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DOI

[10.1080/2578711X.2024.2418227](https://doi.org/10.1080/2578711X.2024.2418227)

Publication date

2024

Document Version

Final published version

Published in

Going Circular

Citation (APA)

Dabrowski, M. M., Williams, J., Van den Berghe, K. B. J., & van Bueren, E. (2024). Circular regions and cities: towards a spatial perspective on circular economy. In M. Dąbrowski, K. Van den Berghe, J. Williams, & E. van Bueren (Eds.), *Going Circular: Unlocking the Potential of Regions and Cities to Drive the Circular Economy Transition* (pp. 13-28). (Regional Studies Policy Impact Book Series; Vol. 6, No. 1). Routledge - Taylor & Francis Group. <https://doi.org/10.1080/2578711X.2024.2418227>

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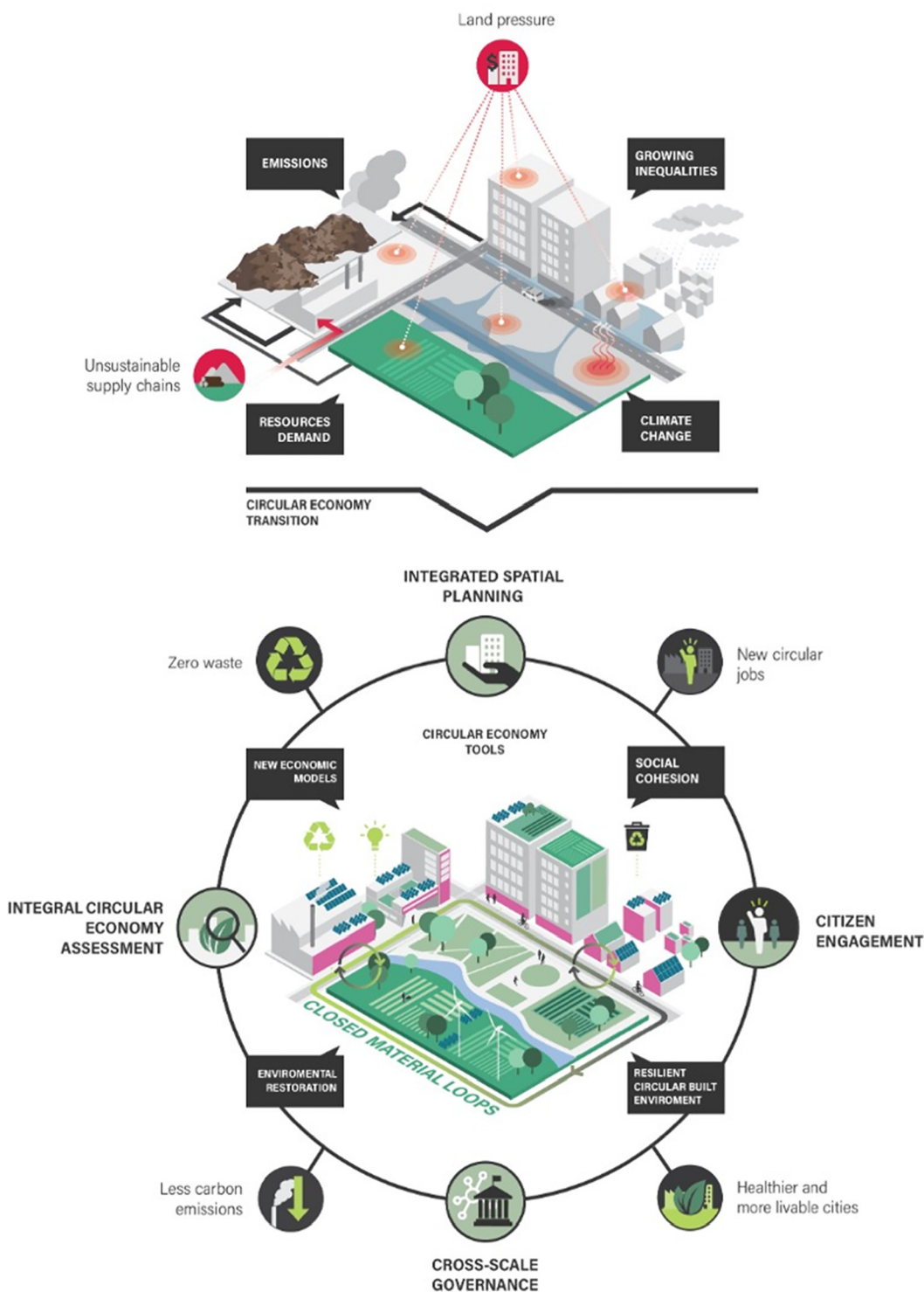
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1. Circular regions and cities: towards a spatial perspective on circular economy

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Keywords: circular economy; regions; cities; space; spatial planning; policy





Source: Authors; graphic design by Fábio Alzate Martinez (TU Delft)

Key message

If a circular perspective is effectively integrated into spatial planning and territorial policies, we can generate numerous synergies from moving towards circular futures.

1.1 OVERVIEW

Circular economy (CE) is territorialised. Economic activities are spatially embedded; they operate across a variety of scales and are heavily influenced by their spatial context. Yet the CE academic literature and policy frameworks rarely address this dimension. If CE policies are to achieve sustainable development goals and be implementable at a subnational level, these shortcomings need to be addressed. In this chapter, we take stock of the current debates and policy on CE in cities and urban regions, critiquing them from a spatial, socio-ecological and governance perspective. On that basis, we outline a new policy and research agenda to bridge the above-mentioned gap and inform the development and implementation of place-based CE policies.

1.2 INTRODUCTION

Cities and their hinterlands are at the heart of several intertwined crises. The activities concentrated in cities are one of the main drivers of climate change, yet cities are also among the primary victims of its impacts (heatwaves, flooding). Urban regions are further impacted by biodiversity loss and environmental degradation, driven by industrial activity, real-estate development and the expansion of urban infrastructure. There is also a housing crisis, exacerbated by the financialisation of property markets and growing demand from expanding urban populations. Meanwhile, the negative impacts of the COVID-19 pandemic have disproportionately affected less affluent urban dwellers, making cities increasingly unaffordable. Finally, cities are also affected by the energy crises that emerged in the context of current geopolitical volatility. Cities consume 80% of the world's resources and produce 50% of the waste.¹ It is projected that between 2015 and 2030 large cities will account for 81% of resource consumption and 91% of consumption growth.² Meanwhile, cities already face resource scarcity issues, particularly with water, energy and food. At the same time, peri-urban areas and rural regions are increasingly affected by the negative externalities of urbanisation. These include, among others, land-grabbing to meet the high demand for space for housing and business activities, pollution and nuisance from waste management facilities, renewable energy production displacing farmers and damaging natural landscapes, and the increasingly industrialised and polluting agriculture required to cater to the growing number of city dwellers.

Given these overlapping crises and pressures, and the fact that addressing them would require far-reaching and possibly unpopular policy changes, there is an urgent need for

new ideas and approaches to rethink urban and regional development. The CE concept, promoting the reduction of waste generation and resource consumption through symbiotic relations between economic activities in closed material loops, is increasingly brought up in this debate as a framework for rethinking the ways in which cities and regions can develop without overshooting the finite planetary boundaries that set the limits for economic growth.^{3,4}

In this chapter, we take stock of the current debates and policy on CE in cities and regions, proposing a critique from a spatial, socio-geographical and governance perspective. On that basis, we outline a new agenda for regional and urban researchers, policymakers and practitioners to bridge the above-mentioned gaps, and inform the development and implementation of place-based CE policies.

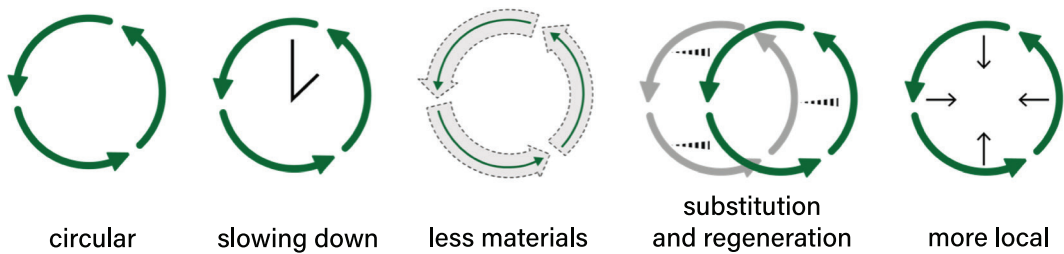
1.3 THE ELUSIVE DEFINITION OF CIRCULAR ECONOMY

As with any new and popular concept, many definitions are put forward, resulting in some confusion.^{5,6} While the concept emerged in the industrial ecology field, related to the notion of symbiosis between branches of industry where the waste of one can be used as a resource for another, and is still often associated with waste management, its use rapidly spread across many disciplines. The most widely used definition is probably that by the Ellen MacArthur Foundation (EMF),⁷ which states that CE is “an industrial system that is restorative or regenerative by intention and design” and uses principles of circulation of products and materials (at their highest value), “designing out” waste and the regeneration of degraded ecosystems, as opposed to the current extractive approach to Earth’s resources.

Others stress that CE is operationalised in systems at various levels,^{8,9} from the micro-level (related to products, companies or consumer behaviour), through meso-level (related to industrial parks where symbiosis and material looping can take place) to macro-level (related to city, region, nation, etc.), in order to improve not only environmental quality but also economic prosperity and social equity for future generations.¹⁰ Next, there is the widely used RESOLVE framework,¹¹ which describes six actions for the transition to CE: (1) regeneration of ecosystems; (2) sharing of assets; (3) optimising efficiency to reduce waste generation; (4) looping of materials and products; (5) virtualising activities; and (6) exchanging unsustainable materials with more sustainable ones. However, the applicability of this framework to an urban system is limited due to its lack of acknowledgement of the scale, location or context in which these systems operate.¹²

With a growing number of areas of application of the concept, the understanding of CE is increasingly broad,¹³ including, for instance, spatial, geopolitical and governance aspects (see chapter 2), social aspects (chapter 3) or environmental regeneration questions

Figure 1.1 The five principles of circular economy (CE)



Source: Authors

(chapter 4). But arguably, most definitions of CE emphasise one or more of the following five principles (Figure 1.1):

- A circular flow of materials and energy.
- A slowing down of those flows to keep materials and energy in use for as long as possible at the highest value possible.
- A reduction of the amount of materials and energy used,
- A substitution of non-sustainable materials by sustainable materials that allows for regeneration.
- A geographical concentration of a circular consumption–production system, or localism.^{14,15}

1.4 WHY DO CITIES AND REGIONS MATTER?

Cities and regions are particularly relevant for enacting a transition towards CE. Two sectors that consume the most resources are both closely related to cities: construction and mobility.¹⁶ Cities are home to a growing number of people, consuming an increasing amount of goods and generating the bulk of waste. But this also means that urban CE policies can have the greatest impact on global resource consumption and waste production. At a regional scale, there is greater potential to increase resource efficiency if more resources consumed in a region are also produced within that region. Equally, more of the wasted resources could be assimilated within the region. The CE helps with this through the recycling and reuse of existing resources and the generation of renewable energy locally. This could not only help reduce regional global environmental footprints, by cutting down resource consumption and greenhouse gas emissions, but also has the potential to bring new economic opportunities, jobs and revenue to a region, while broadening access to resources that were previously unaffordable to some sections of the population.

Cities and regions also matter for CE because they correspond to relevant scales for the experimentation and implementation of policies and solutions that we need to move away from

the current linear economy (take–make–dispose) model in which resources are extracted, used to produce goods and then discarded as waste after use. This reflects the arguments about cities being the critical battleground for dealing with climate change and promoting sustainability transitions, being living laboratories for climate action innovation.^{17,18,19,20} Regions and cities are typically more agile and experimental in their policies than the central governments, and this makes them well-equipped to devise innovative policy tools and approaches and coordinate activities between diverse stakeholders to drive sustainability transitions.²¹

Regions and cities are in charge of a broad portfolio of policies that are already in place and need to be coordinated to promote CE, for instance, waste management, economic development, environmental protection, landscape architecture and spatial planning. They also have the capacity to put forward regulations and incentives to adopt more circular practices by industry, using local building codes, spatial plans and planning conditions, contractual agreements, etc. A good example of “tactical” measures to promote CE and stimulate demand for circular construction is local public procurement built around CE principles, which can be a powerful incentive for construction companies to consider changing their practices and adopting circular innovations. Municipal and regional authorities may be involved in the provisioning of infrastructure, energy, food, public transport, waste and water management services, which enables them to adopt CE practices directly. They can also convene networks of stakeholders essential for the delivery of circular systems and build data platforms to inform decision-making. However, subnational governments have varying capacities and resources to enact these actions and stimulate a transition towards CE.²²

Another factor is that subnational authorities operate “on the ground” and have a better grasp of the local conditions, barriers and enablers of change in regional or local processes.²³ This is an important asset for CE policy, which is affected by contextual features of places such as geographical characteristics, environmental conditions, socio-cultural specificities, economic systems and the presence of industries producing or using specific types of materials. Hard territorial factors such as accessibility and the presence of relevant technologies enable CE operation, while softer territorial factors related to knowledge, the presence of networks and supporting institutions, and awareness of circularity principles and practices among stakeholders are critical for catalysing transitions towards CE.^{24,25} All these factors call for designing place-based CE policies to best address the local or regional needs, challenges, and opportunities for looping and restorative actions.

The regional scale is particularly important for such policies. Within regions, a mixture of urban, industrial and rural areas is often present, connected by “hard” infrastructure (for moving people, goods, waste and resources) and “soft” infrastructure (knowledge provision, governance structures and regional innovation ecosystems). The different spatial distribution of economic activity and of the above-mentioned infrastructures in a given region determines

the feasible options for stimulating and locating circular activities and enabling symbiotic relationships to develop circular systems.

1.5 CIRCULAR POLICIES IN WANT OF A SPATIAL DIMENSION

The “why” question of the relevance of cities and regions in the CE transition is arguably answered — the next question is “how”. There are few templates for urban and regional CE policies. Because of the already mentioned diversity of perspectives on CE, there is also a related diversity of policy discourses on it. While in some policy frameworks CE is considered more holistically, stressing its transformational potential, other policies are based on a narrower and technocentric view, stressing the economic dimension or industrial symbiosis aspects.²⁶ This diversity reflects the different meanings and values that can be associated with CE and the different approaches to its pursuit, leading to different scenarios according to which CE could be achieved: centralised versus bottom-up approaches; high- versus low-tech solutions; growth versus degrowth models.^{27,28} What tends to be overlooked in existing CE policies are spatial questions. There is, however, a growing recognition that the implementation of CE has spatial implications.^{29,30} Such a transformation requires fundamental shifts in regional and urban economies, in spatial planning and policymaking, and the behavioural patterns of consumption and dealing with waste.^{31,32}

The existing conceptual frameworks that could guide the much-needed shift towards urban and regional development based on CE principles are arguably “footloose”, neglecting important (societal) questions on where material flows come from and go to, who drives circular processes and for whom, and what does it take to steer the transition towards positive outcomes in terms of social, economic and environmental sustainability. Consequently, cities and regions implementing CE policies — such as Amsterdam (the Netherlands), Hamburg (Germany), Ghent (Belgium) or Naples (Italy) — face a potent cocktail of political, organisational, spatial, economic and technological barriers for CE transitions. The combinations of those barriers are specific to the different regional or national contexts.^{33,34,35,36}

What is more, the declared policy goals related to “going circular” by a given year (e.g., Amsterdam aims to use 50% fewer materials by 2030 and go fully circular by 2050) tend to be quite detached from the reality on the ground and ignore the complexity of transitions towards CE.³⁷ Instead, many cities and regions are “caught in the circular buzz” — they develop policies that use CE as the new “urban sustainability fix”³⁸ bringing an illusion that we can shift away from a linear, extractive economy merely by promoting new narratives on waste, new circular business models and closing material loops in selected sectors. The risk is that such actions will remain piecemeal and fail to move cities and regions closer to a CE, which may result in a loss of interest in this concept and the search for the next sustainability “buzzword”.

Without a good grasp of what it takes to “go circular” in a given regional or urban territory, of the complexity of this challenge due to the need to collaborate across economic sectors, across scales and levels of government, and overcome major economic, societal and political lock-ins, we risk engaging in “circular washing”. In such a case, the CE label may be used to frame strategies and policies that in reality remain limited to the promotion of recycling, build on only the limited use of circular practices or even may favour circularity in some sectors but in a way that is not sustainable (e.g., promoting timber construction in regions that do not produce timber in the Amsterdam region or importing waste from overseas to sustain waste-to-energy schemes in many Nordic cities).

The current “polycrisis”³⁹ affecting cities and regions as well as the growing socio-economic and territorial disparities that undermine social cohesion and engagement in democratic processes create an urgent need to shed light on the territorial implications of CE and explore ways to tap into transformative potential of this approach. While not a panacea, a spatial perspective on CE does offer the promise of easing some of those pressures. As we argue in this book, integrating a circular perspective into spatial planning and territorial policies can generate a wealth of synergies in the transition to circular futures.

1.6 DEFINING A CIRCULAR CITY AND A CIRCULAR REGION

To consider place-based CE policies for cities and regions, we need to define what a circular city or region actually means. A definition of a circular city is offered by J. Williams.⁴⁰ It is a complex, regenerative and adaptive “socio-ecological system, consisting of a bio-geophysical unit and its associated social actors and institutions” in which three types of circular actions are pursued: (1) looping actions (recycling, reuse, energy recovery, etc.); (2) ecologically regenerative actions (restoring ecosystem and ecosystem services); and (3) adaptive actions that improve the capacity of the urban space and communities to change in the face of new challenges (flexible design and planning, co-creation and learning environment, etc.).

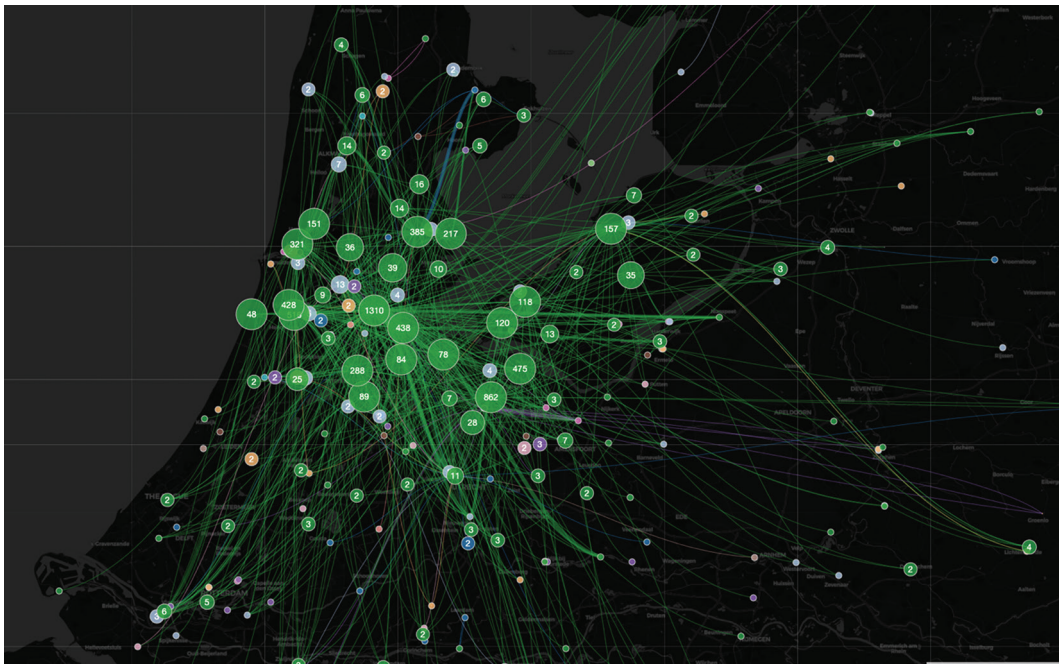
Conceptualisation of a circular region is, however, more challenging. Regions, in general, are notoriously difficult to define. There are different perspectives on what is a region. For example, in defining a region we may consider administrative boundaries, geomorphological systems, perceptions of regional identity and historical legacies. We can also consider patterns of urban agglomeration, industrial networks interconnected by infrastructure, and the much less tangible networks of knowledge and collaboration, interdependencies between the core and periphery where people, companies and economic activities are located, or the rural or peri-urban hinterland where food is produced and resources are extracted. Thus, for the purpose of this book, we define a region as a subnational territorial unit characterised by features such as culture, economy, politics or social structure, delimited by boundaries that

may be physical (e.g., river basins), administrative (part of a country's territorial system) or functional (based on economic linkages or commuting patterns).

From a CE perspective, the circulation of materials across space and time stands central. Thus, a circular region can be defined through interdependencies and connections created by material flows between the different types of territories (urban, industrial, peri-urban and rural), nature, the built environment and actors. Developing a circular region would, thus, entail adapting the socio-technological and socio-ecological systems so that they could nurture looped systems of materials and energy, helping to regenerate the damaged ecosystems.

From an urban metabolism⁴¹ perspective, a circular region is shaped by the geographies of flows of materials, connecting actors and spaces involved in resource-looping actions that aim at extending the life cycle of products and reduce generation of waste. The boundaries of such circular regions are determined by the interdependent activities related to circular actions, such as recycling, repair or reuse of materials and products, the geographical spread of which can vary depending on the sector of the economy and the material flow. This can be illustrated, for instance, by the geographical spread of construction and demolition waste processing networks in the Amsterdam region (Figure 1.2), concentrated on the periphery of

Figure 1.2 Geography of metabolic material flows in the Amsterdam region of the Netherlands, 2016: networks and clusters of the processing of construction and demolition waste (numbers in circles correspond to activities related to this flow) extend far beyond the administrative boundaries of the region



Sources: H2020 REPAiR and H2020 CINDERELA projects

Amsterdam but reaching out to locations spread out across the Province of North Holland and beyond across the Netherlands.

From a regenerative perspective, what matters for circular regions are the natural and constructed green and blue structures. These include rivers and other waterbodies, natural and agricultural landscapes, and urban green areas, which can be regenerated and made more accessible to the inhabitants of the core urban areas and of their hinterland through circular activities to restore ecosystems and provide ecosystem services.

Finally, from an adaptive perspective, a circular region is a relational space in which the diverse stakeholders — ranging from spatial planners, regional policy actors, research and education institutions, companies, non-governmental organisations, and citizens — can collaborate, co-produce strategies, plans and policies, and engage in learning and exchange of knowledge across administrative, disciplinary and sectoral boundaries, which are needed to develop circular solutions tailored to the regional context. From this perspective, what matters are not only the material flows but also the flows of knowledge and information through networks of CE actors.

1.7 KNOWLEDGE AND POLICY GAPS

Such a circular perspective on urban and regional spaces has several policy implications. When planning and designing policies to promote a transition towards circular cities and regions, we need to go beyond the narrow focus on the city and its metabolism and, instead, reconsider the relations between the (urban) core and the peri-urban space (where industrial actors and waste management activities tend to concentrate) and the rural periphery (where especially organic materials originate from and where the by-products of consumption of those materials in the city can be revalorised). In other words, a circular perspective on a city or region invites us to rebalance the relationship between the core and periphery, which is currently skewed towards the cities, placing an emphasis on the crucial role of the hinterland from a metabolic perspective. This, in turn, requires rethinking regional planning and governance to consider circular interdependencies and complementarities across the regional space, as well as embracing “soft planning” approaches for functional circular regions. However, we still lack insight into and successful examples of how to achieve this in practice.

There is an emerging scholarly literature on circular transitions in cities and regions,⁴² on spatial planning for circularity,^{43,44,45} on frameworks for circular urban development,^{46,47} on the role of the regional scale,^{48,49} on bottom-up action in these processes^{50,51} and on participatory experimentation to promote development of a circular built environment.⁵² Most of the research on CE, however, remains concerned with the waste management sector and the most basic circular actions focusing on energy recovery from waste (e.g., waste incineration to produce electric energy and heat) and recycling (i.e., transforming waste into raw materials

that can be used to manufacture new products), overlooking the more demanding strategies towards extension of the life cycle of products and eventually reduction of waste generated that could have more far-reaching impacts on the transitions towards a more sustainable society.⁵³ The same holds true for policy practice. Innovative circular practices and interventions have been rapidly spreading in cities across Europe and globally, including those that aim at the transformation of the built environment and the promotion of environmental and social sustainability, even if they tend to remain rather niche and are hardly promoted in spatial planning and urban policies. In fact, CE strategies and policies do proliferate rapidly, but tend to focus on waste management⁵⁴ or a piecemeal “circular fix”,⁵⁵ seldom taking spatial, regenerative, governance and social aspects into account.⁵⁶ There is very little thinking about what kind of CE we actually want to pursue, how, where and, importantly, for whom.

There is a gap between scientific insights on the transformative potential of CE and policy on the ground. Policymakers tend to reduce CE to a “zero waste” approach, based on recycling or industrial symbiosis, and expect it to help achieve sustainability goals, while generating economic growth, innovation and jobs. Moreover, there are disparities in terms of knowledge and capacity to design place-based CE policies across countries and regions. We can already see huge gaps in progress towards CE across the European Union, for instance,⁵⁷ with highly industrialised countries of Western and Northern Europe leading the way. Even when we zoom into the regions that are leading in terms of engagement with circular business models and employment in CE,^{58,59} we notice that there are substantial differences in the degree of engagement with the CE concept in policy across municipalities and among businesses.⁶⁰

The transition towards CE may, thus, deepen intra- and interregional disparities, with the already more developed and resourceful territories being able to jump onto the CE bandwagon and the lagging ones finding themselves falling even more behind. It also brings forward the question of how to transfer knowledge on place-based CE policies effectively and develop the capacity of all regions and cities to engage in transition towards more circular future. Finally, if we are to avoid “circular washing” and measure and monitor the state of play in CE transitions and the impacts of circular policy innovations, we need to develop new metrics and benchmarking tools. These need to reflect the complexity of CE transitions in urban and regional contexts and be based on relevant data not only on material flows across space but also on the impacts of circular innovations in terms of spatial change, institutional capacities, social cohesion, and even awareness and behavioural shifts among companies and citizens.

1.8 CONCLUSIONS

CE is a promising approach that could nudge cities and regions towards more sustainable development. In this chapter, we highlighted the importance of cities and regions in the

transition towards CE and made a case for considering an often-overlooked spatial perspective on these shifts. Adopting such a spatial lens is needed to understand better the territorial impacts of “going circular”, create the spatial conditions for circular activities, and harness the transformative and regenerative potential of this approach by moving beyond zero-waste strategies and implementing holistic, context-specific CE policies that combine economic, social and environmental dimensions of sustainability. Having defined a circular city and a circular region through the lens of resource flows and the regenerative and adaptive potentials of territorialised circular strategies, we outlined the remaining knowledge gaps and proposed a policy and research agenda to bridge them. The building blocks of this agenda are discussed in the remainder of this book.

Practitioner’s perspective

Our experience of working with local and regional authorities shows that they do start to embrace the circular economy (CE) concept, but it is sometimes perceived as utopian. A peculiarity of local government action is the focus on implementation “within the administrative boundaries”, which makes it challenging for them to work on the reduction of waste within value chains that go beyond those boundaries.

An additional difficulty is the need to incorporate multiple actors into circular processes. Formal constraints on such cross-sectoral and cross-boundary collaborations, the relative novelty of the CE approach, and uncertainties about pilot activities (which are not always successful) raise concerns and hinder adopting holistic approaches to process planning for regional and local circular strategies and projects.

Subnational governments are not always willing to experiment, however; they are keener to innovate with CE by pursuing “smaller steps”. It is also important for them that the benefits of actions to promote CE can be perceived in the short term, ideally with their success announced during the term of office of the local or regional authority.

A Living Lab methodology, increasingly used across many cities and regions to co-design innovative place-based solutions, allows for the gradual expose of diverse local actors to principles of CE and engaging them in joint experiments with circular development in a real-world setting. The challenge, though, is how to build on such participatory experimentation and “anchor” this approach in local and regional policies and planning. The CE approach may “take hold” if it is explicitly formulated — in a development strategy or other planning document — as a goal and a means to achieve sustainability, a concept that subnational authorities already know and understand.

Maciej Kowalczyk and Małgorzata Grodzicka-Kowalczyk are founders of PHENO HORIZON, a consulting company focusing on regional and local development in Łódź, Poland

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