: The proximity of stakeholders and resources matters**

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### **Abstract**

This article explores the territorialisation of the circular economy (CE) and analyses how the geographical and organised proximities of stakeholders facilitate the mobilisation of local resources for CE projects. It focuses on two local CE initiatives in Quebec (Canada) and France, for which 70 semi-structured interviews were conducted. The results highlight the importance of tangible and intangible territorial resources and demonstrate that geographical and organised proximities are crucial to the success of these initiatives. The relational dynamic between local players, stimulated by a sense of belonging and shared values, encourages commitment to CE. Thus, our study showcases the territorialisation of CE and emphasises the conditions enabling such activities to take root locally. This study has significant political implications and suggests the crucial role that local authorities must play in the deployment of CE projects.

Keywords: circular economy, proximity, territory, stakeholders, resources

## 1. Introduction

The circular economy (CE) is now well established in the research and practitioner landscape (Kirchherr et al., 2018; Hachaichi & Bourdin, 2023). This approach is recognised as a major alternative to an extractive production model, advocating for an economy less dependent on raw materials and energy (Rathore & Sarmah, 2020). It specifically aims to replace a linear production perspective with a more resource-efficient approach, as exemplified by Kirchherr's 9Rs (Refuse, Rethink, Reduce, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle and Recover).

However, CE has gained popularity not only due to its intrinsic ecological orientation. In fact, the Ellen MacArthur Foundation's (2015) definition of CE, which focuses on maintaining the highest utility and value of products, components and materials, has helped boost worldwide interest in CE (Kirchherr et al., 2018). Then, major industrial players and supranational institutions were among the first to recognise the value of CE. They adopted and promoted it as a core strategy, guided by a diverse range of motivations, from the pursuit of economic benefits to the response to pressing ecological challenges. Subsequently, public authorities, such as the European Union (See European Commission's action plan on the CE) (European Commission, 2014) and various states, integrated CE into their agendas as an essential lever for ecological transition and the quest for carbon neutrality. These authorities were keen to point out that for large-scale deployment to be effective, the territorialisation of the CE could be a part of the solution (Bourdin & Torre, 2020; Lukkarinen et al., 2023). This local approach enables initiatives to be adapted to specific contexts, optimising their chances of success and positive impact.

Recent research has shown that CE practices are increasingly being developed at the local level as genuine territorial projects (Bourdin et al., 2021; Niang et al., 2023) to enhance and scale-up the transition at global level to sustainable modes of production and consumption (Chembessi et al., 2021b). In these types of projects, a number of territorial players are mobilised to create local economic systems that aim to minimise waste and maximise the use of resources through recycling, reuse and sharing. If more and more local authorities perceive CE projects as structuring their territories, it is because they present numerous economic (i.e. creation of jobs that cannot be relocated), social (i.e. feeling of belonging to a local community) and environmental (i.e. reduction of the local authority's carbon footprint) advantages. The virtuous nature of such projects relies on the effective use of local resources, as they limit their transport and, therefore, the carbon footprint of production while guaranteeing local employment (Bourdin et al., 2021). However, a critical factor for such projects is the ability of stakeholders to collaborate, underpinned by both geographical closeness and structured relationships (Bolger & Doyon, 2019; Jambou et al., 2022; Jesus & Jugend, 2023; Arfaoui et al., 2023).

With the political and social injunction to transition to CE, more and more projects are being established at the local scale. In the context of these approaches, attention is often focused on tangible resources (e.g. minerals, energy, water, fossil fuels, land, climate and biodiversity), regardless of whether they are anchored or relocatable/transferable, with a view to their rational use (Haupt & Hellweg, 2019; Moraga et al., 2019). This article aimed to deepen the understanding of the mechanisms that drive the mobilisation of territorial resources by different stakeholders in the implementation of CE projects at a local scale. It also examines how geographical and organised proximities between stakeholders influence the mobilisation of the resources needed to implement CE projects. The integrated analysis of the cross-influences of (i) geographical proximity between stakeholders, (ii) geographical proximity of

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stakeholders to local resources and (iii) organised proximity between stakeholders on the mobilisation of resources for CE projects constitutes a research gap that we aim to fill. In light of these issues, this article seeks to answer the following research question: How do geographical and organizational proximities between actors generate and shape mechanisms for mobilizing territorial resources to implement CE projects on a local scale? This question seeks to examine not only the influence of these proximities on existing mechanisms, but also to identify and understand new or specific mechanisms that arise from the interaction between geographical and organizational proximities. By addressing this question, we aim to shed light on the extent to which we are observing a territorialization of the CE (Bourdin et al., 2021). We conduct two local CE experiments in the Kamouraska region (Quebec, Canada) and at the Grand Port Maritime de La Rochelle (France) using 70 semi-structured interviews and an analysis of project documents. We explore this CE territorialisation through the theoretical framework of the economics of proximity (Torre & Rallet, 2005; Torre & Gallaud, 2022), which enables us to analyse the mechanisms and strategies for mobilising territorial resources in the CE context (Beurain & Dermine-Brullot, 2022; Jambou et al., 2022; Lenglet & Peyrache-Gadeau, 2020).

In our study, we define the term ‘local’ in the context of the circular economy (CE) as a specific geographical scale, which mainly includes smaller units such as individual towns or clusters of businesses. This definition is based on the works of Porter (1985) and Wolman & Spitzley (1996). We have chosen this scale because it allows for a detailed examination of CE practices, unlike larger scales such as regional, national, or global. At the local level, we can observe the microeconomic dynamics and the immediate impacts of resource management and political decisions more clearly. This scale reveals the interaction of socio-economic and environmental factors within a limited geographical area. However, it is important to distinguish between the terms ‘local’ and ‘territory.’ While ‘local’ refers to a specific geographical scale, ‘territory’ encompasses a physically demarcated and socially organized space. Sack (1986) and Torre (2023) argue that territory not only has a spatial dimension, but it also integrates human, organizational, cultural, and institutional elements. Territories are not simply physical spaces, but they are shaped by specific organizational structures and are the result of social constructs. They represent the collective effort of a group of actors working towards a common project, with its own rules of governance and cultural heritage. Finally, territorialization refers to the action of anchoring economic activities (in our case, the CE) at the local scale and ensuring that these activities adapt to the specific characteristics and needs of the territory.

This study contributes to existing theory by providing detailed insights into the mechanisms of coordination and resource mobilisation in the CE context. In particular, it helps to understand how proximity (geographical and organised) influences coordination and resource mobilisation, thereby contributing to a better understanding of the key factors facilitating the success of CE projects at the local level. Our study also provides empirical evidence of the importance of a systemic and integrated approach to CE that takes into account not only the technical aspects of circularity but also the social, institutional and territorial aspects. Finally, our research has implications for public policy. By identifying the key success factors for CE projects, the study can inform the development of policies and regulations aimed at supporting CE at the local level, particularly those that promote local collaboration and coordination between players or those that support the mobilisation of resources at the local level.

This article begins with a review of the literature on CE and its link to the territory, followed by a presentation of our methodology based on two case studies in Canada and France. We then present our

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results, discuss them in relation to existing works and conclude the study by suggesting recommendations in terms of public policy and research prospects.

## **2. Literature Review**

In recent years, CE has been the focus of much analysis because it offers an alternative to a linear economic model that is considered too resource-intensive, polluting and contrary to the objectives of reducing inputs and impacts in terms of climate change. Therefore, the question of how to make CE more local is now being raised, whether in terms of reducing waste, minimising the transport of resources or encouraging the introduction of local policies that create businesses and generate local jobs.

### **2.1. The circular economy: concepts, principles and territorial foundations**

CE assumes a decoupling between the economy and the environment, particularly in terms of energy extraction, nonenergy raw materials, pollutant emissions and so on (Kirchherr et al., 2017; Korhonen et al., 2018). Inspired by the way natural ecosystems function, in which nothing is lost and everything is transformed (Stahel, 2019), CE refers to significant changes in the way goods and services are produced and consumed to minimise their negative impacts on the environment (Ghisellini et al., 2016; Haupt & Hellweg, 2019). CE is characterised by the need to recycle and add value to the components of the economic system's products and services, from their design to their production and consumption (Rathore & Sarmah, 2020).

It is important to emphasize that the primary goal of implementing the circular economy (CE) is to minimize environmental impact. However, it may seem contradictory to the fundamental principles of the CE to favor the use of imported resources or transport waste to other countries, as this poses environmental threats (Haupt & Hellweg, 2019). This suggests that the local level would be more environmentally responsible in terms of ecological footprint. However, it is crucial to recognize that the environmental efficiency of the CE is not solely determined by local scale. Some studies in political ecology and industrial ecology indicate that in certain cases, organizing production and consumption patterns on a larger scale may be more preferable for environmental rationality (Hanumante et al., 2019; Gómez-Prado et al., 2022).

Several researchers have recently highlighted the local roots of these CE practices (Bourdin et al., 2021; Bianchi et al., 2023), which take various forms. First, CE projects often involve a plurality of actors or stakeholders acting on different micro-, meso- and macro scales (Stahel, 2016; Bourdin et al., 2021; Tapia et al., 2021), such as local governments, businesses, community organisations and citizens. These stakeholders collaborate and coordinate their efforts to implement CE initiatives adapted to their specific territorial contexts. Therefore, CE projects involve the development of local synergies between various local players and sectors of activity as well as the participation, or at least the acceptance, of local populations in which CE projects are to take place (Veyssi re et al., 2021; Niang et al., 2022).

Second, CE becomes 'territorial' by adapting to the resources, constraints and opportunities specific to each area. This includes using local specific resources and considering the geographical, socioeconomic and environmental characteristics of an area to design appropriate and effective CE projects (Lenglet & Peyrache-Gadeau, 2020). This process also involves a forward-looking approach to the material

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resources and knowledge that can be mobilised to deploy and sustain circularity loops that are innovative, profitable and sustainable (Korhonen et al., 2018; Gonçalves et al., 2021). From this perspective, short circuits and local partnerships enable the better use of resources and lower costs while contributing to the resilience and sustainability of the local economy (Tapia et al., 2021; Wuyts & Marjanovi, 2022).

Third, the territorialisation of CE also implies that local public policies play an important role in promoting and implementing these projects. Local authorities can support CE by implementing regulations, incentives and funding programmes tailored to their territorial contexts (Bolger & Doyon, 2019). Local governments can also play the role of territorial intermediaries (orchestrator, facilitator or mediator) to facilitate interactions between project stakeholders (Bourdin & Nadou, 2020). Moreover, local authorities can make use of aid and programmes set up at the national or supranational level to contribute to the local deployment of CE projects. At the European Union level, this is particularly true of the local variations of the Green Deal (European Commission, 2019), which includes a major section on the promotion and development of CE.

Fourth, the local roots of CE projects help strengthen the resilience and sustainability of the local economy. By encouraging recycling, reuse and waste reduction, CE enables local resources to be used more efficiently and sustainably. It also helps to reduce dependence on imported resources and preserve local natural resources (Lenglet & Peyrache-Gadeau, 2020). Furthermore, CE projects can stimulate the local economy by creating jobs in various sectors, such as repair, recycling and remanufacturing, as well as in the sharing economy (Chembessi et al., 2021a; Niang et al., 2023). These jobs contribute to local economic growth and are often more resistant to automation and relocation, thereby increasing the economic resilience of regions (Bourdin & Torre, 2020). By reducing dependence on imported raw materials and promoting short supply chains, CE can strengthen local economies' resilience in the face of external economic shocks, such as fluctuations in the price of raw materials on world markets (Bauwens et al., 2020).

## **2.2. Mobilising territorial resources for the circular economy**

The transition to CE, when it is part of a local approach, largely refers to the mobilisation and enhancement of different territorial resources (Lenglet & Peyrache-Gadeau, 2020; Torre, 2021), which may either be tangible or intangible (Camagni, 2017; Gumbau-Albert & Maudos, 2022). Tangible resources are material assets that can be used to implement CE projects. They include natural resources, infrastructure, equipment and organic or inorganic waste that can be recycled or reused (Chembessi et al., 2022; Kirchherr et al., 2018). These may also be local natural resources, such as water, soil, minerals or biomass (Niang et al., 2022). Similarly, the recovery of local waste, whether organic or not, is a pillar of CE (Rathore & Sarmah, 2020; Bahers & Durand, 2021). This may also include the infrastructure and equipment needed for waste treatment, the production of renewable energy and the implementation of other CE initiatives.

Intangible resources are nonmaterial assets that can support the implementation of CE. They include know-how, skills, stakeholder networks, culture and values (Gumbau-Albert & Maudos, 2022; Chembessi et al., 2022). These resources are pivotal because they often mirror the cultural identity,

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values and traditions of a local area, influencing how CE projects are conceived and implemented. Some studies have shown that local know-how and skills in resource management, recycling, repair and remanufacturing, among others, are essential for implementing CE (Lenglet & Peyrache-Gadeau, 2020; Chembessi et al., 2021a). Intangible resources also include local networks of citizens, businesses and organisations that can facilitate the implementation of CE by encouraging collaboration, the sharing of information and resources and the coordination of efforts (Christensen, 2021; Niang et al., 2022; Jambou et al., 2022), or at least facilitate its installation and avoid excessive sudden releases. These intangible resources are of great interest because they enable stakeholders to develop territorial innovations and produce essential local expertise conducive to the development of CE (Chembessi et al., 2021a; Veysière et al., 2021).

Recent literature has also shown that these resources all have a second dimension: their transferability or, conversely, their local roots (Chembessi et al., 2022; Kirchherr et al., 2018; Torre, 2021) (Table 1). On one hand, transferable resources are relocatable. In other words, they are free of any local ties and can therefore be reproduced or transferred to another location (Chembessi et al., 2021a). Anchored resources, on the other hand, are inseparable from the territory. This shows that while certain CE solutions may be universally applicable, others are tailor-made to local conditions and specificities.

**Table 1: Local resources of a circular economy**

	<b>Tangibles</b>	<b>Intangibles</b>
<b>Anchored</b>	Earth, climate and biodiversity (e.g. soil fertility specific to a region, unique local ecosystems)	Know-how, culture, heritage and local network (e.g. traditional farming methods, community-driven waste management practices)
<b>Relocatable/ Transferable</b>	Minerals, energy, fossil fuels and water	Knowledge, ideas and inventions (e.g. Patented recycling technology and sustainable design principles)
<b>Potential Limitations/ Challenges</b>	Localised resource depletion (e.g. Overextraction of minerals leading to environmental degradation) or lack of local resources	Potential cultural barriers or resistance (e.g. resistance to new methods due to strong cultural heritage)

Adapted from Torre (2021)

### 2.3. Territory and the circular economy: A proximity approach

The analysis of the CE–territory relationship can be based on the analytical framework of the economics of proximity (Torre & Rallet, 2005). This approach suggests that proximity, whether geographical (spatial proximity) or nongeographical (organised proximity), plays a key role in the dynamics of innovation and cooperation between economic players.

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‘Geographical proximity’ refers to the physical distance and access time between actors and locations (Torre & Rallet, 2005; Torre & Gallaud, 2022). In the context of CE, it can encourage the establishment of local circularity loops (e.g. recycling, reuse and repair), for example, by facilitating the transport of recycled materials or the sharing of equipment and resources (Bourdin & Torre, 2020). Therefore, the distances travelled by resources and players are crucial to the local initiatives developed (Bahers & Durand, 2020; Chembessi et al., 2022). Geographical proximity can encourage the development of projects such as industrial symbiosis, in which waste from one company becomes the resource for another, thereby reducing waste and costs. It can also facilitate the creation of short waste recovery circuits, thus reducing the ecological impact of transport and contributing to the virtuous nature of CE in terms of its environmental impact. Furthermore, geographical proximity can strengthen the territorial roots of CE projects by encouraging the use of tangible local resources and by adapting projects to the specific characteristics and needs of the area (Bourdin et al., 2021). Finally, it can facilitate coordination and communication between local players, thereby stimulating cooperation and innovation in CE projects (Torre & Gallaud, 2022).

Apart from this geographical proximity, in the analysis of the CE–territory relationship, the determining influence of organised proximity should also be considered. In fact, geographical proximity is not sufficient to ensure the coordination between the players in a territory (Torre & Gallaud, 2022) or the development of territorial resources (Jambou et al., 2022); organised proximity is also necessary. ‘Organised proximity’ refers to the intensity of the social, institutional and cultural relationships that link players (Bahers & Durand, 2020; Beaurain & Dermine-Brulot, 2022). It is also the extent to which players share norms, values, institutions or networks (Torre & Rallet, 2005). For example, if businesses, public authorities and citizens share a common vision of sustainability, they are more likely to work together to set up recycling, reuse and repair systems (Jambou et al., 2022). In addition, local networks can facilitate the sharing of information and resources, and local institutions can provide the regulatory framework and incentives needed to promote CE. Organized proximity does not always require physical proximity or territorial connections. It can also manifest between individuals who have never met in person, such as internet developers forming communities of practice based on shared interests (belonging) or members of the same diaspora who share a common background (similarity). Additionally, it can endure between individuals who were acquainted in a particular location but now reside in different places, yet still maintain regular long-distance relationships (Torre & Gallaud, 2022; Torre & Rallet, 2005).

Therefore, in the context of CE, organised proximity can facilitate cooperation and coordination between the various players involved in projects, such as companies, civil society organisations and public institutions. It can also encourage the exchange of knowledge and experience, the establishment of links of trust and the creation of synergies between players (Jambou et al., 2022). In addition, it can help overcome certain obstacles to the implementation of CE projects, such as resistance to change, conflicts of interest or lack of resources (Niang et al., 2020; Bourdin & Nadou, 2020), by facilitating exchange with local stakeholders and the possibility of involving them in joint projects.

Two logics underpin the implementation of the relationship of organised proximity with the territorialisation of CE, illustrating the role of a territory’s intangible resources in its development (Torre & Rallet, 2005; Grimbert et al., 2023). The first rationale, generally referred to as the ‘rationale of

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belonging', refers to individuals' capacity for exchange and networking, as well as for organising their activities (Jambou et al., 2022). Therefore, CE depends on the ability of territorial players to activate their spatial relationships and take advantage of them (Chembessi et al., 2021b; Jambou et al., 2022). The second logic, called the 'logic of similarity', illustrates the importance of mechanisms and rules for resolving different conflicts or problems in local CE experiments, as well as the acceptance and sharing of common rules and objectives by local players (Bourdin & Nadou, 2020; Niang et al., 2020). Indeed, CE implies a relationship between multiple economic activities, stakeholders or resources within a territory. This multiplicity gives rise to a diversity of intentions, representations, production problems or perceptions of territorial issues, which can be sources of conflict, asymmetries and/or relationships of domination between groups of stakeholders. Therefore, the abilities of territorial players to regulate these issues, facilitate interactions between them or make them easier *a priori* due to their ability to discuss and share common objectives make them decisive factors in the implementation of CE (Jambou et al., 2022; Niang et al., 2020)..

### **3. Methodology**

Our methodological approach consists of several main steps: identification and selection of the case studies, data collection, analysis and interpretation of the data. This section presents the two case studies selected for our research, followed by the data collection and analysis strategies.

#### **3.1. Presentation of the two case studies**

This article examines two local CE experiments. The choice of these study sites was motivated by the following factors:

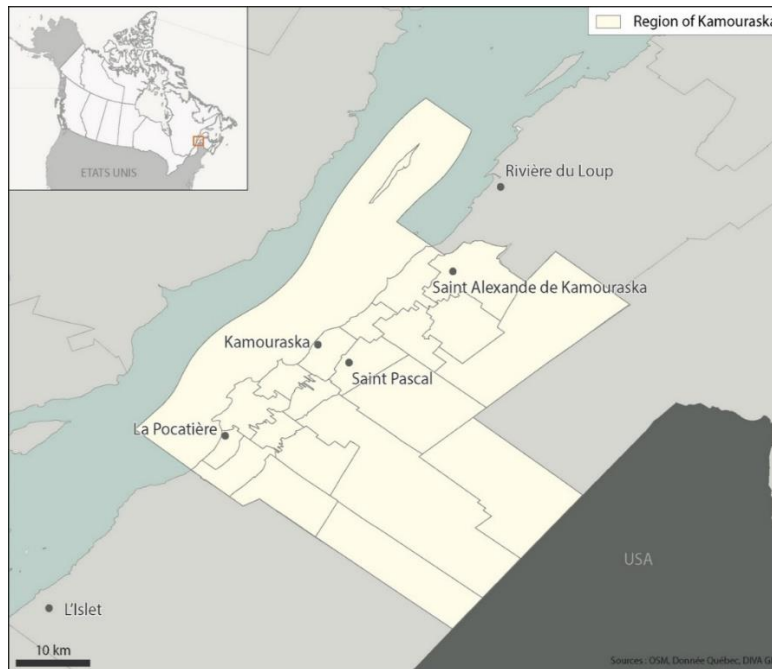
- (i) The circularity initiatives implemented in both cases have already been tried and tested: they all began in the early 2010s, and there is a significant exchange of flows (at least 40 per approach).
- (ii) The projects are not limited to a single activity but involve an exchange of flows and interactions between industries, businesses, institutions, community organisations, research centres and local populations on a local scale.
- (iii) The systems studied have clearly established governance or coordination structures and mechanisms that enable local coordination methods to be analysed.

The first case is located in the Kamouraska region of Quebec (Figure 1).

**Figure 1:** Region of Kamouraska (Quebec)



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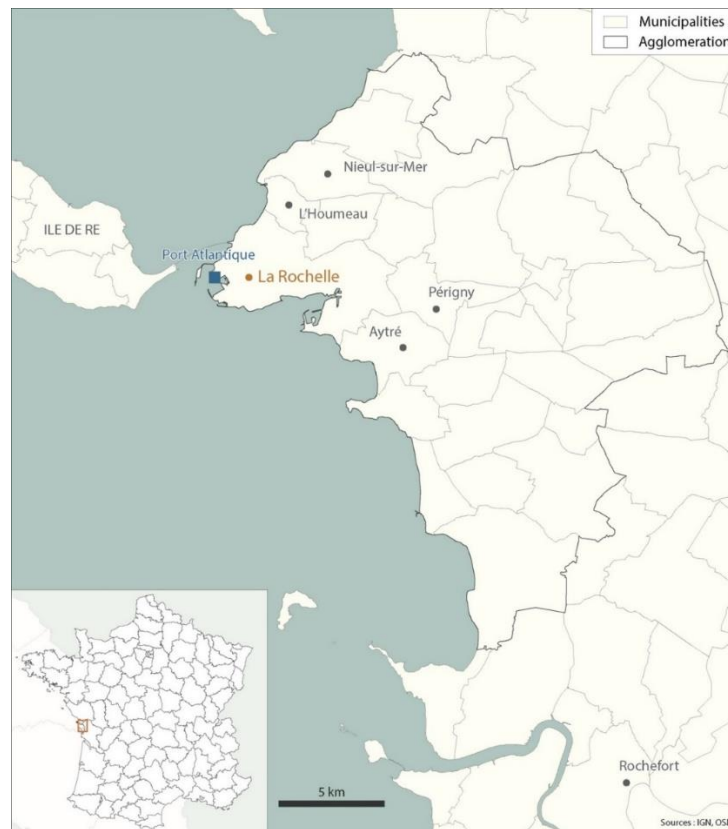


A semi-urban area in eastern Canada, the Kamouraska region has been experimenting with local CE since 2013, with more than 70 businesses from different sectors, including agriculture, forestry, mining, manufacturing, food, retail, services and crafts, among others (**Appendix 1**). These businesses—with the support of other local players—focus their efforts on developing an exchange of resources that can be described as tangible. Between 2016 and 2020<sup>1</sup>, 52 material exchanges (i.e. 337 tonnes) were developed between the stakeholders. The most important materials involved were wood waste, cardboard, ferrous metals, glass, foam, ash, fabrics and food waste. In addition to these exchanges of resources, there are other initiatives implemented locally that touch on different pillars of CE, such as the sharing and leasing of professional equipment, staff pooling, recycling of unavoidable energy and process optimisation.

The second case study is located in the La Rochelle conurbation in France (Figure 2). This case concerns the circularity initiatives developed since 2015 by around 50 companies at Port Atlantique La Rochelle (Figure 2). These companies operate in a variety of sectors, including oil and gas storage, agricultural exports, agri-food processing, forestry exports, paper mills, manufacturing industries, logistics and freight transport, ship repair and construction and fisheries (**Appendix 2**). The circularity initiatives developed by these companies mainly concern the exchange of materials (e.g. wooden pallets, concrete and plaster residues, and rainwater), the shared collection and sorting of waste and the recovery of energy from cereal residues. The companies are also involved in the development and collective supply of renewable energies, the pooling of services and equipment and so on. Other initiatives are also being studied, particularly those focusing on transforming companies' logistics circuits to promote sustainable sourcing and purchasing practices.

<sup>1</sup> Data collection was carried out from March 2018 to May 2020.

**Figure 2** : Location of Port Atlantique La Rochelle



### 3.2. Gathering information

Data collection was based on iterative semi-structured interviews with different categories of stakeholders in the two case studies (**Appendix 3**) and the analysis of various project documents (**Appendix 4**). Overall, we conducted 70 semi-structured interviews with 52 study participants (Table 2). We interviewed some of the study participants several times, either to corroborate certain information or to follow up on the process or on certain initiatives that were under consideration or currently in progress at the time of our first interview.

**Table 2: Study participants**

	Kamouraska		Port Atlantique La Rochelle	
	Number of respondents	Number of interviews	Number of respondents	Number of interviews
<b>Project organisations</b>	5	10	3	5
<b>Partner organisations</b>	4	8	8	8
<b>Local and regional authorities</b>	3	6	5	5

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<b>Companies</b>	14	16	10	12
<b>Total</b>	26	40	26	30

For each category of participants in the study, interview guides (**Appendix 5**) were constructed around different themes. To grasp the modes of coordination that have been set up at the territorial level with regard to CE, along with the relationships of proximity that underpin this coordination, the following themes were addressed during the interviews: (i) the institutional framework of spatial planning, (ii) the forms of proximity between players, (iii) the role of local public policies and beyond, (iv) the local socioeconomic context and (v) the flows of tangible and intangible resources and their degrees of local anchorage. All interviews were transcribed and anonymised in strict compliance with confidentiality agreements with the study participants. The interviews were transcribed, as the data were collected to ensure direct interaction and the possibility of reacting and reproducing information with the partners and the study sites.

The interview data were enriched with a literature review. We assessed documents related to the projects, such as material flow analyses, exchange summaries and stakeholder agreements. Stakeholders' internal documents, such as activity and sustainability reports, were reviewed, and public policy documents, including laws, decrees and briefing notes, were examined. We also considered press articles and publications that highlighted the two projects.

### 3.3. Data analysis

The collected data were analysed comprehensively using the word–concept approach. This method seeks to understand the logic behind individual and collective perceptions related to a phenomenon. It analyses the meanings attributed to each participant and their actions. This helps in discerning stakeholders' perceptions and the factors influencing their actions, for which they may be partial authors (Fürst & Grin, 2018). The approach allows for a deeper comprehension of the phenomenon, helps in contextualising results and aids in comparing and interpreting participants' narratives (Kabongo & Boiral, 2017). Typically, this strategy relies on concept words to convey each main idea, aiding in understanding stakeholder discourse (Bowker & Star, 2000).

Concept words assist in the social construction of a phenomenon's reality (Wetherell, 1998). They emerge from stakeholder discourse and promote knowledge development (Lacity & Janson, 1994). Although they can be derived from theoretical discourse frameworks (Gee, 2014; Wodak & Chilton, 2005), our approach aligned with the latter method. We sourced concept words from the economics of proximity vocabulary to depict and analyse territorial resource utilisation. These terms further synthesised stakeholder discourse.

We chose six conceptual terms from the economics of proximity related to our research goals: 'territory and anchorage', 'distance', 'resources', 'actors', 'public policies' and 'interactions'. Responses from the interviews were manually coded using these terms (**Appendix 6**), with up to three codes per response. This coding helped interpret each respondent's perspective on the issues discussed. The qualitative method allowed for discourse characterisation based on the variables or stakeholder categories. For both case studies, we recorded the frequency of each concept word among the participants (**Table 3**). This

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coding consolidation ensured a coherent and statistically validated alignment between stakeholder discourse and our research aims.

**Table 3: Coding of interviews using concept words**

	<b>Kamouraska</b>	<b>Port Atlantique La Rochelle</b>
<b>Territory and Anchorage</b>	253	314
<b>Distance</b>	48	75
<b>Resources</b>	26	32
<b>Players</b>	301	220
<b>Public policy</b>	15	26
<b>Interactions</b>	341	157

We interpreted the individual interviews by identifying key themes in the stakeholder discourse about local resource mobilisation for circularity practices. These analyses were then grouped into four factors: i) interaction modes, ii) territorial context's influence, iii) public policies and their local variations and iv) resources used for local CE initiatives. For each study area, we crafted a report with elements such as interview analyses, material exchange summaries and promotional media details. We subsequently compared the reports to discern the overall trends and insights pertaining to our research goals. Our findings showcased the core aspects of local resource mobilisation in CE in our two case studies.

#### **4. Results**

Local CE experiments take place within a territory, with its morphological and organisational characteristics (Bianchi et al., 2023; Chembessi et al., 2022; Niang et al., 2022) presenting different opportunities, constraints and challenges for circular approaches. The CE initiatives in the Kamouraska region or at Port Atlantique La Rochelle rely on different categories of tangible and intangible territorial resources. For each category of resources (tangible or intangible) used by stakeholders in the implementation of CE, we can identify the territorial context, modes of interaction and public policies at work (Table 4). Our study is organized in a way that first emphasizes the importance of the resources themselves, as they form the foundation of CE initiatives. We then shift our focus to examining the influence of the territorial context on the mobilization of these resources. This approach allows us to highlight the interconnectedness of the physical, cultural, social, and institutional aspects of territories. Next, we explore the various modes of interaction, analysing how stakeholder relationships and proximity dynamics within territories affect the mobilization of resources and the implementation of CE practices. Lastly, we explore the role of public policies, highlighting how they both shape and are shaped by the intersection of resources, territorial characteristics, and stakeholder interactions.

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**Table 4: Summary of the results**

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	Kamouraska	La Rochelle
<b>Tangible resources</b>		
<b>Tangible resources</b>	- Fabric foams, fabric, wood residues (45%)	- Construction and demolition waste (40%)
	- Perlite dust (8%), steel residues (involving 4 companies)	- Wooden pallets, handling waste (20%), fertilizer residues reuse (8%)
		- Valorisation of rainwater, solar, and submarine base energy
<b>Territorial context</b>	- Proximity to forests, presence of wood industry	- Presence of construction companies, port activities
	- Access via Highway 20 and national roads	- Agricultural area, valorization of renewable energy
<b>Modes of interactions</b>	- Geographical Proximity enabling resource exchange	- Local exchange due to geographic closeness, networking meetings to identify resources
	- Networking to identify valorization of materials	- Collaborations with companies in neighboring areas for material recovery
<b>Public policies</b>	- Integrated management of residual materials, environmental standards	- European, national, local environmental standards, Territorial Climate and Energy Plan, 'Territoire Zéro Carbone' strategy
<b>Intangible resources</b>		
<b>Intangible resources</b>	- Large industrial/manufacturing groups, SMEs in various sectors including service, high technology, agroforestry, and food processing.	- Local CE companies in sectors such as cereals, hydrocarbons, agriculture, agricultural bulk, and freight transport.
	- Internal stakeholders' know-how, skills, and vision of the territory.	- Support in terms of know-how from Internal stakeholders of organizations.
	- Leadership and sense of belonging to the region by key Local actors.	- Leadership and sense of belonging to the port area by key Local actors.
<b>Territorial Context</b>	- Presence of key actors and their proximity relationships, vision of a creative area with good quality of life.	- Diverse Local economic activity and Geographical Proximity of companies in the port area.
	- Influence from innovation and research centres specializing in new manufacturing processes.	- Presence of at least 75 companies in diverse sectors, contributing to potential networking.
	- Proximity to college centers for technology transfer, incubators, start-ups in technological innovation.	- Presence of public/private technical organizations and university institutions influencing the mobilisation of intangible resources.
<b>Modes of interactions</b>	- Geographical proximity fostering collaborations, sustainable development lunch meetings (DDD) for CE appropriation.	- Proximity interactions in the port area, working groups meetings to foster relations and understanding of CE.
	- Social embeddedness of economic and technical relations, previous collaborations instrumental for CE initiatives.	- Shared values for environmental improvement and territorial development, collaborations with external actors sharing ideas and resources.
<b>Public Policies</b>	- National and regional policies for integrated management of residual materials, local authorities' incentives for CE practices.	- Environmental public policies leading to sustainable development charter, French law for energy transition and green growth, public support in funding and technical expertise.
	- Financial programs for local CE network facilitation, organization of recruitment seminars/workshops.	- Public agencies supporting stakeholders with funding and technical expertise, mechanisms for structuring and running networks.

#### **4.1. Leveraging local tangible resources**

Our results reveal that circularity practices consist of making the most of tangible local resources on the one hand and taking local specificities into account based on policy tools on the other. In both case studies, the most important exchanges of materials are based on tangible resources specific to the region. Our analysis of the interviews and project documents highlights the desire of the stakeholders to mobilise resources at the local level, thus favouring relationships based on geographical proximity.

##### **4.1.1. Tangible resources**

In t Kamouraska, 45% of circularity practices come from the exchange of fabric foams, fabric and wood residues (**Appendix 7**). Around 25% of material exchanges (12 out of 52) involve foams and fabric scraps, 20% involve wooden pallets and 8% concern perlite dust<sup>2</sup>. Significant tangible resources in circular practices refer to steel residues, which concern at least four local companies. At Port Atlantique, around 40% of material exchanges concern construction and demolition waste (**Appendix 8**), and 20% are related to the processing of wooden pallets and waste handling. Moreover, 8% of circular exchanges involve the reuse of fertiliser residues. The other main tangible resource is rainwater (10%). The data show the valorisation of a sun and submarine base. Stakeholders take advantage of the high levels of sunshine and annual rainfall in their CE projects.

The quantity of available local resources plays a key role in their possible mobilisation by close stakeholders. In Kamouraska, the use of ash or biomass residues from local businesses by local farmers was abandoned, partly due to a lack of resource volume that was relatively close. At Port Atlantique, the stakeholders highlighted that as part of a circular waste recovery project in La Rochelle, difficulties emerged from the development of a biogas unit due to the insufficient quantity of cereal residues in the neighbourhood. For this project to proceed, biomass would have to be sourced from very far away to obtain the necessary volume.

##### **4.1.2. Territorial context**

In each territory, the circularity practices consist of making the most of tangible local resources and taking advantage of local specificities.

In Kamouraska (57% of the surface area is covered by productive forest land), due to their geographical proximity to forest resources, many local businesses are involved in wood industries. They are mainly specialised in the manufacture of pallets for transporting goods. The region is served by Highway 20 and two national roads that provide access to other regions of Quebec. This local presence of wooden pallet manufacturers, road infrastructure and a certain accessibility of land has led to the installation of several goods transport companies in the territory. Their geographical proximity to companies in the wood sector largely determines the significant exchange of wood, foams and fabric residues in the local CE initiatives. The availability of wooden pallets has led a number of local businesses to implement

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<sup>2</sup> Perlite is a natural resource consisting of volcanic rock that contains water.

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circularity initiatives based on the recovery of wood residual materials. Similarly, the exchange of foams and fabric scraps has been implemented due to the geographical proximity to forests. The foams and fabric scraps essentially come from the industrial processes of local companies manufacturing furniture from local wood.

Port Atlantique is distinguished by the presence of several companies in the field of construction, whose activity ranks fourth in terms of quantities of goods processed in the port sector<sup>3</sup>. Due to this geographical proximity, construction and demolition waste resources are available locally in sufficient quantities. Furthermore, in the port sector, we note the presence of two companies specialising in the storage, processing and distribution of demolition waste, whose geographical proximity has strongly influenced the implementation of reuse and/or recovery practices for construction and demolition residues through the CE project. The valorisation of wooden pallets and handling waste was enabled by the presence of international port transport companies and their geographical proximity with other companies specialising in recycling, recovering and reusing wooden pallets and handling waste also located in the port sector. The valorisation of fertiliser residues is related to the presence of companies specialising in fertiliser production, industrial waste recycling and cleaning and of local farmers who are the final users in the metropolitan region of La Rochelle, a predominantly agricultural territory (65% of its surface area). Hence, the exchange of materials integrates the advantage of geographical proximity.

#### **4.1.3. Modes of interactions**

The mobilisation of tangible resources relies on the links of geographical and organised proximities to the local actors in our two case studies. The exchange of materials would not have been possible if the resources were not available locally due to the potential economic costs of transporting them from other areas.

*‘We exchange our materials with several players who are geographically close to us. We don’t want to send our materials elsewhere. It was going to cost a lot. We look for a solution here’.* (verbatim; Kamouraska)

However, the stakeholders also build strong relationships and jointly develop collective projects based on shared common visions. Obviously, geographical proximity is not enough to mobilise and develop local resources in the CE process. To address the issue of the quantity of local materials, stakeholders sought to identify companies in neighbouring areas to increase the quantities of tangible resources. In Kamouraska, for example, a company located 50 km away was mobilised to produce biogas. In La Rochelle, the recovery of cereal residues and the reuse of certain materials require cooperation with companies in neighbouring areas. These interactions in the mobilisation of tangible resources refer to the logic of organised proximity between stakeholders. We emphasise a logic of the similarity of norms based on the desire of the stakeholders to mobilise resources at the local level and on an individual and collective desire to respond to environmental issues. Regarding the environmental vision, the tangible resources mobilised in our two study cases are part of a shared objective of stakeholders to limit the degradation of environmental quality.

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<sup>3</sup> In 2019, for example, 1,077,878 tonnes of goods were processed by companies in the construction sector.



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*‘We wanted to reduce the extractions in quarries, gravel pits and sand pits. And we thought that we were capable of doing this with the circular economy, of reducing the exploitation of wood and peat, of improving the management of residual materials, of preserving our landscape heritage and our biodiversity’.* (verbatim; Kamouraska)

*‘It was clear to us that we needed to find a solution to improve air quality, limit the artificialisation of the coastline, better manage our waste, organise the transport and storage of hydrocarbons differently and protect the population. We found that with the circular economy, we could do a lot of things that we weren’t doing before and which will have an impact on the environment, particularly among people who live next to the port’.* (verbatim; La Rochelle)

This collective vision that helped mobilise tangible resources must be related to the organised proximity between the actors, their logic of belonging to the same productive space, the same sector of activity or the same professional category. It may also be particularly understood through the relational links between the actors, who are facilitated by geographical proximity and the shared and collective vision of their future and territory. Our interviews reveal that the so-called ‘networking’ meetings in Kamouraska allowed stakeholders to collectively identify the materials to be valorised, specifically the avenues for valorising or exchanging wood residue. At Port Atlantique, the 21 meetings of the nine working groups between February and October 2017 enabled the collective identification of the tangible resources around which the following must be developed: biomass, materials, water, pallets, shared waste collection, energy, alternative transportation and solarisation of buildings.

#### **4.1.4. Public policies**

Our results show that the tangible resources mobilised in the CE initiatives benefit from an institutional framework favourable to transitioning towards CE in the two areas.

In Kamouraska, the national policy and regional plan for the integrated management of residual materials, progressively implemented and enhanced since 1970, define the major restrictions on the elimination of certain residual materials, such as wood, organic matter, paper and cardboard (Chembessi et al., 2021b), which are the tangible resources most valued in the local CE project. In addition, since 2016, the residual materials management plan (2016–2020) has explicitly indicated the implementation of actions related to CE on the valorisation of wood residues, perlite dust and metals, among others. The financial programmes from the provincial government to support CE mainly concern the improvement of recovery practices for certain recyclable materials (wood, metals, paper and cardboard, plastics and glass). Finally, the environmental standards of governments (local, provincial and federal) on the emissions or discharges of contaminants, air quality, wastewater supply, petroleum products and contaminated soils, among others, are also a determining factor for the main tangible resources (types of material residue) mobilised by stakeholders in the implementation of CE.

At Port Atlantique, the mobilisation of tangible resources is a response of local stakeholders, particularly port companies, to European, national or local standards on environmental issues. According to our interviews, the institutional mechanisms on recycling, waste reduction and limitation of greenhouse gas

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emissions, as part of the *Territorial Climate–Energy–Air Plan*<sup>4</sup> and the *Territoire Zéro Carbone strategy*<sup>5</sup>, have played a major role. Thus, the law of 4 July 2008 on port reform, which obligates port companies to integrate the challenges of sustainable development, safety and environmental impact into their daily operations, seems to be a key determinant in the initial reflections about material residue management, which later led to CE initiatives. In addition, the network of 12 waste collection centres and the waste-to-energy plant set up by the city of La Rochelle, along with the experience and know-how they provide, are particularly well used by firms involved in CE operations.

## 4.2. The mobilisation of local intangible resources

Our results show that the mobilisation of local intangible resources (e.g. know-how, past experience, skills and culture) is, above all, rooted in a relational dynamic between local players. Their geographical proximity is an asset to collaborate together. In our case studies, circularity practices are also built around certain key local players and their sense of belonging to the area. Their involvement in the experiments fosters local mobilisation and encourages other local players to become involved.

### 4.2.1. Intangible resources

The intangible resources mobilised mainly involve a network of actors and their know-how, skills and vision of the territory. CE initiatives in Kamouraska mobilise large industrial and manufacturing groups, small- and medium-sized enterprises in the service sector, high technology, transport, agroforestry and food processing. At La Rochelle, local CE companies operate in different sectors, such as cereals, hydrocarbons, agriculture, agricultural bulk and freight transport. Both initiatives are developed with the support of the know-how of individuals working within these organisations. The local transition to CE relies on their motivations, knowledge and skills. The employees of environmental departments and services in certain large companies are actively involved in the dissemination of the principles and modalities of CE and its appropriation by local actors. Therefore, the development of the recovery of material residues mainly relies on the mobilisation of their specific knowledge of these materials.

*‘We knew that there were people who had convictions and who really wanted to move things forward, others who knew what the circular economy was, who could talk about it. We went to find these people so that they could help us bring other worlds on board, to know the things that we need to develop, the materials that would do the job, how to promote certain materials...’* (verbatim; Kamouraska)

Furthermore, the know-how of project organisations in network animation and coordination and their knowledge of local stakeholders play a decisive role in the implementation of CE initiatives.

*‘The Port guarantees good long-term relations between the different companies here. It knew how to bring businesses—even people from the city or the region, everyone who is involved—to this project.’*

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<sup>4</sup> The Territorial Climate–Energy–Air Plan is a comprehensive strategy aimed at addressing climate change and energy issues at the local level, encompassing measures to reduce greenhouse gas emissions, promote energy efficiency and improve air quality within a specific region or territory.

<sup>5</sup> The Territoire Zéro Carbone strategy is a regional initiative focused on achieving carbon neutrality within a specific territory by implementing sustainable practices and reducing greenhouse gas emissions.

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*The Port knew how to mobilise. And if people are there, it's because the Port is capable of doing it*. (verbatim; La Rochelle)

Circular practices are also built through these key local actors' leadership and their sense of belonging to the region. Their commitment has spurred local mobilisation. They foster involvement in local mobilisation and encourage other local players to become involved. Therefore, some stakeholders joined the initiatives because of the involvement of these local actors with a certain reputation in the area. *'When we mention that [a local multinational rolling stock manufacturer] is part of the circular economy, it's reassuring for everyone in terms of credibility*'. (verbatim; Kamouraska)

#### **4.2.2. Territorial context**

Our data show that the intangible resources mobilised in CE initiatives are strongly influenced by the territorial context. The presence of key actors and their proximity relationships in the territories and the vision of a creative area play a determining role in the implementation of CE.

CE enhances existing knowledge and promotes new skills. In both cases, several large companies have environment-related departments and services that play an important role in the development of CE initiatives. The staff are involved in disseminating the methods that make CE possible: *'[At the Atlantic Port of La Rochelle], the large companies that have in-house QSE and QHSE managers have been very important for the project*' (verbatim; La Rochelle). In Kamouraska, the development of a timber industry was based on the knowledge of a company employee: *'Many of the stakeholders thought that they had found everything with timber, but it helped them to find other solutions*'. (verbatim; Kamouraska)

However, the diversity of the local economic activity has also played an important role in the setting and mobilisation of the actors' networks, including their know-how, skills and vision of the territory, in the implementation of CE. The launching of large-scale manufacturing activities, particularly in transport infrastructure and agricultural machinery, agriculture and timber harvesting, has facilitated the design of the circular project. These local actors play an important role in the implementation of CE. In addition, their geographical proximity to innovation and research centres specialising in the implementation of new manufacturing processes—also present locally—have helped the development of circularity practices.

*'Three college centres for technology transfer, an incubator for the development of biological food products, a start-up in technological innovation, the college and the institute all help to create the circular economy. With these people who are here, we could try to develop something in the circular economy*'. (verbatim; Kamouraska)

At La Rochelle, the mobilisation of intangible resources (network of actors, know-how, knowledge, vision of the territory, etc.) is related to the presence in the port area of at least 75 companies operating in different sectors of activity, such as fishing, export of hydrocarbons, wood, cereals, luxury products and nautical activities. This diversity of sectors of activity and the geographical proximity between companies offer the potential for networking, heterogeneity and/or complementarity of actors essential to the development of CE initiatives.

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*'We are lucky to have all of these businesses here. They are very important for the project'*. (verbatim; La Rochelle)

The local presence of public or private technical organisations and university institutions is part of the influence of the territorial context on the mobilisation of intangible resources. These actors contribute to the strengthening of organisational capacities and the acquisition of the necessary expertise to implement CE initiatives. They are involved in disseminating CE in the local network.

#### **4.2.3. Modes of interactions**

The interactions in the mobilisation of intangible resources in the implementation of circular practices in Kamouraska and Port Atlantique are largely related to the geographical and organised proximity between stakeholders.

In terms of geographical proximity, of the 70 stakeholders in Kamouraska, 30 are located in the city of La Pocatière and 25 in the city of Saint Pascal. The two cities are 30 km apart and connected by a highway and two national roads. At La Rochelle, with the exception of local authorities and public organisations that support CE initiatives, all companies are located in the port area. Thus, short-distance interactions encourage local actors to collaborate and mobilise the resources necessary for the implementation of circularity practices through formal or informal meetings.

In terms of organised proximity, interactions around the mobilisation of intangible resources are primarily part of the social embeddedness of the economic and technical relationships between stakeholders. This social embeddedness is also facilitated by the geographical proximity between the actors that allows them to meet. In Kamouraska, the 'sustainable development lunch' meetings greatly contributed to the appropriation of CE by territorial actors, the mobilisation of resources and the implementation of circularity initiatives. They were also used to determine the network densification strategies and the profiles of actors to be mobilised to ensure the sustainability of the initiatives. At Port Atlantique, the meetings of the nine working groups allowed the stakeholders to *'get to know each other, learn about the CE and maintain good relationships'* (verbatim; Kamouraska). These meetings contributed to their involvement in the implementation of circularity initiatives.

The mobilisation of intangible resources is also related to the logic of belonging in organised proximity: The actors belong to the same social networks, most often informal. Assisted by social ties and geographical proximity, they initiate collaborations without clear contractual frameworks around the resources to be mobilised and the initiatives to be implemented. Many circularity initiatives have been developed due to the interactions between the local stakeholders (e.g. economic development agencies, local authorities, research centres, incubators, etc.), which for many have existed well before the start of CE experiments. Previous interactions and collaborations have been decisive in the implementation and transition to CE, nourished by long experiences of collaboration and the relationships established between all local actors.

Nevertheless, these collaborations are guided by shared values, such as collectively improving their environment, making their territory stand out and developing its resources. The interactions in the mobilisation of intangible resources refer to the logic of similarities of values between the actors, aided

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by low metric distances, which help to create and strengthen joint actions between the stakeholders for the implementation of CE. Moreover, our case studies show that the mobilisation of intangible resources does not only rely on the interactions between local actors but also on the interactions between the local actors and those from other regions, sharing their ideas and resources for the implementation of circular initiatives for the use of their know-how. These interactions have helped stakeholders in the development of CE initiatives. *‘All the organisations needed to share the same concepts, the same ideas, then appreciate the potential of the approach, see what it could bring’*. (verbatim; Kamouraska)

#### **4.2.4. Public policies**

Our case studies demonstrate the importance of the involvement of public policies, especially of local authorities, in the mobilisation of intangible resources favourable to the transition to CE.

In Kamouraska, the national policy and the regional plan for the integrated management of residual materials have always singled out businesses and local authorities as the key players in the transition to what are now considered CE practices. Implemented since 1970, they have enabled local actors to develop great experience and know-how in concerted local approaches to recovering and reusing waste materials (Chembessi et al., 2021b). In addition, the residual materials management plan for the Kamouraska region (2016–2020) indicated the priority mobilisation of local industries, businesses and institutions in the implementation of CE. The mobilisation of local actors has also been enhanced by incentives (e.g. public funding, waste disposal tax rebates, technical support and coordination support) from various levels of government to foster the transition to CE in Quebec. For example, financial programmes have enabled the recruitment of a local CE network facilitator and the organisation of specific events, such as business recruitment seminars and/or workshops. Local public organisations and local authorities are also actively involved in the structuring of the network and the development of local circularity practices.

At La Rochelle, the various public policies or regulations on environmental issues led all port stakeholders to adopt a sustainable development charter in 2010. In response to public orientations, the adoption of this charter specifically reinforced a constraint for all companies in the port and encouraged several actors to implement different environmental practices. Furthermore, the French law of 2015 on energy transition and green growth aids in CE implementation. According to the incentive’s measures, at least three public agencies should support stakeholders with funding and technical expertise. Their support complements various financial and intermediation mechanisms (assistance in structuring and running actors’ networks), from which stakeholders in the CE initiatives at the Grand Port Maritime benefit.

## **5. Discussion and Recommendations**

In this study, we analyse the interplay of geographical and organised proximities in local CE initiatives, addressing a gap in the existing literature. We demonstrate that while geographical proximity undeniably aids in material exchanges, it is not the sole determinant of the success of circular local experiments. We show that coordination and interaction among stakeholders, facilitated by logics of shared visions and belonging – grounded in organised proximity – is of the utmost importance. Equally significant is the role of intangible resources, which our study illustrates as being deeply intertwined with the dynamics

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of organised and geographical proximities. We also emphasise the indispensable role of local authorities not just in initiating but also in critically ensuring the long-term viability of CE projects.

### **5.1. Proximities and local resources**

Our results show that the various exchanges of tangible resources aimed at building CE initiatives are closely linked to their geographical proximity, mainly because short distances facilitate the exchange of materials. In particular, the geographical proximity between stakeholders enables them to assess the potential materials available from each party involved in the project. In this way, certain materials are recovered because the companies that have them are close to those that need them or can integrate them into their respective production processes. This result confirms Arfaoui et al.'s (2023) study, which highlighted the importance of geographical proximity in mobilising resources for CE.

Our analysis reveals that although it is a necessary condition, geographical proximity to the resources is not a sufficient condition for such CE approaches to be deployed on a local scale. In addition to the issue of the quantity of resources available, as mentioned in our results, CE approaches also presuppose that stakeholders interact with one another. This is because CE, by definition, is based not only on the principle of exchanging resources (Bourdin et al., 2021) but also on knowledge and know-how (Kirchherr et al., 2017). This dimension refers directly to organised proximity, and also to geographical proximity between local actors.

Regarding organised proximity, we highlight that the ability of stakeholders to coordinate and cooperate (facilitated by common organisational structures, networks of relationships, similarities in practices or ways of thinking of values, etc.) is important in the successful deployment of circular initiatives. Moreover, the synergy between diverse stakeholders, including businesses, local authorities and civil society, underpins the success of CE initiatives. These interactions are often facilitated by pre-existing organisational structures and regional networks that have evolved over time. This is in accordance with some studies that have highlighted the role of interactions between players and their coordination in setting up CE projects (Jambou et al., 2022; Niang et al., 2022). On one hand, this organised proximity responds to a logic of belonging, with participation in local networks for the exchange of materials and knowledge. On the other hand, it follows a logic of similarity with the establishment of local standards and the organisation of meetings by local operators to develop a common perspective and ensure adherence to the principles of CE.

As far as the mobilisation of intangible resources is concerned, we show that it is based on economic or social interactions, coordination mechanisms between stakeholders and the sharing of common values, norms and representations related to ecological issues or arising from public policies. These results confirm the state of the art reported by Veysi ere et al. (2021). Here, again, we find the importance of the two logics of organised proximity in terms of belonging and similarity. Belonging to the same local networks and sharing common values, such as ecology, facilitate the implementation of CE projects. But it is important to notice that geographical proximity also plays a key role here, because the geographical proximity between stakeholders enables them to have joint meetings and to set face to face interactions frequently.

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Furthermore, our case studies reveal at least two possible dynamics in the process of mobilising local resources. First, the mobilisation of local intangible resources (e.g. skills, knowledge and stakeholder networks) contributes to the creation or enhancement of tangible resources, whether or not they are located in the area. Second, the mobilisation of tangible resources also generates local intangible resources (Chembessi et al., 2021a) or requires the mobilisation of similar resources from other areas (Bahers & Durand, 2020). Thus, tangible resources cannot be dissociated from intangible resources. Additionally, our study underlines that the local nature of CE projects cannot be considered a static or closed system. We found that stakeholders can call on resources from beyond their territories or transfer them to other territories to develop local CE projects or support the transition to CE (McCarthy et al., 2018; Valencia et al., 2023).

Finally, we note that the historical context of a region significantly influences its capacity for successful CE implementation. Thus, regions with a legacy of resource efficiency and industrial symbiosis seem to have fertile ground for CE due to established practices and mindsets. From this point of view, the previous collaboration between companies belonging to the same sector facilitated the collaboration and deployment of successful circular initiatives.

## **5.2. The role of public authorities**

We highlight the role played by public authorities not only in the development of CE experiments but also in their sustainability. Their necessary involvement in the implementation of CE projects refers to the concept of ‘territorial intermediation’ (Bourdin & Nadou, 2020) and to the place of governance structures (Polge & Torre, 2018). Thus, the mobilisation of territorial resources is based on the capacity of local authorities to federate the activities and strategies of territorial actors; to bring together different forms of knowledge, practices and skills; and to promote the emergence of local CE projects to accelerate local transition dynamics (Gonçalves et al., 2021). The actions of these organisations consist of developing both tangible and intangible resources, a development facilitated by their detailed knowledge of local issues and stakeholders.

Following the key findings of our study, it is evident that the success of CE projects relies on strengthening them with a territorial dimension. Their success relies heavily on enhanced collaboration among local stakeholders within the concerned territories. Such partnerships are pivotal for resource mobilisation and ensuring project success. Our analysis indicates that while some policies and actions are indeed context-specific, others have the potential for broader application. For example, governance structures facilitating stakeholder engagement and financial incentives for resource optimisation are universally applicable, albeit with necessary adjustments to local conditions. In this momentum, the intervention of public authorities is crucial. Thus, the following policy recommendations are made:

First, the European Union (EU) and the Federal Government of Canada needs to encourage its member states (EU), provinces and territories (Canada) to embrace CE as an effective strategy for achieving carbon neutrality. It must also deepen its commitment to local authorities by funding more CE projects. In this context, the European Structural and Investment Funds and the Canada Community-Building Fund stand out as a privileged financial tool to support local authorities.

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Second, states (EU), provinces and territories (Canada) need to acknowledge the significance of coordination between stakeholders and the predominant role of local authorities in the execution of CE projects. With their deep-rooted knowledge of the local landscape, they should be recognised as key mediators skilled in strengthening the relationships between different stakeholders and fostering beneficial organised proximity for the project stakeholders. In this regard, their status as central players in this transition should be reinforced, with a notable increase in both empowerment and allocated funding. Moreover, states must actively commit to providing tailored tools, drawing inspiration from inter-companies' synergy initiatives in France (Jambou et al., 2022), to assist local authorities in their brokerage role.

Third, local authorities should promote multi-stakeholder CE initiatives and guide project stakeholders in identifying and mobilising available and existing resources. Specifically, they could encourage the use and development of local resources, for example, by providing financial incentives or facilitating access to these resources for companies and organisations involved in CE. The authorities could also include the development of exchange platforms to facilitate the linking of players with surplus resources with those who need them. Furthermore, local or decentralised public policies could encourage cooperation and exchange between local players, such as facilitating the creation of networks of players involved in CE or supporting the sharing of good practices. This could also involve the creation of territorial governance structures to coordinate the efforts of the various players involved. In addition, policies could encourage cooperation between different territories, such as by supporting interterritorial cooperation projects or facilitating the exchange of know-how and resources between territories.

## **6. Conclusion**

Although the literature on CE acknowledges the significance of coordination among actors, there is a lack of comprehensive understanding regarding the mechanisms that drive the mobilization of territorial resources during the local implementation of CE projects. In this article, we argued that geographical and organised proximities influence the existing mechanisms and we showed that new or specific mechanisms emerged from the interaction between the two types of proximities. Our results underline the critical nature of tangible territorial resources in generating and advancing CE practices as well as the indispensable role of strong interactions between local actors. They emphasise that the mobilisation of intangible resources, such as economic expertise and know-how, cultural relationships and local cooperative networks, is also vital to the successful execution of CE strategies. Our results show that the effectiveness of these interactions is amplified by both geographical and organised proximities, which not only facilitate but also enrich collective efforts in favour of CE.

In addition, our analysis of the two case studies reveals that the geographical proximity of actors to tangible resources plays a central role in the launch and development of CE initiatives. This geographical proximity is fundamental because it enables these resources to be used in a way that reduces transport costs and ecological impacts, such as carbon emissions. The local availability of tangible resources has a significant influence on the ability of stakeholders to carry out CE projects. Examples include the efficient use of biomass ash and residues in Kamouraska and the productive use of cereal by-products in La Rochelle. It should be noted that organized proximity plays a role too, because it is at the origin of the mobilization of actors to use and value these tangible resources.



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As far as intangible resources are concerned, our results highlight the importance of organised proximity between local players. The feeling of belonging to a territory, the sharing of common values, the development of collaborative know-how networks and the experience of cooperation have been identified as essential factors in mobilising players to implement CE initiatives. The interactions between the various players strengthen their ability to engage in CE, making it possible to capitalise on existing knowledge (the logic of belonging), to express their support for joint projects and to share values that contribute to the implementation of CE (the logic of similarity). We also show the crucial role of local authorities as intermediary territorial players (who have the capacity to foster geographical and organised proximities) in the deployment of CE projects. Geographical proximity also plays a role here, related to the possibility of the local actors to have face to face meetings and local reunions.

Finally, it should be noted that this study is based on a limited number of territories. Thus, we do not suggest that our results are universally applicable but rather that they are indicative of the interplay between localised factors and specific (or 'place-sensitive') CE strategies. Therefore, we encourage future research to build on this groundwork by exploring a wider range of territories to enrich the discourse on how different territorial characteristics influence the operationalisation and effectiveness of CE practices. Longitudinal studies could also be conducted to understand the evolution of CE projects and how their scale varies according to changes in the mobilisation of local resources.

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