

ISSN: 0046-9017 (PRINT)
ISSN: 2456-6519 (ONLINE)

IJRS

INDIAN JOURNAL OF
REGIONAL SCIENCE

VOLUME: LIII
NUMBER: 1
JUNE 2021

50 years of Publication



www.rsai.org.in

VOLUME: LIII
NO. 1

INDIAN JOURNAL OF REGIONAL SCIENCE

JUNE 2021

THE CIRCULAR ECONOMY, SOLUTION FOR A SUSTAINABLE TERRITORIAL DEVELOPMENT

André Torre* and Sabrina Dermine-Brulot**

Circular economy aims to break with linearity through a new organization of industrial society and its flows, based on circularity. In this approach the environmental question becomes an opportunity for economic development rather than a constraint. This notion tends to replace the concept of sustainable development but has a similar objective. This study finds that the territory can be considered as a relevant scale to consider the circularity of the economy, due to the geographical proximity of the actors involved, the local environmental problems to be solved, and the economic and social benefits to be expected. However, some strategies will contribute to the sustainable development of the territories, while others, such as recycling, can cause, locally, interesting environmental, economic or social benefits, while creating negative rebounds in other jurisdictions. This study sketches a convergence between CE approaches and territorial analyses: while CE gradually takes on the spatial, then territorial question, parallel territorial analyses are increasingly interested in circular dimensions. This raises the question of the potential for territorial innovation to shift towards strong sustainability.

INTRODUCTION

Let's start with an observation that all scientists agree on today: natural resources are depleting, the climate is changing and warming, pollution caused by human activities accumulates and harms natural ecosystems as well as the services they can provide. At the same time, social and economic inequalities between or within territories are growing, while concerns about the well-being of present and future populations are gradually emerging all Regions and States, even the most prosperous (MEA, 2005; CPI, 2019)

The effects of these global and complex changes are spreading, often because of the economic and political choices made over several decades to combat them. A paradox? No, because economic growth, globalization and technological innovation, which are the main ingredients of the administered policies, are also at the origin of the current situation and continue to feed it, in particular, through linear production processes. The search for growth leads to an increase in the number and quantity of goods produced and is based on a growing incentive to consume them. This strategy has considerably changed the habits of the populations worldwide, towards the purchase of disposable goods with a limited lifespan that are thrown away when their function is no longer fulfilled. Thus, productive systems are increasingly generating waste and polluting substances, especially as the linear organization of the industrial system leads to the ever-increasing taking of natural and energy resources, incompatible with the physical limits of the biosphere.

Different scientific streams of research that have emerged over the past 50 years have raised questions about the questions of reconciling economic growth and development, preservation of the

*Professor, French National Institute for Agriculture, Food and Environment (INRAE), France INRA, AgroParis-tech, Université Paris-Saclay. E-mail: torre@agroparistech.fr

**University of Technology of Troyes, France, ICD-CREIDD. E-mail: sabrina.brulot@utt.fr

environment and social well-being. They include environmental economics (CROPPER and OATES, 1992), political ecology (PAULSON et al., 2003), ecological economics (VAN DEN BERGH, 2001), industrial ecology (FROSCHE and GALLOPOULOS, 1989) and circular economy (BOULDING, 1966). These approaches, often competing on the borders of the scientific and socio-political worlds, influence many international, national and local public policies, and aim to translate the major challenges of the sustainable development of society locally, in a concrete and operational way. But their territorial or spatial anchoring asks questions. While all agree on the recognition of the complexity of the problem and on the need to adopt a systemic vision, the translation into local actions is not obvious. Words and fashions follow one another. After a long concern about sustainable development (BRUNDTLAND, 1987), the notions of ecological and social transition of the economy or circular economy are often used now (MACARTHUR, 2015). They both rely on technological innovation, whereas sustainable development has failed in public policy due to its lack of precision and operational rationality. It is sometimes associated now with the trend of decline or becoming an overused term, from politics to industrial managers.

Circular economy (or green growth), defined by scientists in the 1960s based on the physical and economic limits of material flows through the industrial system, appears as a response to this dominant linear model (BOULDING, 1966). As its name suggests, it aims to break with linearity through a new organization of industrial society and its flows, based on circularity. In this approach the environmental question becomes an opportunity for economic development rather than a constraint. This notion tends to replace the concept of sustainable development but has a similar objective. Through policies carried out from the local to the national areas, it is a question of striving towards a more sustainable society, physically (what the biosphere can bear in view of its physical capacities and limits) and morally (how far we are prepared to go in order to meet our needs).

Yet circular economy (CE) strategies are ambiguous. Advocating operational methods of breaking up linear processes, they are based in fact and above all on technological innovations, without questioning the dominant economic model based on the economic and production globalization, and mass consumption. Moreover, the spatial and territorial dimension remains in question, while circularity must be operationalized in the territories. Recycling strategies, for example, implementing energy flows, require a certain geographical proximity between the producer and the consumer, for obvious technical reasons. But in the other cases, the principle of locality is rarely sought, which can be a problem from an environmental point of view. The long distance flows, in response to market logic, generate significant greenhouse gas emissions. Moreover, the relocation of recycling in the places less costly to install treatment units makes the impacts of these processes invisible to producers, and therefore ultimately acceptable through ignorance or blindness. In this raising tension-to achieve the overall objectives of sustainability of the industrial society without slowing down its growth-what is the place of the territorial variable? Is the economic development grounded at the territorial and not at the global level an emerging solution? Can circularity contribute or oppose this territorialisation of the economy?

The aim of this article is to discuss the territorial dimension of the CE and its sustainability, through three sections. First of all, we present the notion of territorial development and ask questions about its poor consideration of the environmental dimensions, and by extension, of its possibly weak sustainable character. Secondly, we present the circular economy approaches and show how they are more and more interested in local dimensions. Noting the similarities and the nascent hybridization of the two analytical streams, we question the validity of a circular approach at the level of the territories, and especially its virtuous character. We eventually ask the question of the conditions for a sustainable territorial development.

TERRITORIAL DEVELOPMENT: SUSTAINABILITY AT STAKE

Pioneers of Territorial Development: The Productive Dimension

The benchmarks for an analysis of territorial development were set in the 1980s, with researches focusing on local dimensions, production processes, and then on innovation and technology. This is particularly true of local productive systems analyses. In a first phase appeared the approach of industrial districts (BRUSCO, 1982), local groupings of people and competitive firms on the world market despite their (very) small size, inspired by MARSHALL's analysis (1919).

This approach has rapidly expanded to other types of localized groups of producer, involving R and D laboratories and firms of different sizes, not always belonging to the same sector (MARKUSEN, 1996). The approaches of local milieus and productive systems have thus placed the emphasis on a more generic model, focused on formal relations and exchanges, in which the production of knowledge is essential for territorial development (MAILLAT, 1995). The enterprises, linked by cooperative relations, share complementary activities within a specialised group, often marked by a strong technological dimension.

Finally, PORTER (1985, 2003) imposed the canonical terms and concepts of clusters, regrouping of firms and laboratories working in related industries, in geographical proximity, and whose technological and knowledge interactions increase performance, competitiveness and the level of innovation. This approach quickly went beyond the origin field of management to extend to systems less focused on high-tech activities or lower performance (GIULIANI AND BELL, 2005), and then became a tool for local or national development policies (OECD, 2001). Then flourished the approaches in terms of technopoles, competitiveness poles, science parks, business clusters, etc.

The idea then arised that development is linked to innovation or creation processes, which generate transformations of production systems and lead to the spatial concentration of people and wealth. Endogenous innovations, R and D expenditures or incentives to innovate play an important role in the implementation and success of growth dynamics, the transfer and dissemination of innovations at local level (FELDMAN, 1994; AUTANT-BERNARD et al., 2007), face-to-face relationships and spin-off phases or support for creative effort. Localized spillovers of innovation or knowledge, which spread within the local system, are seen as the drivers of development.

Governance and Involvement of Local People

More recently, appears the will to take into account all the actors—or stakeholders—of the territories, with the idea that growth alone cannot suffice and that a development process is being piloted and negotiated, with the need to involve local population in decision-making processes. (LOUGHLIN et al., 2010) Researches on territorial governance reveal how collaborative and conflicting behaviors of local populations and residential mobilities shape territorial development processes (TORRE and TRAVERSAC, 2011). The will to go beyond the productive dimensions alone, and to take into account the opinions of the local populations is important.

Putting the mosaic of stakeholders in the territories and subsequent land-use issues at the forefront calls for a broadening of research themes, beyond just production and innovation relations. It is nevertheless important, in the case of territorial development, to analyze the ways in which people participate in decision-making concerning development projects and their implementation, as well as the opposition they may arouse, to take into account and study the two drivers of territorial development: production relations but also governance processes.

It appears that territorial development is not only about increasing, improving or diversifying production; it also covers other dimensions, such as mental and social changes in populations or changes in institutional structures (PERROUX, 1964). In order to decide and to control their future,

the territories have an interest in taking control of their destiny and initiating their own development projects, which cannot be conceived independently of the processes of public government and governance. Hence a clear interest in territorial governance issues.

“Good governance”, advocated by the World Bank or the IMF, with its recipes supposed to guarantee countries or regions competitiveness, is very prescriptive. But the term also applies, in a totally different way, to the coordination of actors, social groups and institutions with a view to achieving common objectives and participating in decisions, breaking with the pyramidal or hierarchical approach of government in favor of more flexible forms, supposed to be closer to men and organizations. Networks of economic and social actors are thus considered, with their willingness and capacity for expertise and innovation (KOOIMAN, 2000), the integration of public-private partnerships in the definition of development objectives (WETTENHAL, 2003), the participation of various organizations (associations, companies, NGOs, etc.) in the drafting of laws, rules and regulations (PIERRE, 2000), or the mechanisms facilitating the involvement of ever more informed and organized stakeholders in decision-making processes.

Definition of Territorial Development

If the notion of territorial development then slowly emerged, it is because the concept of territory has gradually found its place, not without resistance sometimes. Beyond its multi-semantic character, it is adopted primarily today because it refers, rather than to defined boundaries, to organized relationships, groups or populations (SACK, 1986). Collective productions, resulting from the actions of a human group, with its citizens, its governance structures and its organization, territories are not only geographical entities. In permanent construction, they are elaborated by oppositions and compromises between local and external actors. They are rooted in long term path dependency, with a history and local concerns rooted in cultures and habits, the perception of a sense of belonging, as well as specific forms of political authorities, as well as organizational and operational rules.

The term territorial development is rather recent. The authors have long preferred those of regional or local development, or even of development from below (STOHR and TAYLOR, 1981), all based on a productive approach, as illustrated by the emblematic case of localized production systems or clusters. Territorial development, which focuses on rather small geographical areas, has been imposed by successive enrichments (TORRE, 2019). It defines the improvement of the wealth and well-being of populations located in a territory, and is based on innovations (technical, organizational, social and institutional) in production and land use, and on competition and cooperation between actors, given the initiatives and oppositions of the local populations.

- (1) Territorial development processes cannot be reduced to the sole behavior of productive actors and institutions in charge of development policies, but they involve other territorial stakeholders: local or territorial authorities, decentralized State services, consular bodies like chambers of commerce, local governance arrangements and devices, and associations like NGOs;
- (2) Cooperation and social construction processes should be integrated into the analysis of development processes. Far from being anecdotal, new social and institutional practices are at the heart of territorial innovation processes, not to mention the willingness of networks of local actors to steer their own development model, whether they are collective actions or manifest opposition to the will of States or large corporations;
- (3) The contemporary issues of scarcity and competition on land, soil wear and land grabbing of States in search of fertile land puts the question of space at the heart of development processes and projects. The introduction of land use issues and the choice of land management methods thus helps to reconcile the land use approaches with those of regional science.

Thus, in addition to the traditional notion of territorial competitiveness (CAPELLO, 2017), two other concerns are also raised: attractiveness issues, which highlight the ability to attract not only productive activities but also tourists or the residential economy, and resilience issues (DAVOUDI, 2014), which must enable the territories to survive, to perpetuate themselves, and to avoid the exit of populations or of major competences.

The Introduction of Environmental Dimensions

Today, the emergence of the territorial dimension is coupled with an increased interest in environmental and sustainability issues, traditionally poorly addressed in studies of territorial development. Global concerns about climate change, biodiversity preservation or energy and ecological transition find a local expression. Indeed, while climate change is global in nature, its consequences in terms of extreme weather events are very local. The inconveniences they cause, like air pollution, eutrophication of natural environments or pollution of soils and rivers lead to an increasing awareness of many actors, for which territorial development can only be envisaged by integrating these environmental and sustainability issues.

Thus, in the face of the social and environmental limits of the major economic models and the advent of sustainability issues, new ways of analyzing and defining territorial development actions appear, with a marked concern for environmental or ecological dimensions. These innovative approaches are based on a strong territorial anchorage and they help to change the vision of territorial development, by reorienting it towards a stronger link to the dimensions of nature and the creation of new tools, instruments and devices for its implementation. One talks about sustainable territorial development whose objective is to respond to these new concerns, and which favors territorial loops and an explicit use of local material and intangible resources.

This is the case for short proximity channels, with a small number of stages between producers and consumers and the reference to local consumption, especially agricultural or food, or more generally food systems based on clusters of circular bio economy. Environmental and ecological issues are at the heart of the debate, as with the example of methanation. As a non-fossil energy alternative facing the challenge of growing energy needs, this technology offers a natural treatment of organic waste, leading to the production of gas that converts to energy (biogas), coming from the biological decomposition of organic matter and from a digestate that can be used as compost. Methanation is a farm-based agricultural project, involving local groups of actors, often with a territorial content based on inputs from different industries and linked to more urban dimensions such as wastewater treatment plants.

These examples fall within the scope of CE which, as explained below, can be considered as an interesting strategy to engage the ecological and social transition of the territories. Many local public development policies are structured on this new model, giving rise to concrete actions aimed at various targets (consumers, firms, local governments). But what is its exact connection with spatial and territorial dimensions? And above all, does this model really contribute to a more sustainable territorial development?

CIRCULAR ECONOMY: AT THE SERVICE OF THE TERRITORIES

The Circular Economy, from Concept to Public Policy

Elaborated during the 1960s, Circular economy is a concept whose application aims at a better reconciliation of economic growth, environment preservation and social well-being (GREGSON et al., 2015). Although the spatial dimension is more or less present, it aims to respond locally to the major challenges of the sustainable development, in a concrete and operational way. Since the

1990s, the term CE has been used for many international, national and local public policies, instead of sustainable development (HOBSON et al., 2018). While the Sustainable Development Goals were clearly stated, the implementation modalities remained unclear, including the scale at which it is most relevant and effective to act. The term suggests that a compromise is necessary: to develop, but in a sustainable way. It lacks precision and operational rationality; that of EC, on the other hand, has the merit of being very explicit on the question of circularity (in opposition to the linearity of the current economies). It is based on a principle: a loop operation, coupled with a greening of practices (MACARTHUR, 2015). Reference is made about the economy, and therefore indirectly and implicitly about growth, in a positive and optimistic way, which makes sense in the minds of public actors, firms and populations.

In response to the physical and thermodynamic limits of the biosphere, which are imposed on human societies, CE proposes a new model opposed to the classical linear one. According to BOULDING (1966), it is necessary to consider the closed “Earth” system as a whole, with its limited resources and capacities to absorb pollution, in order to rethink the interactions between the environment and the economy. Man must find his place in this ecological system, which will continuously recycle materials using only external energy inputs, namely the sun.

Other authors share this view, such as AYRES, which, together with KNEESE and D'ARGE, develops a theory to explain the relations between the economy and the environment on the basis of material balance sheets (KNEESE et al., 1970), then resulting in the concept of industrial metabolism (SPASH 2013). This relation, also discussed by GEORGESCU-ROEGEN (1979) in terms of thermodynamics, enables PEARCE and TURNER (1990) to propose a CE model introducing the concepts of positive or negative amenity, depending on the impact of economic activity on resource stocks and more generally the environment. It is therefore under the prism of material and immaterial flows that CE is initially addressed, the objective being to define a model and mechanisms of regulations that allow to ensure a form of economic growth within an “Earth” system with limited biophysical characteristics.

From the 1990s the CE was introduced into many public policies. In Germany, a series of measures relating to the prevention and recycling of waste led to a law in 2012. This is also the case in Japan: due to an increase in pollutant emissions and a lack of local resources requiring many imports, the possibility of a transition to an EC is explored, which means organizing the recycling of end-of-life materials and structuring supply chains. China introduced the notion of territory as an institutional perimeter of action, distinguishing and promoting the implementation of EC measures at three levels: micro (the factory), meso (the ecopark) and macro (the city, the region, the country) (SHI et al., 2006). The objective is clear: to reconcile rapid economic growth and a more modest consumption of raw materials and energy, thanks to the circularity of the economy and the flows (SU and ZHOU, 2005).

In this context EC became institutionalized at European level, in the early 2010's, with the creation of the Ellen Mac Arthur Foundation and the publication of a roadmap by the European Commission (2011). In France, for example, the creation of the Institute of the Circular Economy, in 2013, consecrates the introduction of the concept in public policies and induces a very rapid diffusion among firms and territories. Considered as a factor of territorial development, able to generate new activities providing jobs and value, EC could be an innovative solution to territorial challenges in terms of competitiveness, resilience and the exploitation of specific local resources, or even the mobilization of actors around territorial governance issues. Finally, EC takes the form of concrete operational strategies which, even if they differ at the margin in the way they are named from one country to another, are based on recycling, lengthening the duration of products use through reuse or repair, responsible consumption, responsible purchasing, economy of functionality, eco-design and industrial symbioses.

The Progressive Integration of the Spatial, Then Territorial, Question

Spatial or territorial issues are only rarely addressed in EC strategies, with the exception of industrial symbiosis approaches (KORHONEN, 2001). These approaches describe local systems where different flows of energy, water and materials, such as industrial products, biomass or waste, are integrated into spatialized loops that allow for the massive reuse of products and residues and their re-injection into the production process, within small territories. This strategy refers to the concept of industrial ecology which, for technical and economic questions, only makes sense if the companies that exchange the flows of materials and energy are geographically close. In order to transform economic activity as a whole Industrial ecology is inspired by the cyclical nature of the functioning of natural ecosystems (FROSCHE and GALLOPOULOS, 1989). In this sense, it refers to the notion of locality, and to the analogy with natural ecosystems: the consideration of the «local» conditions the interaction patterns that are used to consider the transformation of industrial society into an industrial ecosystem (KORHONEN, 2001). Responses to local problems and constraints are at stake: the idea is to create new interactions between economic actors, by mobilizing available local resources. The operation character of industrial ecology therefore only makes sense at the territorial level, with and for its actors, even if the scope of this territory may vary (BRULLOT, 2009).

Thus, industrial ecology is often mobilized by public actors (in France in particular) in order to conduct policies at the level of their legal and administrative territory, aimed at reducing the production of waste, to ensure the energy transition or to improve the environmental quality of an industrial zone. However, the emergence of new public policies is based on public-private partnerships whose governance rules need to be invented at different spatial scales (EHRENFELD, 1997).

The link to the territory and its actors was also introduced by authors (BOONS and HOWARD-GRENVILLE, 2009) who evoke the notion of social embeddedness. According to them, industrial symbioses give rise to an embedding of economic and organizational activities at the heart of social arrangements and processes. Indeed, many studies show that industrial ecology is based above all on collective action, which requires the intentional collaboration of actors around a common and shared objective: territorial development (KASMI, 2020). Beyond the compulsory geographical proximity (TORRE and ZUINDEAU, 2009), it is above all a relational or organized proximity that characterizes the interactions within a territory, when it is considered as a social construct (BOONS and BAAS, 1997; HEWES and LYONS, 2008; BOONS and HOWARD-GRANVILLE, 2009). Its configuration - that is, the role of past and present actors, the stakes they bear, the management of resources - directly influences the type of actions implemented, in terms of governance but also of strategies of flows optimization.

The territorial dimension is at the heart of the industrial symbioses that, by construction, are spatialized. But the virtues of geographical proximity between the different production and/or consumption units are also often highlighted in the other EC approaches focusing on the relations between actors of the same territory and the collective management of resources and of waste, according to a logic reminiscent of that of the local production systems (see part 1 of the paper). The territorial scale would notably allow to reduce transport costs by facilitating the circulation of flows, and establish relevant productive partnerships between local enterprises (CHERTOW and LOMBARDI, 2005) including in the agricultural sector or agri-food.

The other CE approaches have a relation to the territory which results essentially in the fact of generating (locally or not) positive or negative impacts on the economic, social or environmental level, for public actors, firms or populations.

The Benefits of the Circular Economy for the Territory(s)

Essentially considered at the level of the enterprises, or even of the value added channels, the strategies of recycling refer to a very techno-centered approach. The materials to be recycled can be transported from one end of the planet to the other to be processed and then re-injected into production processes following a purely economic rationality and in response to regulatory constraints. However, local labor markets are favored in waste collection and dismantling activities, which require a large amount of unskilled labor force. Thus, companies developing circular economic models would be able to generate profits and create jobs where the activities are located.

CE is based on new business models, for example in the case of the economy of functionality. These “sustainable business models” allow the reduction of costs related to raw materials and the development of high added value products. Anchored in the territories, they contribute to the creation of a territorial value by internalizing economic, social and environmental stakes in their interactions with other actors. Let us think of familial farms that are part of a territorial cooperative ecosystem involving different actors (producers, households, etc.) and adopt, in addition to the production and sale of vegetable products, a sustainable model of food production, offering to their customers training to better feed themselves, and reducing waste and food waste.

Methanation, through the transformation of organic waste from agriculture and local communities in bioenergy and organic fertilizer, is also often presented as a positive example (OECD, 2009). Based on a strong territorial anchoring, the local loop is part of a logic of developing renewable energies through the production of biogas, and agricultural fertilization from digestate. It thus contributes to the reduction of diffuse pollution (water and soil) and GHG emissions due to chemical fertilization, as well as to the dynamism of rural areas through the creation of new local enterprises and jobs.

For local and regional authorities, it also appears a good solution, with the possibility to reduce public expenditure through the diminution of waste to be managed, and to improve the quality of life of populations through the reduction of water, air and soil pollution and GHG emissions (MIRABELLA et al., 2014; NESS, 2008). Finally, the promotion of renewable energies and the synergies in energy production and consumption are likely to contribute to the struggle against the energy problems of the most disadvantaged households and to the control of energy.

Questioning the Possible Impacts at Territorial Level

But CE can also cause negative economic and social impacts. Its effects, particularly in terms of opportunity costs, are rarely studied but they are real, like in neighborhood conflicts (SABIR et al., 2017). For methanation, BOURDIN et al., (2019) report conflicts related to the social acceptability of projects and the rejection of populations in the face of perceived risks. Observations made in France in crop agricultural areas show that the actions of individual or collective farm methanisers in order to obtain a source of income linked to the resale of biogas lead farmers to dedicate all or part of their crop to this activity, to the detriment of local economic ecosystem and historical cultural practices.

In addition, local loops can be complex to manage. A short food chain focuses on local products or inputs but can also lead to significant cost increases due to the necessary logistics associated with the packaging, storage and sale of the products. This may limit its competitiveness in the face of mass distribution, which adopts policies aimed at developing responsible product lines (organic products, local sectors, fair trade).

The implementation of EC approaches in a territory therefore requires knowledge of negative externalities, in terms of neighborhood conflicts, job and value destruction on other sectors of

activity, or environmental impacts. An EC project should necessarily be subject to an overall cost-benefit analysis to highlight its positive and negative territorial impacts (beyond the individual scale generally chosen for any decision on the deployment of innovative projects). A reduction in the external dependence of territories in terms of primary materials and energy could open up the possibility for local actors to re-appropriate their development choices (TORRE, 2019) and to prevent against the rising of commodity prices (MACARTHUR, 2015). Provided they avoid rebounding effects, they could become more attractive and resilient, and avoid the exit of local people and skills.

As a result, EC approaches are flourishing and proving attractive in their ability to combine environmental and territorial dimensions. But they hardly become a model because they raise many questions. In particular, is it possible to resist the effects of competition and to set up local loop operating arrangements that are not affected by the external world and have no negative impact at territorial level? There is also the question of whether shorter supply chains and the willingness to provide local supplies can counteract the rationalization of costs based on long distances transport of commodities, or whether the impacts in terms of conflicts, loss of biodiversity or soil quality can call into question the virtuous character of this model.

THE LONG MARCH TOWARDS SUSTAINABLE TERRITORIAL DEVELOPMENT

What Sustainability for Territorial Development?

EC's approaches, taken in isolation, appear to address environmental issues and, under certain conditions, can contribute to the economic development of the territories. But a more systemic analysis of the solutions adopted reveals the emergence of rebounding effects far beyond the territory and significant in environmental, economic and social terms. It then raises the question of the validity of a circular approach at the territorial level, and especially of its virtuous character, because of the more or less controlled external effects, local or global, as well as the impacts on growth. Moreover, one can question the real degree of sustainability of this strategy when applied at the level of a territory and not in a global way.

Indeed, the issue of territory is at the heart of some EC's strategies—which are based on geographical proximity and the organization of local actors—to address environmental and social issues while generating new resources. The benefits offered by the territories are essential conditions for their development. Some strategies only make sense because they involve geographically close actors, such as energy recovery, which requires geographical proximity between the transformation of waste into energy and its consumption. These strategies have become the spearhead of public policies aimed at contributing to the development of territories and responding to climate change. In view of the potential problems they may create, it is important to examine their degree of sustainability at the territorial level. Does CE make it possible to contribute in a sustainable way to territorial development? Under what conditions? On what scale is it efficient? Are we talking about strong or weak sustainability?

While strong sustainability presupposes a non-substitution between natural capital and products resulting from technological innovations, low sustainability considers that built capital can replace natural capital and that negative externalities generated by economic activities can be offset by technological innovation and economic growth (EKINS et al., 2003). An analysis of how EC's strategies are implemented, and their direct and indirect environmental, economic and social impacts, shows that the majority of policies respond to low sustainability objectives.

Circular Economy and Sustainable Territorial Development

The territorial component has remained poorly investigated in approaches to sustainable development, because the very globalizing and general vision prohibits any serious spatial approach. The schematic representation of sustainable development by the three environmental, economic and social pillars leaves little room for the spatial dimension, and this <managerial> rhetoric is finally quite far from the initial definition from the BRUNDTLAND report (1987), which refers to “a mode of development that meets the needs of present generations without compromising the ability of future generations to meet their own needs”. Intergenerational equity does not appear in the definition of sustainable development and it induces strategic orientations of companies whose environmental, social and economic benefits are very centered on the latter dimension, without obligation to put in perspective with more global stakes. Yet the formula <think global, act local>, used by René DUBOS at the first Summit on the Environment in 1972, provides a spatial dimension to this approach. But it struggles to find its way into the strategies of economic and public actors, often reduced to the legal-administrative scope over which the actor’s competence or power is exercised, at a time when sustainable development issues generally cross borders.

On the other hand, it is clear that environmental questions, resource scarcity and sustainability issues are rarely addressed, with rare exceptions, in territorial development issues. The authors prefer to focus on productive aspects, most often in a very linear way, even if this choice is rarely explicit, or to address governance or negotiation issues at the local level. The environmental dimension is then most often relegated to a context condition, which largely exceeds local issues, or, on the contrary, reduced to the problems of (difficulties of) development in rather peripheral areas such as nature parks or protected areas.

Towards a Sustainable Territorial Development

The circular processes described above cannot be reduced to the behavior of productive actors and institutions in charge of development policies; they extend to other stakeholders in territories such as local or territorial authorities, decentralized State services, consular bodies, local governance mechanisms (PNR, Countries, etc.) and associations. They require consideration of the dimensions of cooperation and social construction as well as the willingness of networks of local actors to pilot their own development model.

It is also crucial to integrate the issues of land scarcity, land grabbing and land competition, as well as land degradation and land occupation at the heart of development processes and projects. Indeed, the availability of soils is not infinite, whether it is the overall volume available, or the quality of these soils to give rise to agricultural activities for example. The waterproofing and the artificialization of the soils resulting from the excess of construction and the urban sprawl puts the territories at risk. On the one hand, the available soil stock is rapidly declining. On the other hand, the quality of available land is deteriorating strongly due to the massive addition of fertilizers and plant protection. The result is the depletion of the land resource, which poses a fatal risk to the sustainability of the territories.

It should also be noted that these virtuous systems are not founded solely on technical relations. They are also based on elements that relate more to social and organizational dimensions such as trust between actors, the sharing of values between partners, sophisticated modes of coordination and organization and strong geographical proximity, which allows the loopback of flows at the local level. If one adds the related variety of technologies, which combines both a diversification of objects and compatibility of techniques and productions, one cannot help but draw a parallel with the notion of clusters (or local production system) (TORRE, 2014). In particular, it highlights the

interdependencies and interactions in a territory (for example, between the actors of production and recycling), as well as the predominance of the local dimension.

While the approaches to the circular economy remain fragmentary, and often confined to specific and circumscribed cases, they shed light on the most salient features of sustainability at the local level and its expressions: innovation, wealth creation, reduction of the environmental footprint, specific governance, attractiveness and resilience... We can add: virtuous land use, reduction of social inequalities and improvement of well-being, which allows us to provide a definition of sustainable territorial development based on the basic characteristics of territorial development and integrating sustainability issues.

Indeed, in our opinion, sustainable territorial development aims, through innovative processes of production, consumption and land use, to improve wealth and well-being, by seeking to reduce the environmental footprint of human activities (on the territory and beyond), taking into account the limited nature of natural ecosystems and the involvement of populations. Within this framework, CE would aim at reconciling, on a theoretical level, the need for economic development of firms and territories, while reducing its environmental footprint and social inequalities within and between territories: in other words, starting from the intrinsic limits of the biosphere, it would be necessary to ensure the development of territories while integrating the stakes of sustainability. These processes would result from technological, social, institutional and organizational innovations and involve all stakeholders in collective projects and renewed governance schemes, defined by agreements or oppositions.

CONCLUSION

We have seen that the territory can be considered as a relevant scale to consider the circularity of the economy, due to the geographical proximity of the actors involved, the local environmental problems to be solved, and the economic and social benefits to be expected. However, some strategies will contribute to the sustainable development of the territories, while others, such as recycling, can cause, locally, interesting environmental, economic or social benefits, while creating negative rebounds in other jurisdictions (BAHERS and KIM, 2018). The question of the CE's contribution to the sustainability of the territories remains a complex topic, as it is subject to the characteristics of the different strategies and their implementation, even in the case of a positive contribution in terms of territorial development. This is the reason why it is necessary to introduce the definition of sustainable territorial development, which takes into consideration the environmental impacts beyond the scope of action considered.

Our work thus sketches a convergence between CE approaches and territorial analyses: while CE gradually takes on the spatial, then territorial question, parallel territorial analyses are increasingly interested in circular dimensions. This raises the question of the potential for territorial innovation to shift towards strong sustainability. Does it enable a paradigm shift, based on the transformation of society and the values of the stakeholders? Indeed, the objective of CE, which aims to reconcile the economic growth of production systems and the reduction of their footprint on the environment, is rather and whatever the strategy, in a logic of low sustainability: substitution of other forms of capital for natural capital and compensation for negative externalities of economic activities by technological innovations and economic growth. It is then possible that strategies such as industrial and territorial ecology, eco-design or recycling have only a paltry effect on the impact of activities on the environment in a few decades. It is mainly true for the exhaustion of resources, as long as the consumption of raw materials and soils continues to grow, i.e. that the dominant paradigm of consumption and mass production is not questioned. CE, even with high efficiency rates, will only delay the end of resource depletion but will not achieve strong sustainability goals.

REFERENCES

- Autant-Bernard C., J. Mairesse and N. Massard (2007): Spatial knowledge diffusion through collaborative networks, *Papers in Regional Science*, 86(3), 341–350.
- Bahers J. B. and J. Kim (2018): Regional approach of waste electrical and electronic equipment (WEEE) management in France. *Resources, Conservation and Recycling*, 129, 45–55.
- Boons F. and L. W. Baas (1997): Types of industrial ecology: the problem of coordination, *Journal of Cleaner Production*, 5, 79–86.
- Boons F. and J. Howard-Grenville (eds.) (2009): *The social embeddedness of industrial ecology*, UK, Edward Elgar.
- Boulding K. E. (1966): The economics of coming spaceship earth, in Jarret H. (Ed.), *Environmental quality in a growing economy*, Baltimore, MD: John Hopkins, University Press.
- Bourdin, S., M. Colas and F. Raulin (2019): Understanding the problems of biogas production deployment in different regions: territorial governance matters too, *Journal of Environmental Planning and Management*, 1–19. <https://doi.org/10.1080/09640568.2019.1680158>
- Brundtland, G. (1987): Report of the World Commission on Environment and Development: Our Common Future. United Nations General Assembly document A/42/427.
- Brusco, S. (1982): The Emilian model: productive decentralisation and social integration, *Cambridge Journal of Economics*, 6, 167–184.
- Capello, R. (2017): *Regional Economics*, 2nd Edition Routledge, p. 354.
- Chertow, M. and D. Lombardi (2005): Quantifying economic and environmental benefits of collocated firms. *Environmental Science and Technology*, 39, 17, 6535–6541.
- Cropper M. L. and W. E. Oates (1992): Environmental economics: A survey, *Journal of Economic Literature*, 30, 2, 675–740.
- Davoudi S. (2014): Climate Change, Securitisation of Nature, and Resilient Urbanism, *Environment and Planning C: Politics and Space*, First Published January 1, <https://doi.org/10.1068/c12269>
- Ehrenfeld, J. R. (1997): Industrial Ecology: A framework for product and process design, *Journal of Cleaner Production*, 5, 1–2, 87–95.
- Ekins, P., S. Simon, L. Deutsch, C. Folke and R. De Groot (2003): A framework for the practical application of the concepts of critical natural capital and strong sustainability. *Ecological Economics*, 44: 165–185.
- Feldman, M. P. (1994): *The Geography of Innovation*, Dordrecht, Kluwer Academic Publishers.
- Frosch, R. A., N. E. Gallopoulos (1989): Strategies for Manufacturing. *Scientific American* 261: 144–152.
- Georgescu-Roegen, N., (1979): Energy analysis and economic valuation, *Southern Economic Journal* XLIV, 1023–1058.
- Giuliani, E. and M. Bell (2005): The micro-determinants of meso-level learning and innovation: evidence from a Chilean wine cluster, *Research Policy*, 34 (1), 47–68.
- Gregson, N., M. Crang, S. Fuller and H. Holmes (2015): Interrogating the Circular Economy: the Moral Economy of Resource Recovery in the EU. *Economy and Society*.
- Hewes, A. K. and D. I. Lyons (2008): The humanistic side of eco-industrial parks: champions and the role of trust, *Regional studies*, 42/10, 1329–1342.

Hobson, K., N. Lynch, D. Lilley and G. Smalley (2018): Systems of practice and the circular economy: transforming mobile phone product service systems. *Environmental Innovation and Social Transitions*, 26, 147–157.

IPCC (2019): *Climate Change and Land: An IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems* [P.R. Shukla, J. Skea, E. CalvoBuendia, V. Masson-Delmotte, H.-O. Pörtner, D. C. Roberts, P. Zhai, R. Slade, S. Connors, R. Van Diemen, M. Ferrat, E. Haughey, S. Luz, S. Neogi, M. Pathak, J. Petzold, J. Portugal Pereira, P. Vyas, E. Huntley, K. Kissick, M. Belkacemi, J. Malley, (eds.)].

Kasmi, F. (2020): Industrial Symbiosis and Territorial Development: The Cross-Fertilization of Proximity Dynamics and the Role of Information and Knowledge Flows. *Journal of the Knowledge Economy*. doi: 10.1007/s13132-020-00631-7.

Korhonen, J. (2001): Four ecosystem principles for an industrial ecosystem. *Journal of Cleaner Production*, 9, 253–989.

Kneese, A. V., R. U. Ayres and R. C. D'Arge (1970): *Economics and the Environment: A Materials Balance Approach*, Resources for the Future, Washington, Inc.

Kooiman, J. (2000): Societal governance: levels, modes, and orders of social-political interaction. In: Pierre J. (ed.) *Debating Governance. Authority, steering and democracy*. Oxford University Press.

Loughlin, J., F. Hendricks and A. Lidstrom (eds.) (2010): *The Oxford Handbook of Local and Regional Democracy in Europe*, Oxford University Press, Oxford, 785p.

MacArthur Ellen Foundation, (2015): *Towards a circular economy: business rationale for an accelerated transition*.

Maillat, D. (1995): Territorial dynamic, innovative milieus and regional policy, *Entrepreneurship & Regional Development*, 7, 2, 157–165.

Markusen, A. (1996): Sticky Places in Slippery Space: A Typology of Industrial Districts, *Economic Geography*, 72, 2, 294–314.

Marshall, A. (1919): *Industry and Trade*, Mac Millan, Londres, 875p.

Millennium Ecosystem Assessment (MEA) (2005): *Current state and trends assessment*, Washington D.C., Island Press.

Mirabella, N., V. Castellani and S. Sala (2014): Current options for the valorization of food manufacturing waste: a review, *Journal of Cleaner Production*, 65, 28–41.

Ness, D. (2008): Sustainable urban infrastructure in China: Towards a Factor 10 improvement in resource productivity, *International Journal of Sustainable Development and World Ecology*, 15, 4, 288–301.

OECD (2009): *The Bioeconomy to 2030. Designing Policy Agenda, Main Findings and Policy Conclusions*, OECD, Paris.

OECD (2001): *Innovative Clusters. Drivers of National Innovation Systems*, OECD, Paris, 420p.

Paulson, S., L. L. Gezon and M. Watts (2003): Locating the political in political ecology: An introduction. *Human Organization*, 62 (3): 205–217.

Pearce, D. W., R. K. Turner (1990): *Economics of Natural Resources and the Environment*. HarvesterWheatsheaf, London.

- Perroux, F. (1964): *Economic Space: Theory and Applications*, in J. Friedmann et W. Alonso (éds.), *Regional Development and Planning*, M.I.T. Press.
- Pierre, J. (ed.) (2000): *Debating Governance. Authority, steering and democracy*. Oxford University Press.
- Porter, M. E. (1985): *Competitive Advantage*, The Free press; New York.
- Porter, M.E. (2003): The economic performance of regions, *Regional Studies*, 37, 6–7, 549–579.
- Sabir, M., A. Torre and H. Magsi (2017): Land-use conflict and socio-economic impacts of infrastructure projects: the case of DiamerBhasha Dam in Pakistan, *Area Development and Policy*, 1, 40–54.
- Sack, R. (1986): *Human Territoriality. Its Theory and History*. Cambridge University Press, Cambridge.
- Spash, C. L. (2013): *The Ecological Economics of Boulding's Spaceship Earth*. Institute for the Environment and Regional Development, Vienna University of economics and business.
- Shi, L., L. Xing, J. Bi and G. B. Zhang (2006): *Circular economy: A new development strategy for sustainable development in China*. 3rd World Congress of Environmental and Resource Economists, 3–7 July, Kyoto, Japan.
- Stohr, W. B. and F. Taylor (eds.), (1981): *Development from Above or Below? The dialectics of Regional Planning in Developing Countries*. John Wiley, New York.
- Su, Y. and H. Zhou (2005): Promoting circular economy development a basic national policy, *Northern Economy*, 1: 8–10.
- Torre, A. (2019): Territorial development and proximity relationships, in Capello R. and Nijkamp P. (eds.), *Handbook of Regional and Development Theories*, 2nd edition, Edward Elgar Publishers, Cheltenham, p. 674
- Torre, A. and J. B. Traversac (eds), (2011): *Territorial Governance. Local Development, Rural Areas and Agrofood Systems*, Springer Verlag, Heidelberg & N. York.
- Torre, A. and B. Zuideau (2009): Proximity economics and environment: assessment and prospects, *Journal of Environmental Planning and Management*, 52, 1, 1–24.
- Van den Bergh, J. C. J. M. (2001): Ecological Economics: Themes, Approaches, and Differences with Environmental Economics, *Regional Environmental Change*, 2(1), pp. 13–23.
- Wettenhall, R. (2003): The rhetoric and reality of public-private partnerships. *Public Organization Review*, 3(1): 77–107.