Chapter 5
Peripheral Urban Areas: Perspectives on Sustainable Regeneration

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Abstract The last decades have witnessed a rapid modification of existing urbanization patterns, which have progressively modified the concept of peripheries. The considerable heterogeneity in types and number of urban peripheries and their diverse set of dimensions (spatial, social, and economics) go beyond the concept of the distance from a city core. Urban peripheries are increasingly characterized by discontinuity, heterogeneity, spatial and social fragmentation. At the same time, new economic opportunities and innovation emerge from peripheral areas. The complexity and the dynamism of these areas require new strategies of sustainable urban regeneration. In this framework, urban planning is a critical instrument to address specific demands or challenges in addition to building community-based approaches. This work employs a place-based case study, the project G124 carried out by the Renzo Piano Foundation, in order to evaluate its first outcomes. The project is aimed at "mending" Italian peripheries by involving the community and local stakeholders, as well as enhancing local resources and self-construction for micro-interventions. It is based on the idea of the "beauty" of peripheries, regarded as value through which it is possible to improve sense of belonging and affection. In so doing, the research provides new perspectives about innovative planning approaches based on innovation in decision-making processes finalized to improve urban sustainability in peripheral areas.

Keyword Urban peripheries · Urban regeneration · Participatory design · Place-based approach · Creativity

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5.1 Introduction

In recent years, urban periphery has become a fuzzy concept. At the global scale, urban peripheral areas have been undergoing bewildering changes due to a wide repertoire of transcalar processes and territorial dynamics which have completely transformed the long-established dualism between core and suburbs. The worldwide increasing rates of urbanization (UN-Habitat 2013), mostly in countries of the "Global South," have been nurturing unparalleled socio-economic disparities. The very concept of peripheries has become controversial to the point to make it challenging to trace its conceptual evolution. As a result, in several disciplines, ranging from regional economy to urban studies and social sciences, heated debates have been focused on the challenges, advantages, and critical aspects of urban renewal programs in complex and multifaceted territories such as urban peripheries.

This chapter aims at scrutinizing some theoretical and methodological approaches in urban planning of peripheries through a place-based case study approach (Yin 2018) which, as Stake (1995) puts it, provides some predictions to be texted in other contexts of study: namely, the Mazzarona neighborhood in the Southern Italian city of Siracusa, selected by Renzo Piano for the second edition of his program of "mending" peripheries.

Data were collected according to multiple methods in order to provide different perspectives. We spent considerable time in the case study context, taking extensive field notes, reflections, and comments in order to provide an in-depth understanding of the processes which the selected neighborhood was undergoing. We carried out extensive fieldworks during the several stages of the project, ranging from the preparatory phase to participatory planning meetings and events open to the local community. In order to achieve the most objective positionality about ongoing dynamics, we also used a triangulation of methods by using additional data collection methods such as the critical discourse analysis (Waitt 2005) both of planning documents and manifestos, retrieved from a variegate set of informational sources ranging from institutional reports and data collection to perceptions and point of view of the stakeholders involved and community participation.

The work is organized as follows. The second part reviews the theoretical evolution of peripheries with the aim of exploring conceptualizations related to the challenges of spatial planning in "marginalized" places. Theoretically inserted at the interplay between critical urban geography and the planetary urbanism framework, the paragraph deepens the interwoven urban processes deriving from urban sprawl and shrinkage, in order to pinpoint the key elements for a sustainable community-led participatory planning of urban peripheries.

The theoretical section also encompasses analyses of several flexible and adaptive approaches for urban regeneration planning by taking into account the traditional stakeholder-based participatory methods as well as Artificial Intelligence (AI) and participatory design theory for urban planning.

Finally, the last section retraces the evolution of planning approaches in Italy, with a specific focus on a recently developed urban regeneration program of

peripheries implemented since 2014 by the star architect Renzo Piano. As a "senator for life," the architect decided to devolve his salary to some small-scale urban regeneration programs in selected Italian peripheries, by involving several young Italian designers and urban planners.

Although some controversial implications of the motto-style architectural manifesto, as underlined by Boano and Astolfo (2015), it is interesting to evaluate the renewal program of "mending" peripheries due to the challenges and achievements of such hyper-local approaches to urban planning. In particular, the final paragraph synthetizes the experience gained in an urban periphery of a Southern Italy city, Syracuse, selected within the last edition of the Renzo Piano's "mending" program and used as an exploratory case study in this chapter in order to highlight potentialities of participatory planning in peripheral areas.

5.2 Planetary Urbanism, Uneven Spatial Development, and Contemporary Peripheries

Over the last few decades a widespread awareness has been raising that the urban dimension is one of the main controversial issues for pursuing the goal of environmental, social, and economic sustainability.

According to the seminal work of Brenner and Schmid (2015) on planetary urbanism, which arouses heated debates and intellectual disputes (Brenner 2018), some macro-trends are spreading at the global level which have been challenging long-lasting assumptions about the epistemology of the urban.

Firstly, growing rates of urbanization have been shaping unpredictable forms of marginalization, stagnation, and shrinkage which foster unprecedented geographies of uneven spatial development. Secondly, territorial inequalities molded by the previous cycles of industrialization were easy to capture because of the typological differentiation of dialectical spaces they produced (urban/rural, center/periphery, and so forth). Nowadays, on the contrary, the "poles" of long-entrenched dualisms mutually create one another at the different scales, continuously rewritten by capitalism-led spatial development. Thus, poverty and wealth, centrality and marginality, development and decline reciprocally produce one another at the different scales, ranging from the neighborhood to the global level.

Thirdly, the so-called cityness has become a more complex and differentiated concept compared to the previous capitalist industrialization cycles. As a result, a proliferation of urban forms and functions is incorporated in polymorphic, increasingly variegated and multiscalar geographical spaces and institutional frames.

Brenner and Schmid (2011, 2015) emphasize that the transformation of urbanizing landscapes at the global scale is also fostered—among the other things—by the ongoing development of megacities and polynucleated metropolitan regions, notably in the Global South; the increasing densification of inter-metropolitan networks and the related infrastructural investments; the large-scale resource extraction

systems (for water, energy, and so forth); land grabbing due to the expansion of large-scale industrial agriculture; and the enduring reorganization and functional shifting of traditional outer edge settlements owing to the creation of fresh export processing zones, delocalized factory implantations, back office sites, knowledge-based high-tech clusters, data processing facilities, and intermodal logistics terminals.

These land use changes fostered by urbanization processes are incorporated within new geographies of a growingly multiscalar and polarized urban governance which has emerged from the several waves of market-oriented neoliberalism and the related projects of deregulation, privatization, and austerity, notably in the aftermath of the 2007–2009 crisis.

In line with the most recent critical urban studies, the risk of universalizing ideologies of "the" city is embedded in technocratic, entrepreneurial, neoliberal visions of mainstream global urban policies, which foster a proliferation of "smart," "creative," "sustainable" cities without taking into account the (re)-production of new geographical inequalities due to the financialized accumulation by dispossession (Swyngedouw and Kaika 2014).

Although criticizing the "city-centric" singular visions that underpinned at length the major urban theories, Brenner (2018) emphasizes the wide-ranging consequences of the increasing processes of capitalist agglomeration, which have been molding increasingly variegated and uneven spatial developments. It is crucial to go beyond the idea of "the" city as a monolithic spatial agglomeration by completely reframing the socio-spatial lens through which urban development can be read. In order to achieve this, it should be necessary to go through a critical reconceptualization which should overcome long-entrenched geographical dualisms.

Furthermore, planetary urbanization is not produced by the same causes nor it encompasses the same implications in the Global North and Global South. Thus, it is crucial to use specific conceptual tools and frameworks as well as place-based planning strategies which could deconstruct traditional visions of urban/rural relations, core–periphery, and so forth, according to the deeply-rooted spatial features at the local and even micro-local scale.

Contemporary place-based planning strategies should face the challenges that cities have been dealing with, by overcoming the long-entrenched "obsession" with establishing a neat boundary between "city" and "non-city spaces" in a world of increasingly generalized urbanization and rapidly imploding/exploding urban transformations (Brenner 2018).

As urbanization is a constantly changing phenomenon of varying intensity and functions at the global scale, the epistemological effectiveness of concepts such as center and periphery should be indeed completely reframed.

As a matter of fact, contemporary peripheries appear to increase in number, typology, and assumptions in terms of sustainable urban planning. Retracing their conceptual evolution does not mean to oversimplify them, but rather, on the contrary, to mirror their inherent complexity and multiscalar character. As La Rosa et al.

(2017, p. 172) put it, "it is crucial for planning research to increase understanding of how urbanisation processes in peripheral contexts might improve sustainability of peripheries and their wider metropolitan contexts."

5.3 Peripheries: A Multifaceted Concept

In the last decades, urban peripheries have been experiencing deep transformations owing to a tangle of interwoven factors at the different scales. As already underlined, the growing rates of urbanization at the global level (UN-Habitat 2013), mostly in "emerging" countries, have been fostering unprecedented socio-economic inequalities, by shaping new forms and functions of urban peripheries. The apparently conflictual processes of urban sprawl and urban shrinkage have increasingly transformed the concept of peripheries to the point to make it difficult to trace in a single way its assumptions (Taylor and Lang 2004).

To start with, there are even differences in their definition. Although they can be generally described in terms of geographical, socio-economic, and political distance from a core, following a traditional epistemological dialectics center/periphery, in Europe urban peripheries are generally regarded as disadvantaged spaces, strictly dependent on core areas, which suffer from marginality and disconnection (Geneletti et al. 2017). They usually refer to urban settlements grown up at the edge of the inner city, often within a social housing program development, thus being marked by lack of basic services, effective infrastructure networks, and inclusive public spaces.

On the contrary, in the North American scenario, extra-edge urban settlements, which are usually the outputs of a long-lasting urban sprawl, are commonly identified with suburban, rurban, and exurban areas not necessarily characterized by socio-economic disadvantages.

In their comprehensive review about urban peripheries, Geneletti et al. (2017) emphasize the terminological variety and the related implications in terms of semantic assumptions.

Due to its undefined character, the term "suburbs," very common in the Anglo-Saxon context, is usually followed by further specifications to emphasize the specific location or a distinctive functional feature: inner-ring, outer, high-density, low-density suburbs, and so forth.

Furthermore, negative implications are often embedded in terms of landscape deprivation, social marginalization, poor housing stocks, socio-economic and environmental vulnerability, unplanned and chaotic spatial development fostered by urban sprawl (Epprecht et al. 2014).

Apart from the widely-used "suburb," other terms are commonly used to indicate peripheral areas, ranging from "peri-urban" to "fringe" and "edge." Finally, the term "peripheries" has a multiscalar connotation, since it can be referred both to a more or less well-defined center/ring relationship within a city–region and to a wider a meso/macro scale. So, "peripheries" can include not only the local level (namely, urban settlements at the outer skirts of an urbanized area), but also the meso/regional and

macro level of those urban nodes which are peripheral compared to "world," "global" cities (Hall 1966; Sassen 1991) or first-rank cities, that is to say the financial and economic hubs within a worldwide urban hierarchy.

As causes and factors are concerned, the rise of urban peripheries can be connected to a variegated and multifaceted repertoire of processes and dynamics which entails both the peripheralization regarded as a synonym of socio-economic and cultural marginalization, regardless of its pure geographic localization from the core, and the emergence of new urban agglomerations, included the informal ones, in the outskirts of already existing urban nodes (Bernt and Rink 2010).

These processes are interwoven with apparently opposed dynamics which have been shaping new forms and functions in central areas, such as the so-called back-to-the-city movement that has transformed the relations between core and ring since the post-war era in the Anglo-Saxon contexts (Glass 1964). As a matter of fact, several transformations have concurred in the residential rediscovery of inner cities, embedded in the postindustrial and postfordist transition, which counterpart the middle class's contemporary suburbanization in North America and North Europe. These changes, which foster processes labeled under the name of gentrification, include the economic (re)production of capitals in inner cities—according to Smith's rent gap theory (Smith 1979)—; changes in consumption behaviors of the baby boomers or new "creative classes" (Florida 2002; Ley 2003); and the shift from a "managerial" city to an "entrepreneurial" city due to neoliberal waves (Harvey 1989).

Finally, at the European level, scholars and institutional actors have recently put emphasis on the so-called inner areas, namely marginal territories usually located in the most "internal" zones which have experiencing growing rates of depopulation, outgoing migration, unemployment, and lack of basic services. In the Italian scenario, they have been classified according to a set of socio-economic and cultural indicators within the SNAI Strategy framework (*Strategia Nazionale Aree Interne*, Inner Areas National Strategy) aiming at reducing the divide between "richest" areas and "poorest" ones. Well, these inner areas are actually defined according to a variegated set of indicators mirroring their different levels of peripheralization, not regarded as the pole of the urban dialectics between inner city and outer edges, but rather as a sub-national level of different grades of marginalization.

As a result, very different concepts of peripheries have recently emerged at the global, regional, and local scales. Before dealing with the role of planning in addressing challenges related to the sustainable, inclusive development of urban peripheries, it is, therefore, necessary to scrutinize the differences in conceptualization and methodological frameworks related to peripheries:

As Geneletti et al. (2017, p. 232) put it,

> The adequacy and effectiveness of the existing sustainable planning approaches for tackling the various, complex and dynamic systems represented by con-temporary peripheries should be understood to improve current planning practices and identify needs for future research.

In advanced city–regions the territorial organization has become growingly asymmetric, polycentric, fragmented and often uneven in terms of non-place-bounded networks which have completely reconfigured and rescaled territorially

nested urban systems. This has traditionally implied an increased attractiveness of some selective activities in core areas and the mounting marginalization of more peripheral areas.

According to critical urban studies, large-scale development projects, such as museums, parks, business centers, and waterfronts have been embedded in the last decades in urban branding strategies aimed at re-enforcing the competitive positions of the related metropolitan economies in a global context of fast changing hierarchies. These projects of urban restructuring often foster new geographies of exclusion and social polarization within market-driven urban policies, by reflecting global pressures as well as incorporating local, regional, and/or national deregulation of governance (Swyngedouw et al. 2002, p. 550, 551):

> The new urban policy, developing in parallel with the new neoliberal economic policy, squarely revolved around re-centering the city. Old forms and functions, traditional political and organizational configurations, had to give way to a new urbanity, a visionary urbanity that would stand the tests imposed by a global and presumably liberal world order. Repositioning the city on the map of the competitive landscape meant reimagining and recreating urban space, not just in the eyes of the master planners and city fathers and mothers, but primarily for the outsider, the investor, developer, businesswoman or -man, or the money-packed tourist.

However, the privileged urban areas attracting new investments are not limited to inner cities. According to Salet and Savini (2015, p. 448),

> The planning of new metropolitan centralities entails significant political challenges as these territories are in a critical geopolitical position. outer areas are the target of increased attention and urgency as spaces where urban growth has to be addressed in the 21st-century city.

As a matter of fact, in the most advantage city–regions, quite unexpectedly outer segments of some peripheral areas, particularly those enclosed by the first city rings at the intersection of big infrastructural networks, have increasingly experiencing spatial changes due to public and private market-led investments.

Polycentrism in metropolitan development has shaped different spatial manifestations over the last few years. While urban policies have been usually addressed to the city cores (Swyngedouw et al. 2002), nonetheless in some cases government and/or private-led investments have been recalibrated towards areas located outside the urban cores, which have resulted to be more attractive for low land values and profit opportunities after development, such as, for instance, university campuses or startup incubators, conference centers, retail and entertainment complexes, and so forth:

> "These have dominated the spatial planning agendas of areas that in the past were called 'the periphery', and these areas have thus been excluded from mainstream urban agendas" (Savini et al. 2015, p. 457).

While this shift can be interpreted as a revitalized interest for less attractive areas, in the meantime this could be explained through the lens of gentrification which, far from being confined to central areas, has been shaping new uneven spatial developments also in peripheral and/or rural areas. As a result, spatial planning and urban

policies should be addressed towards a wider strategy encompassing social mix policies, housing affordability, strategy to support traditional retail and consumptionscapes.

Since periphery is not just a disadvantaged fringe as it is often depicted, as the authors (*ivi*, 457) put it,

> The spatial, social, environmental, and economic results of these interventions show large variety, and it is difficult to establish general patterns in this changing development geography. Yet, despite the limit of generalization for research, the increased variety of ways to address the uncertain and variegated change of the urban fringe poses an important challenge for urban policy making: how can smart growth, environmental sustainability, and the achievement of balanced socioeconomic development be supported in politically and territorially splintered metropolitan areas? (Grant 2009; Raco and Street 2012; Wilkinson 2012)

As a consequence, an increasing awareness is spreading on the need to develop new conceptual and methodological tools for sustainable urban planning, management, and design, particularly in fast changing peripheral territories (La Rosa et al. 2017). In particular, at the "metropolitan" scale, the cross-administrative boundary, which entails a fragmentation of several urban policies among municipalities belonging to the same metropolitan area, needs to be reframed conceptually and methodologically in order to address the related complex spatial relations (Geneletti et al. 2017).

Furthermore, the ongoing waves of neoliberalization, which have encompassed a stepping back of public intervention in favor of public–private actions, have fostered the narratives of urban regeneration at the different scales as a spur for local economic growth.

As Parés et al. (2014) underlined, these kinds of narratives often imply oversimplified generalizations about tools, strategies, and scopes of urban governance, neglecting, for instance, long-entrenched dynamics of continuity and even resistances to change.

As Salone puts it (Salone 2018, p. 133),

> the international debate about urban regeneration has so far privileged large-sized interventions in "deprived" inner areas, mainly conceived as an application of conventional measures of physical rehabilitation and socio-economic development according to a blue-print global model. In this kind of experiences even the claim for an active participation of local residents tends to be reduced to ritual mechanisms that do not seem able to stimulate the rise of an enlarged decision-making and a real bottom up process.

According to Kallin and Slater (2014), the rhetoric of Smart Growth underpins an anti-sprawl anti-modernist attitude, and mixed-use urban settlement is now twinned with the New Urbanism approach which is the core of several urban renewal programs, posing what the critical urban scholar calls the "false choice between gentrification (a form of reinvestment) and a 'concentration of poverty' (disinvestment)."

If several considerations about gentrification-led displacements are embedded in central urban locations—as in "classical" gentrification—the cycle of disinvestments and investments has been affecting in recent years also the peripheral and even rural areas (Kallin and Slater 2014; Hochstenbach and Musterd, 2018). As a matter of fact,

it is not unusual that large-scale urban regeneration programs in peripheries (implying demolitions and reconstruction) exploit territorial stigmatization together with regeneration through gentrification as "two sides of the same conceptual and policy coin." By a continuous reproduction of the urban stigma, the "blemish of place" becomes both the target and the rationale to filter up the peripheral area: a variegated set of institutional narratives and discourses which furthered the area's negative reputation to legitimate state-led huge interventions.

So, the question of the "power" to decide about a community's residential choices—their "right to the city"—should be addressed in every urban regeneration project, whatever it could be the more or less "centrality" (or "peripherality") of the related neighborhood.

Following Brenner and Schmid (2015), inherited paradigms of urban intervention, ranging from the post-war state-led modernist programs to neoliberist entrepreneurial market-led agendas of the 1980s onwards, are no longer viable to face the current extreme pressure cities have to deal with.

In this context, tactical urbanism is often seen as a theoretical and analytical framework to guide and interpret emergent urban design experiments in several contemporary cities, embedded in several local planning agenda insofar it would entail appropriation of urban space as well as social justice.

Synthetically, tactical urbanism encompasses a repertoire of bottom-up low cost and small-scale actions producing ecology-driven changes—often in a temporary manner—into urban environment, especially in city gathering. In many cases, bottom-up approach supplements top-down projects. Although traditionally referred to "guerrilla urbanism," "pop-up urbanism" "city repair" or "Do it yourself—DIY-urbanism" as to highlight the participatory and bottom-up perspective, recently this small-scale, low-cost, and temporary actions are often promoted by professional urbanists who tend to seek out flexibility of land use planning and territorial governance as well as encouraging for increasingly engaged pro-active citizens in shaping their own urban spaces. This shift from top-down long-term big-scale urban planning to small-scale participatory urban micro-actions is also due to the austerity regime underwent by several urban agendas. While "insurgent" and "spontaneous" practices of everyday urbanism stem exclusively from "guerrilla" actions of local communities, the term "tactical" also entails those micro-actions developed by local institutional actors.

Although being controversial owing to the rhetoric of "bottom-up participation" it could imply, tactical urbanism conveys a crucial idea of contemporary urban planning, particularly in peripheral areas: micro-actions at the hyper-local level, based on a *truly* participative planning methodology, can mirror local community's expectancies and even resistances to change.

This is particularly clear when spatial planning has to address the challenges that contemporary peripheries have to face. Without considering them just as deprived and marginalized areas nor just as "living" workshops for innovation to be exploited for market-led interests, peripheral areas have first of all to be reconceptualized in order to reframe their inherent territorial, socio-economic, and spatial complexity, going beyond some widely-spread narratives of "smart growth." What is more, it is

even more crucial to adopt mixed quali-quantitative methods, included participatory and community-led planning strategies, in order to catch the socio-spatial practices informing everyday life of cities. These tools are also capable to incorporate conflictual uses, functions, and perceptions that are embedded in the spatial organization and representation of the territories emerging from "postsuburbanization" (Phelps et al. 2015; Savini et al. 2015). Issues such as poverty distribution, housing affordability, transport accessibility have to be reframed within national and local urban policies, by taking into account new relations among national governments, the core city, and private actors, embedded in an ever-changing geography of the wider city–region where categories such as "center" and "periphery" have been recently completing changing.

As Geneletti et al. (2017; p. 238) underline,

> The relative low number of papers focusing on urban peripheries that was found in our search suggests that peripheries remain a marginal topic in research of sustainable planning approaches. This is also reflected in the lack of a shared definition of urban periphery among the reviewed papers. The social sciences have formulated many different definitions that describe peripheries starting from the socio-economic and institutional processes that determine their generation (Sassen 2005). However, these definitions have a limited capacity to drive actions on peripheries, which can justify the fact that they are largely overlooked by the papers. No shared, practice-oriented classification of peripheries exists (. . .)
>
> However, resources and opportunities for sustainable planning of urban peripheries are seldom discussed. Very few papers highlight the presence of positive elements, and even fewer go beyond simple acknowledgement to demonstrate how it is possible to act on them.

Particularly in the aftermath of 2007–2009 crisis and the related post-recession austerity regime there has been a flourishing of policy and academic interest in the idea of resilience planning which mirrors a widespread discourse on sustainability. However, in their place-based analysis of post-recession urban development, Raco and Street (2012) highlighted how different local interests tend to establish their own selective storytelling around fuzzy concepts such as recovery and resilience in order to support a greater emphasis on economic competitiveness, "with broader social and even environmental policy agendas being refashioned to act as contributors to economic recovery." As a consequence, it becomes more and more crucial to develop community-led place-based planning strategies which, starting from micro-actions at the hyper-local scale, could deeply transform in a sustainable way the present and the future of extremely rich and complex urban areas such as the peripheral ones.

5.4 Participatory Approaches for Urban Peripheries

As already highlighted, contemporary peripheries are characterized by odd opposition and endemic problems with complex, and thus multifaceted, dynamically changing, contextual issues, difficult to capture or steer. In these areas physical, infrastructural, environmental, economic, and social issues define what planners call

"wicked problems," i.e. difficult to define, with unpredictable consequences, and defying rational decision-making. This term has gained importance in urban planning and policy analysis, especially after the adoption of the concept of sustainable development since the early 1990s, which has introduced the environmental dimension to the complexity.

New flexible and adaptive approaches for urban regeneration planning are spreading in order to deal with strategic opportunities and social pressure, development requests, and protection needs. In particular, the importance of relationships and interactions between peripheries cities, landscapes, and communities emerged for the circularization of sustainable development processes through a long-term commitment with continuous improvement in the short/ medium term (Fusco Girard and Nijkamp 2004).

The search for finding urban planning approaches, which includes "wicked problems" of cities and peripheries is increasingly inspiring scholars, in order to give a contribution for the transition from models of urban spreading growth to urban regenerative cycles by which transfer a set of values in terms of civil engagement, environmental, and productive perspectives.

Over the last several decades planning theorists have proposed numerous alternatives offered by different theories closely intertwined, that shed light on the same phenomenon from different perspectives, and for many purposes work together as a unity (Sager 2001). Therefore, methods useful for regeneration of peripheries have splintered into a large number of different approaches.

Broader shifts towards post structural and postmodern thinking undoubtedly broke the rational, technical planning model in the 1950s and 1960s. The rational, technical, method for planning model of the 1950s and 1960s is rooted in the positivist tradition of modernity, and was concerned primarily with procedural planning issues. Engagement with stakeholders and communities was not part of this process and the planners' role was that of the technical expert in managing the process. The 1980s saw the shift towards "post-positivism" and "post-structuralism" in a range of new social theories, which planning theorists drew on to find new ways to explain and suggest roles for planning. Urban regeneration was called upon in the debate through the introduction of innovative approaches to overcome some critical points of contemporary cities for achieving some durable development in terms of economics and of social and environmental condition (Watson 2016).

The post-normal science approach, developed by Funtowicz and Ravetz (1993) at the beginning of the 1990s has underpinned the importance of including grassroots stakeholders as scientific peers and for integrating their diverse perspectives into the scientific analysis. They suggest that the complexity of the interactions and the differential impacts on stakeholders require to relay not only on the so-called experts, but it is recommended to involve an "extended peer community," consisting of all those affected by and willing to discuss the issue at hand. This "extended peer community" approach is reflected in urban planning and regeneration process in peripheral areas, in which the role of the complex and multi-stakeholder relationship among private subjects, communities, and public administration has evolved from a traditionally linear science-policy interface towards a more interactive governance

system that involves actors beyond scientists and policymakers. Participation mechanisms emerged by the need to meet the nature of policymakers' demands and at the same time to stimulate an active transformation for a synergy between citizens and technicians. Urban regeneration processes have recognized capable of generating social and economic activation mechanisms, encouraging a sense of re-appropriation of public spaces. Nowadays, the importance of stakeholder involvement in regeneration processes is well-established in the practices and in the literature for normative reason (the benefits for a democratic society and equity are crucial) and for pragmatic reason (participation improves the quality and sustainability of decisions) (i.e., Munda 2004; Rey-Valette et al. 2017).

Urban regeneration works on planning and design processes directed to the social part and to economic stakeholders, acting through effective participation aimed at the empowerment of local actors and at supporting local development according to sustainable resources. Participatory methods represent a valuable help for communities that undertake the path of self-construction. Researchers tend to use participation for pragmatic reasons, whereas in participatory development, normative argument has been more prominent. Participation develops local trust, improves a program's efficiency, and supports the theory that complex socio-environmental problems meet diverse knowledge, values, and ideas. Multi-methodological frameworks for the implementation of urban planning in peripheral areas are often based on multi-criteria decision aiding (MCDA). It emphasizes the idea of problem construction, focusing on the modeling of the decisional context, starting from the beliefs and values of the actors involved in the decision-making process. This is used to construct the most appropriate decision-making model for a given context (Roy 1990). MCDA transcends traditional Operational Research (OR), which analyses only one criterion, by using normative mathematical models to find an optimal solution. At the end of the 1960s, new methods emerged to support the decision-making process for complex problems, the so-called soft approaches. However, there are no features inherent in classical MCDA, which capture the values of multiple decision makers or consider social uncertainty in public policy decisions such as planning activities.

Over the years, many scholars have recognized the importance of adequate problem structuring to reach favorable outcomes in analytical decision support interventions. Most of them have relied on impromptu problem structuring practices. The use of a formal methodology for identifying the key variables and interactions in a complex problem situation may enhance problem structuring and system dynamics modeling. PSMs (Problem Structuring Methods) are now widely accepted decision analytic tools and there is an emerging body of research and practice on the integration of such methods with other formal and/or quantitative methods (Tsoukias et al. 2013). PSMs deal with unstructured problems characterized by the existence of multiple actors with divergent perspectives and disparate, and/or conflicting interests (Rosenhead and Mingers 2001). The methods of PSM rely heavily on the participation of stakeholders in the decision-making process and often employ qualitative models (Montibeller and Franco 2010).

One of the most used tools is the cognitive map that creates a visual representation of how participants think about a particular issue by analyzing and arranging the problems, identifying causes and effects, explaining causal links and diagramming how concepts relate to each other (Eden and Ackermann 1998).

According to the theory, based in cognitive psychology, Kelly (1955, 1970) argues that human beings are problem finders/problems solvers, continually striving "to make sense" of their world in order to "manage and control" that world. By identifying the causal links of a problem, actions are guided by logic rather than emotion. Understanding how individuals or group members perceive a situation is fundamental, as it is this that influences actions. Checkland (1978) calls this approach of thinking of systems as mental constructs to help individuals make sense of problematic situations "soft systems thinking." The development and application of the necessary skills, methodologies, methods and technologies, needed to engage relevant stakeholders in policymaking in a meaningful and reflective way. In light of this, it is useful to incorporate other decision support systems into the multi-criteria methodology to create a single paradigm—the learning paradigm—to ensure the process is consistent and theoretically and practically cohesive (Midgley 1997).

5.5 Artificial Intelligence and Participatory Design Theory for Urban Planning

Data collection and analysis methods, such as surveys, focus groups, case studies, participatory observations, interviews have been criticized since they capture a relatively limited sample of data tightly focused, time and space specific, restricted in scope and scale, and relatively expensive to generate and analyze. New urban science has opened new windows of opportunity to deal with the enormous amount of information currently available. It generates valuable knowledge for enhanced decision-making and provide insights in urban peripheral planning. In particular, data mining employs sophisticated algorithms to automatically extract useful knowledge and insights from datasets in order to find frequent, hidden, previously unsuspected, and unknown patterns (Fayyad et al. 1996). The results can be visualized in novel ways, in an understandable format prior to their deployment for decision-making purposes. Being a buzzword, there are a wide variety of definitions and criteria for data mining. Data mining is also referred to as knowledge discovery, machine learning, and predictive analytics. However, each term has a slightly different connotation depending upon the context.

The main advantage of data mining and the underlying algorithms for urban planning can be approached as an evolving, systematic knowledge in form of explanations and predictions using data-driven inductive empiricism. It uses computational methods to discover meaningful structures in the data mainly derived from the fields of machine learning and artificial intelligence. The commonly used

algorithms are based on decision rules consisting in a simple "if-then" statement where "if" is a condition (also called antecedent) and "then" a prediction. Decision rules are probably the most interpretable prediction models and their structure semantically resembles natural language.

Broadly are used two types of Machine Learning algorithms. The supervised learning, algorithms consisting of a target/outcome variable (or dependent variable) which is to be predicted from a given set of predictors (independent variables). Using these set of variables, the training process continues until the model achieves a desired level of accuracy on the training data (such as regression, decision tree, logistic regression). The unsupervised learning, algorithms used when there is not any target or outcome variable to predict/estimate and thus used for clustering in different groups, such as Apriori algorithm, K-means (Meij 2002).

Analogy, re-combination, and re-elaboration are continuously applied to the design due to the input of different stimuli (Borgo and Stufano Melone 2019). This means that urban planning activities rely on a corpus of rules, informally referred to as "the state of art," where all different layers of meanings, effects, and functionality of the designed object find a place and integrate. These layers must embrace the intention of the designer/architect, but also attain the needs and the expectations of those who will live in and use those space.

Various reasons justify the adoption of data-intensive algorithm in urban planning for dealing with wicked problems. According to Schön (1983) the reflexive architect works by continuously asking herself the question: "what if?" The view of activities as receptive actions (knowing in action and reflection in action) departs from the idealization of the practitioner as a (rational) problem solver.

To answer the "what if" question, one has to image cases alternative to the present and to the immediately foreseen, and this act of imagination is based on the distinction between what is expected (or even desired) and what is possible. The reflective architect uses the rules of its domain to extend her thinking from the class of expected cases to the larger class of possible cases. When facing a new or unique problem which falls outside known categories, this investigation becomes a process of artistic design. The structure of this procedure is like a reflexive dialogue that permeates all the design activities (Borgo and Stufano Melone 2019).

In this perspective creativity plays an important role within the design process in architecture, according to the cognitivist approach using the tools of knowledge engineering and scientific literature related to Artificial Intelligence. Creativity is often considered as an innate ability, but can also be regarded as a process able to transform and recombine existing entities, toward different, novel configurations. In cognitive environments of artificial intelligence research, creativity is seen as a normal function of the human intellect, to be analyzed according to a strict theoretical and experimental scientific investigation. The modeling and design of artificial space environments, cities and urban architectures in particular, must take into account highly heterogeneous information sources.

It is surprising to note that creativity is not a priority in the mainstream research in AI and it has been studied intensively in design research, especially with empirical approaches. Starting with early work by Eastman (Eastman 1969, 1970), Akin

(1978) and still others, a large quantity of contributions has been produced. A remarkable feature of a majority of this research is the quasi-total reliance on the problem-solving paradigm and in their interpretation of their results (Kazakci 2014). There is now a growing consensus (Dorst 2006; Hatchuel et al. 2002) claiming that problem-solving, even in a broad sense, is too restrictive as a "lens" to interpret design, which is a cause for concern in the interpretation of those results (Wagner and de Vries 2019).

However, adopting the problem-solving paradigm as their conceptual framework for analysis, those studies only recently contribute. Concept–Knowledge (C–K) theory has recently contributed to the modeling of design, especially in designing alternatives This theoretical framework provides powerful generative mechanisms to overcome cognitive obstacles, thus improving our ability to innovate (Pluchinotta et al. 2019).

There are different issues discussed under AI, which offered perspectives based on traditional paradigms of AI, such as learning and interaction (Bedau 2003). Some authors refer to a dual "imaginative constructivism," coming from design research, where creativity can occur both at the level of top-down generation of new definitions and the bottom-up generation of methods for building object (Kazakci 2013). The notion of design as imaginative constructivism has allowed to introduce an alternative worldview, namely the-world-as-it-can-be, opposed to classical and foundational models in AI and related fields, such as decision and learning models, implicitly based on that we call the-world-as-it-is paradigm. The dual constructivist perspective offers the possibility to create novelty in urban planning. Creativity is the ability to come up with ideas or artifacts that are new, surprising, and valuable. The deepest cases of creativity involve someone's thinking something, which, with respect to conceptual spaces in their minds, they could not have thought before. Innovation in action for urban regeneration depends on the discovery of new matches a context of a strong intention, the strong factor which activates the re-combination of elements.

5.6 From the Rehabilitation of Historic Centers to the Urban Regeneration of Peripheries in Italy

In the last 60 years urban planning has slowly but deeply changed its way of acting on the territory thus replacing an additive and expansive approach with a transformative approach. This period can be defined as the "3Rs period" since it can indeed be divided into three different phases respectively marked by urban Rehabilitation, Requalification, and Regeneration.

The first phase started with the eight Congrès International d'Architecture Moderne (CIAM) in 1951 in Hoddesdon titled "The Hearth of the City" and continues through the 1960s. In Italy, the founding of ANCSA Associazione Nazionale Centri storici ed. Artistici (National Association Historic and Artistic

Urban Centres) and, in particular, the subsequent adoption of the declaration called La Carta di Gubbio (The Charter of Gubbio) on the safeguarding of the historic urban centers, signed in 1960, constituted the starting point of the Italian conservation policies of historic centers. During these years the debate on the historic centers is marked by a growing awareness of their symbolic significance and role for communities as the embodiment of identity values and of the need to preserve their historic values through urban rehabilitation.

The focus of the second phase, which develops through the 80s, is on the "existing city," i.e. those urban peripheries and marginal areas with no historic value or which have lost their urban quality often because they have been turned into dormitory suburbs without any identity. In this second phase the "existing city" becomes the place where it is possible to insert or re-insert urban quality through urban requalification. It aims at restoring quality and meaning to the open space system, the urban relation system, and the built environment of our peripheries also through innovation processes. The third phase, the contemporary one, corresponds to the period between the end of the XX century and the first decades of the XXI century. The disciplinary debate on the field focuses its attention on those areas which have never had or have lost their role inside a territorial system. These are generally dismissed or abandoned areas undergoing functional change or technological obsolescence, places that show symptoms of environmental, physical, social, and economic decline. These communities, industries, and places in decline become places in which regeneration "[breathes] new life and vitality into an ailing community, industry and area [and brings] sustainable, long term improvements to local quality of life, including economic, social and environmental needs" (Evans and Shaw 2004, p. 4) through urban regeneration.

During these last 60 years urban rehabilitation, urban requalification, and urban regeneration have represented three different ways of transforming and intervening in the urban context and have also testified the evolution the way of understanding urban transformation has undergone along with the development of new normative instruments. Each of these terms reflects different disciplines with different visions, methodologies, and objectives. Nevertheless, they share some common ground: they all intervene in already urbanized areas but, most importantly, with no soil consumption. In some ways, urban regeneration embraces both urban rehabilitation and requalification but, by postulating the inextricable relation between territory, economic activities, and the community needs, it goes further.

Its pursues a triple aim which defines three capitals: the improvement of the urban infrastructural capital, of the socio-economic capital, and of the physical and environmental capital. Then, urban regeneration aims not just at the physical and spatial improvement of certain areas or at their economic development (they are important but not enough to explain the process of urban regeneration) but also at the improvement of their social and housing conditions, energy efficiency, environmental sustainability, and ecology. In other words, urban regeneration promotes social inclusion, urban welfare and equity. It represents an open and inclusive process of economic and social progress as well as of transformation of the physical space and this is a deep cultural change in urban transformations. This is precisely its

innovative, holistic character. It embraces the theme of conservation typical of urban rehabilitation and that of transformation typical of urban requalification in order to intervene in the urban space in a more comprehensive and integrated way. Since urban regeneration addresses both urban physical decay and social decline, its actions must necessarily be physical, economic and must stress the social inclusion; its actions "seek to bring about a lasting improvement in the economic, physical, social and environmental condition of an area that has been subject to change" (Roberts 2002). Unfortunately, urban regeneration is often exhausted in the theme of economic improvement, is considered just as an architectural project or urban space planning. An effective urban regeneration process is based on compliance with the criteria of physical, environmental, economic, and social sustainability. It enhances social cohesion and resilience.

5.7 A Place-Based Case Study: The G124 Project

Since 2013 Renzo Piano has identified in peripheries "the great project of our country [...]: the city that will be, the city that we will leave to our children" (Piano 2014, p. 12) and in young people the best energies capable of triggering countless "sparks" in these forgotten territories.

Peripheries of Milan, Catania, Venice, Rome, Sora, Padua, Syracuse, and now Palermo and Modena are the places on which, in the various editions of the G124, the working group of Senator Piano decided to work through urban mending actions; places where "to sew and tie together different parts of the city [. . .] means to reestablish in a world relationships between subjects and conflicting objects; means [...] the problem of incongruity" (Secchi 1989, p. 31). Small groups of young architects, the "leading architects" of peripheries have experimented new forms of participation in urban regeneration under the supervision of expert architects. They worked on small projects that involved the inhabitants of the peripheries and aspire to build beauty in "discarded" places. This modus operandi aimed at the design of small intervention to regenerate the peripheries and to build on social identity, sense of belonging, and social dignity.

The G124 project was carried out in a relatively short time of 1 year, and with modest financial resources available. It was finalized at building on physical, tangible, and concrete transformations albeit limited, and social networks, to demonstrate that it is possible to change and that peripheries have a future.

The following figure briefly synthesizes the processes which have been activated, the involved actors, the participatory tools used, and the outputs achieved both in terms of community involvement and of micro-architecture interventions (Table 5.1).

A bottom-up design approach was adopted through shared design actions and co-design processes, which empowers and invites the inhabitants to be active protagonists. In other words, it stimulates the inhabitants of the suburb to work synergistically together with all the social (associations and individual citizens),

Table 5.1 Community participation, tools, and outputs

Community participation	Tools	Micro-architecture
Three young architects working on the project for a year Several academicians and experts from a variety of field (sociology, co-design methods, geography, economics, and so forth) Community stakeholders: Members of a neighborhood social cooperative and the local parish Teachers of the local school; several inhabitants of the neighborhood Institutional stakeholders: Local municipality councilor, local politician representatives	Three face-to-face meetings at the Renzo Piano Foundation (Genoa) Several fieldworks and community "listening": exchanges and confrontations with local community throughout the year Several urban promenades with local stakeholders Two meetings at the local parish One meeting at the social cooperative office One workshop of co-design with external experts and local community One event of presentation of results	One architectural equipment linking the neighborhood to the bike route and the waterfront (a wood ladder connecting to the solarium) One bus stop shelter One grandstand for the soccer field The "garrison" (*Il presidio*): An equipped space within the former office of the neighborhood district, open to the community

economic, and institutional actors promoting the interaction and collaboration between citizens, institutions, and technicians.

Some authors have criticized this approach for interventions in peripheries, considering it inadequate both in terms of economic resources and methodological approach (Manzione 2014), as well as ineffective in architectural terms (Manzione 2014). These criticisms suffer from a double ideological limit: the idea that only a strong centralization of the urban regeneration process can produce a change and that only a substantial public investment can sustain the transformation over time. The experiences of the Agence Nationale pour la Rénovation Urbaine (ANRU) in France show how crucial is to invest important economic resources in peripheries and how important it is to trigger social innovation processes in the practice of urban regeneration. Many scholars, observing how the current economic crisis is strongly reducing the margins of public action, demonstrate how urban regeneration and social innovation are two sides of the same urban and social process (Ostanel 2017).

The introduction of social innovation in regeneration is challenging due to the increasing concentration of phenomena of poverty, social exclusion, crime, cultural marginality, and foreign immigration in peripheries. Since its first experiences, the G124 project has identified social innovation as a cornerstone of the urban regeneration process of periphery. Different areas of intervention, strategies ad action have been identified in order to elaborate an agenda for further work on sustainability pathways useful for policy makers.

Several of the above methodologies have been applied in our case study, and in particular the Concept–knowledge (C–K) theory has proved to have a great potential in design alternative strategies in a process by which something unknown

intentionally emerge from what is known. New knowledge has been produced constantly and has intervened in the design processes completely unknown to most of us.

The results show that urban regeneration process in the periphery of Mazzarona is grounded on its valuable environmental resources, landscape, archeological and social heritage characteristics.

Improvement of the quality of life of inhabitant has emerged as one important goal in the regeneration process of the area as well as for the whole city. Regeneration of green spaces participate to this achievement, by providing to citizens outside places, where they can rest, enjoy nature, meet each other, participating in this way to better social cohesion. Besides social considerations, green spaces and trees also have a high impact on climate mitigation. Therefore, a long-term vision was also elaborated as uniting component that all stakeholders from leading politicians to citizens and interest groups can refer to. Thematic working groups have defined main intervention areas/measures as well as strategies and connected actions. Stakeholders and citizens have been stimulated to share their points of view, and gain information on "hot topics" connected to thematic domains in order to have a broader/clearer view on the situation and preparing the ground for new citizen engagement connected to the areas of intervention (Table 5.2).

Each intervention of the G124 has triggered new processes and become a Keynesian social and architectural multiplier of the periphery. For these reasons, the importance of the G124 project lies not in the size and quality of the architecture but it builds but in the possibility that it offers to give trust, voice, and active citizenship to those who live in the suburbs, which claim the right to better quality of life declined in all its aspects.

5.8 Concluding Remarks

Over the last few decades, urban peripheral areas have been increasing in number, typology, and implications, which make it necessary to completely reframe both theoretical frameworks and methodological approaches of sustainable urban planning. Since urbanization has becoming an increasingly complex and multifaceted phenomenon at the global scale, traditional dualisms which urban and regional sciences are built on, such as center/periphery, should be entirely re-conceptualized in order to catch the inherent multiscalar complexity of ongoing processes that have been shaping contemporary urban spaces.

On the one hand, the growing rates of urban sprawl have been upsetting fragile balances between urban core, suburban rings, and peri-urban settlement areas. On the other hand, urban shrinkage has increasingly transformed the concept of peripheries to the point to make it difficult to trace in a single way its assumptions. These transformations have also increased the complexity of the challenges which contemporary urban planning has to face, owing to the unprecedented socio-economic inequalities and new forms of marginalization affecting urban peripheral areas.

Table 5.2 Main areas of intervention and strategic lines for actions

Area of intervention	Strategy	Actions
Distance between the periphery and the city center	Identification of urban attractors	Implementation of services according to their features of attraction for visitors and related to main points of interests
Distance between the periphery and the coast	Intervention on the cycle path	Promoting mobility services Greenways dedicated to walking and cycling routes following public transport corridors
Ground connections of the buildings with the streets, not defined by urban design but by a spontaneous use of the spaces	Redefining the front road	Green pathways connection between the houses and the roadway
Abandoned large open spaces	Using spaces with different services for citizens	Playground with play areas, thematic gardens, urban gardens, trees for gathering areas
Lack of relations of affection and belonging of inhabitants	Encouraging the interrelationships between citizens and urban context	Encouraging the active participation of inhabitants in self-construction projects, and in administration future choices
Huge road sections	Reduction of the width of the roadways	Implementation of cycle-pedestrian paths
Lack of services for citizens	Establishment of new services	Construction of schools, social centers, sports centers, provide areas for retail
Valorization of cultural attractions for tourists	Enhancement of the Dionigian walls within the museum system of the city	Paths and elements useful to discover the visible marks of the wall system
Sea-bathing activity	Promoting tourism and recreation	Integration of services such as shelters, boxes for the sale of drinks, benches near the service, access to the sea facilitated
Pollution caused by illegal landfills disposals	Transforming the dis-economy of illegal landfills into economics	Creation of ecological islands to facilitate recycling

As a result, it is crucial for planning research to increase awareness about the impacts of urbanization processes in peripheral contexts in order to improve sustainability of peripheries and their wider metropolitan contexts.

Although far from being devoid of controversial assumptions, as underlined along the chapter, the place-based case study has demonstrated to what extent multi-method frameworks, ranging from qualitative community-driven qualitative methods to multi-criteria decision aiding models, could provide a truly participative

approach for urban regeneration of peripheries, capable to trigger hyper-local innovation processes which go beyond the mere architectural renovation. The theoretical and methodological approach embedded in the Renzo Piano's program of "mending" peripheries is rather aimed at empowering local communities, insofar as they can become active agents of changes, supporting experts of urban planning in re-designing their lived environments according to their exigencies and expectations.

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