Urban Planning for the Circular Economy: a spatial turn in theory and practice

White paper

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Executive summary

This white paper examines how urban and territorial planning can operationalise the circular economy (CE) by addressing its spatial dimensions, which remain insufficiently integrated into policy and practice. It responds to the need for translating circular economy principles into land-use decisions, infrastructure provision, and governance arrangements that are implementable within real urban contexts. The paper aims to clarify how circular economy strategies can be "territorialised", meaning embedded in the spatial, institutional, and material realities of cities and regions. It focuses on the role of local and regional public authorities, given their responsibility for land-use planning, infrastructure coordination, and development control. The scope combines conceptual framing with applied insights, structured around four systemic domains: circular developments, circular infrastructure, land management, and multi-level governance.

The central challenge is the lack of spatial specificity in circular economy implementation. While CE is often conceptualised through resource flows and technological solutions, planning systems require clarity on location, land requirements, infrastructure needs, and governance coordination. This mismatch constrains implementation because planning decisions are territorially bounded, whereas material flows and circular systems operate across scales and sectors.

The analysis is grounded in a Community of Practice (CoP) established under the Circular Cities and Regions Initiative (CCRI), which brought together practitioners from European cities and regions. The CoP functioned as a structured peer-learning platform to exchange experiences, identify barriers, and co-develop planning approaches. It focused on four thematic areas that reflect key spatial entry points for circularity: (1) promoting circular developments, (2) allocating space for circular infrastructure, (3) managing land circularly, and (4) coordinating multi-level governance. Despite contextual differences, several systemic barriers recur across participating cities. Circular developments require planning frameworks that enable adaptability, reuse, and material recovery across building lifecycles, which remains uneven because regulatory mandates are often limited, market practices favour conventional construction, and cost structures do not consistently support reuse. At the same time, circular infrastructure operates across multiple spatial scales, where its effectiveness depends on proximity to users and material flows, access to logistics networks, and the availability of appropriately zoned land, which means that planning must coordinate neighbourhood-level functions with city-wide systems and regional facilities. Land management practices increasingly reflect a circular logic in which land is treated as a finite resource, prioritising regeneration, densification, and reuse over expansion, which aligns with broader European objectives on limiting land take and improving spatial efficiency. These dynamics are shaped by governance arrangements, where the city-region emerges as a critical scale because material flows and infrastructure systems extend beyond municipal boundaries, requiring coordination across jurisdictions.

These insights from the CoP indicate that the circular economy can function as an organising framework for spatial planning provided that its implementation is grounded in territorial conditions, institutional capacities, and explicit management of trade-offs between land uses, economic objectives, and social outcomes. This implies several strategic directions:

- **Integrate circularity into core planning instruments,** including zoning, land policy, procurement, and permitting, because these shape spatial outcomes over the long term.
- **Secure land for circular functions**, recognising them as essential urban infrastructure, which requires protection from displacement and long-term planning certainty.
- **Adopt lifecycle and land-use hierarchies**, prioritising regeneration, reuse, and intensification before expansion, which reduces land consumption and supports systemic efficiency.
- **Plan across scales**, particularly at the city-region level, where infrastructure systems and material flows can be aligned with territorial realities.
- **Strengthen institutional coordination and data systems**, enabling planners to connect spatial decisions with material flows and governance processes.

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Introduction

Introduction: A spatial perspective on circular economy

Transitioning to a circular economy (CE) is a growing priority for local governments, but it is often understood in terms of abstract resource loops, with less clarity about what circular economy looks like on the ground. [1] [2] For public authorities under pressure to deliver on climate, housing, and economic goals, this lack of spatial clarity is no longer just conceptual, it is a practical barrier to action. Where in cities would circular activities occur? How much land would they use, and where? What kind of infrastructure and accessibility will they need? This lack of definitional and spatial precision makes it difficult to translate CE principles into concrete planning and projects, delaying implementation at a time when cities cannot afford inaction.

Urban space plays a central role in how circular systems are shaped and made possible. The link between circularity and urban form runs both ways: the way we design and organise cities shapes which circular practices are possible, and those practices in turn reshape urban space. This view resonates with a long intellectual tradition, from early urban sociologists like Jane Jacobs' (1961) to Hillier & Hanson's (1989) insights that spatial configuration shapes behavioural and social patterns. In the context of CE, this means that spatial form conditions the capacity of citizens, businesses, and institutions to engage in circular activities by influencing accessibility, proximity, and how well they can interact, share resources, and collaborate. Conversely, the operationalisation of CE principles introduces new spatial demands: facilities for recycling, repair and reuse, shared production spaces, and multifunctional infrastructures that commingle industrial, commercial, and residential uses. These are not marginal or temporary uses, but structural components of a functioning circular system that must be deliberately planned for. Advancing urban circularity, therefore, depends as much on *where* and *how* circular practices occur as on the technologies, activities, or policies that support them.[3]

This white paper helps local governments in Europe move towards "territorialising" the circular economy by clarifying the spatial implications of circular economy. Territorialisation refers to grounding circular strategies in a territory's specific spatial distribution, land-use requirements, material flows, and governance arrangements. It translates circular economy from an abstract principle into a tangible practice embedded in urban space and institutions, enabling planners and policymakers to envision circularity in real urban contexts and imagine alternative spatial futures.[4] By making the land, location, and infrastructure implications visible, territorialisation also allows governments to anticipate trade-offs early rather than reacting to conflicts once space has already been allocated. Examining the circular economy from a spatial perspective surfaces its broader economic, social, and environmental potentials, beyond the widespread but limited "zero waste" approach focused on efficiency gains, recycling and industrial symbiosis. Adopting a spatial perspective enables planners and policymakers to design more holistic, context-specific CE policies and integrate circular economy into a wider swath of urban planning and policymaking.[5] Engaging more explicitly with a spatial perspective can also help reveal the power relations and socio-spatial inequalities embedded in sustainability transitions.[6] Decisions about where circular activities are located, which areas host infrastructures, and who benefits from or bears the burdens of transition are inherently spatial and political, raising important questions of spatial justice. This perspective resonates with recent work calling for more integrative and practice-oriented approaches to circular economy in urban planning. [7]

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[1] Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. Resources, conservation and recycling, 127, 221-232.
[2] Furlan, C., Wandl, A., Cavalieri, C., & Unceta, P. M. (2022). Territorialising circularity. In Regenerative territories: Dimensions of circularity for healthy metabolisms (pp. 31-49). Cham: Springer International Publishing.
[3] Kini, P. G., & Hariharan, A. N. (2025). Spatial circularity in sustainable urban development: a scoping review of the spatial dimension of circular economy. City, Territory and Architecture, 12(1), 1-29.
[4] Lucertini, G., & Musco, F. (2022). Circular city: urban and territorial perspectives. In Regenerative Territories: Dimensions of Circularity for Healthy Metabolisms (pp. 123-134). Cham: Springer International Publishing.
[5] Dąbrowski, M., Williams, J., Van den Berghe, K., & Van Bueren, E. (2024). 1. Circular regions and cities: towards a spatial perspective on circular economy. Regional Studies Policy Impact Books, 6(1), 13-28.
[6] Nicolas-Artero, C., & Dell'Angelo, J. (2026). Sustainability transition frameworks: Integrating space, scale, nature, power, and justice. Environmental Science & Policy, 177, 104327. Retrieved from https://doi.org/10.1016/j.envsci.2026.104327
[7] Bortolotti, A., Caterina, V. G., & Zaib, K. A. (2023). Which circularity for Urban Design and Planning? A compass to navigate Circular Economy research knowledge and methods. Planning Practice & Research, 1–20.

This is especially important in the context of growing urbanisation and competing land demand in Europe. In many cities, population growth and rising demand for housing, mobility, infrastructure, and services are intensifying pressure on limited urban land, while Europe's overall resource consumption already exceeds its territorial capacity. If everyone on Earth consumed like a typical European, nearly three planets' worth of land and resources would be required.[8] At the same time, other cities, towns, and regions face population decline, leaving local authorities searching for ways to reactivate underused buildings and infrastructure and to stimulate new economic activities and employment opportunities. Within this context, circular economy initiatives introduce additional and often poorly anticipated spatial requirements. Across both growing and shrinking territories, circular economy initiatives introduce specific spatial requirements, including production and repair spaces, logistics facilities, reuse hubs, and waste and resource management infrastructure. Without explicit spatial recognition in planning frameworks, these functions risk being displaced, marginalised, or pushed to suboptimal locations. This can result in inefficient land use, fragmented implementation, rising costs, and missed opportunities for synergies. The challenge, therefore, is not whether circular activities require space, but whether governments proactively manage this demand or allow it to be shaped by ad hoc market dynamics and land competition.[9]

Urban and territorial planning provides a key tool to manage these competing priorities. While the circular economy is often framed as an additional demand on already scarce space, its potential lies instead in its capacity to integrate and operationalise objectives that are already central to planning across housing, mobility, climate action, and economic development. Many core planning principles are, in fact, inherently circular. Urban planning has long aimed to limit land take, optimise the use of existing assets, promote multifunctionality, and reconcile economic activity with environmental and social constraints. From this perspective, the circular economy does not introduce fundamentally new goals but rather offers a practical and operational framework to reinforce and align long-standing planning ambitions.

In this sense, a spatial circular economy functions as a means to multiple ends: a practical action framework through which resource efficiency, climate objectives, economic activity, and social goals are jointly implemented and spatially coordinated. When embedded in spatial planning, circular strategies can support multifunctional land use and generate synergies between urban functions, rather than adding new sectoral demands. However, this integrative potential will not materialise automatically. It requires deliberate policy choices, updated planning instruments, and institutional coordination across sectors and scales of government.

Despite this, the spatial dimensions of the circular economy remain underexplored in policy debates, which continue to focus primarily on waste management or industrial processes. As a result, there is limited understanding of whether and how public administrations at municipal, provincial, or regional levels are translating circular economy ambitions into urban planning instruments, land use regulations, and spatial policies.[10] Bringing space to the centre of the circular economy discussion is therefore an urgent governance task, not a purely analytical one.

A CCRI Community of Practice for circular urban planning

This paper synthesises the learnings of the Urban Planning for the Circular Economy Community of Practice (CoP) within the Circular Cities and Regions Initiative (CCRI). The CoP was established to improve understanding of how public administrations are integrating circular economy principles into planning practice, not as a standalone policy domain but as an integrative framework that connects housing, mobility, climate action, economic development, and spatial governance. It aimed to facilitate peer learning among cities and regions, and to co-develop scalable and practical actions that leverage the circular economy's potential to align multiple urban agendas

[8] Global Footprint Network (2019). National Footprint Accounts. Retrieved from https://www.overshootday.org/content/uploads/2019/05/How_many_Earths_2019_English.pdf
[9] Dąbrowski, M., Williams, J., Van den Berghe, K., & Van Bueren, E. (2024). 1. Circular regions and cities: towards a spatial perspective on circular economy. Regional Studies Policy Impact Books, 6(1), 13-28.
[10] Furlan, C., Wandl, A., Cavalieri, C., & Unceta, P. M. (2022). Territorialising circularity. In Regenerative territories: Dimensions of circularity for healthy metabolisms (pp. 31-49). Cham: Springer International Publishing.

through spatial planning. To structure its work, the CoP selected four thematic areas reflecting key intersections between circular economy and urban systems. These themes guided discussions and helped systematically identify persistent barriers and enabling conditions for implementation:

I. **Promoting circular developments:** Encouraging adaptive reuse, circular demolition, modular design, and alignment with other sustainability requirements such as housing provision and energy efficiency. This theme highlights how circular approaches to the built environment can reconcile development needs with resource and land constraints.

II. **Allocating space and developing circular infrastructure:** Identifying and integrating the spatial requirements for infrastructure that closes, slows, and narrows material loops, identifying land for these functions, and managing trade-offs between uses. The theme draws on research on territorialisation, urban metabolism, and spatial proximity.

III. **Managing land circularly:** Applying circular economy principles to land-use planning itself. This theme positions circularity as a guiding logic for land-use decisions, helping to allocate land according to a clear hierarchy of priorities, such as avoiding new land take, safeguarding agricultural and natural areas, and directing development towards reuse, densification, and regeneration in coordination with housing, economic development, and environmental objectives. It engages debates on sustainable land governance, urban sprawl, and land-use optimisation.

IV. **Exploring scale and multi-level governance:** Examining how circular strategies are coordinated across neighbourhood, city, regional, national, and EU scales, and how responsibilities for managing competing land uses are distributed across governance levels. This includes enabling horizontal collaboration between municipalities and vertical alignment between planning and sectoral policies. The theme reflects literature on polycentric and multi-level governance, policy integration, and territorial cohesion.

This white paper draws on the discussions and experiences shared by participating authorities within the Community of Practice, complemented by a targeted review of academic literature. Together, these sources provide a multi-layered understanding of how circularity is being interpreted and implemented across contexts, forming a shared knowledge base to support cities in translating circular economy concepts into actionable, territorially grounded planning strategies. In doing so, this white paper aims to:

- **Clarify the spatial and territorial dimensions of the circular economy** by providing urban planners and local governments with a structured interpretation of the spatial implications of circular strategies and how they can be territorialised in practice.
- **Link academic perspectives with planning practice** by connecting, on one hand, academic discourses exploring concepts of circularity and modelling of the potential impacts of various circular activities, with, on the other hand, the ways that local governments are interpreting, negotiating, and operationalising CE principles in real-world planning contexts.

The structure of the white paper follows a progression from conceptual framing to applied insights and transferable solutions. The paper first identifies the elements of circularity that require spatial consideration and outlines the ways in which planning frameworks and instruments can influence their implementation across cities and regions. The methodology chapter, then, details the combined research approach, which integrates a preliminary literature review and interviews with insights developed through the CCRI Community of Practice on Urban Planning for the Circular Economy. The main body of the paper presents findings structured around the four systemic challenge areas that guided the CoP meetings in 2025. Each thematic chapter concludes with key takeaways that synthesise the main lessons emerging from practice. The paper then turns to scaling and replication, discussing how approaches developed in one context can inform others, the interlinkages between the challenge areas, and conditions that influence transferability. The concluding section reflects on the broader implications of the findings for spatial planning and future circular economy implementation.

02

Why urban planning matters for the future of the circular economy

Why urban planning matters for the future of the circular economy

Over the past decade, research has increasingly recognised that the circular economy (CE) does not unfold in an abstract system of resource loops and cannot be delivered through technological fixes or global value-chain optimisation alone.[11] Instead, a growing **"spatial turn" in CE scholarship** shows that circular practices are inherently territorial. Whether circular strategies succeed depends on where facilities are located, how land is allocated, how actors cooperate across jurisdictions, and how infrastructures and governance systems are organised. In practice, the CE is not a generic model of resource efficiency, but a territorial transformation defined by local conditions, planning choices, and institutional capacity.[12]

Taken together, this body of research shows that the circular economy is not just an environmental or economic agenda: it is a spatial one.[13] For policymakers and planners, this means that circularity cannot remain a parallel environmental initiative; it must be an integrated approach embedded within urban and regional planning, where long-term decisions about land use, infrastructure and zoning are made.[14] [15] [16] Through these competencies, planning becomes a territorialising agent, shaping the physical and institutional spaces in which circularity can take root.[17] [18] Without this spatial anchoring, circular strategies risk remaining fragmented pilots rather than contributing to a systemic transition.[19] Researchers emphasise the need to align circular strategies with the geographic, infrastructural, and land-use realities of cities and regions. This has given rise to the concept of "**spatial circularity"**, an analytical lens that prompts governments consider *how* circularity fits into territorial development, *where* interventions should occur, and *which* spatial conditions are necessary for circular systems to function.[20] [21] In practice, this lens becomes particularly relevant in key planning decision arenas such as strategic plan-making, land and property policy, development control and permitting, and public procurement.

Urban planning, understood as the coordination of practices and policies by public, private, and civil society actors to shape the built and natural environment, thus emerges as a key mechanism for translating circular knowledge into spatial action.[22] Through these instruments, planning authorities can embed circular objectives directly into the spatial organisation of cities and regions. This white paper focuses on the role of spatial planning by local public authorities, where many of these decisions are made and implemented. This scope also reflects the expertise of the city and regional government representatives in the working group that informed this paper.

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[11] Böhm, S., & Alexander, A. (2024). Towards a place-based approach to circular innovation. Journal of Innovation Management, 12(1), XII-XXII.
[12] Kini, P. G., & Hariharan, A. N. (2025). Spatial circularity in sustainable urban development: a scoping review of the spatial dimension of circular economy. City, Territory and Architecture, 12(1), 1-29.
[13] Kębłowski, W., Lambert, D., & Bassens, D. (2020). Circular economy and the city: an urban political economy agenda. *Culture and Organization*, *26*(2), 142-158.
[14] Tondelli, S., & Marzani, G. (2025). How to Plan for Circular Cities: A New Methodology to Integrate the Circular Economy Within Urban Policies and Plans. Sustainability, 17(12), 5534.
[15] Van den Berghe, K., Dąbrowski, M., Van Bueren, E., & Williams, J. (2024). 6. Policy recommendations for facilitating an urban and regional circular economy. Regional Studies Policy Impact Books, 6(1), 99-108.
[16] Van Der Leer, J., Van Timmeren, A., & Wandl, A. (2018). Social-ecological-technical systems in urban planning for a circular economy: An opportunity for horizontal integration. *Architectural Science Review*, *61*(5), 298-304.
[17] Williams, J. (2020). The role of spatial planning in transitioning to circular urban development. *Urban Geography*, *41*(6), 915-919.
[18] Williams, J. (2023). Circular cities: planning for circular development in European cities. *European Planning Studies*, *31*(1), 14-35.
[19] Bortolotti, A., Caterina, V. G., & Zaib, K. A. (2023). Which circularity for Urban Design and Planning? A compass to navigate Circular Economy research knowledge and methods. Planning Practice & Research, 1–20.
[20] Kini, P. G., & Hariharan, A. N. (2025). Spatial circularity in sustainable urban development: a scoping review of the spatial dimension of circular economy. City, Territory and Architecture, 12(1), 1-29.
[21] Remøy, H., Wandl, A., Ceric, D., & Timmeren, A. V. (2019). Facilitating circular economy in urban planning. *Urban Planning*, *4*(3), 1-4.
[22] Singhvi, A., Athanassiadis, A., & Binder, C. R. (2025). Configurations for circularity? A scoping review of urban planning approaches in the circular economy literature. Urban Research & Practice, 1-21.

Territorialising the circular economy

Across diverse studies, several spatial dimensions consistently emerge for territorialising circularity in cities:

- **Existing and new development sites.** The circular economy shapes space first at the level of buildings and sites, through decisions about both existing and new infrastructure. For existing buildings, circularity prioritises renovation, adaptation, and changes of use over demolition and new construction.[23] For new developments, it influences design choices, encouraging flexibility, modularity, and more intensive use of space. Many circular infrastructures, such as repair and reuse hubs, biowaste and bioeconomy facilities, decentralised logistics spaces, renewable energy systems, and industrial symbiosis zones, are particularly sensitive to their location.[24] Location directly affects the environmental, economic, and social value they generate. Spatial planning, therefore, plays a key role in embedding these developments where they work best, ensuring proximity and accessibility, anticipating and mitigating distributional effects, and supporting long-term, multifunctional use rather than competing claims on scarce land.[25]
- **Material flows and socio-economic networks.** Beyond individual buildings and sites, circularity shapes space through how materials move between activities and how the output of one process can substitute the input of another. When these connections are organised locally or regionally, fewer virgin resources are needed and long-distance transport can be reduced, lowering overall global material and energy throughput. However, circular systems can also generate new spatial dynamics within urban regions. Unlike the linear system, where materials are often produced elsewhere and imported in consolidated flows, circular value chains may require more frequent movements within cities as materials are collected, sorted, repaired, and redistributed. Achieving circularity therefore requires more than technical optimisation; it also depends on connecting the people and organisations involved and carefully planning how these flows operate in space. In practice, this involves identifying key material and energy flows, locating the infrastructures that support them, and understanding how distance, accessibility, and co-location affect cooperation between local and regional governments, businesses, SMEs, and community groups. [26] [27] [28] When this spatial understanding is embedded in urban plans and regulations, the circular economy becomes place-based, informing zoning choices, land allocation, and public and private investment decisions in line with what the territory needs.[29] [30] [31] [32]
- **Land allocation and governance.** Land allocation is fundamentally a governance challenge in contexts where housing, mobility, climate action, economic activity, and environmental protection compete for limited space. When embedded in urban and territorial planning, circular economy principles should not introduce an additional land-use claim but provide a decision-making logic to structure how land is prioritised and allocated. By favouring the protection of natural and agricultural land (Regenerate), intensification over sprawl (Reduce), and reuse over expansion (Reuse), circularity can help guide spatial choices in line with existing urban and climate objectives. Effective governance aligns land-use planning instruments, infrastructure provision, and sectoral policies to coordinate these priorities and mediate trade-offs between functions. Without governance

[23] Zhang, N., Gruhler, K., & Schiller, G. (2023). A review of spatial characteristics influencing circular economy in the built environment. *Environmental Science and Pollution Research*, *30*(19), 54280-54302.
[24] Tsui, T. (2023). Spatial approaches to a circular economy: Determining locations and scales of closing material loops using geographic data. *A+ BE| Architecture and the Built Environment*, (20), 1-230.
[25] Hubmann, G. (2022, September). The socio-spatial effects of Circular Urban Systems. In *IOP conference series: earth and environmental science* (Vol. 1078, No. 1, p. 012010). IOP Publishing.
[26] Tapia, C., Bianchi, M., Pallaske, G., & Bassi, A. M. (2021). Towards a territorial definition of a circular economy: exploring the role of territorial factors in closed-loop systems. *European Planning Studies*, *29*(8), 1438-1457.
[27] Chembessi, C., Bourdin, S., & Torre, A. (2024). Towards a territorialisation of the circular economy: The proximity of stakeholders and resources matters. Cambridge Journal of Regions, Economy and Society, 17(3), 605-622.
[28] Gura, K. S., Nica, E., Kliestik, T., & Puime-Guillén, F. (2023). Circular economy in territorial planning strategy: Incorporation in cluster activities and economic zones. *Environmental Technology & Innovation*, *32*, 103357.
[29] Bourdin, S., & Torre, A. (2025). Economic geography's contribution to understanding the circular economy. Journal of Economic Geography, 25(2), 293-308.
[30] Soto, C., Thomson, C. S., & Uti Nchor, J. (2024). Realizing the potential for circularity in Glasgow through the socio-spatial dimension of urban systems. Building Research & Information, 52(8), 957-983.
[31] Newell, J. P., & Cousins, J. J. (2015). The boundaries of urban metabolism: Towards a political–industrial ecology. *Progress in Human Geography*, *39*(6), 702-728.
[32] Zheng, Y., Cheng, L., & Wang, Y. (2022). Measuring the spatial conflict of resource-based cities and its coupling coordination relationship with land use. Land, 11(9), 1460.

alignment, allocating space for circular initiatives remains fragmented.[33] [34]

Methodological challenges in analysing spatial circularity

The spatial dimensions described above show that making the circular economy work in practice depends on very concrete decisions: where buildings and infrastructures are located, how material flows and people are connected, and how land is prioritised. Methodologically, however, analysing these spatial aspects of circularity remains challenging.

A first challenge concerns **boundaries and scale.** Urban planning decisions are usually made within administrative borders, such as municipalities or regions, while many circular material flows extend well beyond these boundaries.[35] Waste treatment facilities, recycling markets, logistics chains, and industrial supply networks often operate at regional, national, or even international scales. This creates a mismatch between the areas that public authorities can directly plan for and the geographies in which circular systems function. As a result, circular strategies can appear coherent in plans but prove difficult to implement on the ground. Similar challenges are well known in city-level carbon accounting, where outcomes vary depending on whether emissions are measured within administrative boundaries or along consumption-based supply chains. This more mature debate may offer useful lessons for developing methods that better capture the spatial realities of circularity.

A second challenge is **spatial data availability and analytical capacity**. Many circular economy analyses rely on aggregate indicators, such as total waste generated or materials consumed. While useful for setting overall targets, such information does not answer the practical questions planners face when translating circularity into spatial decisions: where exactly do materials arise, how far do they travel, and which locations are suitable for specific circular activities? Addressing these questions ideally requires combining multiple datasets, including land-use plans, building stock and construction permits, waste and energy flows, business locations, and infrastructure networks. In practice, however, public authorities often lack access to sufficiently detailed and interoperable data and may not have the analytical capacity, such as GIS-based tools, to perform complex spatial analyses.[36] Yet recent practice suggests that cities do not need comprehensive datasets to begin. A minimum evidence base can already support early spatial planning for circularity by combining existing land-use data, key logistics and infrastructure nodes, and proxy indicators of material activity such as building age, renovation cycles, construction permits, or sectoral business data. Even with relatively simple spatial analysis, these layers can help identify likely material hotspots, potential locations for circular infrastructure, and possible conflicts or synergies with existing land uses, allowing cities to start operationalising circular economy objectives while progressively improving their data systems.

A final methodological challenge worth mentioning, although many more exist, concerns the **divide between quantitative and qualitative approaches to studying circularity in spatial planning**. Research grounded in industrial ecology tends to prioritise quantitative and metabolism-focused methods, such as material flow analysis, life cycle assessment, and spatial modelling to measure material throughput, emissions of carbon and pollutants, and area of land used for certain purposes. Meanwhile, governance research often relies more on qualitative methods, including case studies, interviews, and policy analysis, to understand how decisions are made, how institutions coordinate across jurisdictions and departments, and why certain spatial arrangements enable or constrain circular practices.[37] [38] Integrating quantitative and qualitative methods is therefore essential to produce

[33] Balletto, G., & Ladu, M. (2023, June). The role of spatial circular planning in urban governance. a set of indicators to evaluate performance in urban regeneration. In International Conference on Computational Science and Its Applications (pp. 104-118). Cham: Springer Nature Switzerland.
[34] Bourdin, S., & Jacquet, N. (2025). Closing the loop at the local scale: Investigating the drivers of and barriers to the implementation of the circular economy in cities and regions. Ecological Economics, 231, 108542.
[35] Appendino, F., Roux, C., Saadé, M., & Peuportier, B. (2021). The circular economy in urban projects: A case study analysis of current practices and tools. Transactions of AESOP.
[36] Tsui, T. (2023). Spatial approaches to a circular economy: Determining locations and scales of closing material loops using geographic data. A+ BE| Architecture and the Built Environment, (20), 1-230.
[37] Marzani, G., & Tondelli, S. (2024). Highlighting circular cities trends in urban planning. A review in support of future research tendencies. TEMA, 17(2), 231-247.
[38] Prendeville, S., Cherim, E., & Bocken, N. (2018). Circular Cities: Mapping Six Cities in Transition. Environmental Innovation and Societal Transitions, 26, 171‑194.

evidence that is both analytically robust and practically useful, linking material impacts with institutional feasibility and helping planners justify and design circular interventions that work in specific territorial contexts. In practice, however, bringing these different types of data and perspectives together is difficult, because they operate at different scales, use different assumptions, and follow different research traditions, making meaningful integration an ongoing challenge.

Scope of this white paper

The literature on spatial circularity identifies several elements that need to be territorialised for circular economy strategies to function in practice, notably development sites and infrastructures, material flows and socio-economic networks, and land allocation and governance. At the same time, the methodological challenges discussed above show why these elements are difficult to analyse and act upon directly: material flows extend beyond administrative boundaries, spatial data is often too coarse or fragmented to guide land-use decisions, and quantitative flow analyses are rarely aligned with the institutional realities of planning and governance.

In response to this tension between analytical ambition and practical feasibility, the Community of Practice structured its work around four areas (promoting circular developments; allocating space and developing circular infrastructure; managing land circularly; and exploring scale and multi-level governance). These themes do not correspond one-to-one to the analytical dimensions identified in the literature. Rather, they were selected as practice-driven entry points:

I. **Promoting circular developments** translates questions about buildings, sites, and material choices into concrete planning and design decisions.
II. **Allocating space and developing circular infrastructure** addresses the spatial implications of the systems needed for circular economy to work.
III. **Managing land circularly** operationalises land governance debates applying circular principles to land management itself to manage trade-offs.
IV. **Exploring scale and multi-level governance** responds directly to boundary mismatches between planning jurisdictions and circular material systems.

Deepening practical research in these four areas helps turn the idea of a territorial circular economy into something cities can work with, by connecting everyday planning decisions about land, buildings, and infrastructure with how materials flow and how different levels of government make decisions.

> *"The holistic integration and operationalisation of circular systemic changes with geographic and land-based attributes is referred to as* ***spatial circularity****"*
>
> **KINI, P. G., & HARIHARAN, A. N. (2025)**

03

Methodology

Methodology

This white paper adopts a mixed-methods and iterative learning approach, combining a systematic literature review, exploratory interviews, and workshops within a Community of Practice (CoP). This design ensures that the resulting guidance integrates both scientific knowledge and the grounded expertise of urban planning practitioners.

Preliminary literature review and interviews

A **structured literature review** mapped the state of academic discourse on CE in relation to urban planning. The review focused on peer-reviewed publications indexed in Web of Science, ensuring coverage of high-quality and internationally recognised research across spatial planning, industrial ecology, urban governance, and circular infrastructure studies. The analysis examined key concepts, recurring thematic clusters, methodological approaches, and identified knowledge gaps, with particular attention to how spatial dimensions of circularity are conceptualised and operationalised. The results of this review are presented in the previous section.

To complement and triangulate these findings, a first series of **exploratory semi-structured interviews** was conducted with practitioners from participating cities and regions. These interviews served two purposes: (1) to identify perceived challenges, needs, and drivers in municipal implementation, and (2) to test, refine, and prioritise the thematic areas emerging from the academic review considering real-world constraints.

Together, the literature review and interviews produced a longlist of potential themes that directly shaped the design of the CoP sessions and the analytical framework of this paper.

Community of Practice (CoP)

The Community of Practice on *Urban Planning for the Circular Economy* brought together planners and circular economy practitioners from European cities and regions to exchange experiences, identify barriers, and co-develop practical approaches to integrating circularity into spatial planning. The working group consisted of a dozen members from eight cities, who met online six times between June 2025 and February 2026.

Recruitment

Recruitment followed a purposive sampling strategy via an open call on the CCRI website, dissemination through CCRI communication channels, and targeted outreach to ensure diversity of contexts and experiences. Participants were urban planners, circular economy officers, or practitioners affiliated with public authorities or related organisations from the following eight cities and regions: ReLondon (UK), Perspective.brussels (BE), Amsterdam (NL), Valonia / Southwest Finland Region (FI), Berlin (DE), İzmir Planning Agency (TR), Tampere & Circular Pirkanmaa (FI), and Guimarães (PT). They were not compensated for their participation. Additional cities were invited as guest contributors to specific workshops.

Scope refinement and prioritisation

Project partners identified prospective topics to focus the CoP activities, based on a literature review[39] and exploratory interviews, previous knowledge sharing activities on urban planning.[40] During the first session (kick-off meeting), project partners presented those topics together with short descriptions and guiding questions. CoP participants then engaged in a facilitated discussion to collectively evaluate and prioritise themes based on their understanding of how well they capture the most critical levers for embedding CE in cities. They selected four themes to structure the following four workshops:

[39] Williams, J. (2020). The role of spatial planning in transitioning to circular urban development. *Urban Geography*, *41*(6), 915–919.
[40] World Circular Economy Forum. (2024, April 16). Urban planning catalyses the implementation of circularity [Session PS10]. World Circular Economy Forum 2024. https://wcef2024.com/sessions/ps10-urban-planning-catalyses-the-implementation-of-circularity/

I. **Promoting circular developments:** How CE territorialises at new and existing building level; how buildings are reused and recovered, and new constructions are designed to support modularity, material efficiency, and adaptive use.

II. **Allocating space and developing circular infrastructure:** Identifying spatial requirements for CE infrastructures such as repair hubs, recycling facilities, and renewable energy systems, and integrating them into the urban fabric.

III. **Managing land circularly:** Allocating and governing land via circular principles to reconcile net zero land take targets and balance different, competing uses.

IV. **Exploring scale and multilevel governance of CE activities:** Coordinating responsibilities across neighbourhood, city, regional, and national levels, and enabling collaboration between actors to implement systemic circular strategies.

Other dimensions, such as social behaviour, financing, or consumer engagement, were recognised as relevant but were determined to be out of scope because they have a weaker territorial element. A sixth and final session was held in 2026 as an open session to validate the findings of each session and reflect on key learning. The outcome of that session served to validate and share the content of this paper.

Workshop preparation, facilitation and analysis

Workshops were designed and executed through a collaborative process combining preparatory analysis, facilitated knowledge exchange, and iterative validation. Prior to each workshop, the facilitation team deepened the literature review to extract key concepts and thematic debates relevant to the upcoming session. In parallel, practitioner input was collected through short questionnaires or semi-structured interviews.

All workshops were conducted online to enable broad participation and facilitated using the collaborative whiteboard tool Miro. Each two-hour session combined structured analytical tasks (e.g., mapping actions, challenges, and drivers) with open discussion. Contributions on Miro served both as qualitative data points and as elicitation tools, as participants commented on and built upon each other's inputs. Minutes and Miro boards were saved and shared with participants to ensure transparency.

Following each workshop, the facilitation team synthesised the inputs and compared them with the scientific literature, identifying agreements, contradictions, and emerging gaps. The resulting iterative cycle (i.e. preparation, facilitation, synthesis, and validation) ensured that the outputs of the CoP were co-produced, empirically grounded, and analytically robust. The insights from this process form the basis for the analyses and recommendations in this white paper.

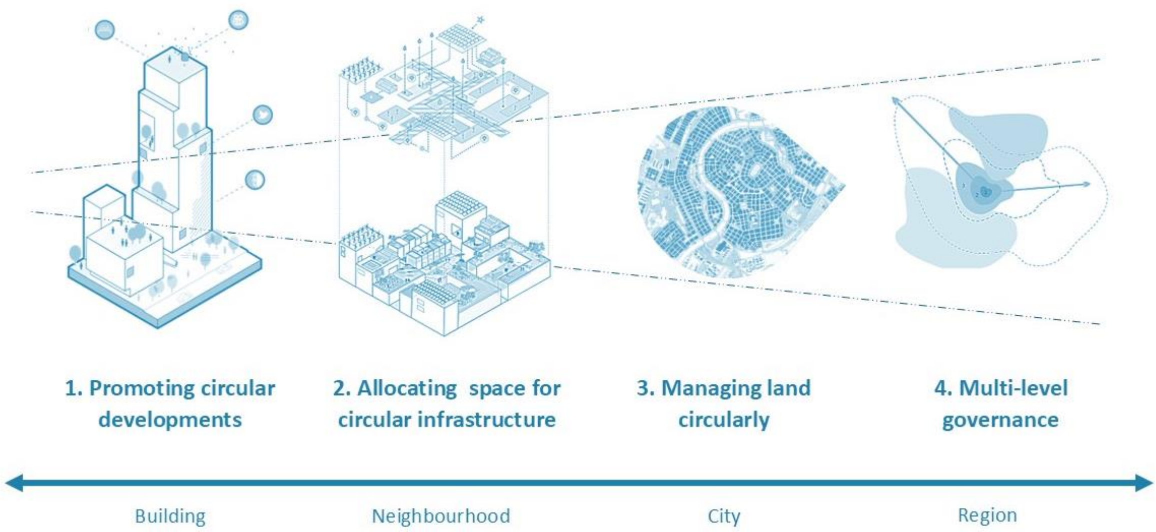
04

Findings & Systemic Solutions

Findings & Systemic Solutions

The following section provides a deep dive into the four topics explored during Workshops 1–4: promoting circular developments; allocating space and supporting circular infrastructure; managing land in more circular ways; and addressing questions of scale and multi-level governance. Each theme brings together insights from recent academic debates, distilled through a targeted review of relevant literature, and the practical examples and experiences shared by urban planning practitioners throughout the Community of Practice sessions (Figure 1).

Figure 1. Territorialising CE at different levels: an overview. Author's own elaboration from publicly available online sources.



I. Promoting circular developments

The transition toward circular urban development starts at the level of buildings, with a clear recognition that cities cannot meet climate, affordability, and resource-efficiency goals by relying primarily on new construction. Constructing new buildings is one of the most land-, carbon- and resource-intensive activities in the urban system, generating vast amounts of construction and demolition (C&D) waste. Studies increasingly stress that the most sustainable square metre is the one that already exists.[41]

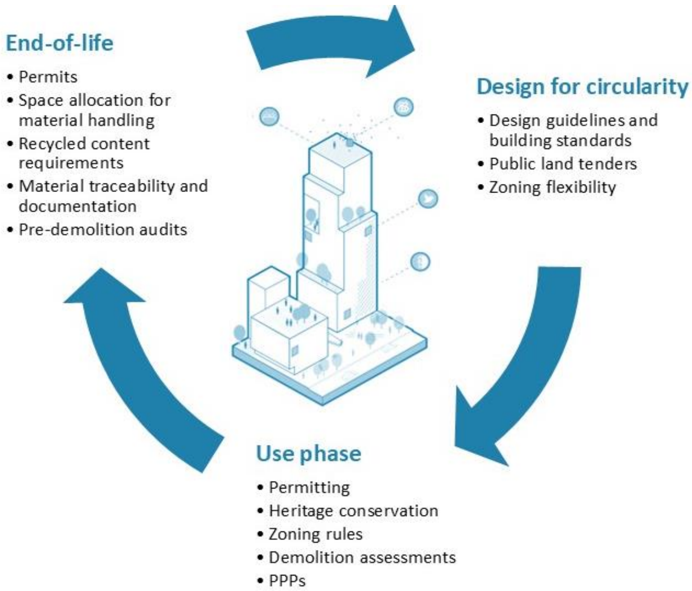
For a circular city, this means promoting circular developments and using planning instruments to encourage buildings that can be repurposed, adapted over time, and eventually reintegrated into material cycles. However, turning this principle into real urban transformation does not occur through market dynamics alone, particularly given the diversity of actors involved in design, construction and end-of-life phases. These include developers, real-estate investors, architecture and engineering firms, construction companies and subcontractors, material suppliers, and component manufacturers. Planning instruments such as zoning regulations, land-use policies, building permits, design and sustainability assessment frameworks, and conditions attached to development approvals can steer private sector actors toward circularity and locate these developments to locations that are able to

[41] Çimen, Ö. (2021). Construction and built environment in circular economy: A comprehensive literature review. Journal of cleaner production, 305, 127180.

generate environmental, economic, and social value for all.[42] [43] At the same time, these instruments are essential to ensure that circular developments are not concentrated only in high-rent areas where circular upgrades can fuel property value increases and displacement, but are distributed in ways that support social objectives and avoid reinforcing patterns of green gentrification.[44]

The CCRI CoP session, therefore, focused primarily on what planning instruments cities can mobilise to influence private-sector decision-making. The discussion examined the three main stages of a building's lifecycle—design, use, and end-of-life—to illustrate how planning tools can support circular practices and the barriers that currently prevent their widespread application (Figure 2).

Figure 2. Promoting circular developments. Author's own elaboration.



1.1. Circular design requirements

Designing buildings differently can help cities plan more flexibly and sustainably: not only in how buildings are constructed, but also in where and under what spatial conditions circular development takes place. For municipalities, this means enabling building types that can adapt over time rather than locking spaces into single uses.

Modularity is a core circular economy strategy in the built environment, enabling adaptability and flexibility for building to accommodate changing social, economic, and spatial needs over time.[45] For example, this means housing can be reconfigured as household sizes change, offices can be converted into homes, and ground floors can shift between shops, workshops, or community uses. When combined with design for disassembly, these approaches also make future material recovery and high-value reuse of building components more feasible. At the same time, it reduces the need for demolition, and, in turn, waste generation and dependence on new construction materials.

Circular design is not only an architectural or engineering concern (for example, modularity, layered systems, and design for adaptability or disassembly). It is also a spatial planning and land-governance issue, because municipalities decide where these building types are enabled. Municipalities use a combination of regulatory, land, and procurement tools to influence both how buildings are designed and where circular buildings are located (Table 1).

[42] Kreinin, H., Fuchs, D., Mamut, P., Hirth, S., & Lange, S. (2024). Transforming provisioning systems to enable 1.5 lifestyles in Europe? Expert and stakeholder views on overcoming structural barriers. *Sustainability: Science, Practice and Policy*, *20*(1), 2372120.
[43] Bolger, K., & Doyon, A. (2019). Circular cities: exploring local government strategies to facilitate a circular economy. European planning studies, 27(11), 2184-2205.
[44] Hubmann, G. (2022, September). The socio-spatial effects of Circular Urban Systems. In *IOP conference series: earth and environmental science* (Vol. 1078, No. 1, p. 012010). IOP Publishing.
[45] EIB (2024). A guide for circularity in the urban built environment. Retrieved from: https://advisory.eib.org/_tools/resources/documents/a-guide-for-circularity-in-the-urban-built-environment.pdf

Planning instruments used by municipalities include:

- **Design guidance or building standards (where possible)** that set expectations for layered construction, reversible connections, modular systems, documentation of building components (for example building passports and material tracking), and adaptable elements such as façades. These tools influence how buildings are constructed and how easily they can be adapted over time (Amsterdam; Brussels; Wiltz).
- **Public land allocation and tender criteria** that reward modularity, adaptability, and demountability. By making circular design a condition for accessing public land or winning development rights, municipalities not only influence design quality but also steer *where* circular buildings are developed, for example in strategic regeneration areas or around public transport nodes (Amsterdam; Brussels; Tampere; Turku).
- **Zoning flexibility** that permits temporary structures, reversible uses, and building typologies designed for functional shifts without requiring entirely new formal approvals. This allows planners to designate areas where change over time is expected and supported (Izmir; Paris).

Persistent challenges continue to limit the mainstreaming of circular design:

- **Limited municipal mandate over building standards** constrains what cities can require. In many countries, binding requirements for modularity, adaptability, or reversible construction sit at national level. While cities can promote circular design through guidance, incentives, or pilot projects, they often lack the legal authority to mandate these approaches across all developments, limiting consistency and scale.
- **Zoning rigidity in current planning frameworks** still assumes single-use, long-term fixity, making it difficult for buildings to change functions over time. As a result, buildings are typically approved for one specific use and struggle to change function later without complex and time-consuming planning procedures.
- **Cultural and market preferences favour conventional construction methods,** which are perceived as cheaper, faster, or less risky. Standard practices such as glued or tightly bonded components lock building elements together, making later disassembly or adaptation costly or impossible.
- **Limited market capacity for circular and modular construction**, as few firms currently have the expertise, products, or business models to meet circular design or tender requirements; without parallel capacity-building and market preparation, stricter criteria risk excluding smaller or locally embedded companies from accessing developing rights.

Table 1. Examples of circular design requirements provided during the CoP session #1.

Planning practice / instrument	Challenge / Barrier addressed	Example cities
Design guidance	Need for non-binding requirements for developers	**Amsterdam:** "Het Nieuwe Normaal" establishes a shared design language and indicators for adaptability and modularity. Planners use this framework during the permitting and negotiation phase to structure discussions with developers and architects, helping steer design choices toward circular and adaptable solutions before projects are approved. **Brussels**: The Region uses the GRO design framework and the TOTEM life-cycle assessment tool to guide private projects toward adaptable and lower-impact construction. These tools are continuously updated based on lessons from real projects, such as the Audi Factory, a large-scale industrial demonstrator where movable columns and adaptable layouts allow production lines to change over time. **Wiltz:** A new school complex groups technical systems in accessible layers and uses reversible joints (screws and clips), making future adaptation and reuse easier. This functions as a demonstrator project for new developments.
Land tender scoring	Market inertia: modularity perceived as higher-risk or higher-cost	**Tampere:** Land allocation criteria explicitly include modularity and adaptability, steering circular buildings to strategic sites such as the Hiedanranta redevelopment area. **Turku:** Land allocation used to enable modular pilots and temporary/adaptable building solutions on specific sites to allow future relocation and reuse.
Zoning flexibility	Zoning rigidity; difficulty obtaining approval for temporary or reversible buildings; buildings become obsolete when uses change	**Barcelona:** Modular buildings are used to provide temporary housing on public land designated for facilities, not permanent residential use. **İzmir:** Mixed-use zoning is used to support adaptable buildings such as coworking spaces. Planning rules allow internal functional shifts without requiring new permits. **Paris / Est Ensemble:** Planning incentives (e.g., FAR bonuses, faster permitting) for reversible or modular design, encouraging private developers to adopt adaptable layouts. **Turku:** Local detailed plans allow temporary or modular public buildings and flexible experimentation zones.

1.2. Use phase: reuse of existing structures

Reusing existing buildings can help cities reduce material demand, extend asset lifecycles, and reactivate underused sites. For municipalities, this means prioritising renovation and adaptive reuse where possible before allowing demolition and new construction. Research on adaptive reuse[46] and metabolism-based approaches to refurbishment[47] highlights the significant potential of reuse to reduce construction impacts while supporting urban regeneration.[48]

Reuse can enable cities to evolve without large-scale demolition cycles and can support the spatial redistribution of value, for example, by reprogramming obsolete commercial, industrial, or retail areas into new social, cultural, or productive functions. At the same time, the socio-economic case for reuse is not universal. In many contexts, major refurbishment or deep retrofit can be more costly and complex than demolition and new construction, due to limited opportunities for standardisation, uncertainty about the condition of older structures, and unforeseen costs discovered during works (e.g., hidden damage, hazardous materials, or non-standard component dimensions). These costs may ultimately be transferred to users, for instance, through higher rents, creating potential affordability challenges and tensions between environmental benefits and social outcomes. Acknowledging these trade-offs helps planners identify where reuse should be prioritised and where additional support may be needed. Planning institutions therefore play a decisive role in determining where reuse should be prioritised and under what conditions it becomes viable and socially beneficial (Table 2).

Planning instruments used by municipalities include:

- **Binding reuse requirements in permitting:** Developers must justify demolition and demonstrate renovation options before approval (Paris / Est Ensemble).
- **Heritage and conservation tools:** Using monument or protected status to limit demolition while supporting adaptive reuse (Amsterdam; Turku).
- **Zoning rules and development conditions** link additional development rights (e.g. extra floor space, density bonuses, etc.) to reward retention of existing structures and make retrofitting economically competitive with new construction (Turku; Brussels).
- **Performance assessment tools:** Embodied carbon, sustainability scoring, and lifecycle assessments are required to justify demolition vs reuse (London; Brussels; Amsterdam).
- **Public-private partnerships**. Municipalities lead by example by retrofitting buildings, setting reuse requirements in public projects, and activating underused spaces (Guimarães; Berlin).

Despite promising practices, several systemic challenges still constrain reuse:

- **Legal gaps:** Many planning systems lack statutory mandates for prioritising renovation over demolition.
- **Taxation and market incentives:** Higher taxes on retrofitting than developing new crease financial disincentives. Building new is less costly.
- **Technical constraints:** Structural weaknesses, contamination, or outdated regulations can make refurbishment difficult and add on the cost.
- **Cultural and market norms:** The “demolish and rebuild” mentality remains deeply entrenched among developers and public agencies alike.

[46] Angrisano, M., Bottero, M., Cavana, G., Fabbrocino, F., GRAVAGNUOLO, A., & Fusco Girard, L. (2025). Adaptive reuse of cultural built heritage: towards the implementation of the circular city model. *Frontiers in Built Environment*, *11*, 1561982.
[47] Fernandes, J., & Ferrão, P. (2023). Urban metabolism-based approaches for promoting circular economy in buildings refurbishment. Environments, 10(1), 13.
[48] Foster, G. (2020). Circular economy strategies for adaptive reuse of cultural heritage buildings to reduce environmental impacts. *Resources, Conservation and Recycling*, *152*, 104507.

Table 2. Examples reuse of existing infrastructure provided during the CoP session #1.

Planning practice/instrument	Challenge/Barrier addressed	Example cities
Statutory planning tools	Weak enforceable legal instruments; cultural bias toward demolition	**Amsterdam & Turku:** Heritage protection is often the only legally binding tool to ban demolition. **Paris / Est Ensemble** relies on a charter signed by 55 stakeholders that promotes renovation over demolition.
Zoning rules and development conditions	Financial disincentives; lack of economic reward for reuse	**Brussels (PPAS Biestebroeck):** Zoning plan allows greater development flexibility, such as additional floor area, mixed uses, or phased redevelopment, when existing structures are retained and adapted. **Turku:** Developers receive extra floor space if existing structures are preserved. They use digital/satellite mapping to identify potential development areas and mapping out infrastructure that can be saved to give those rights where it is most needed.
Performance assessment tools	Technical constraints; lack of standardised methodology	**Amsterdam:** Required value assessments (functional, material, cultural, financial, and environmental) to compare reuse versus demolition. **London:** Developers must evaluate carbon impact before demolition; they generally comply to preserve good relations with planning authorities that grant permits. **Brussels** is developing regulations requiring formal motivation for demolition (urban regulation project, not yet approved).
Public-private partnerships	Coordination gaps between authorities, developers, and private actors	**Guimarães:** Old public kiosks repurposed into rent-free spaces for circular businesses; parking areas converted into multifunctional spaces for markets and solar shading. **Berlin – Haus der Statistik:** Large public building refurbished through collaboration between government, city-owned companies, and civil society. **İzmir** repurposed a former coal-gas factory into the Havagazı Fabrikası cultural centre.

1.3. End-of-life: urban mining

Cities generate significant volumes of construction and demolition (C&D) waste, yet a substantial stock of recoverable materials already exists within the urban fabric. When buildings cannot be reused or refurbished, cities can recover materials from dismantled structures and reintegrate them into new projects, creating an “urban mine.”

Research on urban mining, recycled concrete, circular demolition, and secondary materials demonstrates that prioritising local recovery over importing virgin materials can substantially increase resilience, reduce carbon emissions, material use, and transportation-related impacts, as well as create local jobs that do not require higher level of education.[49] However, these benefits are highly conditional and often fail to materialise because destructive demolition, poor design for disassembly, damaged

[49] Purchase, C. K., Al Zulayq, D. M., O’Brien, B. T., Kowalewski, M. J., Berenjian, A., Tarighaleslami, A. H., & Seifan, M. (2021). Circular economy of construction and demolition waste: A literature review on lessons, challenges, and benefits. Materials, 15(1), 76.

components, weak salvage markets, compliance barriers, higher labour costs, longer timelines, and regulatory constraints make large-scale deconstruction and effective reuse difficult in practice.[50]

Urban planning plays a central role in enabling these end-of-life circular practices. Salvaging materials requires spatially coordinated support, including designated processing hubs, storage sites, material banks, and high-value recycling facilities that can receive and process construction outputs from multiple projects. [51] By strategically locating these facilities, planners ensure that recovered materials are accessible across the city to developers, SMEs, and community initiatives (Table 3).

Planning instruments used by municipalities include:

- **Mandatory recycled-content requirements in permits:** Developers must integrate a minimum percentage of recycled or reused materials in new or refurbished buildings (Paris / Est Ensemble).
- **Land allocation:** designating specific sites for material banks, eco-centres, or storage facilities within zoning and land-use plans (Brussels; Guimarães; Izmir; Wiltz; Tampere).
- **Requiring material traceability and documentation** prior to permitting, using tools like material passports, Building Information Modelling (BIM) software, or pre-demolition information statements (Amsterdam; London).
- **Public procurement and contractor compliance:** Stimulating demand for reused and recycled materials through public procurement. Requirements are embedded in tenders, framework contracts, and contractor selection criteria, while municipalities work to address liability, insurance, and quality-assurance barriers (Amsterdam **ASSET** project for reuse centres; Brussels; Tampere; Helsinki; Berlin; London).
- **Pre-demolition audits and circular demolition:** Permits and zoning can require audits to identify recoverable materials, enforce selective deconstruction, and promote material reuse instead of conventional disposal (Turku, Helsinki).
- **On-site waste management:** Planning instruments embed requirements for source separation, on-site sorting, and material tracking into permits, tenders, and procurement (Amsterdam, Turu, Wiltz).

Despite these strategies, several barriers remain:

- **Spatial and temporal mismatches in secondary material flows,** where recovered components are not available in the right place or at the right time to match project needs. This often results in materials being stored for long periods or transported across large distances, increasing the land required for interim storage sites and undermining the potential spatial efficiencies of reuse.
- **Missing infrastructure for component circulation** (e.g., storage depots, consolidation yards, digital and physical marketplaces, and supporting logistics facilities), driven in part by limited land allocation and uncertainty around long-term demand for these functions.
- **Regulatory and insurance constraints,** such as incomplete standards, unclear liability rules, and limited performance certification for reused or recycled components, make it difficult for developers, investors, and insurers to confidently approve their use in construction projects.
- **Economic barriers,** which do not stem solely from material prices, but from broader cost structures associated with recovery of materials, including higher labour intensity for selective deconstruction, testing and certification costs, non-standard dimensions and bespoke fitting, and financial risks linked to delays or uncertainty in material availability.
- **Cultural and market acceptance challenges**, where perceptions of lower quality, unfamiliarity with reused components, and preference for standardised new materials continue to limit uptake, even in cases where high-quality secondary materials are technically available.

[50] Arora, M., Raspall, F., Fearnley, L., & Silva, A. (2021). Urban mining in buildings for a circular economy: Planning, process and feasibility prospects. Resources, conservation and recycling, 174, 105754.
[51] Tsui, T., Furlan, C., Wandl, A., & van Timmeren, A. (2024). Spatial parameters for circular construction hubs: location criteria for a circular built environment. Circular economy and sustainability, 4(1), 317-338.

Table 3. Examples end-of-life management options provided during CoP session #1.

Planning practice / instrument	Challenge / Barrier addressed	Example cities
Minimum recycled-content requirements in permits	Weak enforceable mandates	**Amsterdam:** Projects are required to integrate reused or recycled materials where feasible (around 20%, reflecting current market limits), supported by the *Het Nieuwe Normaal* framework. **Paris / Est Ensemble:** Recycled-content thresholds applied to private multi-unit developments; these objectives for recycled concrete and reused materials are integrated into local planning documents (PLUi). **Guimarães** mandates recycled content in public procurement and links it to broader zero-carbon building goals.
Land allocation and zoning for material banks	Insufficient infrastructure and logistical support	**Brussels** supports circular construction material hubs (eco-centres) focused on reverse logistics for construction material redistribution. **Guimarães & Izmir** developed local hubs for secondary materials (including, but not limited to, construction materials). **Wiltz:** Reuse centre for construction elements, including collection, sorting, storage, combined with training and contribution to national circular construction standards.
Material traceability and documentation requirements	Coordination gaps and lack of transparency in material flows	**Amsterdam:** promotes material passports to document materials from construction through to end-of-life and facilitate circular demolition. **Wiltz:** Implements BIM (Building Information Modelling) and prefab planning to accurately quantify materials and reduce construction waste, making material recovery easier.
Procurement and contractor compliance	Weak market incentives and fragmented enforcement	**Amsterdam** uses procurement to support reuse centres and circular demolition practices. **Tampere & London:** Circular obligations included in contractor agreements and mandatory notification of reusable materials.
Pre-demolition audits	Cultural, financial, and regulatory disincentives; lack of technical expertise	**İzmir:** Pre-demolition audits combined with licensed recovery facilities and controlled disposal permits ensure that materials are safely recovered. **London**: Circular economy statements include pre-demolition data to ensure that developers consider material recovery and reuse in their building projects. **Paris / Est Ensemble:** Requires pre-demolition audits for buildings larger than 1000m², backed by national regulation. **Turku** requires pre-demolition audits through building permits and reuse assessments during proposal phases.
On-site waste management	Poor site-level sorting, behavioural and logistical challenges	**Amsterdam:** Promotes better sorting on construction sites and challenges the “one-container” culture, encouraging contractors to separate materials for reuse rather than mixing everything into a single waste stream. **Turku:** Requires mandatory on-site sorting and coordination among multiple contractors, ensuring that materials are recovered efficiently during construction or demolition.

1.4. Key takeaways

Cities participating in the sessions show that instruments already exist to advance circularity at each stage of the building lifecycle. For municipalities looking to act now, three priorities stand out:

- **Enable adaptable buildings through planning rules and land policy**: Use flexible zoning, land tenders, and design guidance to support modular and reversible buildings that can change over time. This strengthens long-term urban resilience by helping cities adapt to shifting social and economic needs. Just as important as design is location: circular developments should be planned in ways that avoid concentrating only in high-value areas or driving green gentrification, instead supporting spatial justice.

- **Make reuse the preferred option before demolition**: Reusing existing buildings can cut emissions and waste, but it is often more complex and costly than new build, so planners need tools like demolition justification, extra development rights, and carbon-based assessments to level the playing field.

- **Allocate space for circular material flows and logistics:** Urban mining requires space. Cities can support this by reserving land for storing, sorting, and reusing construction materials, and by locating these sites so they are accessible to developers, SMEs, and construction projects across the city.

While significant limitations remain, cities have found practical ways to work around these constraints:

- **Limited legal mandates at the municipal level** mean that cities often cannot require circular building practices through binding building codes, as they are set at national levels. But they can rely instead on guidance, incentives, or public land and procurement as leverages.

- **Existing planning instruments were not originally designed with lifecycle thinking in mind**. But cities can adapt existing tools such as zoning, demolition controls, land tenders, and procurement rules to incorporate circular criteria, including modular design, material reuse, and lifecycle carbon considerations.

- **Limited data on material availability.** Urban mining is difficult when cities lack information on where reusable materials will emerge. Planning departments can require data from demolition projects, map material flows, and use this information to match supply with demand.

London's Whole Life-Cycle Carbon Assessment

Policymakers in London have introduced regulations requiring a Whole Life-Cycle Carbon Assessment (WLCA) for all major new developments to minimise greenhouse gas emissions in the built environment, in line with London's planning policy objectives.

A Whole Life-Cycle carbon assessment provides a comprehensive evaluation of a building's total carbon impact over its entire lifespan. It accounts for embodied, operational and future carbon emissions. By assessing all life cycle stages together, this assessment can guide developers to prioritise design strategies that focus on material reuse, durability and adaptability, key principles of the circular economy.

Although currently mandatory only in certain parts of London, similar requirements may be introduced across the UK through the proposed Part Z regulation, which would require this assessment for new buildings. While this proposal remains under review, many local authorities already require WLCA as part of their planning and sustainability strategies.

This is an example of how cities can promote circular developments through sustainability strategies in urban planning.

II. Allocating space for circular infrastructure

Cities seeking to transition toward a circular economy must confront a central spatial question: what physical infrastructures are needed to close, slow, and narrow material loops, and how can scarce urban land be allocated to them? Circular infrastructure is essential because it shapes how materials, energy, water, and waste move through cities, forming the physical and institutional backbone of urban metabolic flows. Doing so requires space for both large, established systems and smaller, community-led initiatives, each playing a complementary role in enabling circular practices at different scales.[52] [53] Across the literature, a diverse ecology of circular infrastructures emerges, spanning both major technical systems and locally embedded activities. These include reuse centres, repair and maker spaces;[54] biological-loop infrastructures such as composting sites, urban farms, and multifunctional green spaces; integrated water and nutrient systems like rainwater harvesting, greywater reuse, and natural remediation;[55] renewable and energy-recovery facilities; flexible production or experimentation spaces;[56] and mobility and transport infrastructures that support low-carbon movement and efficient material flows (Figure 3 visualises a few of these and more…).[57] [58] [59] Although the next sections focus on a smaller group of priority infrastructures already being implemented by CoP cities, the full, broader list still matters because a truly circular city will need to coordinate all these different functions across the territory.

Many of these infrastructures do not experience the same degree of spatial stability. Large technical systems, such as waste management facilities, logistics platforms, wastewater treatment plants, or energy-recovery infrastructure, are typically anchored through long-term investment cycles, statutory planning protections, and service-provision mandates, meaning that although operators may change, the sites themselves usually remain in place. By contrast, emerging or smaller-scale circular activities (e.g. reuse and repair hubs, material storage depots, maker spaces, community-run sharing initiatives, or pilot-scale bio-based projects) are far more exposed to spatial precarity.[60] These functions often rely on temporary leases for spaces awaiting redevelopment, and therefore compete more directly with dominant and higher-value land uses such as housing, commercial real estate, or speculative development.

Yet the effectiveness of circular infrastructures depends on stable spatial conditions. They require secure and affordable land but also need to be in proximity of both users and material streams, while having access to logistics and storage. Moreover, urban planning rules must allow for zoning categories that recognise urban production. Additionally, bio-loop infrastructures depend on spatial conditions that are environmentally appropriate for soil- and water-related functions (for example, sites suitable for composting, urban agriculture, or constructed wetland treatment). The success of circular infrastructures must not only meet these conditions but also limit localised impacts such as noise, dust, odours, vibrations, and traffic, which can otherwise create conflicts with nearby communities and hinder implementation. Without these conditions, precisely those infrastructures that enable everyday circular practices and experimentation struggle to become durable components of the urban fabric.[61] This

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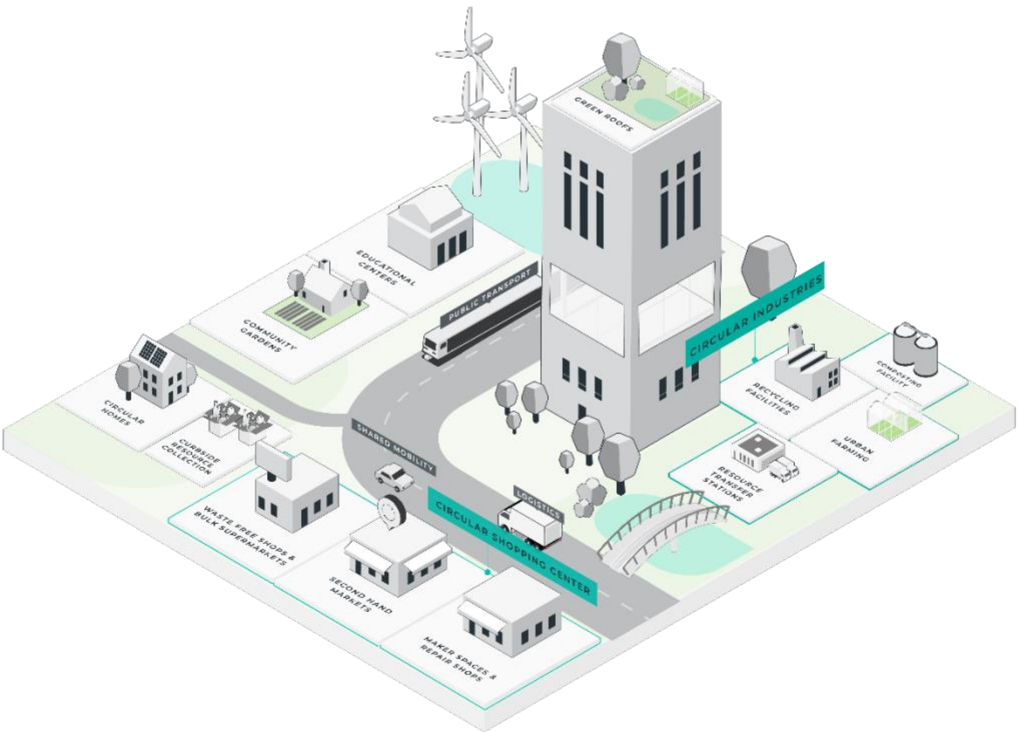
[52] Bahers, J. B., & Rutherford, J. (2025). Urban infrastructures, metabolic resource flows and the contradictions of circular economy 'solutions' in Nantes and Gothenburg. *Urban Studies*, *62*(9), 1897-1918.
[53] Lubacha, J., & Rakoczy-Garus, R. (2024). Space for circularity–exploratory study of local initiatives in Polish cities. *Economics and Environment*, *91*(4), 1058-1058.
[54] Elwakil, R., Schroder, I., & Steemers, K. (2023). Circular Maker Cities: Maker space typologies and circular urban design. *Buildings, 13*(11), 2894.
[55] Nicolini, E., & Mamì, A. (2023). Circular Water Management in Public Space—Experimental Feasibility Studies in Different Urban Contexts. *Sustainability*, *15*(15), 12025.
[56] Valencia, A., Zhang, W., & Chang, N. B. (2022). Sustainability transitions of urban food-energy-water-waste infrastructure: A living laboratory approach for circular economy. *Resources, conservation and recycling*, *177*, 105991.
[57] Franco, S. (2023). Circular economy in urban areas: evidence from global cities. *TeMA-Journal of Land Use, Mobility and Environment*, *16*(1), 239-243.
[58] Liu, X., Schraven, D., Ma, W., De Jong, M., & Hertogh, M. (2024). Achieving a framework of the circular economy in urban transport infrastructure projects: a meso-scale perspective. *Frontiers in Sustainability, 5*, 1475155.
[59] Piñones, P., Derpich, I., & Venegas, R. (2023). Circular economy 4.0 evaluation model for urban road infrastructure projects, CIROAD. *Sustainability, 15*(4), 3205.
[60] Williams, J. (2022). Challenges to implementing circular development – lessons from London. *International Journal of Urban Sustainable Development*, 14, 287 - 303.
[61] Verga, G. C., & Khan, A. Z. (2022). Space matters: barriers and enablers for embedding urban circularity practices in the Brussels capital region. *Frontiers in Built Environment, 8*, 810049.

makes urban planning essential: cities need to recognise circular activities as critical infrastructure. This can help secure space for them through long-term, protective land-use strategies, managing competing land uses while considering social value, ecological regeneration, and urban metabolism.[62] [63] Viewing circularity through this infrastructural lens reveals it as not only a technical challenge but also a deeply political and spatial one, shaped by struggles over land, property, and resource control, and by the risk that circular economy agendas are absorbed into existing urban development models rather than opening up pathways for more just and socio-ecological urban transitions.[64]

Building on this understanding of how different circular infrastructures vary in terms of function, scale, and spatial stability, the second CCRI CoP session centred on three key questions: what types of infrastructure are cities prioritising to enable the circular economy, what are their spatial requirements, and what is the role of the city in ensuring their long-term availability?

Figure 3. Spatial representation of a circular city (adapted from Zero Waste Cities of the Future, Circle Economy, 2024).[65]

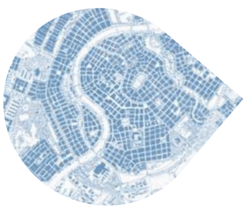


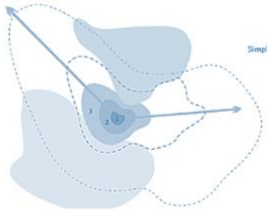
[62] Bahers, J. B., & Rutherford, J. (2025). Urban infrastructures, metabolic resource flows and the contradictions of circular economy ‘solutions’ in Nantes and Gothenburg. *Urban Studies*, *62*(9), 1897-1918.
[63] Zuluaga, S., Saxe, S., & Karney, B. W. (2025). Circular economy strategies in cities as a value-driven approach to infrastructure management. *Journal of Industrial Ecology, 29*(5), 1821-1832.
[64] Bassens, D., Kębłowski, W., & Lambert, D. (2020). Placing cities in the circular economy: neoliberal urbanism or spaces of socio-ecological transition?. *Urban Geography*, *41*(6), 893-897.
[65] Circle Economy. (2023). Zero waste cities of the future [Report]. Retrieved from https://www.circle-economy.com/resources/zero-waste-cities-of-the-future

2.1. Type of infrastructure required in circular cities

Across European cities, a diverse set of circular infrastructure is needed. These facilities operate at multiple scales, from neighbourhood facilities to regional networks (Table 4). Cities are also increasingly highlighting the importance of digital and logistics infrastructure to coordinate material flows, match supply and demand, and make circular systems function effectively in practice (Table 5).

Table 4. Examples infrastructure provided during CoP session at different scales in cities and regions #2.

Scale	Infrastructure needed
 **Neighbourhood** *(Close to residents, small businesses, and local material flows)*	**Reuse, repair & community circularity** • Neighbourhood reuse centres (small construction material resale, DIY reuse shops) (London, Guimarães) • Repair and refurbishment hubs (e.g. Urgezes Circular in Guimarães) • Community material workshops (e.g. Minerva Works, Recollective – London) • Circular economy shops (Guimarães) • Neighbourhood energy communities • Community composting and urban agriculture **Public space to integrate circularity** • Public markets, community facilities, and multifunctional green spaces increasingly to act as platforms for circular activities (events, workshops, etc.) • Reuse of local materials in streets and public realm (e.g. reused materials in Uliopistonkatu street, Tampere region) • Playgrounds and furniture from reclaimed wood (CityWood/Stadshout – Amsterdam)
 **City** *(Connecting neighbourhood flows to metropolitan systems)*	**Urban reuse and material management** • Central hubs to collect, store, and redistribute specific materials (Brussels Wood Park; Stadshout Amsterdam) • City-wide material depots for public works reuse (Turku, Guimares) **Urban production zones** • Circular living labs, innovation districts • Industrial symbiosis areas • Large-scale renovation and construction projects serving as material reuse anchors (e.g. schools, offices) • Urban agriculture zones **Waste and resource recovery** • Distributed city-managed systems for sorting and recycling (Recyparks – Brussels) • Bio-waste treatment and anaerobic digestion • District or building-cluster systems that treat and reuse greywater for non-potable uses (irrigation, toilet flushing, cooling). • Natural remediation or soil-recovery areas **Renewable and energy-recovery facilities** • District heating linked to waste or industrial residual heat (Brussels North district) • Renewable energy generation (solar and wind) **Blue-green circular systems** • Blue-green stormwater infrastructure: swales, retention basins, constructed wetlands, green roofs and permeable landscapes that slow, store and reuse rainwater (Amsterdam) • Urban ecological corridors and biodiversity areas supporting ecosystem regeneration

 **Regional** *(Requires more space; serves multiple municipalities; heavy or land-intensive flows)*	**Large-scale storage & processing** • Large-scale sorting and transformation networks and shared facilities that enable storage, reuse and recycling (e.g., Euro-Delta collaborations). **Construction & demolition material recovery** • Regional hubs for reclaimed concrete, steel, and structural elements (Tampere region reuse initiatives) • Former agricultural buildings repurposed as material storage (Flevoland barns – Amsterdam region) • Land mass coordination sites for excavation soil reuse (Helsinki region) **Industrial symbiosis & production landscapes** • Bio-based material production linked to regional land use (e.g. cattail cultivation for insulation in Amsterdam) • Innovation ecosystems to share industrial by-products and organic waste streams **Renewable and energy-recovery facilities** • Renewable energy generation (solar and wind) • Waste heat recovery from industrial clusters • Waste-to-energy facilities

Across all cities, participants also noted that many cities already have facilities that support CE practices without being explicitly labelled as circular, such as reuse depots, recycling parks or digital platforms for material sharing. In some cases, these practices already happen without the intervention of the public authorities, like, for example, steel reuse, which is driven by construction companies.

Table 5. Examples supporting infrastructure provided during CoP session at different scales in cities and regions #2.

Scale	Infrastructure needed
 **Logistics infrastructure** *(cross-scalar)*	Enables the movement, consolidation, storage, timing, and routing of materials across circular loops (reuse, repair, recycling, bio-loops, energy, construction). **Local collection & first-mile logistics (Neighbourhood Scale)** • Small eco-centres / local drop-off points for waste sorting and reuse (Guimarães) • Neighbourhood-level material exchange points acting as local aggregation nodes before city redistribution (Brussels) • Low-carbon micro-logistics hubs (cargo-bike depots, micro-consolidation centres) • Local reverse logistics pick-up points for repair, refurbishment, and reuse networks **Logistics and consolidation (city-level)** • Urban consolidation centres enabling just-in-time delivery and take-back of surplus materials (Brussels) • Reverse logistics hubs and urban consolidation centres (Amsterdam harbour; Brussels logistics zones) • Urban material buffering depots providing temporary storage to bridge timing gaps between supply and demand • Multimodal urban freight interfaces linking waterways or rail to low-emission last-mile systems • Flexible 'spaces of adaptation' for temporary storage during demolition, renovation, or major public works (e.g. Amsterdam planning practice) **Regional logistics node (regional level)** • Inland port logistics terminals for bulk circular materials • Rail-connected freight terminals serving urban circular systems • Regional circular logistics parks (large-scale storage and redistribution of secondary materials) • Bulk material transfer hubs (construction aggregates, timber, soil, biomass) • Cross-municipal reverse logistics centres
 **Digital infrastructure** *(cross-scalar)*	Digital systems complement physical sites: they enable more efficient matching of materials, facilitate planning for reuse, and reduce the need for physical storage. However, these systems also depend on physical infrastructure in cities and require deep awareness to ensure that digital innovation does not generate indirect resource and spatial impacts (e.g., energy use, data centres, and electronic waste). **Material exchange & visibility platforms** • Opalis.eu – directory of professional reused building material resellers (Europe-wide) • City-level digital material banks (Amsterdam material bank for bridges, cobblestones, construction materials) • Solar panel reuse platform (Solar Bank – Amsterdam) **Municipal reuse management** • Digital inventories of public material depots (e.g. roadworks materials) • Platforms linking supply and demand for secondary materials **Coordination & planning tools** • Digital systems to match demolition outputs with new construction inputs • Routing and load-matching systems for reverse logistics **Regional coordination platforms for soil and mass flows**

2.2. Spatial requirements of CE infrastructure

Circular infrastructure depends heavily on location, affordability, accessibility, and regulatory alignment. These requirements vary across scales.

- **Secure land.** Spatial precarity affects some circular activities more than others, especially reuse centres, repair hubs, maker and sharing spaces, small material storage depots, and pilot bio-based projects. These functions are often located on vacant or transitional sites awaiting redevelopment and typically operate under short-term or easily terminable leases. The key issue is not only duration of use, but tenure security: the constant risk of displacement discourages investment in equipment, workforce development, and long-term partnerships. Temporary circular uses require longer time horizons or formal integration into planning systems (Amsterdam; Brussels; London; Helsinki; Tampere).

- **Proximity to users and material flows.** Many circular activities depend on being embedded within dense urban areas. Reuse centres, repair hubs, neighbourhood sorting points, and digital exchange platforms function best when close to users. Similarly, the effectiveness of organic waste, recyclable, and construction material systems relies on spatial alignment between collection areas, consolidation points, and processing facilities (Brussels; London; Guimarães).

- **Access to logistics and multimodal transport.** Larger-scale CE infrastructures such as reverse logistics hubs, recycling facilities, and material storage depots require efficient connections to regional and metropolitan transport networks. This includes access to waterways, rail, and major road corridors, as well as location within or near established industrial zones. Amsterdam illustrates this with its reliance on waterways for circular logistics; Brussels highlights the need to reintegrate logistics into urban economic zones (Amsterdam; Brussels).

- **Zoning and multifunctionality.** CE requires co-locating activities that conventional zoning typically separates (production, repair, storage, waste handling, exchange, learning, and sometimes housing and public functions), creating a case for multifunctional and mixed-use zoning. But in high-value urban areas, more profitable uses like housing tend to displace lower-rent circular and productive functions. To prevent this, multifunctional zoning must include protective measures that secure affordable space for circular activities. Some cities are already testing such approaches by combining production with housing and integrating circular functions into public spaces and buildings (Brussels; Amsterdam; Guimarães).

- **Ecologically and socially suitable sites.** Many circular economy facilities, especially those dealing with organic waste, reused materials, or post-consumption flows, can create local concerns such as noise, odours, dust, traffic, and visual impacts. Their location therefore needs to fit both environmental conditions (soil, water, and links to green and blue networks) and social conditions. This means reducing real impacts through good design, technology, and traffic planning, and avoiding placing too many burdens on already vulnerable neighbourhoods. At the same time, hiding all “dirty” activities far from view can reinforce the idea that consumption has no consequences. Some lower-impact circular activities, such as reuse and repair hubs, can be visible and accessible, helping people understand how materials are handled and reused. Socially suitable siting is therefore about balancing impact reduction, fairness, and a degree of visibility, while recognising circular infrastructure as a necessary and permanent part of how cities function.

2.3. Planning instruments available to cities to secure land

Cities influence CE infrastructure through land-use decisions, planning frameworks, strategic visioning, public ownership of land, procurement, and regulatory tools. However, the influence of local governments varies considerably: some cities own substantial land and can directly steer development, whereas others depend more on facilitating the enabling conditions for the private sector to develop them (Table 6).

Planning instruments used by municipalities:

- **Zoning and land-use regulation:** Using statutory zoning to allocate and protect space for circular activities, including production, logistics, and material storage (Amsterdam; Brussels; Turku). This also involves revising definitions of "productive" or "industrial" zones to accommodate circular functions and ensuring that circular activities are not displaced by higher value uses.

- **Embedding CE in strategic visions and masterplans:** Integrating circularity into long-term spatial development strategies, masterplans, and urban development frameworks to align CE goals with growth trajectories and infrastructure investment (Amsterdam; Brussels; Turku: Guimaraes).

- **Municipal land stewardship:** Leveraging public land ownership to prioritise circular uses through long-term leases, covenants, or public–private partnerships, enabling facilities such as material banks, reuse depots, and circular innovation zones (Amsterdam; Helsinki; Tampere). In cities with limited public land (e.g. London), this role shifts toward facilitation rather than direct control.

- **Strategic public procurement:** Using public works, construction, and service contracts to create stable demand for reused and circular materials, and to stimulate market development for reuse and repair activities (Brussels ASSET project; Tampere; London emerging practice).

- **Temporary-use and phasing policies:** Allowing CE initiatives to occupy vacant or underused spaces, such as redevelopment sites or public buildings, to support experimentation and early-stage innovation and finding more permanent solutions when ideas are successful (Berlin; London; Amsterdam).

- **Hierarchical and cascading land evaluation:** Assessing land-use options through a structured hierarchy of first- and second-best uses, prioritising functions that maximise ecological regeneration, social value, economic resilience, and urban metabolic performance before allocating land to less circular or more extractive uses. This cascading approach helps ensure that scarce urban land is first considered for its highest circular and societal value rather than defaulting to market price alone (Brussels).

- **Metropolitan and regional coordination**: Planning for circular logistics, food systems, bio-based production, and construction material flows at the regional scale to match infrastructure needs with material catchments, especially where land scarcity is acute (Brussels; Amsterdam).

- **Cross-sectoral and cross-actor coordination:** Aligning waste, water, food, energy, construction, and mobility systems through integrated planning tools, spatial data mapping, and collaborative governance that brings together municipal departments with utilities, private contractors, regional authorities, and community organisations to jointly deliver, operate, and manage circular infrastructure (reported across all cities).

Table 6. Examples instruments used to secure land for circular infrastructure provided during CoP session #2.

Planning instrument	Example city	Key limitation
Zoning and land-use regulation	**Brussels** is revising its regional land-use plan and redefining “productive zones” to better accommodate circular logistics and material recovery functions, while also calling for more structured governance of existing industrial areas to steer their long-term strategic development.	Zoning reforms are slow and politically contested; productive zones still face pressure from housing and commercial development
Embedding CE in strategic visions and masterplans	**Amsterdam** integrates circular ambitions into its development strategies and harbour transformation plans, positioning the port as a long-term circular logistics hub.	Strategic visions are not legally binding and may not prevent displacement when market pressures intensify.
Municipal land stewardship	**Tampere/Helsinki** use strong public land ownership to embed circular requirements in publicly steered development projects,	Only effective where municipalities own land; limited impact in highly privatised land markets (e.g. London).
Strategic public procurement	**Brussels (ASSET project)** used procurement criteria in public construction to require reused materials, helping scale private reuse centres.	Procurement rules can be rigid; higher upfront costs and risk aversion may limit uptake without political commitment.
Temporary-use and phasing policies	Amsterdam extended temporary land-use contracts from five to ten years after early circular projects proved unviable under short-term agreements.	Temporary status discourages investment; preparation costs and weather protection needs can be high for short-duration use.
Hierarchical and cascading land evaluation	**Brussels** promotes cascading land-use logic, assessing biodiversity value, social value and circular value before allocating it to market-driven uses.	Hard to operationalise in statutory planning; economic valuation frameworks still dominate decision-making.
Metropolitan and regional coordination	**Brussels** develops regionally significant infrastructure such as the Construction Consolidation Centre and biomethanisation facilities, recognising that flows extend beyond city boundaries.	Requires coordination across jurisdictions; governance fragmentation can delay implementation.
Cross-sectoral and cross-actor coordination	**Guimarães** acts as a facilitator, linking businesses, parish-level reuse centres, and civic actors through the Climate Pact and digital planning tools (URBIA).	Institutional silos and limited municipal capacity make sustained coordination difficult; lack of data on urban metabolism and its geospatial location.

2.4. Key takeaways

The CoP discussion highlighted practical lessons for how cities can plan and allocate space for circularity.

- **Plan circular infrastructure across multiple spatial scales, building on what already exists.** Circular systems operate across neighbourhood repair spaces, citywide logistics networks, regional processing hubs, and digital platforms that connect actors and materials. Planning strategies should therefore consider how these layers interact rather than treating circular activities as isolated facilities. Not only, many enabling facilities such as reuse depots, municipal yards, or storage sites already exist but are not always recognised as part of the circular economy. Cities can accelerate circular transitions by formally recognising and connecting these existing spaces, rather than relying only on new flagship projects.

- **Secure long-term space for core circular infrastructure.** Spatial precarity remains a major barrier for circular initiatives. Many activities rely on temporary or opportunistic spaces, which undermines long-term investment, professionalisation, and supply-chain development. Cities highlighted the importance of protecting productive land, providing long-term leases, and formally recognising key circular activities as essential urban functions within planning systems.

- **Match different circular activities to appropriate locations.** Different circular infrastructures have different spatial needs. Recycling facilities typically require industrial zones due to logistics requirements and environmental impacts, while reuse centres, repair hubs, and redistribution facilities benefit from accessible urban locations closer to users. Cities can support circular systems by developing a **hierarchical spatial framework** that combines protected industrial zones for heavy activities with centrally located spaces for lighter reuse and repair functions, while linking both to regional storage and processing sites. At the same time, planning decisions should consider **spatial justice**, ensuring that circular infrastructure does not disproportionately concentrate environmental burdens in already disadvantaged areas and that the benefits of reuse, repair, and circular services remain accessible to different communities across the city.

- **Plan circular infrastructure in both space and time**. Some facilities require permanent locations to build stable supply chains, professional capacity, and user trust. Others depend on when materials become available and therefore require temporary storage sites or project-based deconstruction hubs. Planning systems can support both by combining long-term sites with flexible zoning, temporary-use agreements, and phased land-use strategies that allow space to be activated when materials become available.

Brussels Consolidation Centre

In Brussels, a logistics hub for construction materials has been developed to improve efficiency across the construction value chain by optimising storage and transportation through the pooling of resources. The centre is designed as a centralised platform for storing and delivering materials from suppliers exactly when contractors need them. At the same time, it provides space for waste and surplus materials to be stored for further reuse, recycling or disposal at the appropriate time.

Located in the port area, the centre receives construction materials via inland waterways and then delivers them via smaller, low-emission vehicles for last-mile delivery. Previously, Brussels construction companies faced several challenges: materials were delivered directly to construction sites, resulting in excessive traffic, partially filled trucks, and overstocking. Through this centre, the whole value chain becomes more efficient by creating a shared space for interaction among stakeholders, enabling the integration of circular economy practices in a high-waste-generation sector.

III. Managing land circularly

Managing land circularly means recognising land as a finite asset whose value depends on how effectively it is used, reused, and regenerated over time. Instead of treating land as continuously expandable, circular land management focuses on improving how already urbanised land moves through phases of planning, use, underuse, interim activation, regeneration, and transformation. This perspective is relevant both in cities experiencing strong development pressure and in towns or regions facing demographic decline or economic contraction. In both contexts, the challenge is similar: how to make better use of already urbanised land while avoiding cycles of vacancy, underuse, and outward expansion. **Circular land management** translates circular economy principles into land-use decisions through four core actions:

- **Regenerate:** Restore soil quality, ecological functions and degraded land.
- **Reduce:** Avoid virgin land take and limit sealing at source.
- **Reuse / Reconfigure:** Extend and intensify the use-phase of already urbanised land.
- **Recycle:** Close soil and material loops arising from land-use change.

Viewing land through a circular lens also highlights that land is not simply a backdrop to resource flows but as an active, contested and foundational element of circular systems. Land and soil underpin biogeochemical cycles, ecosystem functions, and the spatial organisation of material flows. Yet many circular economy frameworks focus primarily on materials and value chains, while giving less attention to the spatial and territorial conditions that allow circular activities to exist. Yet, territorial research shows that land scarcity, planning systems, land values, and ownership structures directly influence which circular activities can anchor, persist, or scale in a territory. This makes spatial planning and land policy critical tools for enabling circular transitions. [66]

The relevance of a circular land management is also seen from practice. Evidence from the CircUse project[67] and subsequent research by ESPON-SUPER[68] and the European Environment Agency confirms that cities cannot remain competitive, sustainable, or climate resilient if they continue expanding into new land while leaving inner urban areas vacant, underused, or degraded. This pattern of linear land consumption, expanding outward while existing urban areas remain underutilised, generates long-term economic, environmental, and infrastructure burdens cities can no longer afford.[69] Circular land management responds to this structural inefficiency by keeping land in continuous and productive use. Instead of abandoning sites and replacing them with greenfield development elsewhere, land is reused, regenerated, and reactivated over time. This approach aligns with a broad body of research on compact and spatially efficient urban development, which shows that concentrating development within already urbanised areas can reduce infrastructure costs, lower transport and energy demand, limit land take and habitat loss, and improve access to services and opportunities when carefully planned.[70] [71] At the EU level, this approach is directly aligned with objectives such as no net land take by 2050, soil protection measures, biodiversity targets, and territorial cohesion. These objectives reinforce a central insight: sustainable urban development depends less on allocating new land and more on managing the transitions of existing land more intelligently.[72]

Insights from the Community of Practice show that many European cities already apply circular land principles in practice, though often implicitly. The following sections reorganise these practices under the four pillars of circular land management, strengthening their technical coherence and making it easier for cities to scale, monitor, and communicate their efforts.

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[71] Allam, Z., Bibri, S. E., Chabaud, D., & Moreno, C. (2022). The theoretical, practical, and technological foundations of the 15-minute city model: proximity and its environmental, social and economic benefits for sustainability. Energies, 15(16), 6042.
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3.1. Regenerate: Restore soil, ecological functions and degraded land

Regeneration captures a decisive shift in how cities understand land: from a passive surface to build on, to an active ecological asset that must be restored, monitored, and enhanced over time. Insights from the Community of Practice show that regeneration is not treated as a set of enforceable planning actions embedded in land-use regulation, urban design and project delivery.

Key planning instruments and examples:

- **Soil-quality–based permitting and zoning conditions.** Binding requirements for soil surveys, contamination status and soil-function indicators integrated into development permits and zoning decisions (e.g. Brussels Good Soil Strategy), ensuring that land-use changes are conditional on soil regeneration outcomes rather than solely on building rights.

- **Designation of land for ecological restoration.** Spatial plan categories reserving degraded, post-industrial, post-extraction or post-disaster land for ecological recovery, including rewilding, afforestation and wetland restoration (e.g. Izmir Gediz Delta restoration zones).

- **Green–blue infrastructure zoning and hydrological function areas.** Land-use designations for retention basins, floodable landscapes, restored waterways and ecological corridors embedded in local land-use plans (e.g. Guimarães, Turku, Tampere), explicitly linking land regeneration with climate adaptation.

- **Green performance standards embedded in spatial planning.** Quantitative requirements for proximity to trees, minimum canopy coverage and access to public green space integrated into land-use plans and development guidance (e.g. Turku's 3-30-300 objective), which specifies that every resident should be able to see at least 3 trees from their home, that neighbourhoods should achieve a minimum 30% tree-canopy cover, and that all residents should live within 300 metres of a high-quality public green space.

- **Regeneration planning frameworks.** Targeted planning frameworks for contaminated or structurally degraded sites, enabling phased remediation alongside controlled interim or community uses, and supporting their gradual reinvestment and long-term reintegration into everyday urban life (e.g. De Ceuvel, Amsterdam).

- **De-sealing and "depaving" programmes targeted at public space and institutional land.** Cities are increasingly identifying where sealing can be reversed with the highest climate and ecosystem returns. Berlin has mapped potential areas for removal of impervious coverage as a basis for prioritising interventions and building a pipeline of feasible projects.

Taken together, these experiences show that regenerating land within a circular economy goes far beyond simply regreening spaces. It requires institutionalising soil health, restoring ecological and water systems, and actively repairing degraded land through spatial planning instruments. At the same time, cities highlight persistent challenges that complicate regeneration in practice. Soil contamination (particularly in former industrial areas) often limits redevelopment options and increases costs, making remediation a critical but resource-intensive step. Weak or poorly maintained green spaces, such as low-quality green belts, are vulnerable to development pressure when their ecological and social value is not clearly demonstrated. A further challenge concerns fragmented departmental responsibilities: regeneration, soil remediation, water management, green infrastructure, and spatial planning often fall under different municipal units or agencies, making it difficult to coordinate funding streams, timelines, and regulatory procedures. In addition, rigid zoning regulations and limited financial capacity can constrain the ability of municipalities to implement long-term regenerative strategies.

3.2. Reduce: Prevent urban sprawl, land take and soil sealing

Within circular land management, “Reduce” means stopping unnecessary outward expansion (urban sprawl), minimising land intake (conversion of natural, agricultural, or semi-natural land into built-up land), and limiting soil sealing (covering soil with impermeable surfaces like asphalt and concrete). Insights from the Community of Practice show that reducing land take is one of the most politically sensitive yet structurally decisive pillars of circular land management, because it directly supports both climate adaptation and mitigation. By limiting soil sealing, cities preserve permeability, reducing flood risk and urban heat during extreme weather events. At the same time, avoiding further land take protects carbon-storing soils and ecosystems and curbs emissions associated with dispersed, infrastructure-intensive urban expansion.

Key planning instruments and examples:

- **Urban containment: green belts, growth boundaries, and binding protection overlays.** Legally protected zones constraining outward expansion and preventing soil sealing, including coastal protection areas, agricultural preservation zones and urban green safeguards (e.g. Izmir, London, The Hague).
- **Statutory land-take caps and no-net-land-take (NNLT) rules with enforceable sequencing.** Brussels incorporates NNLT into its revised Regional Land-Use Plan by reinforcing objectives for green, blue and brown infrastructure. Tampere applies sequencing rules that prevent the loss of green areas prior to new construction, translating NNLT into enforceable planning practice. These approaches mirror the shift in EU spatial policy and research, from managing land efficiently to actively capping land consumption. NNLT functions as a strategic anchor that makes sure land take only occurs when there are no alternatives.
- **Soil-sealing limits and permeability standards.** Planning regulations set maximum sealing ratios and minimum permeable surface requirements, often tied to building permits and public-space design. Berlin’s Biotope Area Factor (BAF) is a prominent example: it requires a minimum share of “ecologically effective surface” per plot, pushing developers toward permeable ground treatments, green roofs, planted areas, and runoff-reducing designs rather than fully sealed courtyards and parking.
- **Landscape-scale and inter-municipal spatial frameworks to prevent spillover sprawl.** The CoP highlighted that reducing land take often exceeds municipal boundaries. Brussels’ collaboration with neighbouring regions on landscape planning, including cross-regional forest creation projects, reflects a growing emphasis on functional territories rather than administrative borders. Similarly, in Finland, regional planning responds to highly uneven development pressures: while some areas expand rapidly, others face shrinkage and vacancy. Regional-scale instruments allow cities like Turku and Tampere to differentiate between growth management, consolidation and conservation, aligning with contemporary planning theories on polycentric development and territorial cohesion.

Cities repeatedly report a structural mismatch: greenfield expansion is often faster and cheaper in the short term, while the benefits of avoided sprawl and reduced sealing (flood risk reduction, lower heat stress, ecosystem services) accrue over longer time horizons and across jurisdictions. This is why the most effective Reduce approaches combine regulation with mechanisms that make permeability and compactness the financially and procedurally “easy option”.

3.3. Reuse/Reconfigure: Maximise the productive life of already-urbanised land

Under the *Reuse / Reconfigure* pillar, circular land management focuses on intensifying and diversifying the use of already-urbanised land through densification, brownfield redevelopment, and the adaptive reuse of underused sites and buildings. Instead of expanding outward, cities deploy planning instruments that increase residential and functional capacity within existing settlement boundaries, while reprogramming land uses over time to respond to changing needs.

Key planning instruments and examples:

- **Brownfield-first and internal development prioritisation policies**. In London and Pirkanmaa, national and regional "brownfield first" policies steer development toward already-urbanised land, keeping greenfield conversion as a last resort. This is not only about redevelopment of plots, but about reconfiguring entire districts: former industrial areas such as Hiedanranta (Tampere/Pirkanmaa) or large obsolete infrastructures in Brussels (e.g. Schaarbeek Vorming rail yards) are repurposed as mixed, multi-functional urban quarters, often with interim uses while long-term plans are prepared.
- **Temporary use and "spaces in the middle".** Turku, Brussels, Izmir and Pirkanmaa all rely on temporary-use instruments to keep land productive during transition phases. Turku's "spaces in the middle" concept designates land awaiting future development for cultural or community uses; Brussels and Izmir similarly activate vacant plots as sports grounds, gardens or circular hubs. These instruments often combine simple permitting, time-limited contracts and light-touch design, allowing sites to host value-creating activities while maintaining flexibility for future land-use change.
- **Densification through infill, vertical extension, and conversion.** Land take and urban expansion continue even in regions with stable or declining populations, driven by decreasing household size, increasing floor area per capita, car-oriented settlement patterns, and the spatial separation of functions. As a result, maintaining housing supply, public services, and infrastructure efficiency within existing urban boundaries requires substantially higher levels of infill, redevelopment, and functional density than are currently delivered in many European cities. Densification is enabled through minimum and differentiated density requirements, permissions for vertical extensions, subdivision of existing buildings, and conversion of non-residential premises to housing or mixed use. These measures are typically paired with reduced parking standards in well-connected areas and accessibility-based zoning, aligning development intensity with public transport and service capacity.
- **Safeguarding land for circular functions and logistics.** Brownfield redevelopment is not only about adding housing density, but also about retaining space for essential circular functions such as logistics, repair, waste processing, and local production. Experience from ReLondon highlights how housing pressure can displace these activities, undermining circular strategies that depend on proximity. Planning responses include safeguarded zoning, strategic site designations, and clustered or distributed hub models embedded within dense urban areas.
- **Shared use and multi-functional space strategies.** Cities increasingly treat buildings and plots as **time-based assets** rather than single-purpose sites. In Tampere and Turku, this translates into shared use of schools, cultural buildings, sports facilities, and former industrial premises, allowing different users and activities to occupy the same space at different times of day or stages of development.

Cities emphasise that reusing and reconfiguring land is a governance challenge. Coordinating temporary, permanent and multi-functional uses, aligning multiple landowners, and protecting space for non-residential functions under strong housing pressure require active public steering.

3.4. Recycle: Close the loops of soil, excavated materials, and construction resources associated with land-use change

Within circular land management, *Recycle* refers to closing the loops of soil, excavated materials and bulk construction resources generated by land-use change. It operates at the interface between planning, infrastructure and material management, ensuring that the earth moved to shape urban land is treated as a resource rather than waste (Table 7).

Key planning instruments and examples:

- **Circular soil management as a planning concern.** Practitioners in London, Brussels and Pirkanmaa all noted that recycling feels more natural when talking about materials and soils than about land as such. This matches current research, which increasingly treats excavated soil and rock as one of the largest “hidden” waste streams in urban development, with a strong potential for circular use if managed systematically. In Pirkanmaa, contaminated or surplus soils are reused in parks, public spaces or noise barriers, provided risk and regulatory conditions are respected. This reflects wider European work (e.g. ELGIP, CityLoops) on circular soil handling, which promotes safe reuse of excavated soils instead of landfilling, aligned with the EU Soil Strategy and circular economy objectives.

- **Standards and guidelines for aggregate substitution.** Examples from Pirkanmaa, Tampere and Turku show how cities are increasingly reducing the use of newly quarried sand and gravel in road works and land construction, and instead using surplus soil from building sites, by-products from industry, and materials recovered from demolition. National initiatives such as the UUMA and CIRCWASTE programmes promote this shift, demonstrating that recovered materials can technically and economically substitute virgin rock in infrastructure construction when supported by guidelines and standards. From a land perspective, this means that already-urbanised land becomes both the source and sink for bulk materials: excavations in one project supply fill for another, reducing the need for new extraction sites and avoiding large soil dumps at the urban fringe.

- **Regional coordination platforms for soil and material flows.** Tampere and Turku go a step further by coordinating the reuse of excavated soil and rock between projects, including for land reclamation, coastal protection (e.g. breakwaters) and the creation of artificial islands. This is consistent with EU and national guidance calling for regional-scale coordination of excavated soil flows, supported by soil banks, registries or exchange platforms, to reduce waste and maximise local reuse. In circular land-management terms, these coordination mechanisms act as material logistics systems for the territory, ensuring that land-shaping materials circulate within the region rather than exiting as waste.

- **Planning designation of land for soil banks.** Land-use plans and strategic site reservations can secure space for facilities that handle surplus excavation soil and bulk construction and demolition materials, which require large outdoor areas, heavy-vehicle access, and robust ground surfaces. These differ from material banks for reusable building elements (e.g. windows, doors, or structural components) which typically need sheltered indoor storage, cataloguing systems, and finer handling conditions. Together, both types of facilities support circular construction, but they have very different spatial and functional requirements that planners need to anticipate.

Across Europe, research and policy note that recycling soils and bulk materials is often blocked by regulatory and organisational barriers, for example, when excavated soil is automatically classified as waste, or when there is no clear responsibility for matching sources and sinks. The lived experiences from Pirkanmaa, Tampere and Turku show how national programmes, standards and transport-infrastructure strategies can help overcome these barriers but also underline that urban and regional planners need to be directly involved in soil and material governance, not just engineers or waste managers.

Table 7. Examples of circular economy principles applied to land management, adapted from the insights of CoP session #3.

Land Category	Regenerate	Reduce	Reuse / Reconfigure	Recycle (Soil & Materials
Greenfield / Natural Land	Strengthen ecological networks; restore biodiversity; maintain natural soil functions	Avoid land take entirely; enforce ecological and agricultural protection zones; maintain buffers and landscape corridors	Only reversible or temporary uses; low-impact, seasonal, or conservation-oriented interventions	Preserve natural cycles of water, carbon, and nutrients
Gaps in Built Areas	Micro-greening, depaving, water-retention pockets; urban cooling	Prioritise infill over outward growth; make expansion unjustifiable when inner capacity exists	Develop mixed-use infill; allow flexible ground-floor uses; temporary activation	Use circular construction methods; reuse excavated soil and materials
Vacant / Underused Land	Soil remediation, daylighting streams, introducing blue-green systems	Brownfield-first logic: require justification before zoning new land elsewhere	Adaptive reuse, interim uses, circular hubs, social and cultural activation	Recycle contaminated soils; urban mining from obsolete structures; reuse demolition waste
Brownfield (Industrial, Rail, Port, Logistics)	Remediate soil and groundwater; restore ecosystems; manage risk through nature-based solutions	Prevent displacement-driven sprawl; resist conversion to low-density uses	Transform sites to mixed-use districts; reuse existing structures where possible; enable phased redevelopment	Treat and reuse contaminated soils; reuse industrial infrastructure; upcycle materials onsite
Built-Up Residential / Commercial Areas	Improve soil permeability via courtyards, green roofs, tree planting	Contain expansion pressure through intensification and sealing reduction	Renovation, conversion, vertical extensions, shared-use systems; flexible zoning	Recover materials via selective demolition; reuse excavated soil in local landscaping
Public Infrastructure & Roads	Linear parks, stormwater channels, biodiversity corridors	Avoid new infrastructure sprawl; reduce impermeable surfaces	Convert redundant roads or parking to green space, housing, cycling corridors	Reuse asphalt, concrete, and excavation materials in other projects
Coastal, Riverine & Waterfront Areas	Restore wetlands, riparian habitats, floodplains; improve water quality	Protect sensitive edges from urbanisation; restrict densification in risk-prone zones	Reconfigure obsolete industrial waterfronts; adaptive reuse of port buildings	Reuse dredged materials; recycle quay wall and port infrastructure components

3.5. Key takeaways

Circular land management becomes operational when planners apply a clear order of priorities in everyday land-use decisions: regenerate ecosystems, reduce land take, reuse already-urbanised land, and recycle land-shaping materials. The following actions translate these principles into practical planning tasks.

- **Protect and regenerate soils and ecological systems before development decisions are made.** Treat soil, water and ecosystems as infrastructure. Embed soil-quality requirements, permeability standards, and green–blue infrastructure designations into land-use plans and development permits. Prioritise the restoration of degraded or sealed land through remediation, depaving and ecological regeneration.

- **Stop unnecessary land take and outward expansion.** Apply urban containment tools such as green belts, growth boundaries and protected agricultural or ecological zones. Introduce land-take monitoring and targets and require planners and developers to demonstrate that development cannot be accommodated within existing urban areas before allowing greenfield expansion.

- **Prioritise reuse of already-urbanised land and densification.** Adopt a “brownfield-first” approach that directs housing, services and economic activities toward vacant plots, underused buildings and obsolete infrastructure. Support densification through infill, vertical extensions, and conversion of existing buildings while maintaining infrastructure efficiency and service accessibility. Without stronger densification strategies, cities face rising infrastructure costs, higher transport emissions, and continued loss of soil and ecosystems even when populations remain stable or decline.

- **Reuse/Reconfigure space to keep circular functions inside dense cities.** Without safeguarding space for logistics, repair, waste, and local production under housing pressure, densification can unintentionally hollow out the functions that circular strategies depend on, exporting them to the fringe of the urban fabric.

- **Plan the circulation of soils and materials across the territory.** The innovative edge is territorial coordination of excavated soils and aggregates (source–sink matching across projects and municipalities), plus reserving land for soil banks and handling sites. This reframes excavation as a regional metabolism problem that planners can actively steer, reducing landfilling, transport impacts, and new extraction.

Hiedenranta District – City of Tampere

One way to manage land circularly is through the implementation of brownfield-first policies, which steer development towards already urbanised land rather than in undeveloped areas. A clear example of this approach can be found in the Hiedanranta district of Tampere. Hiedanranta is a former industrial area that once hosted the Metsä Board pulp mill. It is currently being redeveloped into a mixed-use city district with housing, parks, streets, and public utilities, integrated into the existing urban fabric while preserving its industrial heritage.

The redevelopment follows circular economy principles, for instance, by conserving existing buildings and constructing sustainable housing around them. During the ongoing construction process, parts of the district are temporarily being used for community and cultural activities, allowing the space to be used before its full completion.

The development is managed by a company wholly owned by the City of Tampere, illustrating how planning can be in line with circular economy principles, reusing space to meet the city needs and respecting the historical identity of the area.

IV. Multi-level governance for circular urban planning

The previous sections have explored how circular urban development can be promoted through planning instruments that influence buildings, through the allocation of space for circular infrastructure, and through more circular approaches to land management. Together, these themes illustrate that circular economy transitions involve a wide range of spatial decisions, from design requirements for buildings to the strategic allocation of land for recycling infrastructure and logistics systems. However, implementing these strategies requires governance systems capable of coordinating action across different stakeholders and spatial scales.

Circular systems rarely operate within the boundaries of a single municipality. Construction materials, waste streams, logistics networks, and industrial value chains extend across metropolitan regions and often beyond national borders. Because of this territorial complexity, circular economy transitions cannot be implemented by cities alone. They require coordination between neighbourhood initiatives, municipal planning, regional infrastructure systems, and national regulatory frameworks. Each level contributes distinct planning instruments, institutional capacities, and policy levers that collectively enable circular urban systems.[73]

The concept of multi-level governance provides a useful framework to understand and manage these interactions. In the context of the circular economy, it matters because circular systems are inherently cross-scalar: materials move from buildings to depots and regional processing facilities, regulations are often defined nationally but implemented locally, and many circular activities depend on metropolitan coordination even when they are initiated at the neighbourhood level. Despite this growing recognition, the literature shows that governance structures often struggle to support circular transitions. Circular economy initiatives in European urban regions frequently remain project-based because institutional arrangements are not designed to coordinate resource flows across territories. Fragmented governance structures, limited cooperation between municipalities, and weak integration between spatial planning and resource management policies often prevent circular initiatives from scaling up.[74] Even in the Amsterdam Metropolitan Area—often considered a frontrunner in circular economy policy—the transition is constrained by fragmented responsibilities between municipalities, regional authorities, and sectoral agencies. While ambitious circular strategies exist, the governance structures required to implement them across the metropolitan territory remain incomplete.[75]

The key challenge is not choosing one “right” level of action but ensuring that responsibilities and planning tools match the functional scale of circular activities. As highlighted by participating cities in the CoP, when governance structures do not align with the spatial organisation of material flows and infrastructure systems, cities may either assume responsibilities beyond their institutional capacity or implement measures that fail to correspond to how circular systems operate. Coordination between levels of government can anchor circular objectives at the scales where they are most effective.[76] multi-level governance therefore becomes a central enabling condition for circular urban planning. It is the institutional mechanism that allows circular design at the building level to connect with regional material flows, neighbourhood experimentation to scale into city-wide strategies, and local planning ambitions to interact with national and European regulatory frameworks. Urban planning is particularly well positioned in this regard because it mediates between governance scales and policy domains, linking strategic objectives with territorial implementation.

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[73] Cramer, J. (2022). Effective governance of circular economies: An international comparison. Journal of Cleaner Production, 343, 130874.
[74] Obersteg, A., Arlati, A., Acke, A., Berruti, G., Czapiewski, K., Dąbrowski, M., ... & Knieling, J. (2019). Urban regions shifting to circular economy: Understanding challenges for new ways of governance. Urban Planning, 4(3), 19-31.
[75] Heurkens, E., & Dąbrowski, M. (2020). Circling the square: Governance of the circular economy transition in the Amsterdam Metropolitan Area. European spatial research and policy, 27(2), 11-31.
[76] Rangoni Gargano, E., Cornella, A., & Sacco, P. (2023). Governance model for a territory circularity index. Sustainability, 15(5), 4069.

4.1. Understanding circular economy governance across spatial scales

Understanding multi-level governance in the circular economy requires recognising that circular systems operate across several spatial scales simultaneously.[77] Recognising these nested scales helps clarify why circular economy governance must also operate across multiple levels. Decisions made at one scale influence possibilities at others (Table 8). For example, material reuse in construction depends not only on building design but also on the availability of regional material banks and logistics networks capable of redistributing recovered components.

Insights from the Community of Practice illustrate how these responsibilities are enacted in practice. At the **neighbourhood level**, circular initiatives often emerge through bottom-up experimentation and local engagement. Examples include repair cafés, community composting initiatives, neighbourhood sharing systems, and small reuse workshops. These initiatives help embed circular practices in everyday urban life and often serve as testing grounds for new solutions. Municipal authorities typically support these initiatives by providing access to public spaces, small grants, or simplified permitting procedures.

The **municipal level** plays a central role in translating circular ambitions into planning instruments and development practices. Municipal planning departments regulate land use, issue building permits, and manage public land. Through these instruments, cities can require demolition audits, integrate circular design criteria into land tenders, safeguard space for reuse hubs, and embed circular objectives in urban development plans. Municipalities also coordinate local stakeholders, including developers, construction firms, waste operators, and community organisations.

Between municipalities and regions lies an **intermediate metropolitan level**, where neighbouring jurisdictions coordinate around shared infrastructure systems and functional urban territories. In many metropolitan areas, circular initiatives require alignment between multiple municipalities that share material flows, labour markets, and logistics networks. Metropolitan collaboration frameworks can therefore play an important role in coordinating circular infrastructure and avoiding fragmented local initiatives. This intermediate level therefore functions as a platform for functional coordination.

The **regional level** becomes particularly important for infrastructure systems that serve multiple cities. Material banks, recycling facilities, soil exchange platforms, and logistics hubs often operate at this scale. Regional governance structures can coordinate investments, align spatial strategies across municipalities, and support industrial symbiosis networks that connect producers and resource users across the territory. In this sense, the regional level enables circular economy initiatives to move beyond isolated local projects and become part of broader territorial systems.

Finally, **national and European governance levels** shape the regulatory and economic conditions under which circular initiatives operate. Participants cities identified several areas where these higher governance levels play a decisive role. These include building regulations, eco-design standards, digital product passports for material tracking, and taxation policies that influence the economic competitiveness of circular construction practices.

Table 8. Examples of governance role at each scale, adapted from the insights of CoP session #4.

Scale	Role in a circular system
Neighbourhood	Enable experimentation, citizen engagement, and social innovation.
Municipal	Consolidation, processing, redistribution. They translate circular principles into planning instruments and spatial strategies.
Regional / Metropolitan	Plan infrastructure systems and material flows to create economies of scale.
National / EU	Provide the regulatory frameworks and financial instruments that shape market conditions.

[77] Wandl, A., Ioannou, O., Gruis, V., Peck, D., Jenkins, A., Geldermans, B., ... & Klein, T. (2026). The Delft scales to aspects circular built environment model: the result of two years of interdisciplinary discussions. Planning Practice & Research, 1-22.

At the same time, impacts and spatial conflicts related to land use, accessibility, and social acceptance are experienced locally, making local planning and governance indispensable. Circular economy projects therefore face a recurring scale mismatch: ambitions are frequently formulated at higher policy levels, while implementation depends on local capacities, space, and political trade-offs. Participants shared concrete examples demonstrating that CE projects rarely succeed when implemented by a single administrative level:

- **Neighbourhood → Municipal scale:** Local composting schemes and repair hubs achieve impact only when embedded into city-wide reuse strategies, collection regimes and zoning protection for circular activities.
- **Municipal → Regional scale:** Coordination of soil and rock flows in Tampere–Turku shows how excavated materials can only be reused effectively when the region provides **soil banks, regional registries and logistic matching platforms**.
- **Regional → National / EU scale:** Cross-border strategies such as the **EuroDelta (NL–BE–DE)** demonstrate that freight, logistics, industrial symbiosis and spatial strategies for CE must be harmonised across regions and states to scale.

These cases show that local innovations depend on higher-level frameworks, while national/EU policies only work if local planning integrates them (Table 9).

Table 9. Examples of multi-level governance for circular urban planning from CoP session #4.

Example city / region	Governance levels involved	Governance innovation	How it unlocks circular economy potential
Amsterdam / EuroDelta (NL–BE–DE)	Municipal, regional, international	Cities collaborate across national borders to coordinate circular value chains (e.g., mobility systems, material flows).	Overcomes fragmented markets and enables circular supply chains to operate at the scale required for infrastructure, logistics, and material recovery.
Helsinki metropolitan region	Municipal, regional	The legally binding regional spatial plan coordinates land use and infrastructure across municipalities, enabling alignment of circular infrastructure and material flows.	Allows circular infrastructure and logistics systems to be planned at the territorial scale where resource flows occur.
London – ReLondon	Sub-municipal, municipal, national	Independent organisations facilitate collaboration between local authorities, the metropolitan government, businesses, and national institutions.	Reduces fragmentation between actors and accelerates the translation of circular policy goals into practical implementation.
Tampere / Pirkanmaa region	Municipal, regional, national	Expert networks connect planners, policymakers, and sector specialists across governance levels to share knowledge and align circular strategies.	Breaks down institutional silos and helps integrate expertise from different sectors (planning, waste, construction, logistics).
Brussels	Municipal, regional	Planning tools require material-flow diagnostics and urban mining analysis within spatial planning processes and development frameworks.	Embeds circular thinking into urban planning decisions and identifies opportunities for material reuse and circular construction.

4.2. The city-region as a critical governance scale

Both the literature and the practical experiences of cities highlight the importance of the city-region as a key governance scale for circular economy transitions. Many circular systems depend on infrastructures and material flows that extend beyond individual municipalities but do not necessarily require national-level governance.

Obersteg et al. (2019) argue that urban regions represent the most relevant scale for circular economy implementation because they combine dense urban cores with peri-urban territories where recycling infrastructure, logistics hubs, and industrial production facilities are often located. [78] Similarly, Heurkens and Dąbrowski (2020) show that the circular transition requires stronger coordination at the metropolitan level to align municipal initiatives with regional infrastructure systems. Experiences from cities reinforce this observation. [79] Regional coordination is often necessary for managing construction material flows, planning recycling infrastructure, and coordinating logistics networks that connect multiple municipalities. Regional planning frameworks can also help align circular strategies across cities, ensuring that infrastructure investments and land-use decisions support broader territorial systems rather than isolated local initiatives. In this sense, the city-region emerges as a strategic scale where circular economy transitions can be coordinated across territories.

4.3. Bottom-up initiatives as a foundation for circular governance

Although governance coordination across levels is essential, circular economy transitions also depend on bottom-up initiatives. Many circular practices originate at the local level through community initiatives, pilot projects, and grassroots experimentation. These initiatives play several important roles. They demonstrate practical solutions, generate social legitimacy, and reveal the spatial conditions necessary for circular activities. For example, local repair networks or reuse centres often highlight the need for accessible spaces, affordable rents, and supportive regulatory frameworks.

However, bottom-up initiatives alone cannot deliver systemic circular transitions. Without institutional support, funding, and integration into planning systems, many grassroots projects remain temporary or limited in scale. Multi-level governance therefore requires connecting these bottom-up initiatives with municipal planning frameworks, regional infrastructure systems, and national regulatory environments. Urban planning can play a key role in this process by recognising grassroots initiatives, providing spaces for experimentation, and incorporating successful pilots into long-term planning strategies.

4.4. Enabling governance conditions

In addition to scale and coordination mechanisms, the meeting highlighted several enabling conditions and structural constraints that strongly influence whether circular economy (CE) governance can deliver systemic change.

Funding structures were identified as both a driver and a bottleneck. While project-based funding is often available, there is a lack of stable, long-term financial support for coordination, platforms, and shared infrastructure, which are essential for circular systems. Fragmented and opaque funding landscapes disproportionately disadvantage smaller municipalities and grassroots initiatives, while rigid funding schemes often fail to reflect the functional scale of circular value chains.

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[78] Obersteg, A., Arlati, A., Acke, A., Berruti, G., Czapiewski, K., Dąbrowski, M., ... & Knieling, J. (2019). Urban regions shifting to circular economy: Understanding challenges for new ways of governance. Urban Planning, 4(3), 19-31.

[79] Heurkens, E., & Dąbrowski, M. (2020). Circling the square: Governance of the circular economy transition in the Amsterdam Metropolitan Area. European spatial research and policy, 27(2), 11-31.

Knowledge, data, and shared narratives were also recognised as critical governance infrastructure. Participants stressed the need for shared definitions, indicators, and metrics, as well as common analytical tools such as maps, diagnostics, and material flow assessments. Structured learning processes, including peer exchange, pilot projects, and expert networks, help build a shared understanding of circular economy objectives and reduce misunderstandings across governance levels and sectors.

Political leadership and institutional capacity emerged as decisive enabling factors. Circular economy transitions require long-term political commitment, clear mandates across governance levels, and dedicated teams with the capacity to work across departments and territories. Without these conditions, circular initiatives remain dependent on individual champions and vulnerable to political turnover.

Structural and regulatory constraints that limit circular implementation in practice. Rigid national regulations, particularly around waste classifications, incompatible planning timeframes, and a persistent lack of recognition that circular economy activities require space all undermine local circular solutions.

4.5. Key takeaways

The idea of multi-level governance for the circular economy is not new. Cities in the CoP have confirmed that:

- **Circular functions cannot be delivered by one municipality alone.** Circular economy actions only work when the level of government matches the territorial footprint of the flow. This includes the need to coordinate logistics networks across municipal borders, since material flows, consolidation hubs, and transport corridors rarely align with administrative boundaries. Intermediary actors and regional coordination are therefore key.

- **The key role of urban regions.** While lighter and community-oriented circular functions, such as reuse centres or repair hubs, can be distributed across cities, more land-intensive or potentially disruptive facilities, such as large-scale recycling plants, bulk material storage, or heavy processing sites, are better planned and managed at the regional scale. This prevents individual cities from carrying a disproportionate environmental and social burden and supports a fairer territorial distribution of necessary but less desirable circular infrastructures.

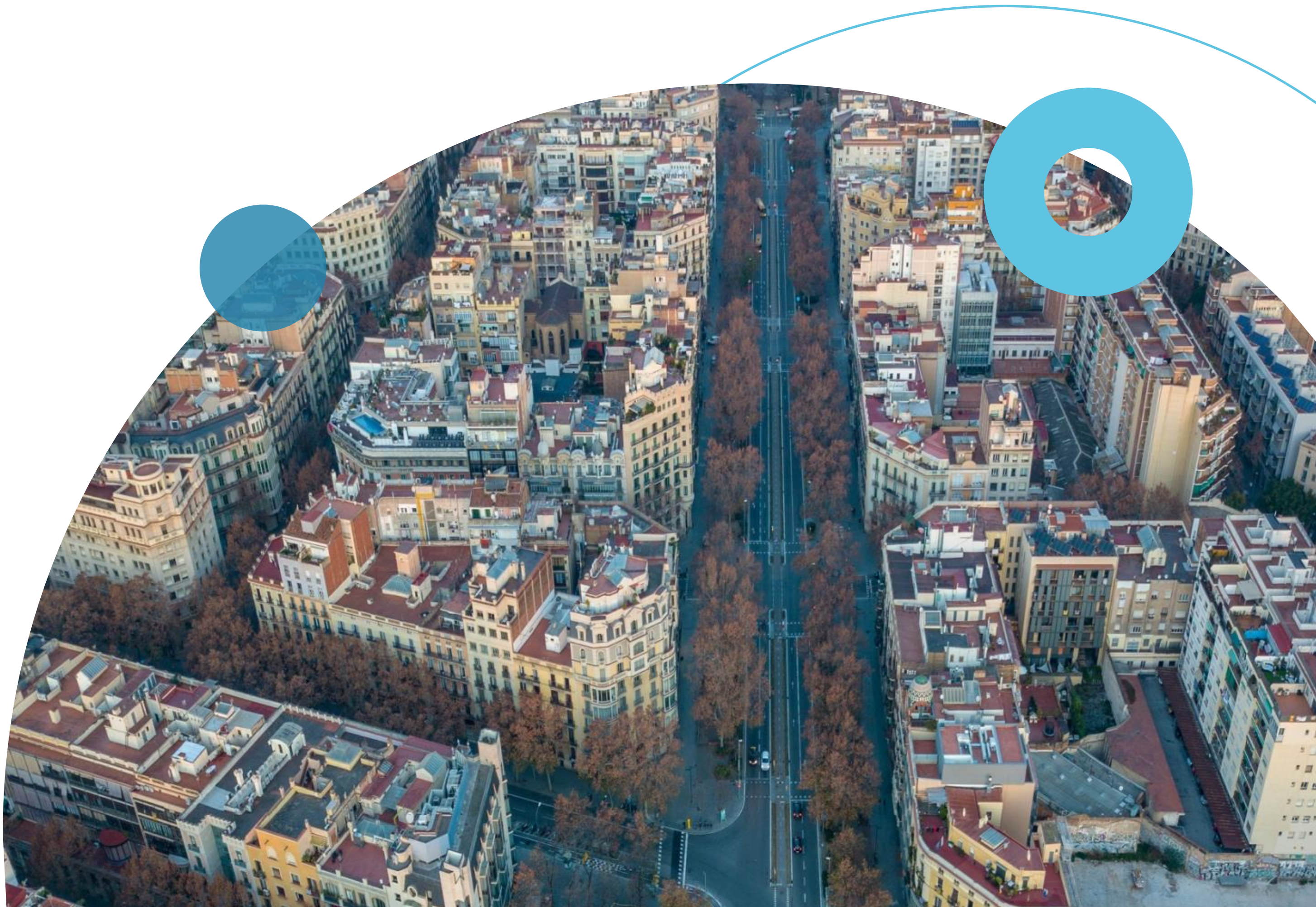
- **Funding must support both projects and coordination capacity.** While cities often succeed in securing funding for pilots and innovation projects, long-term circular impact depends on sustained investment in coordination, shared infrastructure, and regional platforms. Cities and regions benefit most when funding frameworks prioritise shared assets rather than isolated projects.

- **Shared spatial tools and metrics function as governance devices, not just analytical instruments.** Where circular initiatives span multiple actors and territories, the absence of shared definitions, indicators, and data quickly becomes a governance bottleneck. Experiences from projects like ASSET show that maps, spatial diagnostics, and shared analytical tools help align priorities, reveal trade-offs, and build collective ownership.

The ASSET project –Alliance

Several cities and regions within the EuroDelta, a historically strong economic urban area encompassing the Rhine, Scheldt and Meuse deltas, have collaborated through the Interreg NEW ASSET project to understand how interregional cooperation can accelerate the transition to the circular built environment. The project focused on developing a joint strategy to clarify the spatial implications of the circular economy in the built environment across the EuroDelta, while simultaneously identifying innovative solutions at multiple scales. Using the Spatial Strategy for a circular province of South Holland as a baseline, the partners assessed the requirements for establishing a common spatial-economic strategy for the region and explored various forms of intercity and interregional cooperation to address local spatial challenges.

The project enables and explores how circular economy principles can be territorialised across different regions. While the research yielded a range of insights and the publication of the EuroDelta 2050+ book in July 2026, one of its most significant outcomes was the start of a multi-disciplinary triple-helix EuroDelta Alliance, formalised through the signing of a letter of intent by project partners, which included: the municipality of Amsterdam, Metrex (the European Network of metropolitan areas), Perspective.brussels and Bruxelles Environment, Duisburg Business & Innovation, the municipality of the Hague, the province of South Holland, RWTH Aachen and the TU Delft.



05

How to scale, replicate and transfer planning solutions

How to scale, replicate and transfer circular urban planning solutions across the EU

This white paper contributes to a strand of literature that positions the circular economy as an evolving spatial and institutional project, actively negotiated within contemporary planning systems. The growing prominence of spatial questions signals the emergence of a more mature phase of the circular economy. While early CE discourse focused on pilot projects, start-ups, and technological experimentation, spatial considerations remained largely implicit. As circular initiatives move toward large-scale implementation, issues of land, location, infrastructure, and territorial governance become unavoidable. The territorialisation of the circular economy is symptomatic of a transition from experimentation to structural integration within both markets and public policy.

The future of the circular economy will therefore depend heavily on how it becomes embedded in planning instruments at different scales: at building level through permits and design requirements, at city level through land-use decisions, and at regional level through spatial planning frameworks. However, the findings presented in this white paper come from a Community of Practice made up of heterogeneous cities, and not every approach or tool will be equally relevant or applicable everywhere.

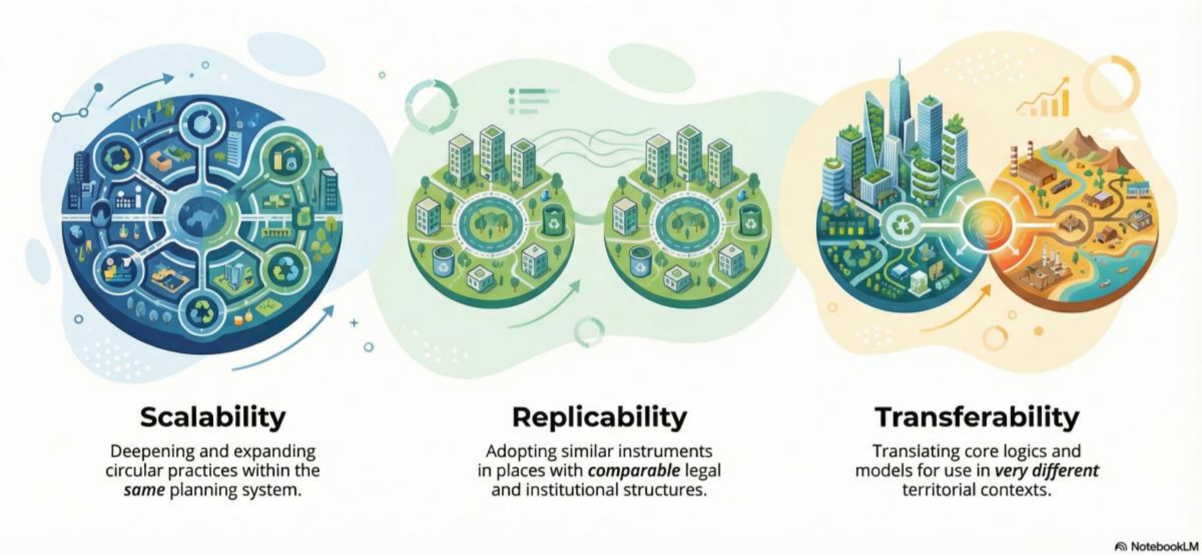
Territorialising the circular economy is less about rolling out new, standalone "circular" planning tools and more about adapting existing high-level planning instruments to support circularity at scale. Zoning regulations, land allocation procedures, building permits, masterplans, and procurement frameworks already shape how cities grow and change. These tools are used repeatedly in every investment cycle, making them the most reliable pathway for steadily increasing circular ambition across more sites, sectors, and decision layers.[80] The specific instruments that cities can leverage depend on the planning systems in their cities, regions, or countries.

To make sense of this diversity, it is useful to differentiate between the main ways circular planning approaches develop and spread. (Figure 4):

- **Scalability** refers to their capacity to deepen and expand within the same planning system, progressively influencing more sites, sectors, and decision layers.
- **Replicability** reflects whether similar instruments can be taken up in other places with comparable legal and institutional architectures.
- **Transferability**, meanwhile, concerns the movement of underlying logics, analytical methods, and governance models across very different territorial and regulatory contexts, where instruments must be translated rather than copied.

[80] EIB (2024). A guide for circularity in the urban built environment. Retrieved from https://advisory.eib.org/_tools/resources/documents/a-guide-for-circularity-in-the-urban-built-environment.pdf

Figure 4. Scalability, Replicability and transferability explained. Note. Image generated using NotebookLM.



Whether a given approach can scale, replicate, or transfer depends in large part on the planning system it sits within. The next section maps out these systems to help readers identify which instruments are most relevant to their own context.

Planning systems and their CE leverage points

Planning scholarship often groups European spatial planning systems into four ideal types: comprehensive-integrated systems, regional-economic systems, land-use management systems, and building-oriented systems. These overlap in practice, and many cities do not fit neatly into a single category.[81] For instance, from the CoP, Brussels shares features of both the comprehensive-integrated and regional-economic systems, and Turkish cities like Izmir combine building-oriented regulatory cultures with emerging metropolitan coordination that resembles other systems. The idealised categories remain useful, but readers should treat them as approximate.

This diversity is one of Europe's strengths: it reflects different legal frameworks, political cultures and historical trajectories, and provides opportunities for experimentation.[82] However, it also means that planning instruments for the circular economy cannot simply be transferred from one city to another. Scaling the circular economy in Europe will depend less on standardising instruments and more on translating shared principles into tools that resonate with each planning system.

Comprehensive-integrated systems (Nordic countries, Netherlands, Germany)

These systems are characterised by strong, plan-led frameworks with clear vertical coordination between regional, metropolitan, and local levels, and a high degree of continuity from strategic plans through to regulation and implementation.

The most direct leverage points for CE in these systems are **statutory zoning and land-use plans**, which can be updated to explicitly accommodate circular functions such as repair centres, material storage, remanufacturing, and consolidation hubs. Many of these activities struggle to find space in conventional zoning categories, resulting in protracted permitting or outright exclusion. Updating land-use definitions to include circular functions is a form of planning housekeeping that removes friction at scale.

[81] Nadin, V., & Stead, D. (2008). European spatial planning systems, social models and learning. Disp-the planning review, 44(172), 35-47.
[82] Nadin, V., Cotella, G., & Schmitt, P. (2024). The classification of spatial planning in Europe: Added value and challenges. In Spatial planning systems in Europe (pp. 266-295). Edward Elgar Publishing.

Land allocation and tender criteria offer a second major lever. Where municipalities control significant land portfolios, they can embed circular requirements directly into development conditions, turning land allocation into a governance tool. For example, CoP member Amsterdam initially tested circular requirements through specific land tenders in innovation districts such as Buiksloterham and Zuidas. Over time, these criteria were integrated into mainstream procurement and land-allocation procedures, allowing circular requirements to influence a growing share of developments rather than remaining confined to experimental sites. This illustrates how circular criteria can scale from pilot conditions to standard procedure within the same planning system.

Regional coordination of soil and material flows is also well suited to a comprehensive-integrated system. In Finland, cities like Tampere and Turku coordinate the reuse of excavated soil and rock between projects at the regional scale, supported by soil banks, registries, and exchange platforms. This kind of coordination requires the vertical integration that comprehensive-integrated systems are designed to provide.

Regional-economic systems (France, parts of Central Europe)

Planning in these contexts is closely linked to state-led regional development, infrastructure investment, and industrial modernisation, with strong roles for regional strategies and economic programming alongside spatial policy.

The priority here is to advance circularity through **regional development strategies** and **investment programmes**. Circular hubs, innovation districts, logistics platforms, and remanufacturing zones can be positioned as drivers of competitiveness, skills, and employment within existing regional economic frameworks. Inter-municipal coordination platforms provide the governance architecture for managing material flows and shared infrastructure across jurisdictions.

National regulation also plays a larger role in these systems. In France, recycled-content thresholds and pre-demolition audit requirements are established at the national level and flow through into local planning documents. Paris and Est Ensemble, for example, apply recycled-content objectives for concrete and reused materials through their local planning instruments (PLUi), backed by national regulation requiring pre-demolition audits for buildings larger than 1,000m². This regulatory architecture makes certain instruments highly replicable across French cities, since the legal basis is shared.

Land-use management systems (UK, Ireland)

These systems rely less on fixed, legally binding zoning and more on case-by-case decision-making guided by policy frameworks, design guidance, and negotiated development management processes.

The most effective CE instruments here work through **guidance, negotiation, and procurement.** The London Plan requires referable developments to submit a Circular Economy Statement, supported by detailed guidance. Because this requirement is embedded in a familiar development-management process, other UK planning authorities with similar legal structures can adopt a comparable requirement without redesigning their systems. Over time, these builds shared professional capacity, comparable data, and standardised circular design responses across authorities. This is a clear case of replicability within a shared institutional architecture.

Supplementary planning documents and development briefs offer additional leverage for securing reuse, material recovery, and circular design outcomes on a project-by-project basis. Procurement-led approaches, implemented through public construction contracts, can also create stable demand for reused and circular materials, helping to develop markets in places with currently limited access to secondary materials.

A key constraint could be limited **municipal land ownership**. For example, in London, where land ownership is fragmented across boroughs and the Greater London Authority does not control extensive land portfolios, they have fewer direct levers and must rely more heavily on regulatory requirements, incentives, or negotiated agreements. This does not prevent circular planning, but it shifts the emphasis from direct public steering toward facilitation.

Building-oriented systems (Southern Europe)

Regulatory attention in these contexts is traditionally centred on buildings, construction quality, and architectural control, while strategic territorial planning and inter-municipal coordination may be more fragmented or uneven in coverage.

The most natural entry points for cities in these planning systems are through **building and refurbishment regulation**. Strengthening adaptive-reuse and renovation standards, construction-waste rules, and heritage-sensitive circular retrofit practices works with the grain of existing regulatory cultures. Izmir, for example, combines pre-demolition audits with licensed recovery facilities and controlled disposal permits to ensure materials are safely recovered. Mixed-use zoning can support adaptable buildings such as coworking spaces, with planning rules allowing internal functional shifts without requiring new permits.

The challenge in these systems is that circular functions operating at a wider territorial scale, such as regional logistics, material flow coordination, or large-scale storage, require inter-municipal cooperation that existing governance structures may not readily support. Emerging metropolitan coordination mechanisms can begin to address this gap, but they often lack the statutory authority or funding to operate effectively.

From instruments to enabling conditions for CE activities

The high-level planning instruments described above create the conditions under which more specialised circular activities can move beyond pilot status and become routine parts of how cities function. These activities, such as soil banks, repair hubs, material depots, reuse centres, and urban mining operations, each have specific spatial and institutional requirements that planning must address.

Heavy-duty material circulation infrastructure

Soil banks, material storage depots, and recycling hubs require large outdoor areas, heavy-vehicle access, robust ground surfaces and would ideally be located relatively near to where materials will be extracted and reused. They also need regulatory clarity about whether excavated soil or recovered components count as waste or as resources. In comprehensive-integrated systems, statutory zoning can designate sites for these functions directly. In regional-economic systems, regional investment programmes can fund shared facilities serving multiple municipalities. In development-control systems, conditions attached to planning permissions can require developers to participate in material recovery schemes. Across all systems, the spatial pressures are the same: cities must safeguard land for these functions in the face of competing pressures for housing and commercial developments.

Reuse and repair spaces

Reuse centres, repair hubs, maker spaces, and community sharing initiatives depend on secure, affordable locations close to users and material flows. Their greatest vulnerability is spatial precarity, as they often occupy transitional sites on temporary leases and are displaced when redevelopment arrives. Planning can address this through protected productive-use zones, longer-term lease arrangements on public land, and zoning that explicitly recognises these activities as legitimate urban functions rather than temporary anomalies. Amsterdam's extension of temporary land-use contracts from five to ten years, after early circular projects proved unviable under shorter terms, illustrates how incremental adjustments within existing frameworks can materially improve conditions.

Circular construction practices

Urban mining, pre-demolition audits, modular construction, and design for disassembly all require a supporting ecosystem of standards, market capacity, and spatial infrastructure. Pre-demolition audits are already required by national regulation in some countries (France, emerging practice in Belgium and the UK) and can be replicated wherever planning authorities have the discretion to request technical documentation as part of development consent. Modular and reversible construction requires zoning flexibility that permits temporary structures and functional shifts over time. Material passports and traceability systems represent a transferable logic ("treat buildings as material banks") that can be adapted to local data standards and construction practices regardless of planning system, as platforms like Madaster demonstrate.

Digital infrastructure and data tools

Geographic Information Systems (GIS), digital twins, Building Information Modelling (BIM) and other material traceability platforms function as digital infrastructure whose core capacities (spatial analysis, simulation, data integration) can be repurposed across planning contexts. These tools are transferable because what travels is the capacity to generate evidence, test scenarios, and visualise complex relationships. Most planning systems already use GIS, meaning circular data layers can be added without changing the underlying planning framework. The transferability of these tools makes them especially valuable for connecting cities working within different planning systems.

The diversity of planning systems across Europe is sometimes framed as an obstacle to scaling, replicating and transferring circular economy practices in urban planning, but it can also be understood as a strength. Different systems create different conditions for experimentation, and the variety of instruments being tested across CoP cities generates a wider pool of practical knowledge than any single system could produce alone.

The evidence from this Community of Practice suggests that progress depends on three parallel efforts. First, cities need to identify the high-level planning instruments that already shape development in their context and adjust them to support circular outcomes. This is where the bulk of the work lies, and it is more productive than searching for novel "circular planning tools" to import wholesale. Second, cities operating within similar planning systems can learn directly from each other's instruments, replicating approaches with relatively little adaptation. Third, the underlying logics and analytical methods can travel across systems even where the instruments themselves cannot. The concept of requiring developers to demonstrate circular performance before obtaining consent, for instance, takes different institutional forms in London (CE Statements), Amsterdam (land tender criteria), and Paris (pre-demolition audits backed by national regulation), but the underlying principle remains sound.

However, some limitations to policy movement do arise. Replicability depends on more than institutional similarity, and meanwhile municipal land ownership, administrative capacity, political mandate, and financial resources all shape which instruments are realistic for a given city. Many CoP cities are relatively large, well-resourced, and politically committed to CE goals. Small and medium-sized cities with fewer staff, tighter budgets, and less political mandate may need to begin with lighter versions of the same instruments, building experience and institutional momentum over time.

The territorialisation of the circular economy remains a new and evolving field. As circular initiatives continue to move from strategy to implementation, adaptive learning across cities and planning systems will matter more than premature standardisation.

Contributions of this white paper

This paper contributes to the academic debate on territorialising the circular economy by grounding it in comparative, practice-based evidence from cities that are actively trying to embed circularity into their territories through a range of urban planning instruments. First, it responds to long standing calls for more implementation-oriented research on how circularity is embedded in planning systems and with what effects, by examining what cities are already doing in practice, whether explicitly labelled circular or not.[83] [84] Many cities are already using different planning tools to support the circular economy, this support is not yet holistic. There is still a clear mismatch between ambitious circular strategies and the actual integration of circularity into statutory plans, regulations, and everyday planning practice. By documenting how cities are experimenting with planning process integration, the paper adds concrete insight to the push toward operationalising circularity in planning, but it confirms that **mainstreaming remains institutionally and politically challenging**.[85] [86]

Building on arguments that circularity should be treated as a spatial planning task rather than a collection of isolated projects, the findings show how embedding circular principles into statutory and strategic instruments such as zoning, permitting, assessment procedures, and city level toolkits is emerging unevenly but signals the **early stages of a broader territorialisation of the circular economy**.[87] [88] Extending this spatial integration to the micro scale, the paper also contributes to debates on how planning can support circularity at the building level, for instance through adaptive reuse, design for disassembly, and material passports, by showing how such principles begin to enter local regulatory frameworks and development control practices (i.e. CoP Session #1 -

Promoting circular developments).[89] Relatedly, it adds to emerging debates on circular land management by showing how cities are beginning to treat land as a finite and strategic resource, linking temporary use, brownfield regeneration, and long term land stewardship to circular objectives (i.e. CoP Session #3 - Managing land circularly).[90] [91]

This spatial turn also reinforces the need for **planning across multiple scales** and administrative boundaries, as material flows, infrastructures, and environmental and social impacts exceed municipal borders and require coordination across jurisdictions and governance levels (i.e. CoP Session #4 - Multi-level governance for circular urban planning). [92] [93] In turn, the paper contributes to governance-oriented scholarship by showing that planning tools and visions only become effective when supported by early investment in institutional capacity, interdepartmental coordination, and multilevel alignment. [94] [95]

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At the level of **land use and spatial justice**, the study highlights the importance of actively allocating and protecting space for circular activities and infrastructure, especially low margin functions such as repair, reuse, storage, recycling, and industrial symbiosis that are systematically disadvantaged in competitive land markets (i.e. CoP Session #2 - Allocating space for circular infrastructure).[96] [97] Finally, echoing more critical and governance aware strands of the literature, the findings show that in practice circular transitions are deeply political and value laden. Cities frame circularity not only as an environmental or economic agenda, but as a spatial project linked to community wellbeing, participation, and social cohesion, while also revealing tensions, trade-offs, and risks of superficial adoption.[98] [99]

Limitations of the Community of Practice approach

A key limitation of the findings emerging from the Community of Practice (CoP) is rooted in its voluntary and participant-driven nature. While this format enabled rich exchange among engaged practitioners, it does not provide a representative picture of the diversity of circular economy (CE) conditions, governance cultures, and spatial realities across the EU. Contributions reflect the situated experiences and priorities of individual participants rather than a systematically balanced sample of cities, regions, or stakeholder groups. In addition, for many participants the territorial dimension of CE was a relatively new area of reflection. As a result, discussions often remained anchored in more familiar material and resource-flow perspectives, with less attention given to a holistic spatial understanding of circularity that integrates land use, territorial relations, and place-based governance. Consequently, the CoP offers depth in selected themes but leaves important blind spots in what a territorially grounded **"second wave of CE"** must address.

Most notably, **some territorial dimensions of CE were only partially explored**. Existing and new development sites were discussed primarily in relation to the built environment, but material flows and the socio-economic networks that underpin circularity received more fragmented attention. Although participants acknowledged the need to account for circular logistics, safeguard strategic nodes and industrial areas, and recognise how spatial-economic configurations and transport choices shape circular flows,[100] [101] the CoP did not translate these insights into operational spatial tools, mapping approaches, or locational strategies. Soft infrastructures such as social networks, community initiatives, and informal economies remained largely outside the discussion, reflecting a broader tendency in CE planning to privilege physical space over relational space. This also meant that the roles of citizens, everyday practices, and behavioural dynamics in shaping land-use transformation were underexplored, despite growing research emphasising these dimensions.[102] **Land allocation and governance questions were more explicitly addressed, yet persistent uncertainties remain**. The CoP surfaced ongoing tensions around spatial requirements for circular activities, especially the competition for centrally located land and the mismatch between the long-term spatial needs of low-margin circular logistics or repair activities and planning systems that often rely on temporary or flexible land uses. [103] [104] However, the political economy of these trade-offs, including how land markets, property regimes,

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and growth imperatives shape what space is made available for circular functions, was not deeply examined.[105]

These limitations point directly to priorities for future research in this emerging, territorially oriented phase of CE. First, there is a need to **reconcile different diagnoses of what is "missing"** in current urban CE strategies. Some strands of literature emphasise urban form, infrastructure, and spatial impacts; others foreground citizen roles, cultural change, or specific practice domains such as heritage reuse. Research is needed to integrate these perspectives into multi-dimensional territorial frameworks rather than treating them as separate agendas. [106] [107] Second, the field urgently requires **more robust tools for spatialising CE**. This includes clearer conceptualisation of location, scale, and functional boundaries; methods to assess territorial factors and cross-boundary interdependencies; and scenario approaches that link spatial planning with circular transition pathways.[108] [109]. **Time** also needs to be treated as a core dimension: how the spatial footprint of circular systems evolves, how temporary uses become permanent, and how long-term planning decisions lock in or foreclose circular options.[110] [111]. Practical instruments such as spatial decision-support tools and mapping methods to identify suitable locations for circular infrastructure remain underdeveloped (i.e. **Error! Reference source not found.**). Finally, **issues of social and spatial justice** in CE territorialisation remain insufficiently addressed. Emerging critiques warn that circular agendas can be framed around competitiveness and innovation while overlooking displacement, uneven distribution of benefits, and the reproduction of existing power relations. Future research must therefore examine who gains access to newly valorised circular spaces, who bears the burdens of land-use change, and how participatory processes can move beyond consultation toward meaningful co-production. [112]

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06

Conclusion

Conclusion

The cases and discussions in this white paper confirm that the circular economy is maturing. As circular activities grow beyond pilots and start-ups, they need stable locations, suitable land, and supportive planning frameworks. This marks a turning point: circular economy is no longer mainly an innovation agenda, but an increasingly territorial one that directly confronts how space is allocated, regulated, and contested. European cities are entering a second wave, in which territory becomes the main arena of transition rather than a background condition. The Community of Practice behind this white paper showed it. Early circular strategies focused largely on waste management, innovation projects, and sector-specific pilots, often supported by temporary funding and parallel initiatives. Now, cities and regions are now confronted with a different set of questions: Where should circular activities locate? Which spaces must be protected, reused or regenerated? How can land-use rules, infrastructure planning and governance structures be re-tooled so that circular practices move from pilot status to “business as usual”? These are no longer optional planning considerations but strategic decisions about how limited land is prioritised.

Through four sessions, cities have uncovered four areas in which this shift can be seen. First, **new and existing buildings** are no longer treated as one-off projects but as part of a long-term circular system. Cities are beginning to require life-cycle assessments, material reuse, pre-demolition audits, and circular procurement. These tools help reduce new construction, cut emissions, and make better use of existing buildings and materials, directly influencing how much new land and raw material extraction is required over time.

Second, cities increasingly recognise that circular activities need **dedicated infrastructure.** Repair centres, reuse hubs, material depots, and logistics spaces cannot just be squeezed into leftover land. Yet these functions are often pushed aside by housing pressure and short-term land uses. Treating them as critical infrastructure means protecting space for them through zoning, long-term land strategies, and supportive policies, while still allowing temporary uses where appropriate. Failing to do so does not eliminate these activities; it simply displaces them, often further away, increasing transport, costs, and social and environmental impacts.

Third, **land itself** is starting to be viewed as a limited resource that should also “circulate”. Instead of constantly expanding into new areas, cities are exploring how to regenerate soils, reuse vacant sites, intensify existing neighbourhoods, and recover what is available within the city. Planning tools such as no net land take rules, density requirements, and soil protection measures help organise these decisions and encourage more careful use of land over time. Here, circular economy aligns directly with one of Europe’s most pressing spatial challenges: reducing land take while maintaining liveability and economic activity.

Fourth, **governance arrangements** are shifting, with the city-region emerging as a key scale for circular transitions, but always in connection with both smaller and larger levels. Many circular flows, such as construction materials, food, biomass, and waste, extend far beyond municipal boundaries, making coordination between cities and their surrounding regions essential. Territorialising the circular economy, therefore, depends on governance across multiple, interconnected scales: neighbourhoods as sites of daily practice, cities as planning authorities, city-regions as functional territories of flows, and national and European levels as providers of enabling rules and resources. Without this coordination, spatial mismatches between where materials arise, where they are processed, and where space is available risk undermining circular ambitions.

Across all these areas, there is no single model of circular urban planning. Some tools work well within the same planning system and can gradually be expanded. Others can be adopted by cities with similar legal and institutional contexts. But in many cases, what spreads across cities is rarely a ready-made instrument; instead, cities borrow and adapt planning logics (such as safeguarding space for repair and reuse, linking material flows to land-use decisions, or using indicators to steer investment) that must be translated into local legal competences, administrative capacity, and land-market conditions. This helps explain why some measures scale within one planning system, why others replicate mainly among places with similar institutional architectures, and why tools like urban metabolism mapping or spatial indicators often travel more easily than binding regulatory packages, yet still risk remaining symbolic unless they are connected to statutory planning, budgets, and enforcement.

The implication is clear: without institutional anchoring, spatial ambitions for circularity remain vulnerable to short-term land pressures and political cycles.

This shift matters because the circular economy's current "second wave" challenge is increasingly spatial: as initiatives move beyond pilots, they hit constraints around land availability, location, logistics, permitting, and regional coordination, pushing CE from innovation policy into the core of planning and governance. As argued in the introduction, the question is not whether circular economy requires space, but whether public authorities anticipate and manage this demand, or allow it to be shaped by ad hoc market dynamics and land competition. In practical terms, this means circular transitions are unlikely to succeed through static masterplans alone or through experimentation that lacks a route to institutional uptake. Research on urban living labs and mainstreaming shows that the key task is building an institutionalisation pathway: aligning strategic plans with regulatory instruments (zoning, development control, standards, procurement) and with land and finance tools (leases, land stewardship, investment programmes) so that effective practices become routine rather than exceptional.

Ultimately, territorialising circularity raises practical governance and capacity questions, and urban planners are central to working through these in everyday practice. They are required to balance circular economy objectives with other statutory responsibilities such as housing provision, mobility, climate adaptation, economic development, and environmental protection, often within established legal frameworks and limited administrative resources. This makes circular economy not an additional sectoral agenda, but a cross-cutting spatial coordination challenge at the heart of public decision-making. Whether circularity becomes more systematically embedded in urban development, therefore, depends not only on technical factors like data availability, analytical tools, and interdepartmental coordination, but also on institutional mandates, land-ownership structures, and the ability of planning systems to manage competing land-use claims over time.

At the same time, important knowledge gaps remain, particularly regarding the political economy of land, the spatial distribution of costs and benefits associated with circular interventions, and the governance arrangements needed to coordinate circular flows across neighbourhood, city-regional, and national scales. Addressing these uncertainties is essential if circular economy objectives are to be more consistently reflected in spatial planning and implementation. Without this deeper integration, circular economy risks remaining rhetorically ambitious but spatially marginal, unable to secure the land, locations, and long-term stability it requires to become truly mainstream.

The CoP has helped sketch the contours of a more spatially aware CE, but its gaps underline that territorialisation is not just about placing circular activities on a map. It requires new mapping tools, governance arrangements, and justice-oriented perspectives that connect material flows, land, institutions, and people across scales.

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More information: Circular Cities and Regions Initiative website

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