Fostering emergent diversity: directing rather than mastering change

The recent theory of planning and urban design recognizes how healthy, vibrant cities behave as complex living systems: they are open, bottom-up, self-organizing, emergent (Allen and Sanglier 1981; Christiaanse, Rieniets and Sigler 2009; Dovey 2012; Portugali 1999; Sennett 2013). The main characteristic of an emergent system is that it cannot be predicted in advance because it is in a constant state of becoming. Such a system arises from unforeseen interactions rather than being determined by an a priori intention. It is resilient because disturbances can be accommodated by fluid adjustments; in fact, the heterogeneous components of the system retain the capacity to endlessly re-organize themselves into emergent interconnections (see section 3).

Jane Jacobs (1961) anticipated many years ago that a city is a problem of organized complexity and that diversity is an essential condition for its vitality and resilience. She highlighted how places which behave as complex living systems retain an endless capacity to encourage unforeseen exchanges between disparate people and how this concentration of people from different backgrounds and their constant interaction stimulates economic growth, innovation, and cultural emancipation (Jacobs 1961; Christiansee 2009).

Despite this awareness, the theory and practice of planning and urban design often fails to elaborate strategies that can cooperate with emergent urban systems and foster city diversity. While, in planning theory, the relationship between complexity and regulation is being thoroughly investigated (Moroni 2015), the relationship between design and complex living systems remains underexplored. In fact, urban design theory and practice are still widely based on master plans, which aim at predicting and controlling the development of specific areas. Master plans tend to propose a new comprehensive vision of the future. They impose a new overall form—considered more healthy and efficient—on an existing reality, considered problematic or obsolete. Master plans usually present themselves as finished projects designed from the top-down: they show the final outcome of the transformation within a pre-defined bounded site. In their best examples, they are animated by a sincere intention to produce a regime of urban complexity able to generate diversity. Nonetheless, they remain external interventions in an otherwise spontaneous and complex urban process, thus they cannot cooperate with emergent urban systems, which are instead bottom-up and self-organizing phenomena (Porqueddu, forthcoming).

The contrast between comprehensive master planning and the city as a problem of organized complexity was similarly highlighted by Jane Jacobs (1961), who argued that...
modern top-down planning strategies were destroying diversity in American cities. Jacobs highlighted how vital cities require “an intricate and close-grained diversity of uses that gives each other constant mutual support, both economically and socially”. According to Jacobs, “the science of city planning and the art of city design, in real life for real cities, must become the science and art of catalyzing and nourishing these close-grained working relationships” (14). For Jacobs diversity cannot be entirely planned or designed because it is an emergent property of the relationship between people and their physical environment, rather than the mere consequence of a peculiar spatial layout or of a certain density of pre-defined functions (Porqueddu 2015; Ikeda 2017).

Furthermore, she highlights how top-down planning and design are not the only threats to emergent diversity and she stresses how diversity can spontaneously veer toward its self-destruction. In this respect, she advocates the need for a kind of planning and design which does not interfere with the spontaneous emergence of diversity, but at the same time, intervenes in order to prevent its emergent decline. She suggests that the role of designers and planners is not shaping the city from the top-down, but monitoring the unpredictable evolution of emergent orders within a city and understanding when an action is indispensable for inverting a negative cycle, in order to foster or maintain “city vitality (something that the planner or planners alone, and the designs and designers alone, can never achieve)” (14).

The aim of such planners and designers is not fixing the problems through external interventions, but rather becoming acquainted with the behaviour of people across space, in order to make more efficient use of their natural capacity to maintain and increase diversity. In this respect, they need to observe more and design less. This attitude requires research methods and approaches, which make it possible to question places, in order to detect—within emergent transformations—the risks for the self-destruction of diversity and to uncover latent capacities for its emergence.

In order to shape such a method of inquiry, the present paper builds upon Jacobs’s phenomenological social-spatial approach, but it extends it to a multi-scale level. In fact, a multi-scale understanding becomes indispensable in the contemporary city, where the rise of mobility and communication technology has brought about a network of exchanges between discontinuous places—opening up new possibilities for interaction and exchange beyond the traditional relationship of proximity (Harvey 1990; Massey 1994; Castells 1996; Amin and Thrift 2002; Boelens 2009). In the domain of this new metropolis, diversity emerges according to the distinct mixture of both local and wider flows intersecting at specific points in time (Massey 1994). In this respect, the mere scale of architecture would not highlight the social-spatial dynamics beyond the boundaries of a specific site and the wide metropolitan scale would not reveal anything about the micro-space scene of perception and human interaction.

In order to shape this multi-scale approach, this paper combines:

1 the recent advance in theories of emergence, complexity, assemblages, adaptation (Allen and Saliger 1981; Portugali 1999; Dovey 2012; De Landa 2006; Gunderson and Holling 2002; Miller and Page 2007; Walker and Salt 2006), which inform an understanding of adaptive cycles across scales.

2 The current advances in mapping techniques (Corner 1999), which can visualize unforeseen relationships between emergent urban form and heterogeneous data concerning the behaviour of people across specific territories and their emergent ways of using and transforming the existing urban spaces.

By integrating Jacobs’s phenomenological social-spatial approach with this multi-scale understanding, the current paper endeavours to formulate a method of inquiry which not only helps us understand the city as an emergent system, but also enables designers and planners to detect place-specific latent capacities for emergent diversity and to uncover the risks for its self-destruction. Here this approach is considered fundamental to developing design and planning strategies which cooperate with emergent transformations rather than trying to master them. In this respect, the present paper (1) traces a strong (but non-linear) connection between place analysis and design practice; (2) shapes a method of inquiry capable of informing every design project that tries to cooperate with the unpredictable nature of cities and their adaptive cycles across scales.

The article is divided into five sections. The first section illustrates the contrast between master planning and the unpredictable emergent nature of city vitality through two examples. The second highlights how the recent advance in theories of emergence, complexity, adaptation and assemblage can inform a multi-scale approach. The third section introduces the Multi-Scale Atlas as a tool for such social-spatial multi-scale investigation. The fourth section illustrates how the Multi-Scale Atlas explores (1) the cross-scale
effects of emergent changes, (2) the place-specific conditions which foster and threaten emergent diversity across scales, and (3) how this understanding can inform the actions which increase emergent diversity and contrast its decline (this section refers to the case study where the Atlas has been developed). The last section draws general conclusions.

The contrast between master planning and emergent urban systems

If we fully embrace the idea that diverse vital cities behave as living systems, we must also accept their unpredictable nature: diversity can emerge and self-destruct in different places and situations far beyond the imagination of a single human being or of a group of them. In this respect, there can be no fixed cause-effect relationship between the emergence of diversity and certain specific built form or density in terms of FAR (Floor Area Ratio) or a certain a priori defined combination of uses (Porqueddu 2015). Even more in the contemporary metropolis crossed by flows of people who travel beyond the boundaries of specific sites.

If diversity cannot be the direct result of human design (Jacobs 1961), then the city proposed by New Urbanism (Duany, Plater-Zyberk and Alminana 2003), apparently based on Jacobs’s arguments, is instead linked to the modern illusion that an a priori top-down designed spatial configuration can generate diversity (Porqueddu 2015). In fact, New Urbanism elaborates a new model of the metropolis, rather than focusing on upgrading and updating the everyday experience across the urban fabric of the American suburban sprawl, which it tends to reject and replace. New Urbanism superimposes a top-down designed new city on a reality considered negative. While the aim is laudable—to solve the problems linked to urban sprawl and to upgrade the everyday experience of these places, which are in fact often desolate and lacking in diversity—this approach is still based on the illusion that the problem can be fixed by external agents, designers and planners, who apply a new and a priori designed spatial configuration onto an existing context.

Nonetheless, there are other ways of understanding urban design, animated by the intention to observe the existing reality and to cooperate with emergent orders. These approaches completely abandon the modern illusion that it is possible to fix the actual situation from the outside by replacing it with a better one designed a priori. Instead, they aim to provide a specific place with the missing ingredient which can activate its ability to evolve in positive directions and to self-produce the solutions to emergent problems, without trying to predict and control the final, formal outcome of the transformation (Porqueddu, forthcoming).

A contemporary example concerns the realization of the Metrocable network in Medellin—as part of the PUI (Proyectos Urbanos Integrals; Integrated Urban Projects), the complex programme of city transformation promoted by the Medellin municipal government and coordinated by Alejandro Echeverri (Echeverri and Orsini 2010). The Metrocable basically endeavours to reconnect and re-integrate the poor, informal sectors of Medellin with the rest of the city through selective intrusion into their social system and minimal damage to their existing structures. The design idea emerges here by detecting the spatial conditions which can foster or threaten emergent diversity. A deep knowledge of the local emergent orders is developed through the collaboration between architects, planners, community representatives, social workers, city administrators and the private sector (Davila 2013).

This detailed observation revealed that these informal settlements have an important resource: a peculiar and vital network of micro-connectivity, which supports the emergent social and economic relations on a local scale. Nonetheless, it also revealed that one of their limits—beside the well-known problems related to extreme poverty and lack of services—is that this labyrinthine structure is not inserted into the network of fast connections on a metropolitan scale and is thus cut off from potential exchanges with other places and therefore from the potential for emergent diversity. In this context, the Metrocable project is a creative solution that can provide fast connections which, in turn, can enhance rather than damage the existing slow micro-connectivity (Porqueddu, forthcoming). In actual fact, the adopted strategy enables to: (1) build fast and direct connections between these informal settlements and the wider metropolitan territory without damaging the existing slow micro-connectivity; (2) turn the steep terrain of the mountains into a potential for a stunning panoramic view over the whole city; (3) utilize the Metrocable stations as hubs to cluster a variety of cultural spaces and sport facilities, thus partially compensating for the lack of services in the area; and (4) reduce social and economic costs (it eschews the demolishment of a large number of dwellings in order to build roads); (5) build the Metrocable over a relatively short period of time as it requires little in terms of land acquisition (Porqueddu, forthcoming). In this respect, the Metrocable is the missing ingredient that can incorporate these informal settlements into a new system of rela-
tionships. In this case, an effective collaboration involving planners, designers and the public administration generates an intervention which is not intended to re-design the informal settlements (by proposing a new order from the top-down). Instead, it endeavours to provide a cross-scale connection which can prevent the self-destruction of diversity across the area and increase the existing potential for its emergence. In this respect, by connecting the existing vital slow micro-network with the wider metropolitan territory, the Metrocable activates the site-specific ability for unforeseen exchanges with the rest of the metropolis, without trying to pre-define or control them.

Around the world, there are some scattered examples of this approach to design. In another forthcoming paper, I begin to collect and compare them, exploring what they have in common, in order to start developing a theory of emergence in urban design. On the one hand, they are all extremely different, operating at different scales and belonging to very distant geographic areas and heterogeneous urban situations: these strategies must necessarily be unique, being creative responses to immanent and site-specific conditions. On the other hand, they do have something in common: they are based on a deep understanding of the place-specific social-spatial dynamics across different scales and they are intended to make more efficient use of the spontaneous capacity of places to maintain and increase their potential for diversity. In this respect, although these approaches do not even refer to Jacobs’s theory, they are consistent with it, being based on continuous minimum adjustments and real life observation rather than on overall comprehensive plans based on abstract principles. Jacobs affirmed that cities are themselves suggesting to the better planners and designers (the ones who are able to listen and carefully observe complex processes) “what principle of planning and what practices in rebuilding can promote social and economic vitality in cities, and what practice and principles will deaden these attributes”(4).

In this respect, these kinds of intervention highlight the urgent need for theories, methods and tools aimed at questioning places in order to understand their emergent complex orders. The multi-scale approach presented here has emerged in order to respond to this need for methods of inquiry, which are an integral and fundamental part of such a design process. Understanding emergent urban systems: a Multi-Scale Approach

The following section illustrates how theories of complexity, emergence, self-organization, assemblage, adaptation can support a deeper understanding of cities as complex living systems and can consequently inform possible actions consistent with their emergent nature. In actual fact, complex systems have been explored in disciplines which are not directly linked to urban studies. Non-linear systems have been investigated by biologists, mathematicians, and physicists; by ecologists such as Gunderson and Holling (2002) and Walker and Salt (2006); and by social scientists such as Miller and Page (2007). Furthermore, Complex Adaptive Systems (CAS) theory has recently been applied to urban studies by Kim Dovey, who combined it with Assemblage Theory (De Landa 2006; Deleuze and Guattari 1980; Dovey 2010; 2012), in order to frame and explore places as socio-spatial territories in a continuous state of becoming and cities as emergent systems (Johnson 2001).

CAS theory and Panarchy (Gunderson and Holling 2002) are particularly relevant because they show how complex living systems evolve in time, across different scales and how it is necessary to understand their cycles in order to prevent their decline. On the one hand, these theories stress that diversity and redundancies of parts are critical to a system’s vitality and resilience: in diverse systems no single part is crucial to the success of the whole; therefore the system can endlessly adapt to unpredictable situations by re-organizing itself into emergent inter-connections. On the other hand, they also show how diversity and redundancy can self-destruct across adaptive cycles and how cross scale effects play an important role in this process. These recurring cycles consist of four phases: rapid growth, conservation, release, and reorganization (Gunderson and Holling 2002; Walker and Salt 2006).¹

Nonetheless, when we talk about adaptive cycles in cities it is easy to become too focused on the specific scale in which we are interested (a building, a street, a plaza, a block, a neighbourhood) and ignore cross-scale effects. According to CAS and Panarchy theory, the crucial point is in fact to consider that the scale in which we are interested is connected to and affected by what is happening at the scales above and below, both in time and space, and that the linkages across scales play a major role in determining how the system is behaving on another scale (Gunderson and Holling 2002). In this respect, if we fully consider the city as a complex living system, we cannot successfully interact with it by focusing on only one scale.²
Long before these studies, Jacobs (1961) anticipated the tendency for outstandingly successful diversity in cities to destroy itself across time cycles and she argued that often the same forces which nourish diversity could contribute to its destruction. Her observation also revealed how linkages across scales are a key aspect in understanding diversity and resilience cycles. In fact, she argued that streets which experience the self-destruction of diversity after a successful period (late conservation phase), can quickly regenerate their diversity (from release to rapid growth), only if they are surrounded by other streets which are in a phase of flourishing diversity (rapid growth). That is to say that in this case a micro-cycle can be positively affected by wider scale processes.

Although CAS and Panarchy theories are not mentioned in Medellin project, the Metrocable strategy is based on a deep understanding of cross-scale links: the potential to retain diversity at the micro-scale of the neighbourhood was enhanced by tracing new connections with the larger scale of the city; that is to say that a widescale action was undertaken in order to retain and improve city vitality on a micro scale. In this respect, CAS and Panarchy theories offer a good approach for identifying the appropriate scale of the intervention according to a multi-scale understanding of diversity cycles. In order to develop such a multi-scale approach, it is necessary to investigate the dynamic relationship (dance) between the physical components of urban space and the existing and emergent behaviour and activities of people across them. In fact, as a set of material components, the city is a simple system (Portugali 2013). Buildings, roads, bridges, fences, traffic lights, sidewalks, trees, shop windows, do not interact without people—they are just scattered elements of potential living systems emerging in the presence of its changing components: people, behaviour, needs, desires, tastes, actions, money, electricity, water, etc. (Porqueddu 2015; Dovey 2010).

The Multi-Scale Atlas presented in the next paragraph, combines Jacobs’s social spatial understanding with a multi-scale approach, which becomes indispensable in the domain of the contemporary metropolis, where our everyday life increasingly develops far beyond the boundaries of a specific settlement and where the emergence of diversity is increasingly related to mobility, time cycles and event geographies. In this respect, the Atlas enables us to understand heterogeneous micro-spaces as components of emergent socio-physical networks stretching out of local boundaries rather than as parts committed to local units (Porqueddu 2015), thus revealing unexpected potential for diversity to flourish.

**A Multi-Scale Atlas**

In order to explore the multi-scale nature of emergent urban systems, a Multi-Scale Atlas is here proposed as a tool for an empirical investigation which develops a social-spatial understanding across scales.

In this respect, the Atlas combines a multi-layer analysis with a multi-scale mapping in a matrix (Figure 1) which makes it possible to explore the links between people’s behaviour, activity rhythms and the physical layout that supports them at multiple scales. Here, the focus is not on individual maps, but on the actual and potential relations between them (Dovey 2010; Dovey and Wood 2015; Corner 1999). The Atlas faces the following questions: how can the existing and emergent spatial layouts support emergent diversity across scales? How do they foster its decline? The matrix is organized into five thematic strips, according to the following five layers (Porqueddu 2015):

1. **Intensity and rhythms**: it shows daily concentrations of people in specific places according to different time cycles, event geographies and commuter flows. This layer is important because, as previously highlighted, diversity emerges from a distinct mixture of heterogeneous people crossing in space (Massey 1994; Jacobs 1961).
2. **Activities and uses**: it shows the distribution, concentration and types of activities across the territory. The mix of heterogeneous activities and uses is considered one of the main generators of diversity.
3. **Network of connections**: it shows how the network of streets, parking lots, sidewalks, etc. supports fast and slow flows of people. Accessibility is considered one of the main factors which fosters emergent concentration of people.
4. **Boundaries and private-public interfaces**: it shows how the layout and types of physical borders encourage or discourage unforeseen interaction between heterogeneous activities and between public and private spaces. This layer is important because complex living systems require open unfixed interactions between heterogeneous components.
5. **Building footprint and density**: this shows the concentration and mix of building types combined with data on density in terms of Floor Area Ratio (FAR). This layer is relevant because density in terms of Floor Area...
Ratio and compact urban form are still central in the discussion on city diversity.6

Every layer is investigated on a wide range of scales, within the framework of:

1. 15 m and 15,000 m². This scale shows how space is perceived and how it supports face to face interaction between people. This is the scale of architecture and design.
2. 1.5 km². This scale shows whether the spatial layout—at the scale of a village or neighbourhood—supports people movements and their interaction across different activities and spaces. This is the typical scale of urban design.
3. 300 km². This scale shows the main infrastructures in relation to the existing urban fabric, natural environments and administrative boundaries, and it highlights the flows between different settlements. This is the typical scale of planning.
4. 15,000 km². This scale situates this territory within the wider scale. It is typical of regional planning and geography.

These maps enable us to study specific micro-spaces in relation to a wider network of relationships. In this respect, they can help frame the scale and type of problem by highlighting the multi-scale dynamics in which micro-spaces are immersed.

In order to frame the scale of the problem, and develop an appropriate action, it is necessary to observe existing territories from different points of view. In this respect, the Atlas also aims to become a cross-discipline tool for intersecting data collected through investigation from different disciplines such as geography, social science and anthropology, landscape urbanism, etc. In actual fact, geographers and planners collect data about people and their emergent activities, but they often show these data through widescale maps, which do not illustrate the physical urban environments (on a micro scale) where these activities and businesses take place. Architects often focus on the human scale, but they rarely observe the behaviour of people across different scales. Social scientists and anthropologists observe human behaviour and informal practices, but they rarely map them (and mapping is the only tool that can draw connections between space, people behaviour and flows, emergent mixes of uses and activities). Landscape ur-

Figure 1. Multi-Scale Atlas (Matrix example)
Banists are the masters in using multi-scale mapping. This is because they work with living materials and they need to understand eco-systems (which are emergent systems) and life-cycles, but they mainly focus on natural elements and they rarely use mapping as a tool to investigate emergent city diversity (cultural, economic, social, etc.). In this respect, the Atlas aims at cutting across all these disciplines in order to welcome heterogeneous types of data, both qualitative and quantitative.

The maps amalgamate the data collected:

1. Through interviews (with inhabitants, administrators and associations).
2. Through behavioural-photographic surveys (the fieldwork required the direct experience of the mapped areas including travelling across the territory at different speeds—driving, walking, public transport experience—and engaging with people while observing their behaviour across space).
3. Through data analysis on commuting and tourist flows and on the distribution of activities across the territory (data collected from ISTAT—Census 2001).
4. Through multi-scale mapping.

The Atlas has been developed across a low density Italian area, called the Oltrepo’ Pavese, a fine grain network of old settlements and more recent nodes, situated 50 km south of Milan (within the Province of Pavia) at the intersection of two important infrastructures connecting Milan, Genoa, Turin and Bologna. The Province of Pavia is a mosaic of 190 micro-municipalities, 172 with less than 5,000 inhabitants: 43% of the population lives in these old traditional settlements at a distance of 2-7 km from each other (Figure 2). This pattern—significant local differences notwithstanding—is prevalent throughout the whole Italian territory, where 72% of municipalities have fewer than 5,000 inhabitants and 43.7% of Italians live in such settlements (Census 2001). The Area of Observation (300 Km²) is situated at the border between the plain and the hills—agricultural and wine-growing areas—and includes eight of these municipalities (Figure 3). The major centre is a small town of approximately 40,000 inhabitants, the others being villages of 900 to 5,000 inhabitants.

Figure 2. The Province of Pavia. (a) Administrative boundaries; (b) Network of connections; (c) Built-up areas
One of the reasons for selecting the Oltrepò was that the importance of a multi-scale social-spatial approach is more evident through a low-density territory where a traditional observation would never highlight the emergent urban complexity of this territory, which is visible just through a social-spatial exploration across scales. In actual fact, one single settlement here is neither large nor dense enough to generate diversity within its boundaries. The only possibility for flourishing diversity here is related to temporary concentrations of locals and strangers—coming from discontinuous places—within the same urban fabric. In fact, local street life can be here nourished just by wider flows, developing on a metropolitan scale. Jacobs herself argued that even a small town can become a complex realm, once it “is encompassed in a metropolitan orbit with its multiplicity of choices and complexity of cross uses” (Jacobs [1961] 1992, p. 435).

Instead, by focusing also on the observation of activity rhythms and on the behaviour of people in space and time (how they use the territory in their everyday lives), the Atlas highlights how this territory is becoming far more complex than a sum of small settlements depending on a wider metropolis. In fact, data analysis, interviews and behavioural surveys reveal the presence of considerable everyday horizontal flows between small municipalities and from major centres toward smaller settlements (Figure 4). In this respect, when observed on a wide scale, this territory behaves as an emergent low-density distributed system, an open network where every single settlement has the potential to become a node connected with several other nodes. In such a system, hierarchy is always shifting: every node could become the centre according to time cycles and event geography—a “meeting place” (Massey 1994) behaving as a component of socio-physical networks stretching out of local boundaries. In this respect, the Atlas shows that even a settlement or suburb which might look neither large nor dense enough to generate diversity within its boundaries, could in fact do so across its urban fabric, according to temporary concentration of locals and strangers—coming from other settlements (Porqueddu 2015).
The specific sites for small scale investigation were selected according to the information collected during interviews and data analysis, which made it possible to identify, across the case study area, the places which own the potential to become nodes or which already behave as nodes in the network (Figure 5).

**Figure 4. Major settlement: Commuter flows (Mon-Fri).**
(a) Outgoing commuters; (b) Incoming commuters.

**Figure 5. Six sites**
Detecting risks and potential of emergent transformations

The Atlas illustrates how the emergent change can generate positive and negative effects (here the transformations which foster emergent diversity are considered positive, while the transformations which foster its decline are considered negative).

On a wide scale, the Atlas highlights the presence of a new layer of distributed metropolitan attractions (such as hotels, spas, sport centres, new workshops, shopping outlets, shopping centres, important showrooms, famous restaurants or clubs) that can catalyze metropolitan flows of people. These attractions are spread across the entire territory, generating a new intensity of flows in and out of small municipalities. Nonetheless, the maps also reveal how these new activities can increase or decrease the potential for emergent diversity and how this is chiefly related to their distribution across the micro-scale spatial layout.

In actual fact, the Atlas illustrates the presence—at the micro-scale of architecture and urban design—of two different spatial layouts. The first encourages an endless exchange between metropolitan flows and place-based street life, between regional attractions and local businesses; the second discourages any unpredictable synergy between latest hubs and existing activities. In actual fact, the first tends to orient the emergent flows of people across traditional settlements, thus increasing the potential for emergent diversity and for new flourishing activities. The second tends to orient these regional flows toward top-down designed unalterable precincts, which are totally disconnected from the local network.

The potential for emergent diversity within small settlements is increased when these latest hubs are placed at a walkable distance from local activities—such as the bakery, the butcher, the newsagent, the primary school, the church, etc.—and, more important, when they co-exist and interact with them in space and time. Figures 6, 7, 8, 9, show that this occurs according to the following spatial conditions (Porqueddu 2015):

1. Metropolitan attractions are interwoven with local activities across the fast-slow network of connections (Figure 6).
2. This mix of local and metropolitan activities is situated at a walkable distance from regional arterial roads (Figure 6-7).

![Figure 6. Local-metropolitan interaction](image-url)
Figure 7. Multi-scale Atlas. Activities-uses
Figure 8. Multi-scale Atlas. Network of connections and parking lots
Figure 9. Multi-scale Atlas. Boundaries, public-private interfaces
3. Small and medium size parking lots are scattered at the edges of the settlement as well as across its fine-grain urban fabric; their strategic position and size encourage people coming from other places to leave their cars and walk through the settlements. This increases the pedestrian traffic in front of local shops—thus nourishing their businesses—and plugs new flows of strangers across the small settlement, thus fostering the potential for random and unpredictable face to face interactions, encounters and exchanges (Figure 8).

4. New activities are not committed to wider precincts or, if they are part of a wider precinct, then they retain a certain degree of autonomy in terms of rhythms and management (if one of these closes at 6 p.m., the others can remain open until 3 a.m.). Such precincts are provided with multiple access which integrate them into the external fast-slow network of connections and parking systems. They have diverse and non-definitive borders—single units can overlook both the inner pathways and the outer sidewalks. Accesses and private-public interfaces can change according to different time cycles and adapt to unpredictable conditions, needs and behaviour, thus fostering unforeseen synergies between heterogeneous activities (Figure 9).

The potential for emergent diversity within small settlements is decreased when the latest hubs are disconnected from local activities. Figure 10 shows that this occurs when:

1. New metropolitan attractions are enclosed within precincts and committed to them. The boundaries of these precincts are impermeable and definitive. All the activities overlook the internal part of the precinct, with no possibility for interaction with the external sidewalks or other local activities, even when they are adjacent to them. Furthermore, different activities within a single precinct do not retain any autonomy in terms of rhythms and management and in terms of spatial layout. They are strongly top-down pre-defined and controlled: there is no possibility of adaptation and no possibility for unpredictable interactions between heterogeneous businesses, also within the precinct.

2. These precincts have only one access, connected with a large private parking lot overlooking fast arterial roads, without any connection with the local network of activities, even when they are placed at a walkable distance from them. Flows of people travelling on a regional scale can directly reach these activities without walking through the settlement, which remains cut off from these new flows. In this respect, these new metropolitan flows do not increase the potential for encounter and exchange (diversity) within the traditional small settlement.

Figure 10. Local-metropolitan disconnection
On the one hand, the Atlas highlights how this territory, when observed on a wider scale, retains the potential to behave as a complex distributed metropolis, where every front door is a threshold between a potentially vibrant and diverse urban street and the peaceful slow rhythm typical of a country village (Lynch 1984). This could evolve into a low density rural metropolis where every single settlement might become a node able to combine: (1) the intensity and diversity of the city; (2) the sense of safety and calm of the village; and (3) the experience of nature in the countryside.

On the other hand, it also highlights the emergent spatial conditions, which tend instead to crystallize a separation between old settlements and new hubs, thus contrasting emergent diversity. Nonetheless the Atlas shows that local businesses and metropolitan attractions can also coexist and interact within small settlements and that this interaction can enable these settlements to remain open, adaptive and diverse (Figure 6, 7, 8, 9).

In this respect, the Atlas highlights how the challenge of the local administrations, planners and urban designers consists in shaping strategies, which could (1) encourage the presence of these new activities within the urban fabric of existing villages and new hubs, thus contrasting emergent phenomena can neither be planned nor designed, these strategies should never aim at producing a top-down definition of the types of activities and their place within existing settlements and across the wider network. Instead they can focus on:

1. Understanding the reasons which encourage the owners of the new businesses to place them outside the existing settlements.
2. Shaping a series of actions which can invert this trend and render the inner part of the settlement appealing for new activities and businesses. These actions should not interfere with the spontaneous tendency of metropolitan businesses to spread across this territory, but at the same time it would transform their negative effects into new potential synergies with existing local activities.
3. Revise the network of streets, in order to better integrate the slow micro-network of the villages into the regional network of fast arterials.

Some of the reasons which might induce the owners of businesses to situate new activities far from the old villages concern the spatial layouts, other the planning system. With regard to the latter, building and planning regulations play a crucial role in orienting the position of metropolitan attractions. In fact, in Italy rules tend to be more restrictive within historical centres (Moroni 2015). While the intentions of these restrictions are valid (to protect the aesthetic value of these urban areas), often they can also prevent the adaptations necessary to update the historical buildings and render them suitable for emergent activities and uses.

Furthermore, the procedures to obtain construction or renovation permits are more complicated when the project is developed in historical buildings or within the historical urban fabric. The overall bureaucratic process is usually longer and thus entails major economic costs (which are already higher due to the greater value of lands and buildings within the historical nuclei).

With regard to the spatial layout, the old nuclei might present problems of accessibility. On the one hand, they usually offer an intricate network of micro-connectivity, which can foster unforeseen synergies between heterogeneous activities and between private and public spaces, but often this intricate structure is not integrated into the network of fast arterial roads. On the other hand, the new nodes situated along them are often isolated from this micro-network, even when they are adjacent to it (Figure 10).

The question then becomes: what innovations concerning the system of rules and the spatial layout are necessary in order to facilitate the adaptation of the existing urban fabric (recent and historical) to emergent changes, while enhancing its aesthetic quality? The system of rules is not investigated in this paper, although it is crucial to managing city complexity (Moroni 2015). In regard to the spatial layout, the main challenges—for urban designers and architects—are:

1. Experimenting innovative spatial and infrastructural solutions (place-specific) that can integrate the historical urban fabric into the regional metropolitan network, without generating traffic problems or other kinds of conflicts within single settlements. This entails the revision of the current infrastructural network and of the layout and distribution of parking lots across the existing urban fabric. Here the creativity of designers is crucial in order to turn existing problems into opportunities to update and upgrade our daily experience of urban space (functionally, technically and aesthetically).
2. Experimenting innovative spatial solutions, materials and technologies, which make it possible to adapt existing buildings and urban spaces to emergent ac-
tivities and uses. This type of innovation concerns soft interventions which enable fast adaptations with minimum costs. The techniques which facilitate high quality transformations with minimum structural and architectural interventions are particularly interesting. In actual fact, they can update the existing urban fabric of the historical centres, by enhancing their aesthetic quality. (Interior design and landscape architecture are the fields which better explore technique for “soft” transformation).

3. Experimenting innovative techniques which could provide existing and new buildings and precincts with responsive, reversible private-public interfaces and accesses that can easily adapt to unpredictable situations and unforeseen individual-collective needs. As previously mentioned, definitive boundaries are one of the main obstacles to emergent synergies between different activities and between private and public spaces.

While point one mainly concerns the action of public administrations and urban designers, points two and three include the work of architects and interior designers for private investors.

Learning from places: understanding and managing multi-scale adaptive cycles in the contemporary metropolis

The present paper presents the Multi-Scale Atlas as a tool for understanding complex diversity cycles across the territory of the contemporary metropolis and it stresses how this understanding is crucial for informing every design-planning strategy which aims at cooperating with emergent transformations. In actual fact, such design strategies are inspired from the self-ability of existing urban environments to remain dynamic, adaptive and diverse. The idea is to interpret the inventions that life brings to the city every day and to work as much as possible with (and not against) the place-based forces which shape them. By accepting the city (and its inhabitants) as co-authors of their project, such designers also agree to limit their interventions as much as possible.

The multi-scale approach presented in this paper highlights how such strategies entail a deep understanding of cross-scale effects and how the multi-scale atlas can inform this understanding. The Atlas highlights the presence of two main levels of understanding (and consequently of intervention) and makes it easier to explore the dynamic between them.

The first level concerns the micro-scale of individual initiative. This is the small scale of fast changes which derives from the will of citizens to endlessly transform existing spaces according to their emergent needs. This level also concerns the ability of architects and interior designers to form innovative solutions that can update the existing urban fabric in a short time. This first micro-scale level concerns two types of intervention:

1. “soft” interventions of design (concerning the revision of the inner distribution, new finishing, lighting design, but also the restoration or restyling of existing facades and the adaptation of public-private interfaces) able to endlessly re-interpret the existing buildings for new purposes and to adapt them to the new technological requirements, with minimum structural changes. The paper stresses how these micro-interventions can have a huge incremental effect on the metropolitan scale. Within the analyzed case study, they can become powerful agents of adaptive reuse of the existing urban fabric, thus reducing the need for urban expansion across the countryside.

2. the construction of new buildings and precincts according to emergent activities and needs. These transformations are slower than the previous ones, but also crucial for the evolution of the existing urban fabric as well as for the quality of urban growth across the territory. The Multi-Scale Atlas highlights how the new buildings and activities can foster emergent diversity or its self-destruction according to their position across the existing urban network and the design of their access and public-private interfaces.

The second level concerns the ability of the public administration to establish a frame (both spatial and normative) which can guarantee that the unforeseen individual interventions of the first level foster city diversity, without the need to over-control the development of every single project. The normative frame is not explored in this paper, although it is considered crucial to foster and manage city complexity (Moroni 2015). The spatial layout requires the ability (on the part of urban designers) to shape a basic infrastructural network (streets, transports, parking lots size and distribution, water and energy networks, parks, public buildings for activities such as schools, hospitals, etc.), whose stable structure provides the basis for balanced transformations without needing to pre-define them. Such designers must accept that their project represents the beginning of a transformation, rather than its final stage.
While a good structure (spatial and normative) minimizes the need to control every single intervention, the cross-scale effects of these incremental changes across the territory need to be constantly monitored, in order to prevent the self-destruction of diversity. The Atlas, in this respect, offers a tool to read these cross-scale effects and diversity cycles. This understanding is crucial to framing the scale of the problem, thus informing any revision of the network, which aims at inverting a negative cycle, through minimum interventions and with the minimum waste of economic resources. In Medellin the small-scale problems of specific slums were mainly dealt with by revising the wide network of connections and related public services. This strategy also made it possible to minimize economic costs also because the new metropolitan connections fostered the existing micro-economic network, thus increasing the ability of a place to regenerate through the individual initiative of its inhabitants. In the Oltrepò the Multi-Scale Atlas shows how a better integration between the slow and fast network of connections could re-orient emergent individual activities and businesses toward the existing urban fabric. This strategy would turn the spontaneous economic vitality spreading across the territory into a generator of diversity, thus inverting a negative cycle.

In this respect, the paper shows how a multi-scale understanding is necessary to shape every design and planning strategies which can channel (in a positive direction) the enormous quantity of individual (place-specific) energy that is concentrated in cities. In actual fact, the simple sum of individual performances, even if each of them is of a certain quality, does not necessarily guarantee the collective quality of the common good.

Finally, the present paper highlights the importance of understanding and detecting the multi-scale nature of emergent phenomena in space. It highlights how an understanding of the dynamic interaction between parts and whole, between micro and macro scale, between spatial details and larger phenomena, is crucial to informing every creative design strategy which is intended to cooperate with emergent place-specific transformations and foster their positive evolution. In this respect, a multi-scale approach is considered an essential part of any planning and design process which aims to channel the enormous quantity of individual initiatives that our cities contain toward the common good. This will hopefully increase the potential for city diversity across the heterogeneous landscapes of our everyday lives which are in a continuous state of becoming.

NOTES

1 These cycles describe how a social-ecological system organizes itself and how it responds to a changing world. During the Rapid Growth, the system’s components are weakly interconnected, and its internal state is weakly regulated. This is the time for innovation and growth. The transition to the conservation phase occurs because the system becomes more strongly interconnected and regulated: different ways of performing the same function (redundancy) are eliminated in favour of performing the function in just the most efficient way. The cost of efficiency is a loss in flexibility: such a system is increasingly stable, but over a decreasing range of conditions. In other words, its resilience declines. Under a small shock the system’s web breaks apart and suddenly comes undone. The release phase is brief and chaotic, but the destruction that ensues has a creative element: tightly bound capital is released, and all options are open. This phase leads quickly into a phase of reorganization and renewal. Novelty arises in the form of new inventions, creative ideas and people. The point in managing and adaptive cycles becomes then how to prevent a large collapse in the late conservation phase. The strategies elaborated by clever managers usually consist in undoing some of the constraints of the conservation phase, in order to navigate a graceful passage through the growth phase, without falling into a release phase (which is costly and unpleasant and involves the loss of capital) (Gunderson and Holling 2002; Walker and Salt 2006).

2 Managers who understand cross-scale effects often avoid a release phase at the scale of concern by generating release and reorganization phases at lower scales, thereby preventing the development of a late conservation phase at the scale of concern (Gunderson and Holling 2002; Walker and Salt 2006).

3 Jacobs (1961) describes this self-destruction cycle in six steps: (1) a diversified mixture of uses at some places becomes a popular and successful assemblage, (2) the success fosters an ardent competition for space and the locality develops, (3) few dominating uses emerge: the winners of the competition represent only a narrow segment of the many uses which together generated success, (4) visually and functionally, the place becomes monotonous and loses its appeal, (5) the local-
ity’s suitability, even for predominant use, declines, (6) the place becomes marginal.

4 Since the early studies of Jane Jacobs (1961) and Christopher Alexander (1965) it has been clear how complex urban orders emerge in the interaction between subjects and objects in space and time (Porqueddu 2015).

5 Jacobs (1961) already stressed the importance of the part-whole dynamic. She described the “ballet of good city sidewalk” as a complex order made up of movement and change, “an intricate ballet in which the individual dancers and ensembles all have distinct parts, which miraculously reinforce each other and compose an orderly whole” (50).

6 The Multi-Scale Atlas shows that density in terms of Floor Area Ratio does not necessarily foster city diversity. Across the case study, maps show how dense and compact settlements can be less diverse and vibrant than low-density settlements (Porqueddu 2015). On the other hand, it has been demonstrated that dense urban environment can be totally lacking in city diversity (Dovey and Symons 2014).

7 This approach is based on the idea that, in the contemporary metropolis, diversity emerges according to the distinct mixture of both local and wider flows intersecting at specific points in time (Massey 1994).

8 In this respect, the Atlas highlights how the problem is not to establish whether the increasing distribution of these metropolitan attractions across the territory is positive or negative. The existing local debate is often confused and polarized: on the one hand, the new hubs are considered responsible of the death for historical centres because they attract flows of people out of them. On the other hand, it is clear that these new activities witness a certain vitality and foster emergent flows across the network of small settlements. The multi-scale maps show that their emergent presence is positive, while their position and spatial layout can create problems. The question then becomes: how to turn these emergent forces into generators of diversity?

9 In this respect, the local debate is often confused and contradictory. The restrictive rules applied to historical centres are in contrast with the widespread intention to protect the beautiful local landscape and to reduce soil consumption. In actual fact, they indirectly encourage the diffusion of the new activities across the countryside outside existing settlements.

10 In Medellín the creative solution consisted of using an established technology—generally associated with ski and tourist sites—as a means of public transport.

REFERENCES


