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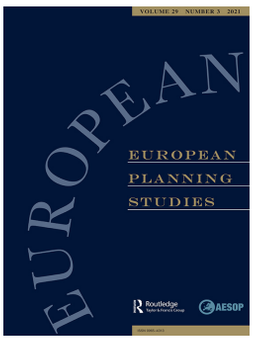

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INTRODUCTION

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Circularities in territories: opportunities & challenges

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ABSTRACT
The circular economy is a new economic model that breaks with the linear model. It is more respectful of the environment and is often presented as an opportunity for sustainable development. From a literature review on this issue, the objective of our article is to focus on the territorial dimension of the circular economy. We present the main issues for future research on territorial innovations, territorial embeddedness, resources and sustainability of circularity.

KEYWORDS
Circular economy; territory; embeddedness; resources; innovation

Introduction

The need to change production and consumption patterns

The dominant economic model is linear. Since the industrial revolution, it has become firmly established in production and consumption patterns. Characterized by the over-exploitation of resources, as well as the massive production of products (goods and services) and waste, it consists of extracting raw materials for the manufacture of products distributed and sold to consumers who use and throw them away as waste at the end of their life cycle. This process requires many resources and primary energy, particularly fossil fuels that emit GHGs (greenhouse gas).

Global economic growth has undeniably enabled the creation and accumulation of wealth to meet people's basic needs for food, shelter, travel or recreation and to raise their general standard of living (OECD, 2018). However, the sustainability of this linear growth economic system is now being strongly questioned (Lieder and Rashid 2016). Indeed, the scarcity of natural and energy resources, as a result of their overexploitation, is leading to an increase in the price of raw materials, creating tensions in a world with a rapidly growing population and an increasingly globalized economy (Preston, 2012; Ellen MacArthur Foundation 2015). Rising commodity prices and increasing climate change disrupt local markets and production systems, affecting socio-economic actors in the territories.

In a context where environmental challenges require consuming less resources and a drastic reduction in polluting emissions, several public action mechanisms have been put in place, particularly by the European Union (EU). In a 2005 statement, the European

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Commission committed member countries to ensure the ecological transition of economies towards a more resource-efficient and less environmentally damaging system (European Commission, 2005). The aim is to decouple economic growth from resource use and reduce negative environmental impacts while ensuring the sustainability and competitiveness of the EU economy. This was reflected in the adoption in 2008 of the energy-climate package followed by the 2030 climate and energy framework. This commits Europe to reduce overall GHG emissions by 40% from the 1990 levels by 2030, increasing the share of renewable energy sources to 32% and improving energy efficiency by at least 32.5% (European Commission, 2014). More recently, the Green Deal for Europe was adopted to accelerate the transition toward a resource-efficient and climate-neutral society by 2050 (European Commission 2019, 2020).

Towards a circular economic transformation

In order to radically change production and consumption patterns, a new economic model has gained popularity: the circular economy. As the circular economy concept is attracting growing interest in the public debate, several political actors and the scientific community have appropriated this notion, in particular, to contribute to its definition and shedding light on its definition modes, conditions and tools of implementation. Today, there is still no internationally recognized academic definition of the circular economy concept (Murray, Skene, and Haynes 2017; Korhonen, Honkasalo, and Seppälä 2018), and many definitions coexist in the literature (Kirchherr, Reike, and Hekkert 2017).

The term circular economy was first used in 1990 by economists David W. Pearce and R. Kerry Turner in their book, *Economics of Natural Resources and the Environment* (Pearce and Turner 1990). Ghisellini, Cialani, and Ulgiati (2016) show that the ideas entangled within the circular economy concept come from several disciplines, such as ecological economics, environmental economics and industrial ecology. The authors identify significant divergences in the theoretical frameworks mobilized in the international literature by the scientific communities, who appropriate the concept differently. The circular economy is sometimes equated with the green economy or the bioeconomy, and often even relegated to the sole issue of waste treatment. Such an abundance of definitions and notions surrounding the circular economy concept leads to some confusion in its understanding, at the risk of a possible decline (Kirchherr et al., 2017). However, they all agree on application principles, highlighting the need for a new virtuous economic model opposed to the linear economic system. The circular economy promotes a more sustainable and environmentally responsible model of economic development, which aims to reconcile economic growth with environmental protection. This economy aims to change the practices of the linear system (to extract, produce, consume and then throw away before extracting again).

Integrating the territorial dimension of circular economy

In the context of socio-ecological and energy transition, many countries present public policies promoting the circular economy as levers for change and evolution of practices and technical, economic and organizational models. There is a strong challenge in

producing new coordination and new modes of national and international governance (Kern, Sharp, and Hachmann 2020). But states are also launching national circular economy plans that are implemented at the local level. The changes brought about by the implementation of the circular economy can be significant: changes in production models, the end of external dependence on resources (territorial autonomy) and the optimization of the territory's resources.

The local nature of the actions implemented is distinguished by a multiplicity of territories and deployment spaces, which are often unequal according to the strategies of the actors and their scale of intervention (Torre and Dermine-Brullot 2019). These actions take place in rural (Salvia, Andreopoulou, and Quaranta 2018) or urban areas (Sanchez Levoso et al. 2020), within a company or an industrial zone, at the level of administrative territories, or even nationally (Ghisellini, Cialani, and Ulgiati 2016). This question of the territorial and spatial inscription of circular activities or actions is newly posed in the literature as a major issue for considering a new mode of territorial development and wellbeing (Cesaretti, Misso, and Shakir 2017) around the circular economy.

The necessary territorialization of the circular economy thus refers to the reasoned use of territorial resources and the control of the circulation of flows (Cerceau, Mat, and G. Junqua 2018; Bourdin and Torre 2020). It concerns the extent of the geographical limits beyond which any circular economy practice is compromised by the appearance of negative environmental externalities, due in particular to the transport of products, resources or waste. It also concerns the capacity of actors to coordinate within a territory to implement the circular economy. This raises the question of the organization and coordination of actors, which plays a decisive role in the territoriality of the exchange links at work, whether they are technical, social or economic.

Contents of special issue

The widely debated issue of locally rooted activities (territorialization) is gaining renewed interest because of the development of initiatives aimed at creating new links between the actors of a territory for transition(s). These links may be between waste and by-products producers and those who use it as a resource (circular economy, territorial ecology), between actors that value biomass or environmental innovations (circular bioeconomy, eco-industrial networks) or links between production and consumption activities (local-based forestry chains, agrifood systems). These public and private initiatives highlight their potential economic, social and environmental virtues and sustainability, and their ability to strengthen geographical proximity and its potential outputs. Whether they are food, non-food chain or circular economy approaches, their purpose is to build circulations and circularities in the territories to promote the relocation of economic activities or even achieve territorial autonomy in certain areas. They also have two points in common: that of linking stakeholders and activities that were not necessarily previously linked and that of using the circulation of material and immaterial flows and natural resources (food, wood, biomass, energy) as a vector for structuring these new coordinations. Therefore, we can wonder how these initiatives reconfigure—or not—the mechanisms and dynamics of production, innovation, local anchoring, inter-territoriality and spatial distribution of activities. The aim of this special issue is to question the

relationship between circularity and territory and provide an overview of the links between territories and circular economy through literature reviews and case studies.

The first contribution to the special issue (Veyssière, Laperche & Blanquart) offers a review of the literature on the link between the circular economy (CE) and territorial development. Based on the observation that the circular economy is more often studied at the firm level than at the territorial level, the authors propose a systematic literature review that provides an overview of the links between the circular economy and the territorial development process (TDP). The authors consider the latter as the product of the interaction between three dimensions: coordination modalities between the stakeholders, institutional factors and the resources. They study how the TDP is addressed by the literature on circular economy—especially in the fields of industrial ecology and industrial symbiosis—by analysing how these three dimensions are taken into account. They show that those dimensions are well represented in the literature and that the quality of coordination, the nature of governance and resources could differentiate several TDPs. An important criterion of differentiation could be how CE is implemented. The authors identify a recurring debate about whether CE implementation should be planned or be the product of self-organised and business-driven dynamics. However, the effective implementation of CE in territories seems most often based on an intermediary model. The authors also highlight a strong focus of the literature on coordination and institutional factors. Resource creation as a step of territorial development remains unclear and rarely studied, namely because of a persistent vagueness about what a resource is.

The next section, comprising three contributions, focuses on the question of the modes of coordination of actors in order to build circularities.

The article of Iceri and Lardon proposes to use circularities to make the contours and dynamics of territorial initiatives more intelligible. They consider that it is important for researchers from different disciplines to find ways to capture the dynamics, meaning capture the interactions, the internal movements in a territory, regardless of the stimulus (endogenic, exogenic, physical, immaterial, cognitive, etc.). But there is also an operational stake, that of enabling local actors to analyse their action and its effects on the territory. To do this, they analyse two collective initiatives of local food systems in France and Brazil. They use complexity theory and different methods to define the components of a collective action and the interrelationships between these components, as well as the circularities (seven are distinguished) within the initiative and between it and its environment. Based on the notion of circularities and extending it well beyond the material dimension, this work proposes an original methodology for analysing the trajectory of an initiative in a territory and its contribution to the dynamics of territorial development.

The article by Lenglet and Peyrache-Gadeau also deals with the analysis of structuring localized collective dynamics, this time in the wood sector. They present an analysis of forest resource valuation systems, with valuation defined as 'the combination of two inseparable processes of evaluation (judgement, legitimation) and valorization (production of added value)'. Like other articles in this issue, they propose a broader vision of circularity (beyond the material dimension) by offering an analysis of the circular valuation modes applied to the case of local timber labels. They show that these labels are the result of interrelationships between linear valuation logics specific to the sector but

also of circularities resulting from the actors' quest for the development of a closed-loop economy and the desire to promote a valuation of the wood resource that is beneficial to the territory. In this case, circularities appear as a component of a collective dynamic for the construction of a new relationship between territories and local actors with their forest resource and its value.

Niang, Torre and Bourdin aim to characterize the coordination of actors and governance at work in a local, circular economy project. Based on a social network analysis approach applied to territorial innovation systems and governance, they analyse the cooperation and synergies in the project, in particular through the quantity and type of links between actors and their evolution over time. These links can be both material and immaterial, reflecting the authors' consideration of this double dimension of CE. Specifically, the results show a different configuration of the networks of material and immaterial flows. The authors highlight the key role of intermediary actors. They occupy a central place in the network and link groups of actors. The authors do not conclude that these are ideal network configurations for the development of the circular economy, but that they are the result of the interplay of actors and the local territorial configuration. Even if the existence of certain intermediary actors seems important, there cannot be a one-size-fits-all network structure and mode of governance to build the circular economy.

The next two papers seek to analyse the nature and forms of resource mobilization at a meso-economic level to implement circularities.

Still using the topic of the implementation of the circular economy, Gonçalves, Galliano and Triboulet examine the resources necessary for the structuring of circularities and the means by which the project leaders obtain them. They thus shed light on the meso-economic dynamics of circularity construction. By mobilizing the literature on the economics of (eco-)innovation specifically, they analyse cases of collective methanisation in rural areas. They show that, although located in rural areas, these projects and their promoters manage to find a number of necessary resources in their local environment, in particular by strongly mobilizing their personal networks and by federating various types of actors who were not linked before the project. The intangible resources may be more distant, but the project leaders manage to access them, thanks notably to the key role of institutional actors, especially public ones. If the cooperation between the different types of actors can be improved, these collective projects and the circularities they promote are strongly anchored in their territories and seem to draw new green innovation patterns.

Gallego-Bono and Tapia-Baranda also show how the circular economy brings new dynamics of innovation based on new cooperation and the enhancement of local resources. They use the example of the sugarcane industry, which they analyse by mobilizing the economics of innovation and the literature on industrial ecology. They show that the linear logic of valuing agricultural resources in Latin America leads to the fragmentation of the networks of actors. The development of local clusters around industrial ecology appears to be a possible vector for the construction of collective actions through 'transformative territorial coalitions'. Following the example of other authors on this issue, they insist on the role proximity plays in building these clusters, stressing here the key role of geographical proximity but also the sharing of common values and objectives (ethical proximity). Comparing a classic sugarcane development network and a transformative network based on the principles of territorial industrial ecology, they show how the

latter, by relying on actors with knowledge that had been marginalized until then, was able to create a collective innovation dynamic that was not only technical but also social (a form of innovation that is traditionally rarely dealt with in the industrial ecology literature). It is not, however, an inward-looking network, as the authors show the importance of links with more distant actors who share the vision of the cluster actors.

The last two articles also address the issue of resources but from the perspective of the effects of the circular economy and the associated socio-economic system on them, and on agriculture specifically.

Marty et al. show how the development of the bioeconomy, and the choices in terms of biomass valorization that it engenders, strongly influence the 'socio-economic metabolism' of a territory. More specifically, they study the effects of the development of methanisation on the production and allocation of biomass of agricultural origin (BAO) and on the entire territorial agricultural system. Based on a metabolic approach belonging to the bioeconomics (funds and flows approach), they point out the sustainability issues raised by the increasing allocation of BAO to anaerobic digestion and the development of crops dedicated to this use. They show both the individual effects (on the choices made by farmers) and the collective effects on the agricultural system and the maintenance of a diversity of local agricultural activities. They thus raise the crucial issue of potential competition over the use of a resource, while considering that this is not inevitable and that a virtuous and concerted scenario for creating BOA circularities between the different types of local agricultural actors is desirable in order to build a truly sustainable territorial bioeconomy.

Last, Halime Güher Tan's article proposes to analyse the circularities linked to socio-economic systems, such as food markets, and the effects of these circularities on agricultural and food resources. To do so, the author compares a market where direct sales prevail and a market with a wholesaler. Again, circularities are addressed in their material and immaterial dimensions. Indeed, using an original combination of methods, the author models direct exchanges and inter-knowledge between producers and consumers. He then proposes to use a specific method to analyse the development potential of the circular economy through farmers' markets. To do so, he mobilizes the ReSOLVE method, which proposes an action plan in six key points for the transition to the circular economy. The main conclusion of this work is that the direct link between producers and consumers favours the development of more circular systems and the valorization of more local agricultural resources.

Looking at future research questions

The diversity of the articles in this special issue in terms of objectives, analytical frameworks, methodologies and contributions shows the richness and complexity of the questions on the links between circularities and territories. The elements that they provide, but also what they do not address, reveal several avenues for future work on this topic.

Territorial anchorage, resources and sustainability of circularity

Future research could seek to understand, either through new methods or through specific theoretical approaches, how resources are mobilized and to what extent

actors take local dimensions into account. From this point of view, it would be relevant to better understand how actors implementing the circular economy seek greater autonomy. They could also seek to investigate which factors can explain the mobilization of territorial and extra-territorial resources. The articles in this issue also show that there is still important work to be done regarding the new resources that may result from the building of circularities. If it seems obvious that circular economy produces new or different coordination patterns, the material and immaterial outputs of these coordinations and their effects on territories at different scales remain widely unknown.

Circular economy (like bioeconomy) also raises the question of what a resource is and how it is valued. Research on territorial development and innovation has long shown that a resource is not a purely material element. Research on circular economy reinforces this statement and the need to take into account the wide diversity of resources. However, it also raises the question of how to consider and integrate the different perceptions of a resource and its value that may coexist in a network or in a territory, and that must be taken into account to build sustainable circular systems.

The sustainability of the systems may also be questioned, as the extent of the networks of actors may contribute to the distancing of flows and exchanges, thus reducing their sustainability: this is what we could call the negative externalities of distance. Forgetting the dynamics of geographical proximity in circular economy approaches, especially when it comes to recycling and reuse, would mean ignoring the environmental dimension of the circular economy. However, this dimension is central to the definition because it is the very thing that thwarts the linear economy on which a large part of human activity is based. Therefore, the analysis of the role of geographical proximity in the exchange of flows is promising. In this context, it seems necessary to develop new methods to delimit the territories of action, allowing the exchange of flows to be optimized in the smallest possible area.

Circularities, perimeters and scales

Beyond the analysis of the scale of spatial deployment of the circular economy and its territorial anchoring, it seems important to look at the convergence between relevant territories (scale of actors) and territories of public policies (institutional perimeter or scale). There is rarely an overlap between the scales of economic actors and institutional territories. However, the latter are often promoters and funders of the former. They can play the role of an intermediary actor (Bourdin and Nadou 2020). Future studies are therefore necessary to better understand how circular economy actors deal with different perimeters and scales.

Circularities, innovation and territories

The case studies in this issue show that the transition from a linear to a circular system relies on different types of environmental innovations, defined as such because of the environmental benefits they produce. These environmental benefits are based on technological, but also organizational, institutional and social innovations. This non-technological dimension of eco-innovation is often central to circular economy processes and

would require further analysis related to the identification of the brakes and levers to circularity, notably the new modes of coordination of actors and activities in territories. Inter-organizational relationships are often central in the implementation of the process of transition towards sustainability, and circular innovative projects are rich sources of insight into how co-located actors with different but related activities collaborate towards eco-innovation. This very specific dimension of circularity, whose first goal is to bring together previously unrelated actors, brings to the forefront the question of place-based factors (beyond resources) and localized trajectories of innovation, which would require more in-depth analysis.

Circular economy and regional or local policies

In terms of public policies, the challenge identified in the articles is to succeed in designing a mode of economic transformation around a systemic and integrated approach. This implies the implementation of public policies taking into account the diversity and the necessary territorialization of these activities. From this perspective, the territorial practices of circularity and circulation of flows should be encouraged, in a logical rebalancing of territories, through an equitable distribution of circular activities and jobs.

Following the industrial and territorial ecology approach, public policies must participate in the support and coordination of the actors in the transition. In the public policies of various countries, industrial and territorial ecology is now understood as a lever for change and evolution of practices and technical and organizational models, integrating both issues of coordination of actors and positive externalities on the territory.

In this context, studies on governance are needed. These should focus on structuring productive and social interactions of new forms of organization and coordination of actors to generate circularity. The reproducibility and generalization of the system of governance studied must be envisaged from the perspective of taking into account local specificities, differentiating one territory from another. The success and sustainability of territorial circularity initiatives cannot be separated from local realities, as each project is specific to its territory and its actors.

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