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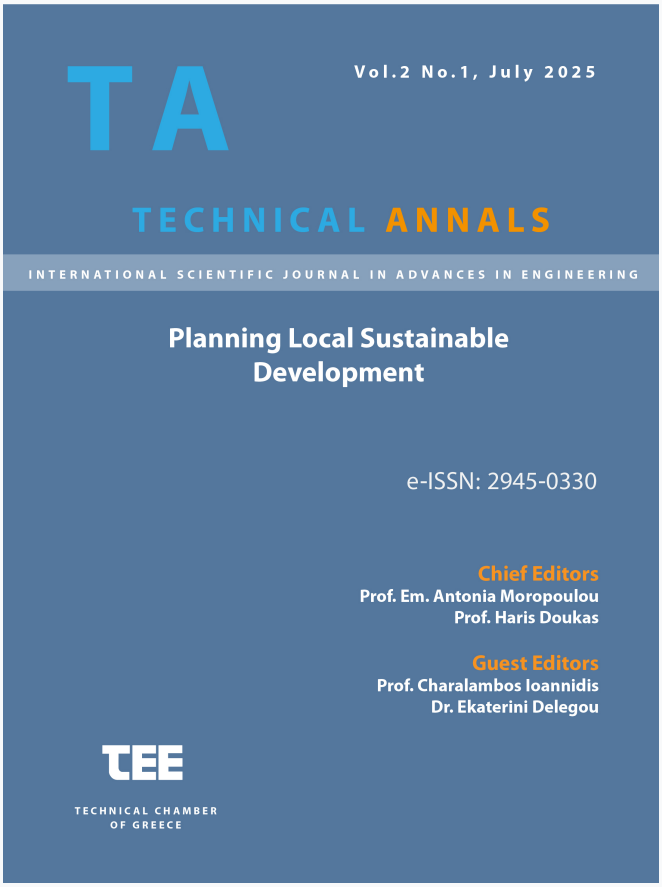

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Urban Regeneration through Creativity and Circular Economy. The case of Mediterranean Historic Cities

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Abstract. Contemporary cities face mounting pressures from climate change, resource depletion, and the fragility of existing urban systems. Circular economy principles are increasingly framed as a response to these issues, and as a proposal for sustainable urbanisation, yet their application in urban contexts is far from straightforward. Rather than a linear model, circularity emerges as a framework that may reshape production and consumption through practices of Reuse, Repair, Recycling, and upcycling. At the same time, it exposes political tensions, uneven capacities, and unresolved questions about who benefits from such transitions.

A recurring pattern is the so-called implementation gap: pilot projects abound, yet comprehensive systemic change remains elusive. Factors include fragmented regulations, short political cycles, and difficulties aligning ecological ambitions with social and economic needs. After investigating a series of cases, small-scale creative and cultural enterprises in Mediterranean cities appear to offer fertile ground for experimentation, linking craft traditions with digital tools and localized reuse practices. Still, their contributions are precarious and easily overshadowed by capital-intensive solutions.

The article ultimately suggests that circular urbanism is less a doctrine than an ongoing negotiation between preservation and innovation, equity and competitiveness, continuity and change. EU Mediterranean projects, led by the National Technical University of Athens, show that modest interventions - adaptive reuse, cross-border exchanges - can generate incremental shifts, but sustainable progress will likely depend on context-sensitive governance and the active participation of local communities.

Keywords: Sustainable Urbanization, Cultural Creative Industries, Circular Urban Planning, Circular Cities, Historic Mediterranean Cities

1 Introduction

In recent years, the convergence of environmental pressures, socio-economic precarity, and rapidly shifting technological landscapes has underscored how contemporary cities evolve. This article situates itself within this transitional moment, proposing an expanded understanding of circular urban planning that moves beyond technical efficiency or isolated interventions, and instead foregrounds the complex interplay between material flows, creative production, governance structures, and socio-cultural dynamics.

In this context, the present article investigates how circularity can be embedded within the fabric of historic Mediterranean cities characterized by dense cultural legacies, diversified small-scale production systems, and persistent governance constraints. Two consecutive European Neighbourhood Instrument Cross-Border Cooperation of the Mediterranean (ENI CBC Med) projects, INNOMED-UP and CARISMED, together offer a rare opportunity to examine circular practices across a broad Mediterranean context. These projects intend to provide both the conceptual stimulus and the empirical grounding for the article's main idea: that circular urbanism must be understood as a situated, negotiated, and context-dependent process rather than an urban plan.

Two overarching research questions leading the research under discussion:

- How can creative and cultural industries—particularly small and medium-sized enterprises—function as mediators of circular transitions in Mediterranean urban contexts?

This question reflects a hypothesis emerging from the two above-mentioned projects: that micro-scale creative enterprises, rooted in local knowledge and adaptive production models, may be in a privileged position to reconfigure material flows and contribute to urban circularity

- Under what institutional, spatial, and socio-economic conditions can circular practices evolve into broader principles of circular urban planning?

Here, the focus turns to the governance and planning level, the capacity of local authorities and territorial features to support sustainable, socio-economic based circular transition.

In addressing these questions, the article undertakes a comparative analysis of various Mediterranean cities, each of which offers a distinct type of creative networks, historical layers, and environmental pressures. The comparative perspective allows for identifying patterns, divergences, and structural tensions that cannot be captured through single-case analysis alone.

Methodologically, the research combines:

- Cross-case comparative analysis, based on data generated through the two projects, including mapping of creative enterprises, material-flow assessments, and policy reviews
- Qualitative fieldwork, workshops, and participatory design sessions with SMEs, local authorities, and stakeholders
- Spatial and institutional analysis, examining how planning frameworks, governance structures, and urban morphologies shape opportunities for circular interventions

- Pilot testing tools and strategies, such as smart bins, material-exchange platforms, and low-cost adaptive reuse models, used to evaluate the feasibility of circular practices in urban settings

Starting with a bibliographic research, the article traces the evolution of the debate on the need to change production patterns in modern cities. It identifies, in line with current scientific discussions, the conceptual foundations and contemporary debates surrounding circularity in cities. It then presents a series of comparative case studies illustrating the diversity of circular approaches in a European and Mediterranean context. Subsequently discusses the specific socioeconomic foundations of circular cities, emphasizing the role of creative and cultural industries as carriers of both traditional knowledge and innovative practices. This is followed by a detailed examination of the INNOMED-UP and CARISMED methodologies, which demonstrate how circular strategies can be implemented across different urban settings. The final section synthesizes these findings into a set of emerging principles for circular urban planning, positioning them within broader discussions on sustainable urbanization and development, adaptive governance, and heritage preservation.

2 The need to change production patterns in modern cities

The accelerating pace of urbanization -coupled with mounting pressures from resource scarcity and climate instability -has brought into sharper focus the need to rethink how we design and govern cities, especially in terms of managing urban resources sustainably, following the direction of sustainable development [1]. While this is not a new concern, the past few decades have made the stakes more tangible. The unfolding climate crisis, now widely visible across geographical regions, along with the socioeconomic turbulence triggered by the COVID-19 pandemic, appears to have intensified environmental degradation and exposed the fragility of existing urban planning systems.

Responding to these overlapping challenges is unlikely to be straightforward. It calls for a layered approach -one that is interdisciplinary, adaptive, and responsive to the particularities of each urban context. Cities, by their very nature, concentrate not only on infrastructure and economic activity but also on data flows, human capital, and institutional power. This density gives them a kind of strategic advantage: they can serve as testbeds for energy-efficient technologies, low-carbon transport options, sustainable consumption patterns, and waste reduction initiatives. That said, this potential is often unevenly distributed and not always fully realized in practice.

Urban areas are also well-positioned to support circular economy principles, at least in theory. [2] Models that promote Reuse, Repair, and Recycling, rather than extraction and disposal, have been gaining traction in policy discussions and experimental projects alike. [3] Shifting production and consumption systems toward circularity is frequently framed as a promising route not only to mitigate environmental harm, but also to enhance residents' quality of life. However, this optimism should be tempered with a recognition that transitions to circular systems are politically contested, socially uneven, and technically complex.[4]

There are potential benefits to be gained: reducing dependency on finite resources, strengthening supply chain resilience, fostering economic diversification, and possibly even creating new forms of employment. Yet these outcomes are not guaranteed. Much depends on how such strategies are implemented, whose interests they serve, and whether short-term efficiencies are balanced with long-term environmental care.

Waste management, even sometimes discussed in dry technical terms, remains a deep political and spatial issue. The European Parliament, in 2022, has underscored its centrality to achieving sustainable and livable urban futures, but translating that into practice often reveals institutional blind spots and governance gaps.

Given these tensions and possibilities, it may be time to revisit how urban and spatial planning are conceptualized—not just in terms of infrastructure or land use, but within a broader, long-term vision aligned with global academic debates and climate imperatives. Rather than treating planning as a neutral tool, we might consider it as a site of negotiation, where competing visions of the urban future are continuously being shaped and contested.

The circular economy is a broad and evolving concept, applicable across virtually all sectors. Rather than a fixed model, it may be better understood as a systems-oriented framework aimed at addressing pressing global issues—including climate change, biodiversity loss, resource depletion, and pollution [5]. What sets this approach apart is its potential to simultaneously touch on multiple dimensions of sustainability: economic, environmental, social, and even cultural.

By contrast, the linear economic model follows a more extractive trajectory: raw materials are harvested, transformed into products, and ultimately discarded as waste. This "take-make-dispose" practice often sidelines environmental concerns and reinforces unsustainable consumption patterns. In response, circular strategies aim to close material loops—retaining resources within productive systems for as long as feasible.

The divergence between linear and circular planning becomes particularly apparent when considered in the context of urban development. Linear models tend to center economic growth around continuous input of virgin resources, while offloading ecological costs onto peripheral or underserved areas. At the same time, a significant load of waste from the craftsmanship, low-scale industrial activities, and construction remains in disuse. This pattern has long contributed to environmental injustice and spatial inequality [6, 7]. Circular planning, by contrast, integrates ecological thinking into the heart of decision-making, advocating for resource efficiency, waste valorization, and regenerative practices that seek not only to limit harm but also to restore damaged ecosystems [8, 9].

This shift implies more than just better recycling systems or greener infrastructure—it requires a review of the entire process of urban regeneration. Urban planners are increasingly being asked to view energy flows, material life cycles, and ecosystem services as background conditions but as key structuring elements of urban form and function [10]. In practice, this may involve strategies such as designing for longevity at the product stage or intervening at the end-of-pipe—through recycling, remanufacturing, or recovery—to prevent materials from being prematurely lost to landfill. When a product reaches the end of its useful life, the goal is to retain its components within the economy, ideally as inputs for new value chains.

The European Parliament (2022) frames the circular economy as a model of production and consumption built around practices such as sharing, leasing, repairing, refurbishing, and recycling—activities that extend product lifespans and minimize waste generation. Yet not all circular strategies are created equal. Recycling and upcycling, for instance, often coincide, though they differ in important ways. While recycling involves reprocessing materials—often with a significant energy cost—upcycling typically entails creatively transforming waste into products of higher quality or environmental value, often through craft, design, or localized innovation.

Recycling should not be confused with reuse, as the latter does not require the reprocessing of materials into new products, materials, or substances. At the same time, recycling should not be understood only as the mere recovery of materials, but also as redirecting the recovered materials towards their next lifecycle.

Upcycling could be defined as a process to convert and remake waste into new products of better quality or a higher environmental value through craftsmanship and design. Upcycling may provide the most sustainable circular solutions since it typically requires little energy input and can eliminate the need for a new product from virgin materials. From this point of view, upcycling is an activity of creating newness or better quality from used or waste materials, while adding value. [11]

It's worth noting that upcycling, despite its contemporary label, is hardly a new phenomenon. For much of human history—and particularly prior to industrialization, people routinely reused and repurposed materials out of necessity. In many low-income regions today, these practices remain widespread, driven not by environmental concern but by economic constraints.[11] Only recently have wealthier societies begun to reembrace upcycling, this time through a market lens, recognizing both its ecological benefits and its potential for consumer appeal.

3 Key Frameworks and case studies

The method "from start to finish and implementation" provides a framework for promoting such principles in urban planning and design. Thinking offers one framework for advancing such principles in urban design. Here, the emphasis lies in eliminating waste by designing systems in which materials circulate perpetually, rather than degrading over time [12]. Applied to cities, this may translate into strategies such as adaptive reuse of existing structures, integration of green infrastructure, or nature-based solutions that perform multiple roles—stormwater retention, air filtration, biodiversity support, and more [13, 14]. Crucially, ‘’from start to finish and implementation’’ design also prioritizes disassembly and recovery, requiring early-stage coordination between architects, engineers, contractors, and waste managers to ensure that buildings can eventually be taken apart and repurposed [15].

While some of these ideas may sound aspirational, evidence suggests they are gaining traction. The convergence of circular and regenerative design marks a deeper shift—from minimizing harm to actively improving urban ecologies [6, 8]. Research

increasingly shows that regenerative strategies can deliver a range of co-benefits: enhanced resilience to climate impacts, improved public health outcomes, and more equitable access to ecosystem services [6, 7].

The "circular city" is emerging as both a policy vision and a practice-oriented model for regeneration and sustainable urbanization—as articulated in the EU Declaration on Circular Cities, such a city commits to transitioning from a linear to a circular economy in a coordinated manner—engaging citizens, businesses, and research institutions alike. Ambition is not merely environmental; it also includes social goals such as equity, well-being, and biodiversity protection. [4]

European cities are beginning to implement these ideas, often guided by evolving EU policy frameworks. However, meaningful progress depends on local adaptation. Policies must be tailored to engage residents and entrepreneurs alike, especially in contexts where waste mismanagement remains a challenge. Social cohesion, too, is not a given—it must be cultivated through inclusive practices that promote shared responsibility, creative reuse, and place-based forms of circular innovation. This, in turn, opens up opportunities not only for environmental improvement but also for socially oriented entrepreneurship and community resilience.

Across Europe, cities are experimenting with circular frameworks in varied and often context-specific ways. Comparative research points to a wide range of local strategies shaped by legacy infrastructures, demographic dynamics, and governance capacity. For example, in Parkstad Limburg (Netherlands) and Satakunta (Finland), industrial histories and local institutional arrangements have significantly influenced how circular principles are operationalized [15, 10]. Urban networks have become important platforms for circulating knowledge and sharing policy innovations. While this horizontal exchange has accelerated learning, it also reveals a tendency toward template-driven approaches that may not always be appropriate for local realities. European Union funding mechanisms have played a crucial role in facilitating experimentation, though some analysts warn of emerging dependencies that might stifle bottom-up innovation [15, 10].

A key pattern that emerges from these European cases is the implementation gap: pilot projects abound, but comprehensive urban transformation remains elusive. The reasons for this are not trivial—entrenched market dynamics, fragmented regulatory environments, and limited institutional capacity all pose significant [15, 10].

Following these considerations, the research turned to several case studies and implementation insights. Examples were drawn from Europe—such as Amsterdam, Parkstad Limburg in the Netherlands, Satakunta in Finland, and Prato in Italy—as well as from other regions across the globe.

These case studies are analyzed and synthesized within the comparative analysis table according to the following criteria: Case Study / Context, Region / City Scale, Governance & Policy Approach, Focus Areas / Sectors, Implementation Strategies, Community & Stakeholder Engagement, Outcomes / Benefits, and Challenges / Limitations.

Amsterdam is frequently cited as a frontrunner in urban circularity, having developed what is often described as one of the most comprehensive local strategies in Europe. The city's approach weaves together construction, food systems, and waste and water management through layered governance and policy alignment across sectors.

Available data suggests that this strategy has yielded measurable benefits in terms of waste reduction and improved material efficiency. However, translating pilot successes into systemic transformation remains a challenge [16, 17].

The Circular Economy Monitor—a tool used to track progress against material flow benchmarks—offers a quantitative dimension to Amsterdam's approach. Still, there are concerns about the robustness and granularity of the data, especially when it comes to assessing the social or distributional impacts of policy measures. Recent critical scholarship points out that despite the city's progressive rhetoric, much of the circular economy agenda remains embedded in growth-driven logics that may ultimately undermine its transformative aspirations [17]. This tension is especially visible when Amsterdam's policies are examined through world-ecological or post-growth lenses.

While Amsterdam has made real strides in infrastructure and pilot implementation, the broader picture is more complex. These advances may well represent incremental adjustments rather than the systemic reordering many advocates envision. The attempt to integrate doughnut economics principles into city governance is noteworthy, but evidence suggests this translation from theory to practice is far from straightforward [17].

Prato, a city of roughly 200,000 inhabitants, serves as the administrative center of its province and ranks as the second most populous urban area in Tuscany, after Florence. Historically, its economy revolved around the textile industry. Even today, Prato is home to one of the largest textile and clothing clusters in Europe, a system that—perhaps somewhat ahead of its time—has been practicing forms of circularity for several decades. Drawing on this long-standing expertise, as well as its involvement in broader European debates on circular economy policies, the city now appears intent on accelerating the transition toward a more structured and comprehensive model of circular urban development.

The Municipality of Prato, has introduced what may be considered an experimental model of "circular city" governance. Its participation in shaping the European Urban Agenda on circular economy reflects a deliberate attempt to bridge local initiatives with supranational policy frameworks. Since 2019, this effort has been formalized through the adoption of the, a document that sets out both strategic priorities and practical measures—though the degree to which these will translate into long-term systemic change remains open to discussion. [18]

Cities beyond Europe present a different set of challenges—and opportunities—when it comes to circular transitions. Santiago, Chile, offers one illustrative case, where decentralized systems for nutrient recovery have been piloted at the neighborhood scale, combining circular logic with job creation and community empowerment. Similar experiments in Indonesia have focused on embedding circularity within small-scale enterprises and informal sector networks.

In Colombia, efforts to establish waste recovery centers in cities like Quibdó point to the possibility of designing circular strategies that simultaneously address waste, unemployment, and environmental degradation. Yet these interventions also underscore the critical role of appropriate technologies and financial sustainability in ensuring durability over time.

Table 1. Comparative Analysis

Case Study / Context	Region / City	Scale	Governance & Policy Approach	Focus Areas / Sectors	Implementation Strategies	Community & Stakeholder Engagement	Outcomes / Benefits	Challenges / Limitations
Amsterdam	Europe / Netherlands	City-wide	Layered governance, policy alignment across sectors; Circular Economy Monitor for tracking	Construction, food systems, waste & water management	Pilot projects, city-wide circular strategy, integration of doughnut economics principles	Multi-stakeholder coordination; policy-led approach	Waste reduction, improved material efficiency	Translation of pilot successes into systemic change; growth-driven logic may conflict with transformative aims; social/distributional impacts less clear
Parkstad Limburg	Europe / Netherlands	Regional / city cluster	Local adaptation of EU frameworks, influenced by industrial history	Varies, with focus on industrial legacy areas	Pilot projects, experimentation via EU funding, knowledge exchange through urban networks	Horizontal knowledge sharing among cities	Localized experimentation; lessons for networked learning	Template-driven approaches may not suit local realities; implementation gap persists
Satakunta	Europe / Finland	Regional	Local institutional arrangements influence circularization; EU framework guidance	Industrial and regional infrastructure	Pilot projects, networked learning, experimentation	Stakeholder coordination	Local adaptation of circular principles	Limited institutional capacity; entrenched market dynamics challenge broader transformation
Prato	Europe / Italy	City	Experimental "circular city" governance; integration with European Urban Agenda; formal Circular City Action Plan (2019)	Textile and clothing industry; urban services	Strategic planning, formalized action plan, policy bridging local and supranational initiatives	Municipality-led, multi-level governance; collaboration with EU partners	Structured model of circular development, leveraging existing textile circularity	Uncertain translation into long-term systemic change; still experimental
Santiago	Latin America / Chile	Neighborhood / local	Decentralized systems, pilot initiatives for nutrient recovery	Waste, nutrient cycles, job creation	Pilot projects at neighborhood scale, decentralized nutrient recovery	Community empowerment, participatory approaches	Circular logic combined with job creation and social benefits	Financial sustainability and technology adaptation critical for durability
Indonesia (various cities)	Asia / Indonesia	Local / small-scale enterprises	Embedded circularity in small-scale enterprises, informal networks	Waste management, circular enterprises	Integration of circularity into informal economic networks	Reliance on local networks and knowledge	Supports micro-enterprises, social inclusion, traditional knowledge	Scale-up challenges; need for context-specific technologies
Quibdó	Latin America / Colombia	City	Waste recovery centers, participatory initiatives	Waste management, unemployment, environmental degradation	Community-based recovery centers, circular interventions	Pre-existing community networks, revalorization of traditional knowledge	Potential social and environmental co-benefits	Financial and technological sustainability; local adaptation critical

Summarizing, experience from these contexts suggests that successful circular initiatives often hinge on pre-existing community networks and the revalorization of traditional knowledge. This points toward a more participatory model of circular planning—one that doesn't simply replicate European frameworks but adapts them to diverse institutional and socio-cultural conditions [19, 20, 21].

4 The socio-economic context at the core of a circular city

The long-standing research engagement of the Laboratory of Spatial Planning and Urban Development at the NTUA School of Architecture has pointed to an intriguing pattern. Active and resilient networks of small-scale artistic, craft-based, and creative enterprises, applying circular practices, continue to operate within historic cities in Greece and across the Mediterranean more broadly, appear to function as potential drivers of urban regeneration. [22, 23, 24]

Their survival, often under difficult economic and spatial conditions, may suggest that such micro-initiatives do more than merely preserve tradition; they also open pathways for reimagining contemporary urban fabric. [22, 24]

Social networking and social awareness appear to be mutually reinforcing elements that underline the functioning of a circular economy. On one hand, the circulation of information through formal and informal networks may enhance public consciousness; on the other, increased social awareness often drives greater stakeholder engagement, which in turn stimulates community-based collaboration and support mechanisms.

If we expand the scope of the circular economy to include its social dimension, it seems more appropriate to frame it not just as a technical or environmental fix but as a constellation of interrelated, systemic responses to global crisis-climate change, biodiversity collapse, waste proliferation, and pollution among them. But "making" a circular economy - an admittedly vague term - entails more than closing loops or minimizing outputs. It involves regenerating ecosystems while placing people and communities at the center of these transitions, acknowledging their role as both agents and beneficiaries of change.

At the urban level, a particularly rich and often underexplored intersection emerges: the relationship between cultural practices, creative industries, and urban development trajectories.[24] Within the framework of the 2030 Agenda, there is strong rhetorical emphasis on the dual protection of the natural and built environment and the mitigation of climate impacts. Yet translating these priorities into action requires more than generic policy prescriptions and involves reconfiguring production and consumption patterns in ways that support equitable, circular, and place-sensitive forms of development.

Cities, - such as Athens, Palermo, Prato, Murcia, Tunis, Hebron, Nablus, Irbid, and Beirut - in this regard, face a dual imperative: to reduce emissions and waste, while also cultivating local ecosystems of collaboration.[11] These ecosystems ideally include small and medium-sized enterprises (SMEs), creative actors, and civic institutions that together can embed circularity into the material and cultural life of urban environments. The emphasis here is not solely on technological "solutions," but also on experimental

governance and new forms of cooperation that might otherwise be overlooked in more traditional models of urban planning.[11]

In this light, the search for viable business models that incorporate waste as a resource - not merely as an externality - gains urgency. These models must be complemented by urban planning design strategies that support their implementation, ideally without displacing vulnerable groups or reinforcing existing spatial inequalities.

The role of culture, and particularly the creative and cultural industries (CCIs), is increasingly being re-evaluated through this lens. [11, 25] Policymakers now frequently cite culture as a driver of urban competitiveness, capable of enhancing a city's appeal to investors, skilled labor, and tourists alike. However, this narrative - while attractive - deserves a closer reading. The integration of CCIs (Culture and Cultural Creative Industries) into circular strategies should not be reduced to a growth imperative; rather, it should be seen as an opportunity to reimagine value, ownership, and participation within the urban economy.

The recycling process, for instance, has evolved in recent decades from a marginal practice to a central component of urban sustainability discourse [11, 25]. Many organizations are now recognizing how cultural narratives, practices, and infrastructures can help embed circular thinking into everyday life. CCIs span economic, social, and symbolic dimensions of urban existence, creating networks that simultaneously support livelihoods, circulate meaning, and generate place-based identities.

Urban development, particularly in cities in the Mediterranean with rich creative legacies, remains closely entangled with productive cultural activity [11, 25]. Several CCI-related SMEs tend to cluster in urban areas where they can capitalize on spatial advantages: proximity to collaborators, access to skilled labor, and lower transportation costs for both inputs and finished goods. These businesses often gravitate toward dense, mixed-use neighborhoods where traditional knowledge systems persist and logistical infrastructures are conducive to flexible forms of production.

Within such urban fabrics, cooperation between Cultural CCIs and other SMEs is not incidental - it is a key characteristic of what some have called a “creative ecosystem” [11, 24, 25, 26]. These ecosystems manifest through a range of organizational forms—clusters, networks, hubs, and shared workspaces - each contributing to the economic and cultural metabolism of the city. When local governance provides sufficient support, these constellations can evolve into durable networks that generate not only economic returns but also social cohesion and a distinctive urban landscape.

Importantly, cultural and creative industries are well-positioned to contribute to the transition toward circular economies, especially by encouraging the efficient use of resources and fostering innovation within SMEs. In historic cities, for instance, creative actors can play a pivotal role in developing waste recycling strategies that respect the architectural and cultural heritage of the city. These strategies, if meaningfully integrated into circular action plans, may help catalyze the revitalization of historic cores, balancing preservation with sustainable future-oriented development.[11, 26]

Today, CCIs not only animate urban economies with new kinds of work, but they also reinforce traditional sectors. Fields such as craftsmanship, publishing, fashion, and the applied arts represent modern continuities of practices long rooted in urban culture.

These sectors contribute both tangible economic value and intangible cultural significance, reinforcing the argument that CCIs have a meaningful role to play in the pursuit of sustainable urbanization.[11, 26]

That said, a persistent contradiction remains: many cities with deep traditions of creative activity have yet to resolve their waste management challenges. This is not merely a technical problem; it is a multidimensional issue with social, economic, and spatial implications—one that continues to generate active scholarly debate.[11, 26]

5 Applying circular practices in Mediterranean cities:From Recycling and Upcycling of Urban Networks to Practices of Circular Urban Planning

5.1 Mediterranean Creative Networks and Emerging Circular Flows

This section examines how principles of the circular economy can inform more sustainable development ways in Mediterranean urban contexts. The discussion is grounded in findings from two consecutive projects—INNOMED-UP (Promoting UPcycling in Circular Economy through INNovation and education for cultural and creative industries in Mediterranean cities), and CARISMED (Capitalization for Re-setting Innovation and Sustainability in MED-Cities) funded by the European Neighbourhood Instrument Cross-Border Cooperation of the Mediterranean (ENI CBC Med).

The INNOMED-UP project sought to explore how creative production networks could be mobilized to support circular practices within cities, particularly by transforming material outputs from one activity into resources for another [27]. This inquiry is closely tied to current pressures linked with the digital and green transition, during which municipal waste management has become an increasingly urgent challenge across Mediterranean cities [28, 29]. The question posed was how such networks might be reconfigured around material circulation, so as to help cities reduce waste and generate new forms of value [28].

Mediterranean cities form historically layered environments shaped by long cycles of trade, craft, and cultural exchange [11, 24, 25]. Creative industries—often small in scale, embedded in local economies, and reliant on artisanal knowledge—continue to operate within these urban fabrics. Their informal or semi-formal modes of cooperation have contributed to economic resilience, cultural continuity, and an underlying form of sustainability that predates contemporary debates. In this respect, these cities appear well-positioned to engage with emerging agendas of circularity and digital tools [11]. Creative SMEs typically operate in adaptive, flexible networks that can facilitate alternative value chains, while their production methods allow for the gradual integration of digital tools.

Based on these considerations, INNOMED-UP also examined how cross-border collaboration might yield mutual benefit: northern Mediterranean cities contribute technological expertise and formalized waste management strategies, while southern Mediterranean cities offer long-standing cooperative production systems grounded in proximity and shared skills. Seven cities were selected for comparative research—Athens,

Hebron, Tunis, Prato, Palermo, Irbid, and Nablus—representing distinct combinations of historicity, productive activity, and socio-spatial diversity.

In northern cases (Prato, Athens, Palermo), circular networks were developed through structured knowledge exchange and technological transfer. By contrast, the southern cities (Hebron, Nablus, Irbid, Tunis) demonstrated how informal yet tight-knit productive relations continue to support collaborative systems embedded in everyday life. The circulation of skills, tools, and materials across these diverse contexts suggests that Mediterranean cities—despite their differences — they share common traditions that can enable cross-cultural knowledge.

The research focused on Small and Medium-sized Enterprises (SMEs) within the Cultural and Creative Industries (CCIs) as critical drivers of change. These enterprises were supported in experimenting with circular production and consumption models, innovation frameworks, and cross-border knowledge exchange. Tools such as digital platforms for secondary material exchange, co-design workshops, and tailored business model development processes were employed in alignment with SDG principles and global sustainable urbanization frameworks [1].

Implementation varied across the partner cities. In the northern Mediterranean, the project worked within more institutionalized ecosystems, while in the southern Mediterranean it relied on traditional systems of cooperation that—despite being informal—revealed deeper examples of economic resilience under constrained conditions. Rather than producing a single model, the project highlighted a plurality of approaches shaped by local material, social, and institutional characteristics. This plurality reinforces the importance of embedded knowledge and adaptive design instead of prescriptive solutions.

Circular transitions depend not only on the creativity of SMEs or community initiatives but also on local institutions, stakeholders, and particularly on municipal authorities capable of planning, regulating, and supporting circular systems [11]. Local governments play a decisive role by promoting upcycling, supporting infrastructural changes, and cultivating new relations between creative industries, traditional businesses, and residents.

Two significant considerations emerged: first, urban and land-use planning must be reconsidered in light of broader circularity debates;and second, transitions toward circular urban planning require deep contextual knowledge, about material flows, technological access, and socio-economic dynamics. One of the project's most tangible outcomes was the establishment of seven urban clusters, each composed of creative enterprises and local stakeholders. These clusters shared secondary materials, equipment, and training resources, working particularly with waste streams generated by crafts, construction activities, and CCI SMEs.

Among these initiatives were "smart bins," hosted by local SMEs, that collect secondary materials such as textiles, leather, plastics, paper, and metals. These are digitally linked to an online platform, enabling material visibility and exchange. A bicycle, designed with recycled components at National Technical University of Athens, is notified via a mobile application to collect and redistribute materials to participating craftsmen.

The overall approach reframes circularity as an additional, context-aware process in

which cities adapt their existing assets and know how. This understanding guided the project's application in Athens.

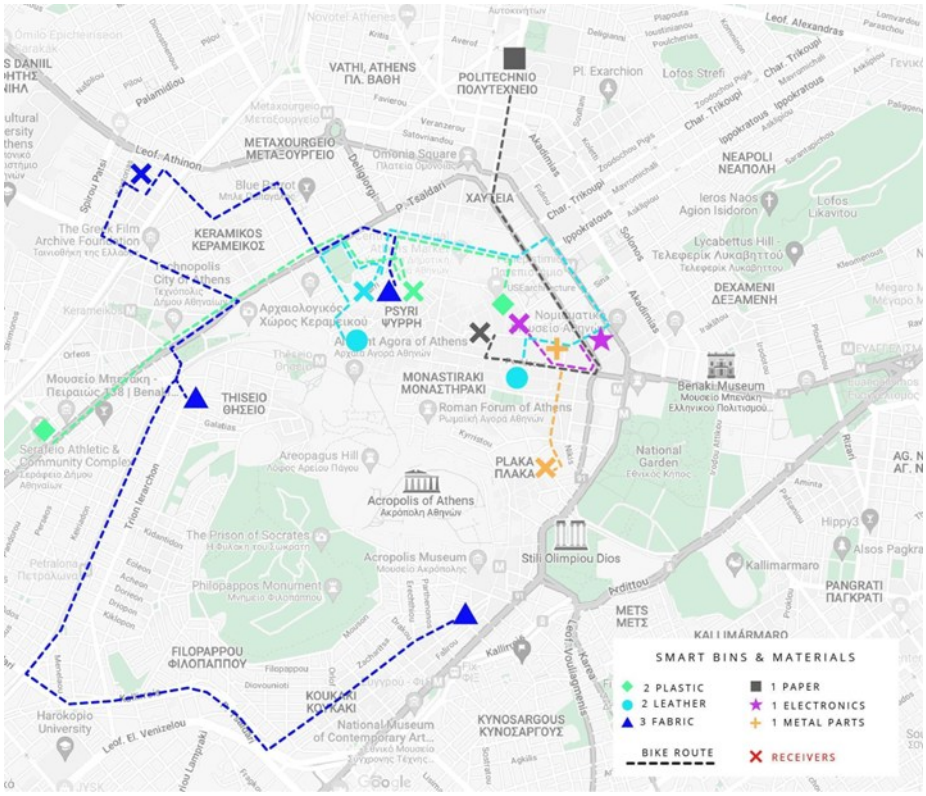

Fig. 1. INNOMED-UP - Map of Spatial distribution of CCI SMEs Cluster in the Historical center of Athens

5.2 Athens as a Living Laboratory of Circularity

Athens, a metropolitan agglomeration of over four million inhabitants and the country's administrative and economic center, remains at an early stage in the transition toward a circular economy. Progress depends on coordinated public policy, specialized training, and the formation of cooperative networks that facilitate knowledge and resource exchange among enterprises. Creative professions, historically concentrated in the center, contribute significantly to the city's economic and cultural identity. Yet these activities face pressures linked to tourism growth, short-term rentals, and market restructuring.

Despite these pressures, SMEs involved in crafts and creative production have historically maintained networks of collaboration and value chains that anchor local econ-

omies. Findings from INNOMED-UP reveal that many of these enterprises have already begun adopting circular business models - incorporating reuse, repair, and upcycling into daily practice. With appropriate policy support, such small-medium creative entrepreneurship can play a central role in advancing circularity from the bottom up.

Selected locations in Athens were equipped with smart bins for the collection of secondary materials: fabrics, plastics, leather, metal components, electronics, and paper. Participating SMEs include textile studios, leather workshops, design collectives working with reclaimed materials, and craft studios producing upcycled products such as accessories or home goods. The digital platform catalogs available materials, enabling new partnerships and exchanges. The smart bicycle circulates within Athens, ensuring collection and redistribution of materials within the historic core.

A basic element of the Athens pilot is the establishment of a dedicated cluster in the historical center, serving as both a spatial and social laboratory. The cluster includes the main project stakeholders, six sub-grantees, and the ten hosts of the smart bins. Two bicycles support the material flows within the network. Several participants hold dual roles as both material recipients and sub-grantees, producing a feedback loop that reinforces the principles of circularity and fosters new forms of collaboration.

Generally, the Athens experience proposes a model of urban regeneration grounded in creative production and environmental responsibility. By strengthening the connections between local artisans, designers, and small enterprises, the project counters the pressures of mass tourism and market-driven homogenization, renewing the historical center as a space of active cultural production.

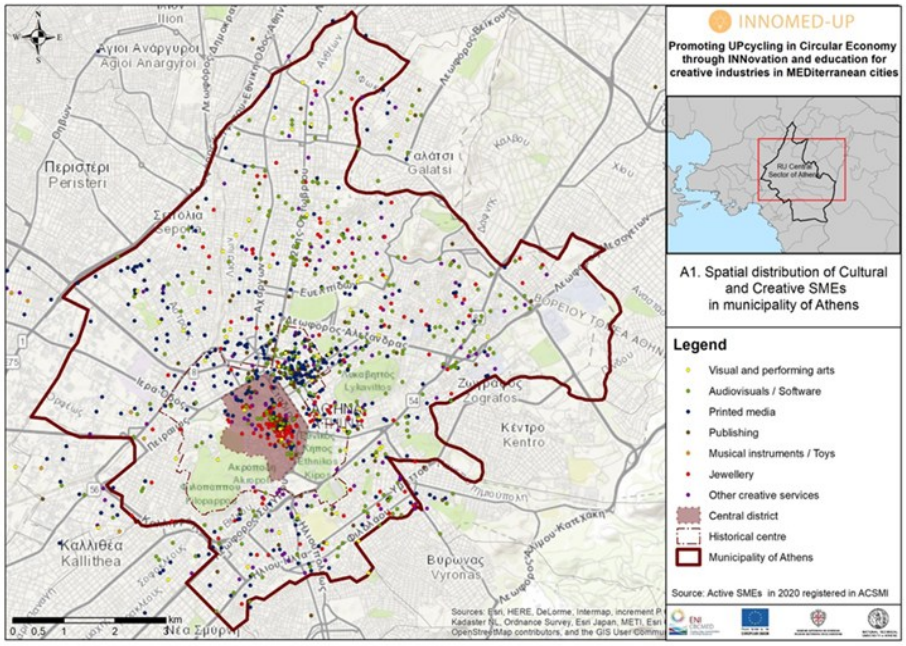

Fig. 2. INNOMED-UP - Map of Spatial distribution of CCI SMEs in the Municipality of Athens

Fig. 3. INNOMED-UP - The "smart" tools of INNOMED-UP.
The bin and the recycled bicycle

5.3 Extending Circular Urbanism from INNOMED UP to CARISMED project

Building on these findings, CARISMED aimed to integrate the practices developed by INNOMED-UP into wider planning frameworks. The project promoted Low-Cost, Adaptive Reuse Strategies (LCARS) as means of repurposing underused or abandoned urban structures. Instead of demolition or high-cost redevelopment, LCARS encourage

cities to work with existing resources, fostering environmentally and socially sensitive forms of urban transformation [25].

While such strategies raise questions around heritage, gentrification, and urban aesthetics, their integration into circular planning frameworks can stimulate new urban cultures and inclusive development patterns. CARISMED pilot activities were implemented in Athens, Hebron, Irbid, Murcia, Palermo, and Tunis. These included reactivating local markets, repurposing abandoned buildings, conducting eco-design workshops, and introducing smart ICT infrastructures to support circular logistics. Craftsmen and creative practitioners played a central role in designing furniture, interiors, and public-space elements from reused materials.

Together, INNOMED-UP and CARISMED demonstrate how circular practices, when grounded in local realities, can open new pathways for sustainable urban development across the Mediterranean.

6 Conclusion and discussion: From Urban Circularity to Principles of Circular Urban Planning

At the end of the research itinerary presented in this article, thoughts and suggestions are put forward concerning the regeneration of cities and human well-being. The proposals are strategic in nature and are suitable for cultural, creative, and productive activities, as well as for the shell of the urban fabric.

Upcycling of materials that were discarded after primary use, as well as refurbishing and adaptively reusing underutilized or abandoned buildings or areas, can extend the life cycle of products and the useful lifespan of building stock. This implies reducing the consumption and waste of products and materials to a minimum. When a product reaches the end of its life, its materials are kept within the economy wherever possible. These can be productively used again, thereby creating further value, contributing to future sustainable development by revitalizing the urban environment whilst achieving competitive advantages for a city and its citizens with low-cost solutions.

LCARs are in direct opposition to the obsolescent traditional, linear economic model. They mostly reflect the changing needs of local communities that seek a new balance and reject the previous consumption-based model. These include eco-design principles and advanced scientific techniques for the restoration and reconstruction of disused buildings and urban areas. They can contribute to protecting the environment, increasing competitiveness, stimulating innovation, boosting economic growth creating new jobs, and improving quality of life.

To achieve the above, a systemic change is required, which must be in line with the directions of the global debate on sustainable urbanization (Agenda 2030, European Policy on the Circular Economy, Declaration on Circular Cities, and the corresponding literature on Circular Urban Design). Therefore, radical changes are needed in consumption, production, urban planning, policies, lifestyles, and values.

In this context, three thematic axes were identified for contemporary, circular urban planning:

1. Green Architecture – Emphasis on environmentally responsive design, the integration of solar energy systems, and passive heating and cooling technologies
2. Smart Systems – Application of digital infrastructure and information technologies to improve energy use, logistics, and communication
3. Recycling and Upcycling – Incorporation of reused furniture and equipment into buildings, encouraging local production and craftsmanship over mass-produced imports

From a broader perspective, the project encourages planners and policymakers to look more closely at the material and institutional conditions of their cities.

- What kinds of building stock are available?
- How do supply chains function locally?
- Where are the gaps, and what assets remain untapped?

There is also a call for a fundamental rethinking of urban policy, a paradigm shift, one might say. Creative and cultural industries, in this view, are not decorative or peripheral. They are integral to shaping new economies and reimagining the future of historical cities. Their embeddedness in place and community makes them ideal actors for promoting circularity, not only in material terms but as stewards of cultural memory and urban imagination.

As emerges from the experimental process described so far, successful implementation of circular urban planning in general—and particularly within historical contexts—will require:

- Attuned analysis of the interplay between public policy and local specificities
- Mechanisms that foster community participation and social inclusion as foundational elements of urban transition
- Governance structures capable of mediating between often-competing priorities: preservation vs. innovation, inclusion vs. competitiveness, continuity vs. change

Taken together, these efforts do not offer a finished blueprint. Rather, they suggest a provisional, iterative process—one that values context over standardization, collaboration over hierarchy, and care over control. Circular urban planning, at least as it emerges through these projects, is not simply a new planning doctrine. It is, in many ways, an invitation to rethink how cities adapt, endure, and imagine their futures.

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