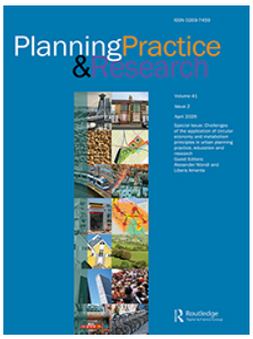

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PRACTICE REVIEW

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Six recommendations for a circular city. Pushing the sustainable urban transition forward

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ABSTRACT

The paper makes six recommendations to address pressing urban challenges that arise from the turn towards circularity. It proposes an approach to bring derelict, vacant and underused land into reuse to drive a sustainable urban transition. It is a call for taking systemic action towards an inclusive and sustainable city. Proposals for identifying *wastescapes* in different urban and territorial critical contexts are highlighted. *Wastescapes* are discarded territories perceived as innovative resources for new public spaces and spatial justice. The paper is a practice review which provides a characterization of *wastescapes* in the Campania Region (South of Italy) which is potentially applicable in other contexts worldwide.

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Circular city; wastescapes; sustainability; design tools; Urban metabolism; sustainability transition

1. Introduction

The spatial dimensions and consequences of the application of circularity principles have been investigated in numerous research projects, publications and implemented in programs and plans in practice in Europe and beyond. However, the spatial dimension of circularity remains largely unexplored and thus, still stands as a relevant and fertile topic for debate.[1] This paper focuses on the still unexplored dimensions of circularity, among which are its spatial scope, possible applications, and effects on the urban environment towards circular city futures.

The objective of the practice review paper is to review experience gained in several research projects which leads to six recommendations – in the form of preliminary tools – to address pressing urban challenges in the delivery of circular and sustainable urban regeneration processes. The recommendations concern possible ways to drive a sustainable urban transition in response to the complex and site specific socio-ecological, environmental, and energy questions for cities, with a specific focus on the regeneration of wastescapes (Amenta & Attademo, 2016; Amenta & van Timmeren, 2018, 2022), in the context of scarcity of soil and material resources (Williams, 2019).

We concentrate on findings of research projects undertaken since 2014 at the Department of Architecture of the University of Naples Federico II in Italy, in collaboration with the Department of Urbanism of the Faculty and Architecture and the Built

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Environment of Delft University of Technology. The projects examine and deepen understanding of the implementation of a circular model with particular reference to *wastescapes* as fertile laboratories for experimentation.

The first project on which this paper builds upon is REPAiR[2] in whose framework a taxonomy of *wastescapes* has been developed (REPAiR, 2018c). In REPAiR's understanding, wastescapes have a wide definition which includes discarded territories, sometimes described as drosscape (Berger, 2006a, 2006b). They are intertwined with the operational infrastructure of waste (Brenner, 2014) and perceived as innovative resources for new public spaces and spatial justice (REPAiR, 2018c). In this understanding, *wastescapes* go beyond the mere definition of brownfields by merging the spatial dimensions of abandonment and dereliction with all the challenges related to the management of material waste happening in or through operational infrastructures.

By reviewing the REPAiR and other research experiences in this paper and delineating six recommendations to implement circular urban environments, this work intends to contribute to the development of a new research project entitled *SPArTaCHus. Sustainable City-Port Areas Towards Circular Hubs. Rethinking Life Cycles of Wastescapes in the City-Port Areas of the Metropolitan City of Naples*.[3] The paper provides a set of preliminary guidelines for circularity to be further specified in the development of the project.

The paper calls for a wide audience to take more integrated actions towards a more sustainable city in which circularity plays a decisive role. Even if the process of wasting, declining, and decaying is an inevitable step within the life of people, things and places, the current linear way in the production of waste constitutes a tangible challenge for the environment which is not able to metabolise waste naturally. Moreover, the linear model of growth is negatively influencing the quality of life of people, generating wastefulness and spatial inequalities. This work is based on an understanding of contemporary territories as ecosystems defined by (still linear) flows of resources, functioning in an unsustainable way leading to scarcity and pollution.

This paper aims to respond to the following research questions:

> How can wastescapes be identified in critical urban and territorial contexts? What tools can bring derelict, vacant and underused land into reuse as part of the circular city approach? How can the circularity of wastescapes in the built environment protect people and the environment from risks deriving from a linear model of growth? How does the city evolve in relation to the scarcity of soil resources?

The paper begins in Part 2 by identifying the pressing urban challenges in the sustainability transition towards more sustainable urban systems (Loorbach, 2017). The framework on which this conceptualization is built entails systemic, complex and multiple dimensions of urban challenges (Köhler *et al.*, 2019). In addressing the first question, the paper concentrates on spatial fragmentation and wastefulness related to different kinds of wastescapes. The latter are the discarded areas that may be reinterpreted and regenerated as innovative resources for a circular urban and territorial metabolism (Girardet, 2010; Lucertini & Musco, 2020; Russo & van Timmeren, 2022). This is done through the tracing of the key outcomes of research projects and plans focusing on the circularity of urban metabolism in the Campania Region, in the south of Italy.

Part 3 proposes a set of tools which can be employed to bring derelict, vacant, and underused land into reuse as part of the circular city approach. The valorization of discarded resources – in a wide sense including spatial and material resources – is seen in this work as a starting point towards circular cities (Williams, 2019). The topic of circular urban and territorial regeneration of wastescapes, and of eco-innovative solutions and strategies to recycle them (EC, 2012) is based on the European goal of implementing eco-innovation to reduce impacts on the environment by increasing the resilience of urban systems and using spatial and material resources more efficiently.[4] They are summarized in the proposed tools and principles that integrate the contextual characterization of wastescapes identified in Part 2.

Part 4 concludes by stressing the role that circularity – in its wide sense – can play for architects, urban designers, and planners in research and practice in dealing with spatial and territorial leftovers that will drive the transition towards long-term sustainability and resilience. Circular metabolism in a multi-risk context is introduced and needs to be further explored.

2. Identifying pressing urban challenges in the sustainability transition

2.1. Linear and unsustainable urban and territorial growth

Pressing urban challenges and overlapping risks play a crucial role in the sustainability transition. Multi-risk governance continues to be a major issue since decision makers and local authorities are still looking for a clear understanding of systemic risk impacts on the environment, economy and society as a whole, and of possible adaptation strategies (Gallina *et al.*, 2020).

Contemporary cities follow a linear model of growth, consuming and wasting material and territorial resources (Furlan *et al.*, 2022). They are characterised by environmental imbalances, for example, soil pollution and the consequent biodiversity loss. Linear flows of resources define the current urban and territorial metabolism (Grulois *et al.*, 2018). They are unsustainable because they lead to resource scarcity, pollution, and anthropic risks. A sectoral way of designing and planning tends to reinforce linear production since it does not consider the systemic interactions among the different layers and flows of urban metabolism (van Timmeren, 2014) (including the flow of people) which define cities and territories (GeementeRotterdam *et al.*, 2014). Linear growth is based on a rising need for natural supplies like water, food, energy, land, and raw materials. This model cannot be maintained for long and has been criticised since the 1970s. Meadows *et al.* (1972) explained in *The Limits to Growth* that increasing rates of resource use driven by population and economic growth are unsustainable and must be reduced.

However, research and practice are still dealing with the challenges of applying a fully circular model of growth in contrast with the linear one. This is to cope with resource scarcity and with the increasing costs for the supply of a large amount of raw materials. The costs to be considered are both economic and environmental. They can be reduced if we live within limits and environmental boundaries in equilibrium with natural processes so that growth is sustainable (Russo, 2014a). This can be done by extending the life cycles of materials and components, as well as of buildings, infrastructures, and territories that are undergoing processes of decline by working

on their recycling and regeneration. The need for a change of paradigm towards a circular, inclusive, and sustainable urban model permeates the discourse of current urban policies and programmes at all levels whilst also addressing other challenges, notably climate change.

At the global level, the United Nations' 17 Sustainable Development Goals assert the urgent need to build sustainable cities and communities through responsible consumption and production processes (Goals 11 and 12) (Desa, 2024). The SDGs are also focused on social justice and the need to reduce inequalities (Goal 10). At the European level the European Union funds, among many other urgent topics, research on circularity and promotes citizens' awareness and active participation in planning processes. This is reflected in the increasing use of the urban living lab as a method to achieve collaborative governance and citizens' involvement in moving towards circularity (see e.g. the research projects Horizon 2020 REPAiR, Horizon 2020 UrbanWINS).[5]

Research and action on circularity are also promoted at the national and local levels. For example, in Italy, the National Recovery and Resilience Plan (*Piano Nazionale di Ripresa e Resilienza*, NRRP) was part of the response to the pandemic crisis, under the EU Next Generation (NGEU) programme (ltalian Government Ministry of Economy and Finances, 2021). It fosters the green transition, and sustainable consumption by improving waste management and kick-starting the circular economy.[6] It is possible to find reference to the shift towards circularity and overall sustainability in contemporary local government policy and planning practices too.

Despite the circular economy being a global trend, commitments made have yet to translate into measurable impacts, otherwise risking a slide into green washing without achieving critical social and environmental objectives (Circle Economy Foundation, 2024).

Clearly more attention to the practical application of circular economy principles is needed for substantial progress to be made (EC, 2014; MacArthur Foundation, 2015; Ellen MacArthur Foundation, & Arup, 2019). Action must adopt an integrated and systemic approach for understanding the complexity of waste systems and designing effective solutions.

2.2. Spatial fragmentation and wastefulness

Linear and unlimited urban growth processes generate waste, inefficiency, and shrinkage, posing a threat to the planet's boundaries (Russo, 2014b). The term 'waste,' derived from the Latin 'vastus,' refers to a vast, desolate, abandoned, or uncultivated space, often implying an area that is useless or without meaning or purpose (Lynch 1990b; Pavia, 2016). Waste has a wide meaning which refers not only to material refuse as the natural outcome of the end-of-life cycles of objects, but also to dismissed, underused and even vulnerable spatial resources and landscapes (REPAiR, 2018c).

Discarded areas could be, for example, former industrial sites, in-between spaces without specific functions, dismissed areas, large paved and impervious underutilized parking lots. They can be large open spaces and artifacts, or small urban fragments which have reached the end of their planned life cycle(s).

Wastefulness is particularly apparent in peri-urban areas. They have an open mesh structure, diffused settlements with mixed functions, and are dependent on the car-based

logic of accessibility to facilities and infrastructures. These features make them particularly vulnerable to wastefulness (Garzilli *et al.*, 2022).

2.3. The contextual characterization of wastescapes in the Campania region, Italy, and their potentialities

Wastescapes have been recognized within the regulatory framework of the Campania Region in the South of Italy. The network of wastescapes has been identified in the regional context following studies for the Regional Landscape Plan (Attademo *et al.*, 2022). In Campania, and, at a smaller scale in the Metropolitan Area of Naples, the spatial pattern of wastescapes constitutes an archipelago of spaces in the city, along the coast, and in its peri-urban and dispersed areas (Attademo *et al.*, 2022). They offer opportunities for urban planning and landscape design as they are often strategically connected to the wider territory and offer opportunities for the potential creation of networks of green areas and/or accessible public spaces. This section reviews the extent and potential of wastescapes in the Campania Region drawing on research and teaching activities. We propose that wastescapes can be categorised in four ways: (a) post-industrial wastescapes, (b) coastal wastescapes, (c) peri-urban wastescapes, and (d) risk-related wastescapes.

2.3.1. Post-industrial wastescapes

Post-industrial wastescapes tend to be located in the hinterland of cities or along the coastline. They are characterized by polluted soils and waters, compromised ecosystems, underused or abandoned industrial buildings, large infrastructure constructions (sometimes abandoned), interstitial areas, gated spaces for production (some of them might be active), and spontaneous (unplanned) developments (Formato *et al.*, 2014). East Naples is one example of this kind of wastescape.[7] In this area the sort of drosscapes, a term suggested by Berger in 2006, are evident with environmental fragility and degradation, and pollution. Drosscapes contribute to the spatial fragmentation of East Naples but they also offer opportunities for strengthening biodiversity and as places for reconstructing the relationship of the city with its wider landscape (Fabian & Munarin, 2017).

The potentialities of polluted post-industrial wastescapes can be explored through a remediation process understood as an integrated and inclusive methodology. In this approach, soil remediation is multiscale and multidisciplinary becoming an 'ecologically oriented landscape project' (Gasparrini, 2014, p. 57). The remediation itself is seen as the first step of a wider regeneration process in which the technological solutions to depollute soils and mitigating risks are coherent with the future uses foreseen by the plan (Russo, 2011, p. 50). The remediation process involves community engagement and can take place alongside compatible temporary uses.

2.3.2. Coastal wastescapes

Coastal wastescapes represent a space of friction between the sea and the hinterland, where they form obstacles to land-sea interactions, and when they lower the quality of life of citizens. The challenges are related to soil pollution (for example, due to former industrial activities), to spatial fragmentation which can be created by impassible closed or gated zones, to social issues caused by the absence of services, and particularly, the risks associated with climate change can be also relevant in coastal wastescapes. These

characteristics present a significant challenge for planning reuse of the area in a multifunctional and resilient landscape (Russo, 2017).

The research project entitled *EcoRegen. Circular economies and peri-urban areas regeneration*,[8] identified and mapped coastal wastescapes in the Metropolitan Area of Naples, understanding them as a resource. It developed a methodology to distinguish and map them, by emphasising, among other things, the fragility of public social housing districts in the coastal territory between Naples and Castellammare di Stabia. These are fertile territories where to implement innovative and sustainable regeneration processes (Amenta & Attademo, 2023).

The port-city areas between East Naples and Castellammare di Stabia are affected by the railway line which runs parallel to the coast. It is an important connection between the municipalities with the city centre of Naples but, at the same time, it fragments the urban fabric along the coast. This fragmentation is exacerbated by the presence of obsolete or underused buildings and open spaces that are physically and visually connected to it.[9]

It has been argued that coastal wastescapes are porous territories (Benjamin & Lacis, 2020; Hein, 2021) that can be regenerated through new systems of green networks (De Martino *et al.*, 2022) and nature-based solutions. This 'third landscape' – as introduced by Clement is a reserve of biodiversity and potential ecological network that can be strengthened (Clément, 2005).

2.3.3. Peri-urban wastescapes

Peri-urban areas wastescapes are associated with agriculture and food production, and also to large, specialized functions such as (underused) shopping malls and production plants that are typically scattered in the urban fringe between city and countryside. The understanding of the processes that caused abandonment, underuse or pollution of peri-urban territories can be key for their regeneration and restoration in the urban metabolism processes. The problem of wastescapes in peri-urban areas was a focus of the Horizon 2020 project REPAiR – REsource Management in Peri-urban Areas: Going Beyond Urban Metabolism.[10] REPAiR investigated the making of more circular and inclusive peri-urban territories by improving the metabolism of waste in six locations in Europe. REPAiR showed the importance of an integrated approach to waste management that consider the circularity of both material waste and wastescapes for an improved quality of life for all.

A project for the municipal plan of Casaluce, in the province of Caserta in Campania, investigated peri-urban wastescapes.[11] This small town has pursued the reintegration of the network of wastescapes in healthier urban metabolism processes. The Municipality of Casaluce will benefit but also the wider surrounding area across the territory of Caserta. The renewal of peri-urban wastescapes transforms them into networks of open spaces and/or multifunctional areas for the city and reconnects them with the structural components of the urban landscape and green-blue networks (Amenta & Formato, 2016).

2.3.4 Risk-related wastescapes

Urban environments that are exposed to multiple risks are prone to both the formation of wastescapes and worsening existing ones. The application of the circular metabolism approach in the regeneration of wastescapes under multiple risks is yet to be explored

fully. However, research is now underway. In multi-risk contexts, the preparedness of decision makers and all stakeholders in hazard situations can be improved through the use of the urban living labs approach for stakeholder involvement, by facilitating the cooperation among different actors and taking into account both the environmental and socio-economic issues at play (Amenta & Arena, 2020).

The value of stakeholder involvement in the regeneration of wastescapes in multi-risk environments has been examined in the preparation of the new Structural Municipal Plan for the Municipality of Sant'Anastasia in the province of Naples.[12] In this case a mix of kinds of risk, including earthquakes and volcanic activity make the conditions particularly complex and fragile.

The objective of sustainable urban regeneration in multi-hazard contexts is an aim of the research program RETURN.[13] This project concentrates on city-wide risk scenario evaluation and the creation and application of circularity guidelines to manage multi-risk environments. It is again connecting multi-risk environments with the circularity approach, and with a specific focus on ecologically oriented urban projects and processes. RETURN is focused on the western part of Naples, namely Bagnoli which is one of the most important post-industrial sites and polluted landscape in Campania, which opens towards the sea. A large part of the territory of Bagnoli where the former ILVA factory was built, lies in a condition of denied accessibility and wastefulness still today, due mainly to soil pollution and in progress soil reclamation processes. In Bagnoli a collaborative approach in the co-creation environments of urban living labs (Steen & Bueren van, 2017; REPAiR, 2018b) is foreseen as a possible way to manage risks in an innovative way and to envision an ecologically oriented regeneration process.

A further possible complication is the link between multi-risk environments, wastescapes and heritage assets, notably archaeological remains. The Pompei[14] archaeological site, which together with Boscoreale and the 'minor archaeological sites' spread across a wide territory constituting a diffuse archaeological park which includes several wastescapes in need of regeneration and with potential to create a network of new public areas. Wastescapes in this case are mainly related to poorly maintained public spaces and social housing districts which are located nearby the archaeological remains. These could be reconfigured into parkland enabling wider accessibility to the smaller archaeological sites outside the boundaries of the main park of Pompei. Having introduced various forms of wastescape we now turn to recommendations for their regeneration.

3. Six recommendations for a circular city

This paper identifies six recommendations that could be followed in regenerating wastescapes towards a circular and sustainable transition under the headings of: (1) *systemic actions; (2) integrated and inclusive governance; (3) proximity; (4) reuse of local resources; (5) porosity; (6) time and ecology*. The overall approach that binds these recommendations is ecological urbanism. This approach understands the city as a complex mix of socio-economic, cultural, and political relationships which require equally complex perspectives and strategies for envisioning possible and desirable futures for all (Mostafavi & Doherty, 2016). The six recommendations consider the complex interrelations among the multiple critical urban contexts in which the different wastescape conditions can overlap and conjoin in the same territorial structure as shown in Figure 1.

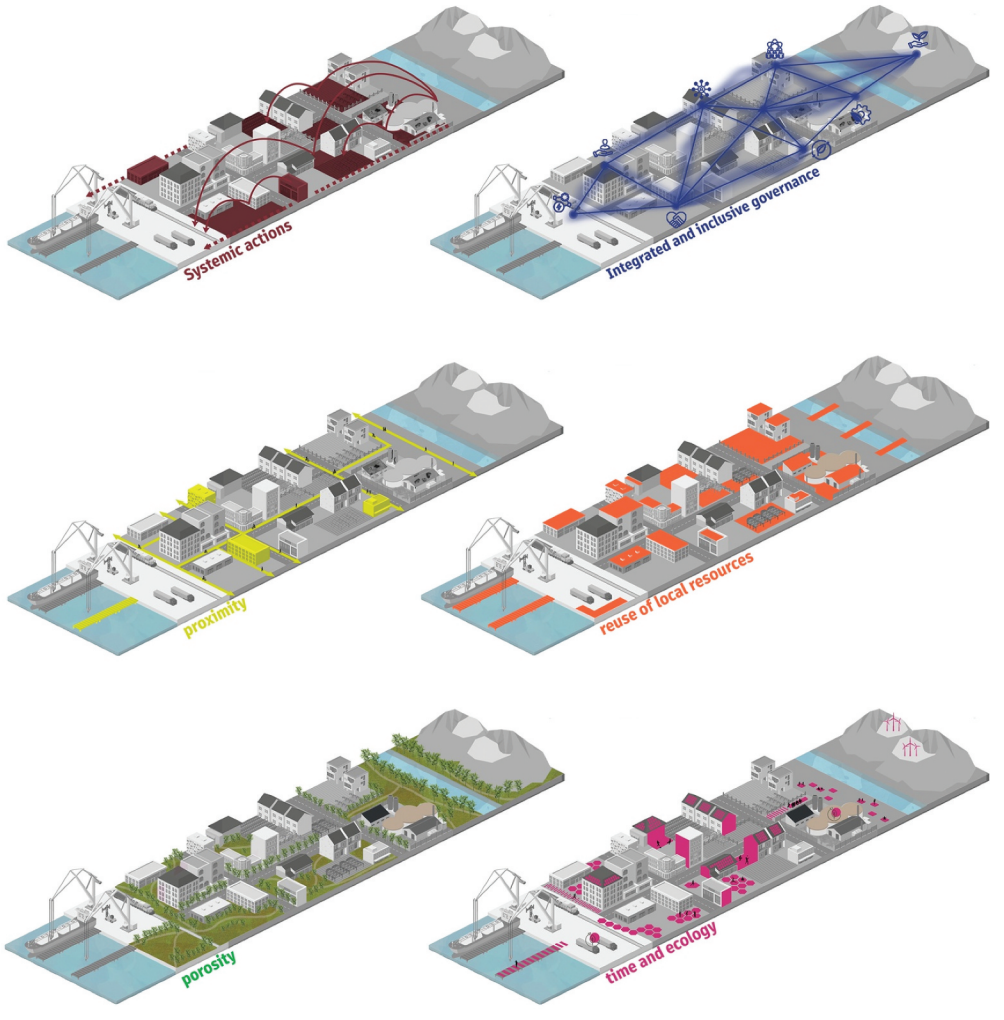

Figure 1. Six recommendations for a circular city. Source: author. Graphics by Filomena Esposito.

3.1. Systemic actions

Whilst there is evidence of innovation on planning for circularity in the literature, an integrated and systematic vision of urban and territorial metabolic flows that engages different disciplines and works across multiple spatial scales is yet to be achieved to meet an overarching challenge for sustainability of urbanisation (STRN Sustainability Transition Research Network, 2023). This will entail growing in a prosperous way, preserving environmental values, biodiversity, and human rights, or to remain within the so-called 'safe space' for development in the economic doughnut model proposed by Kate Raworth (Raworth, 2017). The doughnut is a vision for growth proposed by Raworth which identifies room for a safe kind of development that could assure sustainable growth for all (human and non-human actors) without social deprivation, and without overcoming ecosystem boundaries.

A different kind of growth, as a different approach to growth, conceptualizing urban regions as areas characterized by significant challenges and conflicts, while also serving as spaces for the experimentation of innovative solutions across various dimensions of urban mobility, risk management, public spaces, and quality of life (Russo, 2014a). This attitude can help overcoming the sectoral approach to urban challenges, and take ecology and landscape as the foundation, opening up to a multiscale approach (Russo, 2015).

The idea is to apply systemic thinking as a key element for the transition towards circularity (REPAiR, 2018c; Amenta *et al.*, 2022), and to regenerate wastescapes through an urban metabolism approach that emphasizes the necessity of shifting towards a sustainable and circular urban metabolism (Wolman, 1965; Ferrão & Fernandez, 2013). Expanding the conceptualization of waste to spatial remains, means working on wastescapes which are intersected by resource flows.

3.2. Integrated and inclusive governance

To achieve circularity, collaborative governance promotes an inclusive approach to planning processes by enabling institutional cooperation and stakeholder involvement (Russo & van Timmeren, 2022). Co-creation activities can be carried out in urban living labs (Steen & Bueren van, 2017; Amenta *et al.*, 2019). They can help to overcome the institutional lock-in situations and institutional fragmentation and enable site-specific approaches to stakeholder involvement (Russo & van Timmeren, 2022). To manage the transition towards circular urban metabolism, urban living labs – as a virtual or physical environments where all stakeholder can meet and discuss in a real life setting – can be useful to overcome institutional lock-in situations and to develop eco-innovations (EC, 2018) through a co-creation process. An unhealthy urban metabolism can generate waste and wastescapes leading to critical urban contexts and both spatial and social inequalities (Russo, 2021).

Social and spatial injustice can be addressed in part through co-creation, experimentation and innovation focusing on wasted territorial resources. In territories that are in transition towards circularity, wastescapes are a valuable resource that can be used to develop a circular and just city, with more equal access to public spaces, facilities and infrastructure.

Integrated and inclusive governance can help unpack the complexity of contemporary cities understood as a mix of social, technical, and environmental systems, shaped by resource flows, infrastructures, and governance. These systems are formed through technology, social practices, policies, and institutional choices (Swyngedouw, 2006).

3.3. Proximity

A territorial structure that requires personal mobility, tends to be less sustainable because of its resource use, pollution generated (even with electric vehicles), and damage to social cohesion and citizens' sense of belonging. A more sustainable approach which has gained more prominence during the COVID-19 pandemic, is to plan and design for self-sufficiency and proximity. 'The city of proximity appears like a technical and social platform thanks to which it is possible to do everything that

needs to be done on foot or by bike from where one lives' (Manzini, 2021, p. 36) (English translation by the Author).

The sustainable regeneration of wastescapes following the principle of proximity of urban functions can contribute to more compact self-sufficient settlements and the reduction of unnecessary mobility related. It provides necessary conditions for application of circular economy policy. It may help to strengthen the concentration and contiguity of different urban functions in the same area, especially when tackling underused or abandoned urban structures with the active involvement of local communities. However, it is necessary to provide a 'livable and affordable proximity' for all stakeholders (Hausleitner *et al.*, 2022, p. 95) and considering the possible compatibility of city functions located in the same place, which hitherto would be regarded as not compatible.

3.4. Reuse of local resources

To close resource loops while regenerating wastescapes, it is sometimes possible to use urban mining for the supply of secondary raw materials. The existing city fabric can be a source of second-hand and recycled materials, as well as building components which, when used in regeneration, are the building blocks of the circular city. The opportunities for closing resource loops of material resources in this way will depend to some degree on planning and building policy frameworks at different levels of government, which in turn are locally determined according to the spatial, social, political, and environmental conditions of each territory. Policy should prevent the creation of a 'fragile city' in which buildings, infrastructures, and facilities in general are dismissed at the end of their life cycle because of they are though not to be adaptable for new uses. Policy must encourage flexibility, adaptability and experimentation along new urban paths for circular development, accepting informality and connecting past and present uses (Sendra & Sennett, 2022).

The starting point bearing in mind the need to reduce carbon emissions, should be the re-use of urban land and buildings, and not their demolition. Where construction and demolition waste is created, it should be the primary resource for new building activities. This approach has its roots in ancient times. As Lynch points out: 'in ancient cities, old monuments and buildings were routinely mined for their stones, beams, or roofing material' (Lynch, 1990a, p. 13). Lynch stresses that this approach should be put forward in the future in more structured ways: 'Demolition is a highly specialized and dangerous activity requiring special techniques and equipment' (Lynch, 1990a, p. 13). Material passports and platforms for managing construction and demolition waste are emerging as valid instruments to implement this process systematically. Examples of such approaches are the work carried out by the cooperative Rotor DC,[15] and the research project BAMB Buildings as Material Banks.[16] The reuse of local resources, construction and demolition waste can be combined with the recycling of organic waste for the production of green areas and new soils (REPAiR, 2018a). This can assist in the construction of new ecological networks establishing new relations between the built and natural environments.

3.5.Porosity

Working on the characteristic of porosity of cities means working within existing urban and peri-urban structures, discovering the challenges and opportunities that the existing city offers (Benjamin & Lacis, 2020). Porosity is a tool that can facilitate understanding of the complex interrelations between different urban areas such that their boundaries can be rethought and opened up towards a possible mix of functions (Hein, 2021). Porosity means also rediscovering possibilities for change within the existing urban structures, even in wastescapes.

The latter idea builds on the work of Kevin Lynch's latest book – published posthumously – 'Wasting Away' and on his paper 'The waste of place' (Lynch, 1990b, 1990a). Lynch makes one of the first references to the waste lands of the American territories, understood as challenging territories for environmental equilibrium. He foresees that even if the process of wasting, declining, and decaying is an inevitable step within the life of people, things and places, the current linear production of waste constitutes a real challenge for the environment. Contemporaneously in the Italian context, Vittorio Gregotti and Bernardo Secchi travelled on a similar path by introducing the topic of 'modification' (in Italian '*modificazione*') to indicate the necessity to work within the existing city fabric, and to identify the degree of transformability of the existing urban areas, by distinguishing the 'hard' (less modifiable) and 'soft (more modifiable) parts of cities and territories (in Italian '*parti dure e parti malleabili*') (Secchi, 1984). The hard and soft parts of cities are identified in terms of their physical structure but also in terms of their socio-ecological conditions (Russo, 2011, p. 8).

The regeneration of wastescapes can contribute to porosity by assisting in the creation of the 'open city' (Sendra & Sennett, 2022). They can be 'transitional territories', characterized by porosity (Secchi & Viganò, 2009; Benjamin & Lacis, 2020). They are incomplete and fragmentary territories, which have potential to be adapted as soon as the community needs, and as conditions (economic, technological, etc.) change, and whilst respecting and enabling porosity.

3.6. Time and ecology

Time and ecology can be considered as interdependent considerations for urbanism to facilitate the process of sustainable transition and circularity, with reference to the ecological urbanism approach (Mostafavi & Doherty, 2016). Temporary uses, informal uses, and tactical urbanism can be applied to extend the territorial life cycles and utility of wastescapes (Russo, 2023). For example, it is possible to establish temporary compatible uses in an area at the same time as depolluting soils through bio-based solutions, as demonstrated in the urban regeneration of De Ceuvel (DeCeuvel, 2018), north of Amsterdam. The case of De Ceuvel demonstrates that soil reclamation can be conducted through an integrated approach and a collaborative planning method to put in place a sustainable land restoration, together with environmental rebalancing, while at the same time closing resource loops. Multiple objectives can be met by regenerating wastescapes that give new life and purpose to wastescapes at the same time as tackling mainstream environmental problems and fostering social cohesion in local communities strengthening their sense of belonging. For example, wastescapes can be used to produce energy locally, cultivate crops in small glasshouses and to recycle organic waste as fertilizer, and proposals can be developed in an urban living lab that engages the community.

In the circular regeneration of wastescapes for long-term sustainability, it is important to find resilient solutions and large-scale strategies that adapt to change, protect the environment, and support biodiversity (Amenta, Russo & van Timmeren, 2022). Innovations here include not only technology and products that close resource loops but also planning processes that involve local communities. One way to innovate is through biomimicry, where nature is used as a model to inspire solutions that follow nature's cycles (Benyus, 2002).

4. Research perspectives

In the Campania Region of Italy,[17] knowledge of the circular regeneration of wastescapes is being deepened through academic research and municipal and regional projects.[18] Research is building on the European Landscape Convention's, understanding of ordinary and unconventional geographies of wasted land or drosscapes as important and valuable components of the landscapes (Council of Europe, 2018). Such areas are resource-scapes (Amenta & Attademo, 2023) and offer positive opportunities for a transition towards circularity. This can be described as the 'reverse city' (Gasparrini, 2014; Amenta, 2015), meaning territories to start again for urban transformation.

Wastescapes are to be found in many critical territorial contexts exhibiting multiple concurrent challenges and facing complex risks, making them a fertile field of research for planners and urbanists. Substantial progress is yet to be made towards formulating and applying innovative strategies for their regeneration.[19]

The six abovementioned recommendations for achieving a circular city are intended for a wide audience, including professionals in municipalities and regional authorities, and the academic community. They offer a preliminary statement about the value and potential of wastescapes as a cross-cutting element in urban regeneration, and delineating directions for imaginative solutions and intervention so that they contribute to sustainable and resilient futures. Further research will provide guidance for driving the sustainable urban transition, through the recovery of the 'heritage of wastescapes' making best use of their environmental values as a 'third landscape' (Clément, 2005). Moreover, the physical network of wastescapes recovered through an ecologically oriented urbanism offer an occasion to re-build lost socio-environmental connections and the human-nature equilibrium across territories. Wastescapes can provide a new framework of public spaces and green networks that is accessible to all, supporting the socio-spatial regeneration of city-regions (Montedoro & Russo, 2022, p. 5).

The priority objectives of the proposed approach are:

- to reconstruct an ecological balance within complex and multi-risk territories, based on the multiscale values of working with wastescapes;
- to promote processes for participatory governance, thus stressing the multi-actor perspective to planning with wastescapes;
- to work with communities in innovative ways such as urban living labs and energy communities to explore paths for improved community resilience to risks.

The circular regeneration, design and planning of, with and for wastescapes, whilst being a welcome opportunity re-build socio-environmental balances in city-regions, continues to pose many questions which will be explored in future research programs.

Notes

1. The spatial dimension of circularity was the subject of a public debate that took place on 13 February 2024 at the Faculty of Architecture and the Built Environment, TU Delft, which was organized by Alexander Wandl of the Department of Urbanism, and the Circular Built Environment Hub. The debate included academics, public authorities including the Province Zuid Holland, and the Netherlands Environmental Assessment Agency (PBL), and professional practices working in the field including PosadMaxwan. The aim of the event was to explore possible spatial conflicts, to unravel possibilities in discussion, and to co-design an approach for the circular built environment in the Netherlands.
2. REPAiR – REsource Management in Peri-urban Areas: Going Beyond Urban Metabolism was a European project funded by the Research and Innovation Program Horizon 2020 between 2016 and 2020 under grant agreement No 688,920. The Author has been the leader of the REPAiR Peri-Urban Living Lab of Naples, Italy.
3. Research financed within the framework: 'Programma per il Finanziamento della Ricerca di Ateneo – FRA, 2022', of the University of Naples Federico II, Corresponding proponent: Libera Amenta. Start of the research: 02 October 2023. Foreseen duration of the project: 3 years.
4. For more insights on eco-innovation please look at https://green-business.ec.europa.eu/eco-innovation_en.
5. See the projects' websites: https://h2020repair.eu/, and https://cordis.europa.eu/project/id/690047, last access 07 December 2024. The Author has been European Advisory Board member of the Horizon project URBAN WINS for the University of Naples Federico II.
6. See Next Generation EU, Make it green, https://next-generation-eu.europa.eu/make-it-green_en#:~:text=The%20EU's%202030%20climate%20target,energy%20to%20transport%20and%20farming, last access 07 December 2024.
7. And the object of an investigation of a Research Project of National Interest (PRIN), namely 'Recycle Italy'. See: https://recycleitaly.net/, last access: 27 March 2024.
8. EcoRegen is a research project funded by the University of Naples Federico II.
9. This is one of the topics that the research project SPArTaCHus will investigate in the coming years.
10. REPAiR grant agreement No 688,920. Link: http://h2020repair.eu/, last access: 03 February 2025.
11. The consultancy activity has been carried out by the Department of Architecture of the University of Naples Federico II.
12. Approved in July 2024. See:https://www.comune.santanastasia.na.it/it/documenti_pubblici/piano-urbanistico-comunale, last access: 3 February 2025.
13. See the ongoing project RETURN in which the author is involved as leader of the Task 5.5.2 on the methodology of Urban Living Labs. The RETURN Extended Partnership received funding from the European Union Next-GenerationEU (National Recovery and Resilience Plan – NRRP, Mission 4, Component 2, Investment 1.3 – D.D. 1243 2/8/2022, PE0000005). Link: https://www.fondazionereturn.it/, last access 03 February 2025.
14. See the consultancy project 'Pompei fuori/tra le mura. La città antica, le necropoli, gli ingressi moderni, la Buffer zone e il rapporto con i siti minori', carried out by the Department of Architecture of the University of Naples Federico II. Scientific Responsible prof. Picone, DiARC.
15. See: https://rotordc.com/, last access: 03 February 2025.
16. See: https://cordis.europa.eu/project/id/642384, last access 03 February 2025.
17. This research has been mainly developed in the Department of Architecture of the University of Naples Federico II, in which the author has been involved with different scientific responsibilities through the years, and also in collaboration with Delft University of Technology, where the Author, previously post-doc researcher at the Department of Urbanism, Chair of Environmental Technology and Design, has been Guest Researcher since June 2024.

18. At the moment mainly in the research project SPArTaCHus.
19. See e.g. the ongoing research program namely 'RETURN', SPOKE TS1 -URBAN AND METROPOLITAN SETTLEMENTS, funded within the framework National Recovery and Resilience Plan (NRRP), in which the Author is involved, as member of the UNINA research group coordinated by prof. Mario Losasso, as Task leader of the task T.5.5.2 - City-scale exercise for risk scenarios evaluation. Link to the main webpage: https://www.fondazionereturn.it/, date of access: 3 February 2025.

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