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Quality of Life in Urban Landscapes

In Search of a Decision Support System

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Roberta Cocci Grifoni • Rosalba D'Onofrio
Massimo Sargolini

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In Search of a Decision Support System

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Roberta Cocci Grifoni
School of Architecture and Design /SAAD
University of Camerino
Ascoli Piceno, Italy

Rosalba D'Onofrio
School of Architecture and Design /SAAD
University of Camerino
Ascoli Piceno, Italy

Massimo Sargolini
School of Architecture and Design /SAAD
University of Camerino
Ascoli Piceno, Italy

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Topic CLEAN and HEALTHY: Alessio Acciarri, Claudio Alimenti, Carlo Bisci, Gino Cantalamessa, Bernardino Gentili, Giorgio Di Pancrazio, Barbara Fenni, Alessandro Fusari, Gilberto Mosconi, Francesco Alessandro Palermo, and Adriana Vallesi

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Introduction

This book is based on transdisciplinary research completed in May 2016 that involved about 40 researchers at the University of Camerino (UNICAM) and other European universities. The aim was to define a decision support system (DSS) to orient public administrations when identifying development scenarios for sustainable urban and territorial transformations.

When we assessed the QLandQLife Project in 2012, we realized immediately that to reach the goals of the project, we would have to experiment with a decidedly interdisciplinary approach, in that the different areas of knowledge should interact mutually and achieve a synthesis capable of encompassing the different points of view. We had the proof, based on preceding experience, that monodisciplinary and circumscribed sectoral visions would not have allowed us to reach the goal. The research was deemed worthy of being financed, but when laying out the motivation for financing to initiate this research, one of the main concerns of external referees examining the project was precisely the large number of researchers involved. Not only that, but the researchers pertain to different disciplines, due to which it would have been difficult even to establish a common language for collegial interaction. In effect, the work to encompass various disciplines was made possible through coordination, not only with great effort (everyone waves the flag of interdisciplinarity, but the practical implementation is always more difficult!) but also with great final satisfaction about the synthetic results shared among the different experts involved.

However, in this time of great environmental, social, and economic change, establishing the objective of improving the quality of life means refining the concept of quality of life and considering all the components that can come together to achieve it. We have seen that to affect the well-being of city inhabitants, it could be useful to consider the landscape as a “complex indicator” of urban sustainability (understood to be environmental, social, and economic) and the quality of life of city inhabitants. To test the quality of the urban landscape and consequently the quality of life of city inhabitants, a set of indicators was identified. These were chosen from among those considered by the most renowned international scientific research to “measure” the sustainability of the urban environment and the quality of life of city inhabitants, introducing a dynamic, integrated model of assessment.

This model, configured as a multi-criterion evaluation tool, was designed to update and go beyond traditional indicators of urban sustainability based on the verticality of lines of investigation (mobility, energy efficiency, air and water quality, environmental quality, building performance, etc.). Acting separately, these sectoral indicators have been shown to be widely inefficient for realizing urban complexity and ineffective at proposing constant, cyclic elements of support compared to strategic/structural and operational planning tools. In contrast, as applied to local and large-scale urban plans through synthetic transdisciplinary evaluations, our assessment model can facilitate the evaluation of development scenarios contained in the plans themselves, relating them to the objectives of sustainability and the quality of life that each territorial area plans to pursue. The aim is to obtain an acceptable dynamic balance among the possible development policies, which can be achieved and verified over time with monitoring operations and which are capable of pointing out the criticalities and reorienting the different development options.

In this process, it is necessary to support human presumption with mathematical forecasting methods since a prediction based only on quantitative data is not capable of including the impressions, emotions, and imagination of the communities. Only through the complex application of combined methods can one foresee critical events and make more accurate estimates of future trends.

Managing human settlement sustainably in an increasingly urbanized world therefore means closely connecting the future of the city with ways to improve the health of our planet and the quality of life of humans. The dedication of the European Union to urban regeneration in the coming years through the large mobilization of local governments is important, though urban policies cannot always be attributed to any direct authority of the EU. The new cycle of cohesive policies that will accompany us into 2020 highlights some thematic objectives that range from the transition to a low-carbon-based economy, to the adaptation to climate change, to the prevention and management of risks and from environmental protection to the promotion of sustainable transport and the improvement of network infrastructures. These are objectives that continuously lie in the background and should be set as goals for any study conducted on the city. In this sense, for the goal of management, even the research presented here should duly and appropriately consider the systemic complexity of the city, orienting it to increasing the quality of life.

With cities facing this challenge in the coming years, the research and ability to innovate that various governmental entities know how to set in motion is therefore very important. In particular, urban and territorial policies should consider the profitable combination of many particularly important strategic projects and a myriad of small actions and pointlike projects that are ancillary and/or strictly related to large strategic lines.

In the hopes of implementing the above-mentioned perspective, cities should work amid new urban governance focused on a few central aspects: the protagonism of local communities, the multidimensional use of spaces, and sharing the system of city and territorial values. This premise gives rise to a multilevel, multi-stakeholder model of urban governance in which institutions, businesses, civil society, and citizens meet daily to design the city around a shared, functional paradigm to increase the quality of life for all. In this governance model, citizens possess not only needs but also skills and resources.

The publication is organized into six parts.

The first part (*Quality of the Landscape, Quality of Life, Urban Sustainability*) highlights the main ideas presented in the scientific literature on urban sustainability and quality, recognizing the limits and potential of the current state of the art, which is based on a vertical and strictly disciplinary approach. The change in paradigm with respect to the concept of development grows from an advance in the concept of quality of life which, in the 1970s, began to distance itself from measurements related to the GDP, becoming aware of the fragility of the environmental system, “diseases of well-being”, and other diseconomies produced by failures due to progress.

Today, the debate about the sustainable city and the quality of city life is like a large arena where heterogeneous approaches and contributions from different fields meet without converging on a common vision and, as a consequence, without finding integrated analyses and planning tools appropriate for facing the challenge of sustainability. Most scientific literature on the concept of sustainable cities defines criteria and analysis models that reveal a vertical approach concentrated in specific disciplinary fields. This section highlights the advances the research has made in identifying new transdisciplinary indicators for the quality of urban life and the need to go beyond the vertical, monodisciplinary approach, developing mutual correlations that can be adapted to the context in question.

In this sense, the landscape is used as a “complex indicator” of urban sustainability (including the environment, the society, and the economy) and the quality of life of city inhabitants. Various international scientific organizations and the United Nations itself have designated the landscape as one of the main concerns of sustainability policies in the near future. To better characterize the landscape, the research is organized according to three large areas of investigation: “distinctive and pleasant”, “efficient and nice”, and “clean and healthy”. The first area investigates the role of parks, open spaces, and green areas (linear and pointlike) in cities and the immediate surroundings in relation to the environmental infrastructures of the surrounding territory, slow paths, architectural and archaeological resources, and centralities and places of collective identification in the city. The goal is to improve the activities of living, that is, of working, residing, meeting, social relationships, and leisure. The second area focuses on the overall organization of the city and its energy needs on different building scales and in relation to the urban and economic planning of the city and its territorial context, with the aim of improving the quality of buildings and related open spaces. The goal is an overall reduction of energy consumption and a wider, more intelligent use of energy from renewable sources. The third area examines the safety and quality of the main components of the urban environment (air, water, land) on different organizational scales in the city and in relation to the territorial context, the needs of living, and the formal and compositional balances, both overall and on the individual building scale. The goal is to favour the reduction of every type of pollution and increase the quality of the urban environment.

The second part (*Urban Policies and Quality of Life*) focuses on the description of urban policies present in the city planning and government documents sampled in the research "City of Ancona" on the Adriatic coast. The policies aim to improve the sustainability of development and the quality of life of inhabitants in this city. A lot of vital entrepreneurial energy essential for social and economic growth is concentrated in cities, but poor management of the characteristics and quality of places that can negatively influence the life of residents is also seen, leading to an increase in social exclusion and poverty. Starting with the general framework of these policies, this section deals with the strategies, actions, and interventions implemented in the "Middle Adriatic Metropolitan Area" (AMMA—Area Metropolitana Medio Adriatica), which includes Ancona. These aspects are described in detail in order to understand the challenge of climate change and to promote the quality of the urban environment and the well-being of citizens. In this sense, the Adriatic city is considered an interesting case study for carrying out experimentation with planning and innovations in interpretation.

In reference to recent European Union programmes and based on important international scientific research, this section addresses the selection of a set of indicators suitable for testing the sustainability of the urban landscape and the quality of life in cities with reference to the three large areas of investigation identified in part one of the book: "distinctive and pleasant", "efficient and nice", and "clean and healthy". The selection of indicators of urban sustainability and the quality of life of city inhabitants is made by compiling a "long list" (140 indicators) that organizes and systematizes different indicators selected from recent experiences in European research. These are subsequently reduced to a "short list" more adapted to testing both the current state and the development scenarios established by current planning in the AMMA and in the city of Ancona.

The third part (*Contributions for the evaluation of Urban Policies and Quality of Life*) with reference to the three areas of landscape investigation, describes and investigates the different indicators with the contribution of several experts in the various indicators are then described and investigated in contributions from different experts in the various disciplines involved in the research. The reflections touch on detailed specifics related to the themes that have contributed to defining the indicators: landscape ecology, green spaces, and morphology; urban morphology and urban identity; landscape perception; dimensional characteristics and form for an inclusive, responsible city; urban metabolism and outdoor comfort; land consumption and urban decay; urban sustainability and quality of life; socio-economics; urban accessibility and public transport; social capital and public services; the quest for a metric for urban quality of life; protected areas, biodiversity, and natural resource management; built environments and health; quality of life in an urban context; natural hazards and resources; and waste collection and management.

As described by the various authors involved, the different questions addressed when evaluating the indicators hold different values according to the context of the reflection in which they are located. For example, if we take density in the complexity of peripheral phenomena, it is rather difficult to understand the qualities that can generate densification rather than dilution of the built area and the consequent compression or permeability of the open space. Today, open space certainly holds strategic importance because on the one hand it can rise to the role of augmenting solutions of continuity in the urban continuum, with important effects for ecology, organizing residents' use of open spaces, and environmentally improving some living solutions. On the other hand, it plays a role in compensation and new opportunities. At the same time, while the lack of density can generate isolation and marginalization for the inhabitants living there, greater urban density in consolidated peripheries can generate quality relationships in the sense of a greater propensity to form "community" life.

Still in reference to the density indicator, it is specified that the "living density" indicator only in part coincides with the "population density" in a given city or urban settlement. If we consider the concept of living extended to the city and not only to the buildings, the living density would be considered a measure of the effective presence of people, both residents and daily users of a place and a neighbourhood, including all the closed and open spaces. In this sense, we can indicate how living density implies not only the presence of residential buildings but in general the concentration of people that spend many hours of the day there carrying out different functions within a neighbourhood or part of the city. In this sense, the presence, in addition to housing, schools, offices, and shops, of what is generally called *functional mixité* determines the living density in a certain urban space. In general, this type of density represents an indicator of the quality of life, in that it represents a certain propensity for the life of relationships and exchange among people.

Other, less traditional and consolidated details are presented, which can be helpful in understanding the choice of indicators. For example, the concept of urban protected area, as intended by the International Union for Conservation of Nature (IUCN), while inevitably being based on a margin of uncertainty, is extremely useful for setting fixed points to begin evaluating the possible interactions between protected areas and urban areas. In this case, for example, ecotones that unite different land uses and hold particular value from the ecological point of view are also especially important for managing human uses. To be able to define a set of indicators capable of accompanying the decision-making process, it is therefore useful to analyse the main pressures that urban areas place on the institutional objectives of protected areas and, in contrast, which of these objectives are useful for satisfying the needs of urban populations, always within the final goal of increasing the quality of life.

The fourth part (*A Decision-Support System*) focuses on the description of the mathematical QLandQLife model, which parametrically optimizes the indicators selected in the research phase. These indicators pertain to improvement of the landscape and environmental quality, urban comfort, and physical and mental health and are divided into indicators that can be formalized and those that cannot. The procedure to identify the QLandQLife model combines the results of a neural network approach (with other possible machine learning techniques) with the results of a multiobjective parametric optimization analysis. Neural networks, borrowed from mathematical models with the appropriate filters, have already been used in the territorial sciences.

The fifth part (*Application to the Adriatic City*), focuses on the description of an "urban ideal" resulting from the integration of three interpretational keys -morphology, density, and building height- that allow the different parts of the urban fabric of the sample city (the effect of social, economic, and environmental processes) to be interpreted, highlighting its characteristics and criticalities. This “ideal” was classified by recognizing different “partitions” resulting from the integration of the three interpretational keys identified above. The model was tested in the case of a pivot partitions of Ancona in reference to scenario “0” (the current state) and the trend scenario (based on current or future plans). This part also illustrates how the QLand/QLife model, appropriately optimized and recalibrated based on the current and future applications, can constitute a valid DSS to allow public administrations, planners, and local communities to evaluate the impacts of different policies on the quality of life in the city and the quality of the landscape and to optimize the results obtained by its application. This section also indicates the means to favour the distribution of the results to other Adriatic cities (Pineto city, for exemple) for the possible use of the DSS in similar situations. The decision maker can evaluate the different options presented when identifying possible future urban policies in order to select those that best respond to the objectives of a given community and to correct them based on a careful monitoring procedure. The utility of the DSS to define a new model of development and new urban governance is also discussed, with a focus on the relationships between the quality of life in the city, the quality of the landscape, and the effects of climate change. The aim is to favour social equity and inclusion in cities and to promote environmental and social safety, enhancing the conditions of well-being for all citizens, therefore increasing competitiveness and attractiveness.

The sixth part (*New Research Frontiers*) gathers contributions from specialists that investigate the main themes addressed in the text from different angles. Many of the reflections come from follow-ups to other research that could fruitfully interact with the QLandQLife Project. In particular, these relate to the role of urban agriculture in processes of regenerating the city and territory, relationships between urban planning and the objectives of the healthy city, new decision-making processes, the role of strategies and tactics, the theory of conflicts in participatory methods and the means of identifying stakeholders, the cultural heritage as a spatial resource, the transition from static to dynamic territorial models, the use of experimental and environmental simulations to design and evaluate urban transformations, strategies to restore the landscape and incorporate more nature in the city, territorial and urban recovery, design in search of a contribution to sustainable planning, and relationships between governance quality and the quality of life.

In some cases, these reflections are at the basis of the interdisciplinary collaboration to construct the synthetic assessment model. In other cases, they are marginal considerations that recognize the social and economic importance of the output produced. In any case, this part of the volume aims to open new research horizons and define the expectations of the QLandQLife research with the necessary investigations in new areas of policies/institutions and techniques/science.

School of Architecture and Design Massimo Sargolini
University of Camerino, Ascoli Piceno, Italy

Part I
Quality of the Landscape, Quality of Life, Urban Sustainability

Chapter 1
State of the Art on the Search for Sustainability and Quality of Life in Cities

Roberta Cocci Grifoni, Rosalba D'Onofrio, and Massimo Sargolini

The concept of sustainability appears simple but is difficult to define. It can be at once an idea, a lifestyle, a production mode, or a way of "consuming". As John Huckle writes, "…Like liberty, justice and democracy, sustainability has no single and agreed meaning. It takes on different meaning within different political ideologies and programmes underpinned by different kind of knowledge, values and philosophy" (Huchle 1996).

Applied to human society at the end of the 1980s, this concept was related to another concept that was also difficult to define: the idea of development. With the adjective *sustainable*, development acknowledges the possible limits and conditions determined by the historical context, economic conditions, and the social area of reference.

Today, nearly 25 years after the WECD *Our Common Future* (1987) was published—the principles therein were institutionalized at the United Nation Conference on Environment and Development in Rio de Janeiro in June 1992—a single theoretical conceptual framework that definitively clarifies what the word *sustainability* means in combination with the term *development* has yet to be defined.

What is certain is that *sustainable* causes a certain "paradigm shift" in traditional ways of understanding development. According to Thomas Kuhn,[1] a "paradigm shift" describes the occurrence in which, over time, phenomena are discovered and anomalies arise that existing theories are not able to contextualize and explain, thereby suggesting new theories, new criteria, new values, and new conceptual categories.

With regard to development, the paradigm shift is determined by a growing awareness that well-being and social development cannot be the simple result of

[1] This expression was coined by Thomas S. Kuhn in *The Structure of Scientific Revolutions* (1962) to describe a change in basic assumptions within a dominant scientific theory.

R.C. Grifoni • R. D'Onofrio (✉) • M. Sargolini
School of Architecture and Design, University of Camerino, Ascoli Piceno, Italy
e-mail: roberta.coccigrifoni@unicam.it; rosalba.donofrio@unicam.it; massimo.sargolini@unicam.it

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economic growth and national GDP. Rather, it is necessary to realize the fragility of the environmental system, the “sicknesses of well-being”, and other diseconomies produced by the damages of progress (Hirsch 1976).

For most people, the basic idea of sustainability is largely concentrated on the exhaustion of the planet’s vital resources. Others maintain that sustainability also relates to pollution, nature conservation, and other environmental and ecological aspects. Still others expand its meaning to include aspects related to the quality of human life and well-being. Already in 1991, the World Conservation Union, the United Nation Environment Programme, and the World Wide Fund for Nature wrote in *Caring for the Earth* that sustainable development should mean “improving the quality of human life while living within the carrying capacity of supporting ecosystems”.[2] It was already understood, therefore, in 1991, how the sustainability of development without a quality of life makes no sense and how the quality of life without sustainability has no future.

Over time, despite the multiple applications of the notion of sustainability to specific environments—large companies, agriculture, tourism, and technologies—the area most studied in political action, reflection, and the scientific literature was and still is the city. Cities are highly specialized social/territorial entities that establish and pursue the objectives of socioeconomic development. The advantage of this city activity often has a high cost: the impact on surrounding regions and the quality of life of inhabitants. Cities have shaped the world and continue to do so with growing intensity. More than 50% of the world’s population lives in cities (more than 70% for Europe). It is in cities that Kuhn’s paradigm shift in understanding development becomes clear. Specifically, the deep, rooted associations between development and the realization of well-being between quantitative growth and the quality of life are broken to make room for other values and models of sociability and well-being that do not depend exclusively on economic growth. In this new perspective, “urban sustainability” is no longer a simple objective (Enachescu et al. 2012) but can become a real model for social and economic development capable of guaranteeing a certain level of quality of life for city inhabitants. It is for this reason that both terms—*sustainability* and *quality of life*—have become essential components in city government policies, even when they generate conflict in the practice of urban management.

While they have elements in common, *urban sustainability* and *quality of life* express different concepts, which is very clear in the scientific debate.

The scientific literature has strongly supported a restricted vision of sustainability oriented at protecting the biophysical environment (Rees 1997a, b; Wackernagel and Yount 2000; Willers 1994). This position derives from concern about the complexity surrounding the social dimension of research on sustainability (Perkins and Thorns 1997b, 1999a, 2000, 2001; Barkin 2000; Chiu 2003; Redclift 2000) and emerges from the difficulty of “measuring” the quality of life and social phenomena (Tacchi 2007). However, starting with the WECD (1987), the relatively simple defi-

[2] World Conservation Union, UN Environment Programme, and World Wide Fund for Nature, 1991.

nition of *sustainability*, encompassed within biophysical environmental limits, has expanded to include social and economic concerns, i.e. the concepts of equity and justice.

The social sustainability of development, and therefore the quality of life of city inhabitants, has been addressed in three different ways (Gilli 2010). The first develops the "sociocultural" component of sustainability and deals with the way in which the social and cultural characteristics of the city can be maintained in the face of changes in technological innovation and aspects related to immigration and the labour market. Recognized scholars in this line of research have tried to find a way to reconcile the elements of urban life to maintain with those that should be modified due to modern development processes (Kates et al. 2005; Munro 1995; Borja and Castells 1997; Redclift 2000). The second deals with unequal access to resources, both in a global sense and between generations (Polese and Stren 2000; Smail 2002; Goodwin 2003). This line of research has led to the concept of social sustainability as "progress towards which all human beings tend in order to satisfy their basic needs". In line with this definition, the degradation of the biophysical environment would be just one of the aspects of sustainability that would recall, therefore, a more general view of development. Finally, the third asks how society should change so that development can be ecologically sustainable. Foladori (2005) calls this approach *bridge sustainability* because the final goal is to change society to improve the environment of our planet. Within this line of research, the debate tends to concentrate on models of consumption and the excessive use of resources (Pacione 2001; Finco and Nijkamp 2001; Ackerman 2001; O'Meara Sheehan 2001).

There is also another line of research that some planning movements such as "Smart Growth" and "New Urbanism" refer to, which is compatible with the biophysical and economic sustainability of development, because it follows as a logical consequence. This environmental and economic determinism, however, is not much seen in practice. The movements cited above, for example, while also dealing with quality of life and social sustainability, are mostly concentrated on the tangible biophysical and material aspects of the city.

The tendency for the current scientific debate and ongoing experimentation to concentrate mainly on the environmental aspects of sustainability to the detriment of the social aspects and the quality of life (Vallance et al. 2006) can also be seen in the choice of the indicators used to measure urban sustainability. It is obvious that of the three classes of indicators that characterize sustainability (ecological, economic, and social), the social indicators are the most complex to determine. In fact, different initiatives in sustainability assessment have explicitly overlooked the social and quality-of-life class of indicators, concentrating instead on the other two classes (e.g. Astleithner et al. 2004, p. 17; Zahm et al. 2008, p. 279; Hartmuth et al. 2008, p. 262).

Even when more complex sustainability indicators—introduced by different public institutions and international entities—more carefully considered the multiple, complex aspects of sustainability, the results were unsatisfactory even from the social point of view.

Many indicators such as the Human Development Index, the Environmental Performance Index, the Commitment to Development Index, the Index of Sustainable Economic Welfare, the Ecological Footprint, the Well-Being of Nations, Millennium Development Indicators, Indicators for the EU Sustainable Development Strategy, CSD indicators, and the Environmental Sustainability Index (ESI) present in notable scientific publications (Van de Kerk and Manuel 2008) have been shown to be weak tools incapable of measuring the complexity of urban sustainability (Babcicky 2013). In fact, no single measure seems to be completely adequate (Hák et al. 2007), revealing gaps in knowledge and in the identification of different social/political, economic, and environmental domains that characterize the said complexity.

Many attempts have been made to analyse the failure or partial success of the application of these indicators. From our non-exhaustive review, the first thing that emerges is the vertical approach with which the theme of sustainability and quality of life within the different disciplinary areas is addressed. Different dimensions of sustainability emerge in relation to the quality of life in cities without ever, or only rarely, reaching a synthesis capable of formulating a conclusive, integrated assessment.

In particular, there is an “ecological dimension” of urban sustainability stated as the quality of life of urban populations that becomes clear through studies and research that address and assess:

a. The quality of life related to the presence of nature in cities and the effects on the health of city inhabitants (Grahn and Stigsdotter 2003; Verheij and Groenewegen 2011)
b. The conservation of biodiversity in fragmented landscapes (Watts et al. 2010; De Groot and Boumans 2002)
c. The ability of green areas and specific building materials to contrast the urban heat island (Santamouris 2001)

Other research deals with the aspect of energy in relation to the quality of life in cities. This includes *The Renewable City* by Droege (2006), where the need for an integrated vision of urban phenomena and the failure of governance in managing complex systems are openly declared.

The verticality of this type of approach also characterizes the scientific debate regarding some specific themes, such as the relationship between sustainability and city form. From the ecological point of view, for example, many arguments linked to biodiversity conservation seem to support the compact city over the disperse city (Jencks and Dempsey 2010; Jim and Chen 2003).

The same also occurs for the dimension of urban sustainability with reference to transport, energy, and air quality in relation to the form of the city and the quality of life in the city. Scientific knowledge is divided between supporters of the compact, high-density city as the most effective model for maximizing, for example, the energetic efficiency of the city (Burdett and Sudjic 2008; Kennedy et al. 2011), and those that instead support the disperse model because it is more effective in increasing the use of alternative energy sources (Diamantini and Vettorato 2011).

Other investigations in this field have also looked at the relationship between the form of the city and air quality (White 1994; Hough 1995).

On the social level, research and experiments on the sustainable urban form have considered the quality of the constructed space through its ability to trigger relationships between the place, functions, and end users. In this perspective, the "smart" dimension of the city, with its capacity to create new connections and favour new models of resource use, can contribute to limiting the risks of diseconomies and reignite the sustainable and harmonious development of urban areas (Cheshire and Magrini 2006; Shapiro 2006; Royuela et al. 2010).

Faced with these numerous approaches and the difficulty of effectively synthesizing the choice of necessarily "interdisciplinary" indicators to evaluate urban sustainability in relation to the quality of life in the city, part of the scientific community has become very sceptical regarding empirical proof of the sustainability of development.

Sustainability in terms of a "social construct" is mentioned explicitly. In other words, this is an ethical, ideological, or even functional option aimed solely at conserving the Western way of life and its related inequalities (Luke 2005). According to Tom Waas (Centre for Sustainable Development, Ghent University), the lack of empirical proof for the sustainability of development would also relate to the fact that scientific knowledge can never resolve the fundamental question of what is and is not sustainable. This is because the sustainability of development always implies social choices based on values that are usually abstract ideals that evoke emotional reactions and are typically expressed in terms of "good" and "bad" (Waas et al. 2011). To the author, this conviction suggests that one considers the indicators of sustainability and the quality of life, keeping in mind a necessary "interpretational flexibility". This would allow both the objective and subjective aspects of development to be distinguished and the various points of view and interpretations to be recognized, which are naturally destined to coexist within the interpretational limits of the concept of sustainability.

This type of approach could transform the search for the sustainability of development into a decision-making strategy from the local to the global levels, a "generative action" that could use the different types of indicators to inform the decision-making process. This would allow for comparative analysis, facilitate continuous (social) learning for the parties involved and for decision-makers, and identify knowledge and possible gaps (Waas et al. 2014). The assessment of the sustainability of development and the quality of life would therefore become an indispensable decision-making support tool to understand and interpret the world and to guide us towards a (more) sustainable society. However, this always implies a reduction and simplification of reality and should not replace it.

The QLandQLife research aims to add a small link in this line of research. It proposes a working method based on a holistic, integrated approach to the theme of the sustainability of development and the quality of life in cities in order to address their real complexity and the numerous uncertainties and risks of the contemporary city. The research starts with the indicators of sustainability and assumes the landscape as a complex indicator of urban sustainability.

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Chapter 2
The Landscape as a "Complex Indicator" of Urban Sustainability and Quality of Life of City Inhabitants

Roberta Cocci Grifoni, Rosalba D'Onofrio, and Massimo Sargolini

As mentioned in Chap. 1, the debate about the sustainable city and the quality of life of city inhabitants is like a large arena where heterogeneous approaches and contributions from different sectors meet, without ever converging on a common vision. Consequently, it is difficult to identify effective models to assess urban policies, plans, and projects to address the challenge of sustainability. The sectoral cultural approach to themes of urban sustainability and improving the quality of life in cities has extended from scientific research to plans and projects for transformation. A comparison of different possible project alternatives and monitoring of the results of policies and plans over time is often lacking, as well as an open dialogue between researchers and political and social actors (Bertuglia et al. 2004).

Today it is necessary to overcome this gap both in theory and in practice. A change in direction is needed, a change in everyone's awareness (researchers, interest holders, institutional decision-makers, citizens) that the icon of a city "attentive to questions about the environment" is no longer enough. It is instead necessary to find the source of interactions between humans and biotic/abiotic components to favour urban sustainability. In this sense, recent studies have been increasingly concentrated on the relationship between ecosystem services and human well-being (Elmqvist et al. 2013; Nassauer et al. 2014). They define sustainability as "an adaptive process of facilitating and maintaining a virtual cycle between ecosystem services and human well-being through concerted ecological, economic, and social actions in response to changes within and beyond the urban landscape" (Wu 2014). At the basis of this concept, there is the conviction that the science of sustainability should be concentrated on the dynamic relationship between society and nature, integrating environmental, economic, and social processes on different scales: from the local scale to the global scale (Sargolini and Caprodossi 2015). In this perspective,

R.C. Grifoni • R. D'Onofrio (✉) • M. Sargolini
School of Architecture and Design, University of Camerino, Ascoli Piceno, Italy
e-mail: roberta.coccigrifoni@unicam.it; rosalba.donofrio@unicam.it; massimo.sargolini@unicam.it

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the landscape would represent "…a pivotal 'place' in the place-based research and practice of sustainability" (Wu 2012).

The introduction of the landscape in the science of sustainability is not new. Scholars, who have recently studied the landscape from the ecological and cultural points of view, seem to agree on the importance of the landscape as an operational scale in the field of sustainability research. For example, Forman (1990) maintains that human landscapes—those perceived on the human scale—offer notable advantages with respect to wider scales, despite the so-called paradox of management (Forman 1995). That is, although actions for sustainability tend to be more effective on the local scale, success should often be achieved on a wider scale. The advantages of the landscape approach to sustainability relate to the simplification of the decision-making process (Nassauer 1997; Gobster et al. 2007) and to the definition of common ground for the different subjects working together to improve the society/nature relationship: ecologists, geographers, planners and designers, and decision-makers. No single viewpoint or approach is enough to fully understand the human/environment relationships (Turner 1997).

With respect to the scientific debate briefly described above, which is centred on the operability of the landscape approach to sustainability, the European Landscape Convention (ELC) represents an additional step forwards. In fact, the ELC has sanctioned the comparison between the landscape and sustainable development, between the landscape and quality of life, as the search for a balance between social, environmental, and economic needs (D'Onofrio 2013).

In the second point of the preamble, the ELC states the cardinal objective for the European continent: "…to achieve sustainable development based on a balanced and harmonious relationship between social needs, economic activity, and the environment". In previous international documents that have favoured the spread of concepts and practices of sustainable development, the landscape has not received much consideration. In both Agenda 21 and the Aalborg Charter, references to environmental themes are frequent but the landscape is not mentioned.

The ELC expresses the conviction that the quality of European landscapes and the quality of life of populations that are an integral part of those landscapes is determined by the close interrelationship between economic, social, and cultural aspects that have settled over time and in space. Furthermore, this interrelationship is strongly rooted in the specifics of each landscape. This aspect therefore serves as a possible meeting point for discussing different approaches, the different components of nature and culture, subjective and objective aspects, and material and immaterial elements, even within the goal of sustainable development. It is a sort of "interface between humans and nature", a "litmus paper" for the effects that human activities produce on natural components of the planet (water, land, air, flora, and fauna), affecting their quantity, quality, and distribution, as well as the cultural value of the territory.

Conservation, or the enhancement of these characteristics, favours greater quality of life for the people because it contributes to the local economy and satisfies recreational, emotional, and spiritual needs as well as the sense of community identity. In this perspective, urban landscape planning and design can inspire a broad, multidimensional change in the natural and constructed environments. In pursuing this, urban sustainability coincides with the sustainability of the urban landscape overall (Dinep and Schwab 2010).

Two fundamental concepts on which this research is based are inspired by the relationship between the landscape and sustainability:

– The landscape as an "integrating concept" whose importance is fully revealed when addressing the theme of enhancing territorial transformations, when, more than evaluating the individual parts, one is interested in stability and the operation of the urban system as a whole. The landscape can therefore provide an opportunity to address the problems of sustainability in urban and territorial development in more complex terms.
– The landscape as a "complex indicator" of urban sustainability, capable of bringing together a wide range of aspects and knowledge, to highlight the criticalities and peculiarities of a territory and a city, to allow solutions to the conflicts to be selected in the most balanced way.

Most of the conflicts seen in urban areas are a consequence of urbanization processes that have not considered the limits of the places or investigated their margins of flexibility. Each hypothesis for the sustainable transformation of a place should, in fact, remain within the margins of flexibility that those places need to maintain in order to survive (Paolinelli 2011; Sargolini 2012). Where the balance and stability of the landscape system is manifest in controlling these conditions, the landscape can contribute to solutions to the problems of sustainability (Benson and Roe 2007).

For a landscape-based approach to sustainability, it is necessary to integrate the multiple dimensions of environment, economy, and society, technical aspects (e.g., related to energy savings, environmental management of the city, recycling of resources, etc.), and nontechnical aspects such as social behaviours, the spatial organization of the city, and aesthetic visions.

These different aspects can be investigated through parameters and indicators that do not aim to measure sustainability in absolute terms. As mentioned in the previous section, this is very difficult if not impossible to do. The indicators can, however, provide useful indications to verify that city management is oriented towards sustainability and contribute to determining which actions should or should not be pursued (Ness et al. 2007). To investigate this theme, we start from this assumption and the need to use an approach wherein the parameters and indicators applied are flexible, transparent, and relatively easy to use.

For a landscape-based approach to sustainability, a large number of indicators have been developed in recent decades, especially after the world meeting in Johannesburg on sustainable development. An unending series of international organizations, governmental agencies, NGOs, local communities, businesses, and universities have dedicated significant energy to designing and implementing indicators to assess the state and trajectory of environmental conditions and socioeconomic development. Today, therefore, hundreds of indicators and indices of sustainable development, developed and used on the global, national, and local scales, are available.

Table 2.1 Desirable properties for sustainable parameters and associated indicators (Source: Baral and Holmgren 2012)

Parameters should be: – Forward looking and practical – Small in number (fewer than five) – Adequate in coverage or linkage to SDGs framework – Generally applicable to any landscape situation – Predictive of changes due to management choices – Sufficient when considered together
Indicators should: – Be practical (easy to understand, cost-effective) – Be easily measurable (and compatible with changes in temporal and spatial scales) – Be readily understandable and policy-relevant – Fulfil statistical requirements concerning verification, reproduction, representativeness, and validity – Provide adequate information on spatiotemporal scales – Have high transparency of the derivation strategy – Provide information on long-term trends – Reflect local sustainability that enhances global sustainability

Table 2.2 Indicators, orientations, and sustainable urban landscape

Safety: includes a series of questions that range from the satisfaction of primary needs such as health, education, and protection from crime, as well as the impact of natural and technological catastrophes
Health: incorporates indicators related to the quality of the urban environment, the urban form, urban metabolism, and the sustainability of the local urban system
Perception and culture: refers to the spatial quality, because a "constructive" and attractive quality environment contributes to collective interaction and favours social cohesion in the city, the quality of public spaces, and the vitality of the city
Efficiency: encompasses urban development that guarantees the protection of natural and historical/architectural resources and the cultural and artistic heritage

Source: Amin (2012) Sustainable Urban Landscape: An Approach for Assessing and Appropriating Indicators, Archnet-IJAR, International Journal of Architectural Research, vol. 6, no. 2, 98–114

The literature shows that there is growing interest in choosing concise, balanced sets of indicators to provide meaningful information on specific aspects indicated as the most meaningful. By way of example, Table 2.1 lists "desirable properties" for choosing indicators that can therefore provide quick indications on the sustainable management of a landscape and the effectiveness of current policies. Table 2.2 shows the performance, which, according to some scholars, the selected indicators should ensure, to assess the ability of a landscape to generate and maintain conditions for an adequate, safe, harmonious habitat (MacKendrick and Parkins 2004).

In choosing the most pertinent indicators, it is necessary to consider existing limits and restrictions, such as:

– The physical conditions and laws of nature that confirm that not everything is possible
– Nature and human objectives that confirm that not everything is desirable
– The importance of time in forecasting responses that should keep up with threats, profitability, and sustainability of the urban landscape

In addition, it is clear that the choice of indicators is a complex question that falls under the expertise of different subjects such as decision-makers, designers, researchers, and communities. The choice also depends on the context where the indicators are applied, the scale of reference of the assessment, and the characteristics of the places under evaluation. Indeed, if these references are lacking, it is impossible to choose the indicators.

The holistic approach to the indicators of urban sustainability according to the landscape perspective should therefore work to re-establish the correct relationships between natural processes and human activities, connecting long-term sustainability with the ethical responsibility of individual and collective behaviour.

To investigate the quality of life of city inhabitants, the research addressed the sustainability of the urban landscape, starting from the principles inspired by the European Landscape Convention. This:

- Recognizes the landscape in every place as an "important part of the quality of life for people everywhere"
- Defines the landscape as the result of natural and/or human action and their interrelationships
- Aims to evaluate the landscapes identified, "considering the particular values assigned to them by interested parties and the relevant population".

Following Amin (2012), this quality of life/quality of landscape link is investigated by the research, in the following interpretational keys:

- *Safety*, which consists of a series of issues that range from the satisfaction of primary needs, such as health, education, and criminal protection, to the impact of natural and technological catastrophes
- *Health*, which encompasses indicators related to the quality of the urban environment, the urban form, urban metabolism, and the sustainability of the local urban system
- *Perception and culture*, which refers to spatial quality, because a high-quality and attractive built environment contributes to collective interaction and favours social cohesion, the quality of public space, and the vitality of the city
- *Efficiency*, which includes urban development while guaranteeing the protection of natural, historical, and architectural resources, as well as the cultural and artistic heritage

These interpretational keys can be reduced to three main families of indicators of urban sustainability present in recent research and studied on the European level. These areas—"Distinctive and pleasant", "Efficient and nice", and "Clean and healthy"—are deemed useful to the goals of the research and are observed through the lens of the landscape.

The first large area refers to the role of parks, open spaces, and green areas (linear and pointlike) in the city and the immediate context. It addresses relationships with the environmental infrastructure of the surrounding territory, slow paths, architectural and archaeological resources, centralities, and the places of collective identification in the city to improve the activities of living and therefore of working, residing, meeting, social relationships, and pleasure.

The second area of investigation and assessment, “Efficient and nice”, regards the overall organization of the city and its energy needs on the different building scales in relation to the urban and economic planning of the city and its territorial context. The aim is to improve the quality of buildings and open spaces for interaction as a function of reducing overall energy needs, achieving thermo-hygrometric comfort in open spaces, and more broadly and intelligently using renewable sources of energy. *In this case, the slow landscape is accompanied by energy and perceived well-being, which becomes the matter and structure of new landscapes*. Together, the two approaches dismantle and reconstruct the multiple levels of interpretation and the likewise different problems on which all disciplines affecting the change in our frameworks of living reason and operate.

The third area, “Clean and healthy”, investigates the theme of safety and the quality of the main components of the urban environment (air, water, land). The different scales of city organization are addressed in relation to the territorial context, the needs of living, the formal and overall compositional balances, and the individual buildings. The goal is to favour the reduction of all types of pollution and improve the quality of the urban environment. In this area of investigation, the combination of knowledge from earth, natural, and biological sciences is particularly close, and particular effort is made to favour agreements and comparisons between languages and methods. Our research aims to offer a useful contribution in this direction.

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Chapter 3
Use of Decision-Support Systems in Defining Scenarios for Sustainable, Shared Urban Development

Roberta Cocci Grifoni, Rosalba D'Onofrio, and Massimo Sargolini

The subject of sustainability requires the integration of various areas of disciplinary knowledge and in particular, knowledge related to the overall management and dynamics of ecological and social systems. Traditionally, the different disciplines have addressed the theme of sustainability by developing mathematical models and using indicators to measure the different aspects. However, not all of these aspects can be measured in quantitative terms (Bell and Morse 2008; Pollesch and Dale 2015).

For example, the quality of life and the quality of the landscape depend on some factors that can be defined formally and others for which this is impossible. The latter cannot often be described by mathematical algorithms, such as occurs instead for the former, which depend essentially on the environmental system. As well, in selecting the indicators, the same indicator can be used to measure different aspects of sustainability and urban quality. This is by virtue of the strong interdependence of the disciplines dealing with sustainability and the multiple connections between the ecological and social systems within the urban environment (Batty 2008; Siniscalco 2002; Wiek and Binder 2005).

Therefore, in studying an urban reality in all of its complexity, or rather, in assessing a conservation or transformation project for the current territorial balances, it is important to choose common indicators that can be shared among the different disciplines. A choice of indicators that does not aim to interpret these relationships can make it impossible to achieve some objectives of sustainability that often require systematic, integrated visions of territorial complexity (Hunt et al. 2008). Even if the indicators are increasingly used on different scales to assess the sustainability of policies and territories, their acceptance is not universal. Some scholars are sceptical about the existence of a clear relationship between

R.C. Grifoni • R. D'Onofrio (✉) • M. Sargolini
School of Architecture and Design, University of Camerino, Ascoli Piceno, Italy
e-mail: roberta.coccigrifoni@unicam.it; rosalba.donofrio@unicam.it; massimo.sargolini@unicam.it

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the use of an indicator for sustainable development and a real change within the decision-making process (Gahin et al. 2003; Maclaren 1996). According to some, this is due to a weakness of the research in assessing and monitoring the effectiveness of the indicators (Imrie and Thomas 1995), as well as an excessive emphasis on quantitative evaluation, to the detriment of qualitative evaluation (Hakim 2000; Wong 2002). As well, the dissociated use of indicators that describe the different aspects related to the urban climate are unable to consider the complex organization of the urban environment and the urban/rural gradient, thereby tending to classify urban zones rigidly according to areas that are homogeneous in form and thermal properties (Stewart and Oke 2009; Oke 1973, 2004).

To overcome this scepticism, some researchers have proposed selecting a mix of qualitative and quantitative indicators (Scerri and James 2010). They have shown how the indicators, for an effective measure of sustainability, should not be evaluated individually but in an integrated, systematic manner. This is, in fact, the only way to analyse the dynamic interaction and relationships between the ecological and social components of an urban system.

Nevertheless, the indicators of sustainability and the quality of life in the city are considered “useful tools” to provide a common basis for the systematic assessment of impacts on the urban and territorial levels (Hemphill et al. 2004). The information collected through these indicators can be used to make more informed, holistic decisions regarding the sustainability of policies and projects. The main scope of the assessment is to provide decision-makers with the means to evaluate the natural and social aspects on the global and local scales in an integrated way in the short and long terms. In this perspective, the scope of the evaluation process is to contribute to determining what actions should or should not be pursued, with the ultimate goal of moving in the direction of sustainable development (Ness et al. 2007).

In considering the interaction and dynamic evolution of social and economic life and natural systems, the science of sustainability requires foreseeing an open path both involving the world of research and politics and foreseeing public participation. In this open path, it is important to recognize possible alternatives to development and to make shared conceptual models available as the basis of communication and interaction among the different players in the decision-making process. To effectively address the integration of different roles and experiences, the involvement of and communication with interest holders is fundamental. To this end, various approaches have been proposed that are generally based on participatory workshops (e.g. focus groups), in which a dialogue is established among the different people involved. There are many successful cases and at least a similar number that attest to a reduced impact of these processes on the effective adoption of the results made by decision-makers, as many different factors can negatively condition the participatory processes with such diverse players. The integration of separate disciplines often encounters great problems deriving from different languages—in a sense of terminology—rigidity, and the resistance to sharing spheres of influence, etc.

Therefore, the need/opportunity to share conceptual, similar models to address the formalization of socioecological systems and their dynamics is often overlooked. In addition, an attempt is too often seen to push decision-makers and policymakers to adopt schemes previously developed by researchers that are very often independent of the specific field of application and lack an effective interface for users and to communicate the results. These schemes are perceived by decision-makers as black boxes, whose results should be simply accepted or rejected, in particular when they point in a direction counter to what is desired (Giupponi 2010).

A similar problem, which is even amplified in the negative effects that can result, is seen with local communities. The system to address the population is even more complex because it should be preceded by training spokespeople, who should be capable of interacting and critically examining the proposals formulated by the planners. The relationship with populations could also obviously go beyond the residents, reaching all those who are "interested" in the definitive acceptance of the ELC, in that everyone agrees it can provide useful advice for good landscape management, thereby leading to an increase in the quality of life.

To structure the decision-making paths, "decision-support systems" (DSS) could be used. These may be very helpful when preparing complex territorial phenomena that are difficult to read, providing communicational tools and researcher/decision-maker/user interfaces that are more effective than those generally offered by mathematical models in the case of simulating complex phenomena.

DSSs in the field of sustainability and the quality of life in cities are meant to provide indications about the expected consequences of policies and projects for urban systems. Without replacing the decision-maker, the scope of a DSS is to improve the efficiency of decisions that decision-makers must make, making it possible to consider all the contingent factors linked to policies and optimizing the overall performance of environmental and social systems (Turban 1990). Therefore, the decision-maker uses the DSS not to obtain closed, deterministically identified, circumscribed responses but to better evaluate—in its varied meanings—potential or current transformations in relation to the territorial specifics. To respond to this need, which may be described less deterministically and mechanically, the DSS should be configured as an open system in which, for decision-making reasons, users address the aspect deemed most useful for their scope and not only the final result, which loses value as such.

The DSSs referred to here are supported by modern "scenario methods". In *The Art of the Long View* (1991), Peter Schwartz stated that "…a scenario reminds one of a range of stories written or told according to accurately constructed plot. Stories may express many complex perspectives of event development, while scenarios give them special meaning".

The analysis of possible scenarios for sustainable development and to improve the quality of life in cities can provide a better view not only of potential future events but also the potential impact of decisions on people and the environment. In addition, a scenario analysis facilitates the estimation of results expected over time and the sequence of actions necessary to obtain them (Burinskiene and Rudzkiene 2009).

Different methods have been identified for the creation of scenarios of development, and each of them may be composed of different variations (Bishop et al. 2007). It is certain that researchers prefer methods that combine both mathematical forecasting methods and human presumptions (Chermack and Lynham 2004).

A forecast based solely on mathematical and formally definable data risks overlooking all those impressions, sensations, and evaluations that pertain to collective memory and to the emotions felt by communities. It is therefore incapable of considering the indeterminacy of the future, which is unavoidably attached to the reactions of the different local subjectivities. Instead, through the complex application of combined methods, it is possible to examine and interpret trends and dynamics of critical events and make more accurate estimates regarding future trends.

Therefore, in constructing development scenarios, the role of experts is important, even if not exclusive. Based on their knowledge and with the use of their tools, experts evaluate the importance of and interrelationships among the different options of sustainable development. Despite this, further actions can be considered when making decisions, keeping in mind the material and human resources available. The DSS is developed by acting on the entire reconnaissance and interpretational process, including scenario analysis, which is very important for the decision-making process. The construction of alternative scenarios of development within a DSS should then be used wisely by the decision-maker, preventing it from becoming a tool to legitimize decision-making processes already assumed. There is also the risk that participatory processes often run, in which discussion with the wider population has often been used to take priority over already formulated government choices. In this sense, a great opportunity ensured by a well-used DSS would be lost, that is, the just interaction with the community. Today, this interaction is necessary.

In recent decades, within the EU, an awareness has grown that especially on environmental questions, interaction with local communities is desired. It is therefore not by chance that voluntary agreements based on a participatory model have become the most-used tools of environmental politics, because they represent the most flexible way to protect the environment, landscape, and collective interests (Tonin 2007). The most meaningful experiences in this direction include “Landcare” in Australia, “Ecocoops” in the Netherlands, and the application of the “Environmental Stewardship Scheme” in Great Britain. These begin by recognizing the importance of incorporating local knowledge through the direct involvement of players in development processes to increase the degree of consensus and motivation surrounding development initiatives, thereby strengthening the ability of local communities to manage environmental and landscape problems.

Scenario analysis is a particularly useful tool to encounter local knowledge. It is capable of highlighting the strong and weak points of each landscape necessary to achieve the large objective of sustainability, and it plays a potentially very important role in attenuating the growing diffidence of communities regarding decision-making processes guided by experts. Overcoming this diffidence could be particularly effective when addressing the strategic and regulatory aspects of questions related to sustainability, to ensure that the interaction pertains to the largest perspectives possible for that territory and that area, before concentrating on the minute, specific actions necessary to achieve the strategic objective. In each case, scenario analysis could favour the reciprocal (local community and expert) refinement of positions with respect to the object of the decisions, thereby formulating better informed, mediated, and conscious decisions (Swart et al. 2004).

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Part II
Urban Policies and Quality of Life

Chapter 4
Urban Policies for Urban Sustainability and Quality of Life of the City

Rosalba D'Onofrio, Massimo Sargolini, and Michele Talia

Despite the prolonged, unbridled process of urbanization that has concentrated 53% of the world's population and more than 73% of the European population in cities, the confirmation of an Urban Agenda on the international level is still struggling to take off. As has been highlighted many times, this disappointing result stands in open contrast to the many initiatives assumed in recent decades by the United Nations and the European Commission, so that national governments have almost worked alone and in a convergent way over this period to maintain control of their respective urban policies (Boni 2016).

However, some innovation has been registered in recent years, especially starting with the adoption of a series of important initiatives for and experimentation with new lines of action. These have the potential to mark a turn in the long path of formulating documents and tools capable of directing city government towards more sustainable objectives.

The last two years in particular have been very important for the history of European cities and cities around the world. 2015 saw not only the signing of the Paris Agreement (United Nations Framework Convention on Climate Change, UNFCCC), which was also later signed by China and the United States, but also the adoption of the 2030 Agenda for Sustainable Development by the General Assembly of the United Nations. Among the 17 objectives of sustainable development established in the Agenda, goal 11 is to "make cities and human settlements inclusive, safe, resilient, and sustainable". In March 2016, the European Habitat Conference was held in Prague, the topic of which was "Housing in Liveable Cities". This was an international regional conference organized by the United Nations Economic Commission for Europe (UNECE) in preparation for the United Nations Habitat III Conference. Then at the end of May, the Pact of Amsterdam was approved.

R. D'Onofrio (✉) • M. Sargolini • M. Talia
School of Architecture and Design, University of Camerino, Ascoli Piceno, Italy
e-mail: rosalba.donofrio@unicam.it; massimo.sargolini@unicam.it; michele.talia@unicam.it

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This document institutes the Urban Agenda for Europe, fixes the basic themes, and also identifies a very short timeframe for action (December 2017) for the planned initiatives. This is a plan to reinforce the urban dimension in Europe and therefore to support cities found at the interface of growing problems, in particular, poverty, spatial and social segregation, demographic change, and the use of renewable energy.[1] Finally, Habitat III took place in October 2016, which produced the New Urban Agenda, a global plan of action to be developed over the next two decades. The agenda aims to connect sustainable urbanization with development, providing a framework to plan policies and strategies that can contribute to sustainably managing human settlements in an increasingly urbanized world.

This notable commotion shows how sustainable development, social progress, and individual well-being are closely related to the destiny of cities and their capacity to play an active part in governing changes, to the point that it is precisely within cities that solutions should be found to improve the health of our planet and the quality of life of people everywhere.

Before going into the complex panorama of studies and research that are predetermined to measure urban sustainability and, to a better approximation, the quality of life of city inhabitants, we turn our attention to the principles that inspire European urban policies in the direction of sustainability and the quality of life in urban areas. We will use this knowledge as keys to interpretation in order to select families of indicators of sustainability and the quality of life from a landscape perspective, which is referred to specifically in our research and which is the object of Part 2 "Urban Policies and Quality of Life".

Finally, we will reread and compare the data on environmental accounting offered by the most recent surveys in order to contribute to the discussion, which has been underway for some time, regarding the crisis in the European urban model.

Urban Policies Promoted by the EU

Although the government of urban transformations cannot be traced to any direct authority of the European Union, most European policies present an important urban dimension, not least because many of the challenges Europe has decided to undertake require the conscious, responsible mobilization of local governments and therefore cities. In the perspective of improving the efficacy of European policies, cities have in many cases become the favoured reference of European institutions in defining lines of planning.

[1] The 12 themes in the European Urban Agenda are (1) inclusion of migrants and refugees, (2) air quality, (3) urban poverty, (4) housing, (5) the circular economy, (6) adaptation to climate change, (7) energy transition, (8) urban mobility, (9) digital transition, (10) public acquisitions, (11) work and skills in the local economy, and (12) sustainable use of the terrain and environmentally friendly solutions.

In the beginning, the EU's urban policies grew and developed as a priority of environmental policies as read in the Fourth Environmental Action Program of 1987. In this document, the economic decline of urban areas is closely related to environmental degradation and city inhabitants' conditions of living and working. For example, when the United Nations Conference on Environment and Development (the first Earth Summit) was held in Rio de Janeiro in 1992 and people began to speak about "sustainable development", even the growing European urban policies wound up aligning with the EU's Framework for Action for Sustainable Urban Development (1998). After the first urban pilot projects (1989–1994) and the EU Urban I and II initiatives (1994–1999 and 2000–2006) financed by the European Regional Development Fund (ERDF) and focused on integrated projects to recover disadvantaged urban neighbourhoods, it is with the Cohesion Policy that the different dimensions of urban development were addressed unitarily with the dedicated tools, resources, and rules. A European Commission communication from 2006—"Cohesion Policy and cities: the urban contribution to growth and jobs in the regions"—is significant in this sense, as it clearly marks a change in approach and strategy (Commission of European Communities 2006).

Since then, sustainable urban development has no longer been the object of special initiatives, as had then occurred with urban pilot projects and "urban" community initiatives, but was fully integrated in national and regional operational programmes of European structural funds in the area of which the aspects of the quality of life of city inhabitants, attractiveness, and city competitiveness were developed. Due to the effect of this reorientation, the 2000–2006 cycle of the Cohesion Policy has confirmed the so-called mainstream of urban policies in planning with structural funds. These are policies directed uniformly over the entire European territory or wide portions of it, thus also including urban areas. This imposition was confirmed in 2007–2013 programming, in which the Cohesion Policy was extended to the entire EU territory. It is also true for the new 2014–2020 cycle, in which the commission has set aside at least 5% of ERDF resources destined for member states to support integrated actions in sustainable urban development.

The Cohesion Policy has established 11 objective themes closely tied to the urban environment, including, in particular, the transition to a low-carbon-based economy, promoting adaptations to climate change, the efficient use of resources in order to protect the environment, and the promotion of sustainable transport. In consideration of this, it will be possible to assign about €10 billion from the ERDF directly to integrated strategies for the sustainable development of the urban environment and to ensure that about 750 local administrations will be able to use these resources to realize projects in line with these general goals. The Cohesion Policy promoted in the most recent phase of European planning is aimed at realizing Europe 2020, a strategy for smart, sustainable, and inclusive growth. This strategic construct aims to formulate a new European Urban Agenda and is organized into five objectives: employment, research and development, climate change and energy, education, and poverty and social exclusion.

As anticipated at the beginning of this section, the Pact of Amsterdam finally launched the process to implement this agenda, aiming first at the development and updating of three cornerstones of European policies:

1. Knowledge, which should offer a rigorous basis for the initiatives of the commission, by intensifying the exchange of information and best practices
2. Regulation, which should second innovation or the adaptation of the pre-existing regulatory framework, avoiding further bureaucracy and conflicts among legislation from different sectors
3. Financial support, through the integration and better distribution of the resources already available and those that will be made available

Despite these recommendations, which are destined to have a transverse effect, the pact identifies some themed priorities that should inspire European urban policies in the coming years: (1) inclusion of migrants and refugees, (2) air quality, (3) urban poverty, (4) accessible housing, (5) the circular economy, (6) adaptation to climate change, (7) energy transition, (8) urban mobility, (9) digital transition, (10) innovative and responsible public procurement, (11) jobs and skills in the local economy, and (12) the sustainable use of land and nature-based solutions. Other related themes have been developed around these priorities and should provide integrated action plans within about 3 years.

Despite this complex arrangement, the main point of interest and innovation in the Pact of Amsterdam is very probably the activation of a twofold subsystem of policies. In addition to calling for periodic meetings of the entity charged with coordinating and monitoring the Urban Agenda Working Program (Directors General meeting about Urban Matters), it also introduces transverse partnerships with reference to the thematic lines indicated above. These partnerships, which envision voluntary participation from national governments, local administrations, urban organizations (CEMR, EUROCITIES), European urban programmes (URBACT, UIA), NGOs, and stakeholders, are responsible for creating a specific action plan within 3 years with the objective of making the activation of European urban policies[2] more coher-

[2] The first four partnerships have already begun. These relate to air quality, housing, urban poverty, and the integration of migrants and refugees. The countries and administrations involved are the following:

- The city of Amsterdam (Netherlands) coordinates the partnership on migrant inclusion. Also participating are Barcelona (Spain), Berlin (Germany), Athens (Greece), and Helsinki (Finland).
- The Netherlands coordinates the partnership on air quality. Also participating are Helsinki (Finland), London (UK), Utrecht (Netherlands), Milan (Italy), and Constanţa (Romania).
- Slovakia coordinates the partnership on housing. Also participating are Vienna (Austria), Riga (Latvia), the Scottish Cities Alliance (UK), Poznań (Poland), and Lisbon (Portugal).
- Belgium and France coordinate the partnership on urban poverty. Also participating are Birmingham (UK), Kortrijk (Belgium), Lille (France), Daugavpils (Latvia), Timişoara (Romania), Łódź (Poland), and Keratsini (Greece).

In January 2017, four new partnerships began on the themes of the circular economy in cities, the digital transition, urban mobility, and the jobs and skills market. Finally, by the end of summer 2017, the last four partnerships will have begun related to themes of the energy transition, adaptation to climate change, regulation of public procurements, and sustainable land use.

ent and efficient. The most innovative approach deriving from this new EU policy appears to be the willingness to involve protagonists of urban life in this process, aiming at the value of collaboration and accenting themes such as participatory urban regeneration or territorial cohesion with small and medium urban centres.

The Pact of Amsterdam and the tools implemented by the European Commission are a strong invitation to "create a network" from the European level to the local level, directly involving cities in the exchange of information and experiences and learning.

Urban development is not promoted at the European level only by regional policies and structural funds. A growing number of sectoral policies in the EU are explicitly centred on cities: the energy policy; the Digital Agenda; the Thematic Strategy on the Urban Environment; the Directorate-General for Education and Culture, for Mobility and Transport, and for Climate Action; as well as other initiatives such as the European Cultural Capital, the European Innovation Partnership "Smart Cities and Communities", the European Green Capital Award, and the Covenant of Mayors, which now includes the "Mayors Adapt" initiative. In addition, the regulatory framework established by the EU inevitably impacts the governance of urban transformations, for example, directives regarding air and noise quality, policies aimed at controlling migration, and measures aimed at reducing traffic congestion, whose impact on city life cannot be understated.

The Level of Quality of Life in European Cities

The budgetary laws of many European countries (including Italy after 2016) introduced the need to assess public policies also as a function of their capacity to contribute to the well-being of citizens. Along these lines, the theme of environmental balance as an accounting system parallel to economic and financial accounting seems destined to be confirmed and to constitute a fundamental tool to guide local policies towards sustainable objectives.

However, calculating GDP is not sufficient to provide an exhaustive profile of the evolution of a society or a complex territorial system. This was evident at least starting with the publication of the final report from the commission charged by the Organisation for Economic Co-operation and Development (OECD) to define new rules to measure economic development and social progress (Stiglitz et al. 2009). In particular, the commission recommended measuring well-being by following a multidimensional approach that considered the subjective evaluation of citizens as much as parameters capable of simultaneously appraising environmental, social, and economic sustainability. In detail, the document proposed to integrate GDP with environmental and social indicators; establish an articulated, updated cognitive framework capable of favouring these correlations; monitor the phenomena of social polarization and the creation of inequalities; develop a European system to assess sustainable development; and introduce environmental and social themes in national accounting systems.

In line with confirming this new knowledge, inroads are being made on the need not only to harmonize the different accounting systems but also to develop specific indicators (Sustainable Development Goals, SDGs) to provide a reliable estimate of well-being and sustainable development (Bacchini et al. 2016).

It is also clear that the choice of indicators is not at all neutral and should be continually calibrated starting with careful consideration of the social/territorial context in which each parameter will be used. As the Food and Agriculture Organization of the United Nations (FAO) reminds us: "…indicators are selected to provide information about the functioning of a specific system, for a specific purpose" (Indicators—what are they? FAO 2002). These can constitute a useful tool for guiding political decisions and to evaluate the results of an urban policy or project provided that they are "…policy relevant, scientifically founded, readily implantable, and useful for planning purposes" (Hiremath et al. 2013).

For our research, the results of the Flash Eurobarometer 419 recently provided by the EU on the populations' perception of quality of life in European cities were also considered (European Commission 2016). In particular, the EU is dedicated to providing significant financial support to address the problems emerging from this survey, but has invited all actors and parties interested in urban development to implement a holistic approach in addressing the social, economic, cultural, and environmental challenges that cities are facing.

In the period 2014–2020, the Cohesion Policy will fall heavily in urban areas with about €15 billion worth of investments managed directly by city authorities to invest in the field of sustainable urban development. The study of current and planned urban policies and the analysis of how questions regarding the quality of life are perceived by the inhabitants of 80 European cities constitute an extremely useful starting point to direct our research. Not only, they also serve to delineate the field within which it is convenient to direct the study of indicators to estimate the urban and environmental performance of a determined territory and the level of well-being reached (or perceived) by the urban population or its main components.

At the beginning of 2016, the European Commission published the results of the Fifth Flash Eurobarometer on the "Perception of Quality of Life in European Cities". The survey was conducted in 79 European cities in all EU member states as well as Iceland, Norway, Switzerland, and Turkey. More than 40,000 people participated in the survey, which covered a rich range of urban problems.

The results of this survey were summarized in a report that did not make use of objective data or measurable indicators, but rather a qualitative approach based on the perception that citizens have developed of their "quality" of existence. This representation of urban welfare reflects a desire to describe the quality of life of an urban community with two complementary orientations: an objective approach based on manipulating data and indicators that can be measured concretely and a qualitative approach based on citizens' perception of living conditions (Pissourios 2013). One could naturally object that an evaluation of quality of life using qualitative methods can generate questionable results, but it is also true that if the quality of life were not perceived by citizens, it would not exist (Gavrilidis et al. 2016).

In contrast with previous years, this survey did not use socioeconomic indicators because it evaluated the level of satisfaction of European citizens with respect to various aspects of urban life: safety, air pollution, noise, public transport, health services, social services, education and training, unemployment, housing, and road infrastructures. Overall, the results of the survey indicate that European citizens are very satisfied with the place in which they live: in all cities (except 6) at least 80% of those interviewed said they were satisfied with living in their city. Some results show a positive trend compared to previous years, which is even more evident in the case of Eastern European cities that are trying to recover from a delay with respect to more advanced urban areas.

Respondents were also asked to identify the three most important issues for their city. The results show that most citizens consider health services, unemployment, and education to be the three most important problems. Other problems that emerge include housing, atmospheric pollution, mobility, public transport, and safety.

These results were also confirmed in a survey about quality of life that was recently carried out by Mercer; it likewise testifies to the high level of quality of life that now denotes European cities (Mercer 2016). This study assessed the local living conditions in more than 440 cities around the world. The conditions were analysed according to 39 factors grouped into 10 categories:

(1) Political and social context (political stability, criminality, law enforcement, etc.),
(2) Economic environment (foreign exchange regulations, banking services),
(3) Social/cultural environment (availability of media, limitations to personal freedom),
(4) Medical and sanitary aspects (medical provision, infectious diseases, quality of wastewater, waste disposal, atmospheric pollution, etc.),
(5) Schools and education (standards and availability of international schools),
(6) Public services and means of transport (electricity, water, public transport, traffic congestion, etc.),
(7) Free time (restaurants, theatres, cinemas, sports and leisure, etc.),
(8) Consumer goods (availability of food products/daily consumption, automobiles, etc.),
(9) Housing (rental units, appliances, furniture, maintenance services), and
(10) Natural environment (climate, record of natural disasters).

The score attributed to each factor allows systematic, objective comparisons between the cities to be made. For this reason, in contrast to the survey cited above whose interest was limited to substantially qualitative aspects, the report concludes by proposing an index for quality of life that allows the performance achieved by each urban area to be classified. Ultimately, the comparison made based on this indicator allows for confirmation that European cities continue to enjoy some of the highest quality of life in the world, filling seven of the top ten spots. Vienna continues to lead, followed by Zurich (2), Munich (4), Dusseldorf (6), Frankfurt (7), Geneva (8), and Copenhagen (9). In 69th place, Prague is the highest-ranked city in Central and Eastern Europe, followed by Ljubljana (76) and Budapest (77). The lowest levels of quality of life in Europe are seen in Kiev (176), Tirana (179), and Minsk (190) (Mercer 2016).

The Crisis in the Model of the European City

Given the above-mentioned data, one could conclude that the quality of life is not a problem for European cities. However, from a careful reading, the 2015 Eurobarometer survey shows, for example, that there are significant differences between European cities in ensuring the quality of life of their citizens. There is substantial disparity in the level of satisfaction, which is generally higher in Western Europe than in Eastern Europe regarding public transport, health services, educational services, the state of streets, and buildings in peripheral areas. An analogous break can be seen between countries in Northern and Southern Europe regarding public spaces, the extent of pedestrian areas, and the possibility of finding satisfying work. The level of satisfaction rebounds in the case of low-cost housing. In this case, there is a lot of dissatisfaction in Northern European capitals (especially in metropolitan areas such as Paris, London, and Berlin), in contrast to what is seen for Spanish cities or—limited to the trend seen since 2012—for Italian cities. With respect to the environment, a high degree of air quality is seen in 61 cities. Widespread concern is instead seen in Eastern Europe, although some cities are improving significantly, including Ljubljana, Prague, Miskolc, etc. The satisfaction for green areas is high in 64 cities and low in Southern Europe. Another question asked in the survey relates to satisfaction with climate policies that cities are carrying forward. In this case, the highest levels are seen in French cities, compared to the dissatisfaction revealed in seven European capitals, and growing satisfaction in some Eastern European cities (Kraków, Zagreb).

Even if the European continent reveals a variegated image in which important differences persist not only between Eastern and Western European cities but also between northern and southern cities, we should acknowledge that some models of city operation should be revised even in spite of these regional differences. This is the proposal contained in the European Commission Report "Cities of Tomorrow. Challenges, Visions, Ways Forward" from 2011 (European Union 2011), which intends to become a point of reference for those responsible for urban policies and operators involved in the sector of settlement transformations, not only on the local level but also on the regional, national, or European levels. The report maintains that the European model of urban development is in danger and that the tools necessary to address this emergency must be identified. The dangers in which the European urban development model would be found are the following:

- Demographic changes (ageing population, reduction in number of inhabitants, intense suburbanization).
- Economic crises (which can overwhelm many cities, in particular in Central or Eastern Europe and the old industrial cities of Western Europe).
- A welfare crisis (which has led to a slowdown in the ratio between economic growth, employment, and social progress and caused a large portion of the urban population to be excluded from the job market or forced to fall back on low-qualified and underpaid positions in the service sector).
- Economic segregation, whereby the poor are becoming even poorer and disparities are increasing within cities. Serious inequalities are seen in terms of available

housing, educational quality, unemployment, and the difficulty or inability to access some primary services (health, transport, etc.).

- Increasing social segregation, which in many cases shows the gradual withdrawal of the state from working to redistribute and rebalance wealth.
- Spatial segregation, which has led to the aggravation of ghettoization, pushing socially marginalized groups into peripheral areas.
- The progression of uncontrolled urban expansion, which, through the spread of low-density settlements, constitutes the main threat to sustainable territorial development (since public services are more costly and difficult to guarantee, natural resources are subject to overuse, public transport networks are insufficient, and the dependence on private transport is growing).
- Threats to the urban ecosystems caused by uncontrolled urban expansion or increased waterproofing of the land, which threatens biodiversity and aggravates the risk of flooding and drainage problems).

With respect to the criticalities registered in European cities, the report proposes to transform threats into opportunities, inviting decision-makers to follow new roads that, starting with the progressive integration of policies, can allow some particularly important objectives to be reached. These include:

- Creating a reactive, inclusive economy that is capable of guaranteeing a dignified life for subjects excluded from the job market
- Promoting socioeconomic, cultural, ethnic, and generational diversity as a source of innovation and resistance to globalization processes to ensure that cities of the future pay adequate attention to the needs of both elderly people and families
- Fighting territorial segregation and the waste of energy with better housing, not only to make the city and its parts more interesting and liveable but also more competitive and respectful of the environment
- Developing a global approach when addressing themes related to the environment and energy since the different components of the natural ecosystem are closely related to components of the social, economic, cultural, and political system of the city
- Providing attractive public open spaces and promoting more sustainable, inclusive, and healthy forms of mobility
- Demonstrating an awareness that small-medium cities play an important role not only for the well-being of inhabitants but also for the surrounding rural populations, especially where they promote balanced development of the territory, countering the depopulation of rural zones and the exodus towards large urban areas

Contributing to confirming this new orientation towards the urban crisis, the report advances governance models based on some basic principles:

- The need to guarantee substantial coherence between initiatives with territorial worth and local interventions. Each challenge, whether social, economic, or environmental, is not addressed only at the neighbourhood level but should also be projected to a wider territorial context. It is necessary to focus on complementarity between sector policies on the level of large agglomerations and metropolises and the social and cultural approaches that foresee the involvement and responsibility of citizens on the neighbourhood level.

– The need to ensure dialogue and cooperation between the territorial and administrative levels, as well as between sectors affected by urban development; it is necessary to provide fixed mechanisms of coordination alongside flexible mechanisms. It is therefore necessary to overcome the tension among different interests and reach a compromise among contrasting objectives and diverging models of development. To support this dialogue, it is necessary to have a shared vision.
– The need to practice an original predictive capacity, which is destined to become particularly important for managing transitions, overcoming conflicts and contradictions among the various planning objectives, and developing a better understanding of reality, the feasibility of transformations, and the possibility of effectively reaching the established objectives.

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Chapter 5
Selection of Indicators of Urban Sustainability and Quality of Life of City Inhabitants

Rosalba D'Onofrio, Massimo Sargolini, and Michele Talia

The quality of European landscapes and the quality of life of city inhabitants are closely related to economic, social, and cultural aspects that are manifest in time and space. This connection, interacting with the local economy, responds to the recreational, emotional, and spiritual needs and the sense of identity of the community, as the Mercer survey and Eurobarometer have highlighted. If our cities are unsustainable, as often happens, the urban landscape could/should become the litmus paper that allows the state of places to be synthetically interpreted and supports the delineation of indications to solve the problems (Benson and Roe 2007). When following this road, it is necessary to consider the technical aspects of sustainability policies—such as energy savings, recycling, environmental management, etc.—and non-technical aspects such as social behaviours and spatial organization. All of these aspects together, in addition to the way in which they interact, contribute to determining the characteristics of a given urban landscape and the quality of life of city inhabitants. The continuous "feedback" between sustainability and quality of the urban landscape and their interaction with the quality of life of city inhabitants have been the subject of numerous studies and reflections in the contemporary scientific panorama. In this respect, the 2010 book by Claudia Dinep and Kristin Schwab *Sustainable Site Design Criteria, Process, and Case Studies for Integrating Site and Region in Landscape Design* highlights how "…urban sustainability is fundamentally the sustainability of the urban landscape as a whole". In a 2004 essay, MacKendrick and Parkins maintained that the sustainability of the urban

R. D'Onofrio (✉) • M. Sargolini • M. Talia
School of Architecture and Design, University of Camerino, Ascoli Piceno, Italy
e-mail: rosalba.donofrio@unicam.it

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landscape could be defined as the capacity of a landscape system to generate and maintain conditions for a safe, harmonious, and adequate environment of life that respects ecosystems (MacKendrick and Parkins 2004).

If we consider the quality of the landscape as a synthetic indicator of city problems and the quality of life of its inhabitants, urban landscape planning and design should necessarily inspire a multidimensional and polyvalent change in the natural and built environment. This change then needs to be investigated and monitored over time; it will, in other words, be "evaluated". Redirecting a "diagnostic framework" of urban landscapes and also monitoring and verifying the possible achievement of the objectives of sustainability at the centre of attention means using indicators "capable" of reading, assessing, and evaluating the complexity, visualizing the phenomena and highlighting the tendencies (Rosales 2010). In this sense, it is necessary to:

1. Overcome a "vertical" approach that concentrates on specific disciplinary fields when choosing the indicators. With respect to the current framework of knowledge, the main areas of reflection show the need to address the complexity of urban sustainability and the urban landscape through a transdisciplinary approach, bridging the divisions between different areas of scientific knowledge. On the other hand, they show the need to bridge the strong persistent caesura between scientific/academic knowledge and other types of skills possessed by city users (citizens, professionals, public officials, etc.).
2. Use the indicators as descriptive tools that illustrate the state of an urban system. In this sense, specific objectives should be defined. As well, in moves to support public action, there cannot be a search for "optimal solutions", but the objective of "satisfactory solutions" should prevail (Simon 1976). It should therefore be recognized that there may be multiple solutions to a problem (Simon 1976; Faucheux et al. 1997) and that the search for the set of alternatives using the indicators of sustainability and quality of life should always remain open with respect to its reading and its possible implementation. This research can be considered an integral part of the evaluation process itself, becoming an efficient, effective guide in the search for solutions. An assessment made with systems of indicators does not necessarily produce a new project to be assumed as a model, but suggests guidelines to navigate the changing alternatives and the proper direction to take based on the different criteria and connections between the multiple categories considered.
3. Consider that, to evaluate policies, plans, and projects to improve the urban landscape and therefore the quality of life in the city, it is necessary to use some indicators that are not exclusively formally definable measurements. In other words, they should be able to relate to the people that use them (Miller and Patassini 2005), which also requires a different means of selection. This objective can be reached through the choice of a set of clear indicators that demonstrate and interpret the multiple elements and aspects of the quality of life in the city, considering the selection of indices and rating checklists that have been used on many occasions to ensure the efficiency and performance of urban systems.

4. Assess, based on policy objectives, the possibility of identifying an order of priorities in choosing between the possible alternatives. In fact, if data based on the performance of indicators can be analysed, maintaining an objective attitude based on the datum (indicator) and its characteristics, it is possible to assign weights to the different criteria to establish an order of importance. Through dimensionless numerical values, the weights measure the priority assigned to the various aspects of the problem with respect to the context, the specifics of the problem, and the actors involved. Based on different criteria, the choice of weights can be made by a decision-maker, a group of experts, or the community (in the case of participatory social choices).

A Set of Indicators to Test Urban Sustainability and the Quality of Life in the City According to the Landscape Point of View

The QLandQLife research identifies three large areas of investigation that represent the different "souls" of the urban landscape as a function of sustainability. These are "Distinctive and pleasant", "Efficient and nice", and "Clean and healthy".

The "Distinctive and pleasant" area regards the role of parks, open spaces, and green spaces (linear and pointlike) in the city and the immediate context in relation to the environmental infrastructures of the surrounding territory, slow paths, architectural and archaeological resources, centralities, and places in the collective identification of the city. The aim is to improve living activities and thus also activities related to work, residence, meeting, social relationships, and leisure.

The "Efficient and nice" area deals with the overall organization of the city and its energy needs on different building scales in relation to the urban and economic planning of the city and its territorial context. The objective is to improve building quality and open spaces through an overall reduction of energy consumption and a wider, smarter use of energy from renewable sources. In this case, the landscape perspective is joined by the energy perspective, which becomes the matter and structure of new landscapes. Working together, the two approaches break down and rebuild the multiple levels of interpretation and the different problems on which all the disciplines that affect the transformation of our living areas are based and operate.

The third area of research, "Clean and healthy", primarily investigates the themes of safety and the quality of the main components of the urban environment (air, water, land) on the different scales of city organization and in relation to the territorial context, the needs of living, the formal and overall compositional balances, and the individual buildings. The goal is to favour the reduction of all types of pollution and increase the quality of the urban environment. In this area of research, interaction with natural, biological, and Earth sciences is particularly close, and particular effort is made to favour agreements between and comparison of language and method.

Organized within these three large areas of research, the researchers involved in the QLandQLife research aimed to:

– Select some European research, programmes, and experiments that have been tested in an integrated manner to interpret the quality of life, the landscape, and the sustainability of European cities in recent years.
– Make an initial choice of the indicators of quality of life/quality of the landscape, deduced in large part from this research and in other cases from research identified based on the individual researchers' activities. In the system of evaluation used, the indicators may correspond both to quantitative variables, whose values are numerical, and qualitative variables, whose values correspond to categories, attributes, and the quality of the variable considered.

Research, Programmes, and Experiments of Reference for the QLandQLife Research

The list below presents the European research, studies, and applications in the field selected in order to identify the set of indicators chosen in the QLandQLife research to assess urban sustainability and the quality of life of city inhabitants according to the landscape point of view.

• PRIN "Qualità urbana e percezione della salute" [Urban Quality and the Perception of Health], 2004–2007[1]

This research is based on an innovative notion of urban quality deriving from the European Landscape Convention (ELC). The concept is capable of integrating and developing the different ideas of quality drawn from existing methods of evaluation referring to the environment, the landscape, and, specifically, the urban landscape. The ELC identifies the landscape as an "area, perceived by the people" and an "important part of the quality of life for people everywhere". In this perspective, the importance of the landscape in assessing the effects of a given project was echoed by Italian standard UNI 11109 on the study of environmental impact. This standard, in accordance with the ELC, affirms that in evaluating the effects of a project, the "landscape component (and its quality) is considered in its morphological and cultural aspects and its identity for the community". It seems evident that a more consolidated vision (in the discipline of territorial planning that bases assessments on quantitative criteria) is accompanied by a type of qualitative evaluation of the territory and the project.

For these reasons, the Research Project of National Interest (*Progetto di Ricerca di Interesse Nazionale*, PRIN research) identifies a system of indicators (74 total) that are deemed sufficiently effective in describing the quality of European urban

[1] The scientific coordinator of the research programme was Prof. P. Orlando from the University of Genoa.

reality in a landscape key, referring to parts of the city with a population of 4000–10,000 inhabitants. Each indicator is described starting from precise references and is accompanied by a sheet that reports the indications to allow a judgement to be passed (optimal, good, sufficient, insufficient), which is then translated into numbers. The PRIN research considered the existing systems of European indicators and those certified by international bodies to develop a specific set of indicators from a pointlike comparison with current research in the debate.[2] The indicators identified often express the simultaneous presence of factors for quantitative assessment (numerical quantities referring to physical parameters and/or measurable quantities such as density, surface area, etc.) together with qualitative factors based on perceptive/sensory parameters and disciplinary rules.

For clarity and organization, the indicators were grouped into four large areas of reference—architecture, environment and landscape, usability, and society—each organized into specific areas and a variable number of indicators. The area "environment and landscape" comprises the following aspects: views and panoramas, green spaces and vegetation elements, topographical and morphological aspects of the terrain, natural and seminatural areas, sensory quality, and environmental risks. The area "usability" includes the following aspects: logistics and traffic, density, parking, public transport, and local/pedestrian accessibility. The area "social" includes the following aspects: functions of collective interest, buildings of social interest, buildings of commercial interest, and meeting places. The "architecture" area encompasses the following aspects: settlement and morphological system, linguistics, typology, and urban furniture. The above-mentioned research was applied to the city of Lodi, from which we have taken cues to select the set of indicators referred to in the QLandQLife research.[3]

- *Urban Sustainability Indicators* "Plan Especial de Indicadores de Sostenibilidad Ambiental de Sevilla" *[Special Plan for Environmental Sustainability Indicators for Seville], Barcelona Urban Ecology Agency, 2008*[4]

The Spanish strategy for the sustainability of the urban environment saw the selection of a set of indicators to assess the sustainability of the city based on an urban model responding to the principles of compactness, complexity, efficiency, and social stability. In this context, the Urban Ecology Agency of Barcelona (BCN) developed a special plan to identify the indicators for the urban sustainability of the city of Seville. While the set was designed for the Andalusian capital, its content is

[2] CRISP (Construction and City Related Sustainability) Indicators; Agenda 21 Indicators Italian sites, etc.

[3] The research was published in Delsante I. (2007) (Ed.), *Rinnovo urbano, identità e protezione della salute*, Maggioli Editore, Rimini, and in some international journals, including Delsante I. (2016), "Urban environment quality assessment using a methodology and set of indicators for medium-density neighbourhoods: a comparative case study of Lodi and Genoa". In: *Ambient.* constr. Vol.16 no. 3 Porto Alegre July/Sept. 2016 at http://www.comune.lodi.it/PGT/vas/VAS%20-%20R3%20Indicatori%20Vivibilita.pdf.

[4] The set of indicators referred to in the QLandQLife research were derived from application to Seville. See http://www.ecourbano.es/imag/00%20DOCUMENTO%20ENTERO.pdf.

Table 5.1 Indicators/variables related to each management level

Above ground	Surface	Subsoil
– Energy collectors (thermal and photovoltaic) – Rain collectors – Domestic or city composting – Green roofs – Green façades and balconies – Large tree-covered areas – Urban diversity	– Thermal, acoustic, and lighting comfort – Access to public transport – Public housing – Business diversity – Introduction of communication technology in public spaces – Access to basic services – Access to green spaces – Quality public space – Green corridors	– Space for parking – Merchandise loading and unloading – Service tunnels – Recycling centres – Separate collection networks for residual and rainwater – Seasonal thermal energy accumulator – Spaces for trash collection

applicable to other cities in the Mediterranean. The plan encompasses a wide set of indicators whose use is twofold: they serve as a tool for new urban planning and are used to analyse the current state and to establish pertinent diagnoses. According to this special plan, the ideal scale to address the sustainability of the urban space is the micro-scale, which is intermediate between the building scale and the city scale. The neighbourhood scale seems the most appropriate for the goals of resolving urban problems because it offers greater ease of negotiation among authorities, associations, citizens, and businesses. The model proposed by the BCN theorizes the organization of the urban space on three levels, above ground, surface, and subsoil, which are related to and sometimes conflict with each other. Each level contains variables that play a determining role in influencing the urban metabolism and the quality of life in the city (Table 5.1).

The indicators of sustainability identified assess the degree of adaptation to the "model of the city", both at the beginning of urban reorganization actions (planning) and again once the actions have been realized and executed (use and management). The indicators parameterize the degree of adaptation to a more sustainable model of the city based on the following principles:

– Compactness and functionality
– Complexity
– Efficiency
– Social cohesion
– Management and governance

The parameterization varies according to the place of analysis (dimensions, existing fabrics, new construction, etc.). There are 35 indicators used, organized into the following groups:

1. Urban morphology
2. Public spaces and comfort
3. Mobility and services
4. Urban organization
5. Urban metabolism

6. Biodiversity
7. Urban cohesion
8. Guiding function of sustainability

Assessment of the indicators' degree of conformity influences the sustainability of the given urban model according to three levels of performance: (1) in line with the levels of the sustainable city; (2) not completely satisfactory, but close to the levels of the sustainable city; and (3) not satisfying the conditions of sustainability. For each indicator, the following are provided: lines of action (description of the urban components and objectives), the conceptual framework, and the methodological path (cartographic data, calculation procedures, results).

- *CAT-MED Indicators, Sustainable urban models. MED Programme, 2007–2013*

Launched in May 2009, the CAT-MED project (Change Mediterranean Metropolises Around Time) aims to prevent risks tied to climate change by promoting a sustainable, compact, and multifunctional urban model. It includes the cities of the Agglomeration Community of Pays d'Aix, Athens, Barcelona, Genoa, Malaga, Marseilles, Rome, Seville, Thessaloniki, Turin, and Valencia, as well as the Institute for the Mediterranean, which provides technical support to the partners.

On the one hand, the research proposed to identify and quantify common objectives through indicators. On the other hand, it aimed to define a shared, operational model for the sustainability of Mediterranean cities, which allows urban behaviours to be modified in order to reduce the impact of climate change and improve the life of city inhabitants. It is structured in successive phases:

– Identification of common indicators for the four pillars of sustainable development (environment, economy, society, territory) and its government, as well as the optimal values
– Development of tools to assess metropolitan actions

The results of the pilot study were translated into solutions on a common vision of sustainable urban development that contributes to preventing natural risks related to climate change, common actions to concretize this vision and its shared principles of activation.

The proposal for intervention on urban models activated within the CAT-MED project is organized into three key concepts: compactness, complexity, and proximity to basic services. These concepts, which are related to the urban configuration and more generally to city models, act as references to define the lines of work in the CAT-MED project, allowing paths to be established to lead Mediterranean cities towards sustainability.

In this path, a determining role is represented by the identification of a set of common indicators of sustainability. The definition of a common system of urban indicators of sustainability allows the evolution of the urban areas to be understood over time, i.e. whether the desired levels of sustainability are being achieved or not. The set of indicators was developed together with the partner cities and organized

Table 5.2 CAT-MED indicators

Territorial management and urban design	– Population density – Urban compactness – Urban complexity – Green zones and recreation areas – Green zones and recreation areas proximity
Mobility and transport	– Traffic modal split – Proximity of public transport stops – Proximity to bicycle lanes and paths – Tourist frequency rates – Percentage of pedestrian streets and walkways – $C0_2$ emissions
Natural resources management	– Energy consumption – Water consumption – Waste management and removal – Air quality – Noise pollution
Social and economic cohesion	– Proximity to basic services – Social housing ratio – Labour force participation and unemployment rate – Evolution of the tourist frequency – Environmental activities in primary school

around four main axes: territory and city configuration, mobility and transport, natural resources management, and social and economic cohesion (Table 5.2). The indicators were grouped into a single geographic information system (GIS) with the aim of enabling comparative analysis to reach objectives for effective action against climate change and to understand the position of each city and/or district with respect to the optimum values of the indicators.[5] The indicator sheets include the following fields: concept, relevance, requirements, method, calculation, range of desired values, and main results obtained.

- *SUSTAIN Interreg IV C, 2012*

The objective of SUSTAIN is to create a fully implementable operational tool that is capable of aiding communities and administrations on the European coasts to achieve sustainability in coastal areas. The project developed a method based on a set of indicators and a system of measurement that allows local and regional authorities to self-evaluate sustainability, with the goal of improving the management of coastal areas. The tool can be used by all 22 members of the European Union. Survey indicators covering 22 different themes were selected from within the four pillars of sustainability: governance, economy, environment quality, and social well-being. Main (or fundamental) indicators and optional indicators were identified to reflect the specific local conditions that can vary among the different European regions. A control checklist was used for the governance pillar instead of

[5] The CAT-MED set of indicators (23 total), which the QLandQLife research refers to, are available at http://www.catmed.eu/indicators.

the indicators, which are difficult to measure. Data related to the indicators were inserted within a recently developed operational tool called DeCyDe. This is a calculational—and therefore easy to use—sheet that allows for numerical evaluation of the basic indicators, to permit self-assessment and determine if the administration is proceeding towards sustainable development. The activation of the tool is realized through participatory working meetings during which discussions related to themes, indicators, and data have the same importance as the numerical value obtained.[6]

- *URGE, Urban Green Environment European Commission, DG Research, Key action: Cities of tomorrow and the cultural heritage, March 2001–February 2004*

The URGE project (Urban Green Environment—Development of Urban Green Space to Improve the Quality of Life in Cities and Urban Regions) developed social, economic, ecological, and managerial criteria to assess and develop green urban spaces (Table 5.3). The information produced represents important input for knowledge and actions aimed at improving the quality of existing green areas and identifying efficient design and management strategies for the urban landscape. The originality of the approach in this research lies in the centrality attributed to the multifunctional nature of green areas and the interdisciplinary characteristics

Table 5.3 Criteria proposed by the URGE project

Criteria	Indicators
Ecological criteria	Fragmentation Level of protection Biodiversity Pollution and air quality Hydrology—drainage capacity
Social criteria	Quality of life Health and well-being Education and skills development Community and a sense of local identity Safety and social inclusion Sport and recreation Support, management, and financial resources
Economic criteria	Employment Food production Property value Tourism and events Acoustic and visual barriers
Management criteria	Legislative aspects Planning tools and regulations Integration with other policies Interdisciplinary team

[6]The families of indicators identified (34 main indicators) can be downloaded from http://www.sustain-eu.net/what_are_we_doing/sustain_indicator_set.pdf.

required to address it. The criteria used by the research to select the indicators relate to ecology, society, economics, and management.[7]

- *PROPOLIS Indicators, Planning and Research of Policies for Land Use and Transport for Increasing Urban Sustainability (5th RTD Framework Programme), 2000–2003*

The objective of this research was to assess different strategies for urban sustainability and demonstrate their long-term effects on European cities. To reach this goal, a set of indicators (35) was selected based on their relevance, representativeness, political sensitivity, and prediction of the future. They fall within three categories regarding the fundamental aspects of sustainability: the environment, the society, and the economy (Table 5.4). The results of the indicators were deduced via different methods, including a judgement value, a value of economic assessment, and a value based on a GIS-raster system. To assess the policies, both the multi-criteria method and the cost-benefit method were used. The first is used to evaluate the environmental and social dimensions, while cost-benefit analysis was used to assess the economic dimension.[8]

- *ARPA Indicators, Emilia-Romagna,* "Ecosistema Urbano di Piacenza. Verso un Rapporto di Sostenibilità" *[Urban Ecosystem of Piacenza. Towards a Degree of Sustainability], 2009*

The object of this proposal, drafted by the Regional Agency for Environmental Protection (*Agenzia Regionale per la Protezione dell'Ambiente*, ARPA) in the Bologna and Piacenza sections of the Emilia-Romagna region of Italy, was to provide a set of indicators that could be used to evaluate the sustainability of socioeconomic and environmental conditions of an urban area. Based on some reflections taken from the literature (in particular Odum (1971, 1993), Ricklefs (1983), etc.), the proposal maintains that it is no longer useful to continue to read environmental processes to the detriment of social and economic processes. This is because in an urban context, the relationship between people's social life and the environment in which they operate is particularly intense. This leads to the choice to move the point of observation and introduce two dimensions of investigation: social and economic and environmental.

In order to form a picture of the state and the relationships among the dimensions of each possible area of study, but also to evaluate their evolution over time, a specific set of indicators (Table 5.5) was sought in order to:

- Assess conditions and processes, especially as a function of specific objectives.
- Monitor the efficacy of policies and actions.
- Compare places and situations.
- Anticipate future conditions and processes.

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[7] The families of indicators selected can be found at https://www.yumpu.com/it/document/view/42906895/icc-a-catalogo-interdisciplinare-dei-criteri-checklist-dei-urge.

[8] See http://www.spiekermann-wegener.com/pro/pdf/PROPOLIS_Final_Report.pdf.

Table 5.4 PROPOLIS indicators

	Theme	Indicator
Environmental indicators	Global climate change	• Greenhouse gases from transport
	Air pollution	• Acidifying gases from transport • Volatile organic compounds from transport
	Consumption of natural resources	• Consumption of mineral oil products, transport • Land coverage • Need for additional new construction
	Environmental quality	• Fragmentation of open space • Quality of open space
Social indicators	Health	• Exposure to PM from transport in the living environment • Exposure to NPO_2 from transport in the living environment • Exposure to traffic noise • Traffic deaths • Traffic injuries
	Equity	• Justice of distribution of economic benefits • Justice of exposure to PM • Justice of exposure to NO_2 • Justice to exposure to noise • Segregation
	Opportunities	• Housing standard • Vitality of city centre • Vitality of surrounding region • Productivity gain from land use
	Accessibility and traffic	• Total time spent in traffic • Level of service of public transport and slow modes • Accessibility to city centre • Accessibility to service • Accessibility to open space
Economic indicators	Total net benefit from transport	• Transport investment costs • Transport user benefits • Transport operator benefits • Government benefits from transport • Transport external accident costs • Transport external emissions costs • Transport external greenhouse gases costs • Transport external noise costs

The proposed methodology also seeks to comment on data trends, the possibility of clarifying, analysing, and evaluating the relationships among the indicators in the view of the DPSIR model. The set of indicators refers to the indicators in the European Common Index project and are integrated with further specific indicators characterizing the urban ecosystems. The chosen indicators satisfied the requirements of being

Table 5.5 Emilia-Romagna ARPA families of indicators

41 indicators pertaining to the social and economic dimensions subdivided into the following classes:	• Demographic dynamics (5) • Accessibility to public green areas and local services (4) • Mobility and transport (12) • Economic well-being and the social equity of businesses (7) • Number of businesses with environmental certification (2) • Sustainable behaviour of the public administration (1) • Health and safety (5) • Education (3) • Information and participation (3)
39 indicators of the environmental dimension subdivided into the following classes:	• Energy consumption (5) • Local contribution to global climate change (3) • Local air quality (2) • Quality of water resources (8) • Waste production and management (4) • Noise pollution (5) • Radiation (4) • Sustainable use of the territory (5)

synthetic and rationalizing the use of resources, facilitating the integration of the two dimensions, communication and the usability of data not only when interacting with specialists but also with all citizens.[9]

- *Lagrange Project Indicators, ISI-CRT Foundation Implementing a web-based system to monitor complex urban transformations through indicators* (2014)

The Lagrange research proposed the definition of a synthetic index of urban and territorial quality (*Indice sintetico della qualità urbana e territoriale*, IQUT), which was constructed by merging and weighing indicators chosen from the literature.[10] Urban and territorial quality was analysed while closely focusing on the theme of environmental sustainability and territorial cohesion. By interpreting the reflections proposed within political/institutional and scientific debates, seven characteristics of urban and territorial quality were identified:

- Landscape
- Environment
- Urban planning and mobility
- Architecture and energy

[9] The set of indicators identified can be downloaded from https://www.arpae.it/cms3/documenti/ecosistemi/allegato_ecosistemaurbano.pdf.

[10] The indicators can be downloaded from http://www.valutazioneitaliana.it/contents/pagine/68/allegati/445982460Paper_AIV2014_SilviaBIGHI.pdf.

– Society, culture, and education
– The economy
– Services and public spending

For each of these seven characteristics, some specific "factors of sensitivity" were identified for the purposes of filtering/guiding the choice of indicators. The 87 indicators selected from within the scientific literature and institutional documents refer to the seven characteristics of urban and territorial quality:

– 13 indicators for landscape
– 6 for the environment
– 21 for urban planning and mobility
– 6 for architecture and energy
– 21 for society, culture, and education
– 9 for the economy
– 11 for services and public spending

List of Indicators Selected

Starting with the research, projects, and experimentation listed above, the QLandQLife research selected a group of indicators useful for evaluating the quality of life in the city and urban sustainability according to the landscape view. As illustrated in the next chapter, the indicators were used to apply a transdisciplinary approach by constructing a model that considers the connections and existing relationships between the different aspects of the urban landscape. The goal is not to use such indicators individually but rather to identify their mutual correlation and adaptability to the contest under study (parameterization process).

The selection of indicators within the set of indicators identified by the different research and studies examined was made based on the following criteria:

1. *Representativeness*: the chosen indicators were grouped into three large areas in order to completely represent the different characteristics of the urban landscape: "Distinctive and pleasant", "Efficient and nice", and "Clean and healthy".
2. *Relevance*: the chosen indicators were recognized as being representative and appropriate for describing the multiple aspects, sustainability, and quality of life of city inhabitants.
3. *Predictability*: there are a large number of indicators used for evaluation, but given that the objective is to assist planning, it is necessary to consider only those indices that are truly capable of predicting the impacts of any proposed interventions.
4. *Measurability/assessability*: it is important to guarantee that each indicator can be measured and evaluated. A tool is proposed that can be used to judge not only existing situations but also projects on the master plan scale. It is therefore necessary to avoid indices that would require a design scale that is too small, thus creating a problem of acquiring data.

To build the set of indicators used to construct the decision-support system (DSS), with reference to the three areas of landscape investigation mentioned above, families of indicators referring to the different aspects of the urban landscape and capable of influencing the quality of life of city inhabitants were identified.

For the *Distinctive and pleasant* area, the families of indicators chosen for reference are:

1. Landscape ecology, green spaces, and physical morphology
2. Landscape perception
3. Urban form and identity
4. Gathering spaces
5. Sociocultural aspects

For the *Efficient and nice* area:

1. Uses and forms of the city
2. Metabolism and urban comfort
3. Degradation and land consumption
4. Social and economic aspects
5. Usability, accessibility, public transport
6. Quality of spaces and public services

For the *Clean and healthy* area:

1. Biodiversity and natural resource management
2. Air and water quality and management, energy consumption
3. Natural and man-made risks
4. Waste collection and management
5. Safety

A total of 130 indicators were chosen: 36 for the *Distinctive and pleasant* area, 29 for the *Efficient and nice* area, and 56 for the *Clean and healthy* area. To better understand the meaning of each indicator, a table is provided that summarizes all of the selected indicators according to area and family. For each indicator, the table specifies the source reference, description, the data necessary to apply it, the method of calculation, the unit of measurement, and the possible reference values to consider (thresholds; see Attachment 1).

Other Indicators Useful for Evaluation

By analysing the state of the art, the QLandQLife research also made use of other research, from which other indicators useful for an initial numerical analysis of the QLandQLife model were chosen. One aspect investigated was urban compactness. This measure, which is related to urban compactness, assesses the intensity of land use with respect to the volumes and settlement density. The choice was therefore made to examine the spatial distribution of the built area for homogeneity and density of the existing volumes, thereby evaluating the degree and means of using the area under study with respect to the volumetric intensity of the built area and the distribution of buildings. To estimate the compactness of the fabric, the sky view factor (SVF) was computed, which compares the width of the street or the open space (*W*) with the height of the surrounding buildings (*H*):

$$\mathrm{SVF} = \mathrm{H} / \mathrm{V}$$

On the other hand, to estimate the density of existing volumes, the compacity, *C*, was used (Salat and Nowacki, 2010), which yields a distribution of the present building volume on the territory. The average index of compacity can be evaluated directly from the average of the compacity of the buildings in question with the expression.

$$\sum_{buildings} = \frac{\mathrm{A_{ext}}}{\mathrm{V_b^{2/3}}}$$

The advantage of this coefficient with respect to the more traditional ratio of the external area of the walls to the building volume (A_{ext}/V_b) is that it is dimensionless and gives greater importance to large buildings than to small ones. This index allows building types with a lower degree of compacity to be highlighted; these have a greater effect on land consumption and also represent the thermal energy loss of the volumes considered.

Another index selected to represent land permeability was the building impact reduction (*Riduzione Impatto Edilizio*, RIE) index, an environmental quality index that serves to certify the quality of the building intervention with respect to land permeability and green areas.

This is formally expressed as a ratio between the green and nongreen surfaces.

$$\mathrm{RIE} = \frac{\sum_{i=1}^{n} SVi \frac{1}{\Psi_i} + (Se)}{\sum_{i=1}^{n} SVi + \sum_{j=1}^{m} S_{ij} \Psi_j}$$

where:

RIE = index of building impact reduction
Svi = i^{th} permeable, impermeable, or sealed green surface
Sij = j^{th} permeable, impermeable, or sealed nongreen surface
ψi = i^{th} outflow coefficient
ψj = j^{th} outflow coefficient
Se = equivalent tree-covered surface area

Annex A: Distinctive and Pleasant

CAT.	Indicator	Reference system	Description	Required data	Calculation method	Unit	Threshold
1.1. Landscape ecology, green spaces, physical morphology	1. Permeability	**BCN**	Level of impervious surfaces and their impact on the occupied territory	IP = index of permeability; Ft = surface-type factor; At = area of the type of surface; *S* = surface of reference	IP = [*S*(Ft × At) (m^2)/At (m^2)] 100 (*) (*) of the analyzed area	%	Min. 30%
	2. Presence of trees in public space divided by built surface area	**BCN**	Quantity of trees present per unit of area analyzed	Da = presence of trees; *n* = number of trees; Sc = built surface area	Da = *n*/Sc	n/m^2	Min 1/20 m^2
	3. Tree-lined boulevards	**BCN**	Length of tree-lined boulevards in relation to the length of the streets	Va = tree-lined boulevards; Lc = length of green corridors; Ls = length of street section	Va = [Lc/Ls] · 100	%	Va ≥ 20%
	4. Citizen accessibility to green spaces	**BCN**	Measures the area served by green spaces in relation to their extent	AccV = accessibility to green spaces; Ai = distance of influence of green spaces; AV = area served by green spaces; Atot = total area	AccV = (AV/Atot) · 100	%	Green space >1000 m^2 at <200 m (on foot) Green space >5000 m^2 at <750 m (on foot) Green space <1 ha at <2 km (by bike) Green space >10 ha at <4 km (public transport)
	5. Proximity to green urban corridors	**BCN**	Measures proximity of the area to a green urban corridor	Sections of street with access to the green urban corridor (linear metres)/100 linear metres	(linear metres)/100 linear metres	m	Up to 600 m

	6. Morphological structures with landscape importance that can influence the quality of spaces	**PRIN**	Assesses pertinence or contiguity of the site to a system of geomorphological interest typical of the specific place	Landscape assessment of the current and designed states	Qualitative judgement	Scale from insufficient to optimal	OPTIMAL: Presence throughout the site with positive influence GOOD: Concentrated presence within the site with positive influence SUFFICIENT: Concentrated presence within the site but uninfluential INSUFFICIENT: Presence throughout the site with negative effects
	7. Presence of areas for landscape/ environmental use	**PRIN**	Assesses the quality of a place according to the presence of routes of architectural and landscape value	Landscape assessment of the projects	Qualitative judgement	Scale from insufficient to optimal	OPTIMAL: Widespread presence with high interest GOOD: Concentrated presence with high interest SUFFICIENT: Concentrated presence with medium interest INSUFFICIENT: Concentrated presence with low or no interest
	8. Presence of areas with natural or landscape interest	**PRIN**	Assesses the presence and extent of areas of natural or non-anthropized landscape interest	Landscape assessment of the projects; SIC; ZPS; Agenda 21	Qualitative judgement	Scale from insufficient to optimal	OPTIMAL: Widespread presence with high interest GOOD: Concentrated presence with high interest SUFFICIENT: Concentrated presence with medium interest INSUFFICIENT: Concentrated presence with low or no interest
	9. Presence of environmental islands	**PRIN**	Assesses the presence and quality of urban environmental islands, i.e., areas with a unique architectural and urban-planning design aimed at optimizing the use of spaces for biking and walking	Landscape assessment of the projects; Agenda 21, etc	Qualitative/ quantitative judgement	Scale from insufficient to optimal	OPTIMAL: Widespread presence over >40% of the site GOOD: Widespread presence over 30–40% of the site SUFFICIENT: Widespread presence over 20–30% of the site INSUFFICIENT: Low, concentrated presence over <20% of the site or complete absence

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	10. Presence of ecological areas (green permeable agricultural areas)	**PRIN**	In this case reference is made to the presence of agricultural areas in peri-urban bands around the city. The presence of such areas is a parameter of quality since the landscape is viewed as a vector to create new identities and forms of appropriating the places	Landscape assessment of the projects; Agenda 21, etc	Qualitative judgement	Scale from insufficient to optimal	OPTIMAL: Widespread presence of ecological areas over >20% of the site GOOD: Widespread presence of ecological areas over 15–20% of the site SUFFICIENT: Widespread presence of ecological areas over 10–15% of the site INSUFFICIENT: Total absence of ecological areas
	11.Presence of plant species that can influence the living quality of the area	**PRIN**	Assesses the presence of plant species that stimulate or activate the senses (through shape, scent, or colour) to arouse a sense of recognizability in users	Vegetation quality around social buildings—18 indicator system for CGSP and choice of demolition or renovation	Qualitative judgement	Scale from insufficient to optimal	OPTIMAL: Consistent presence of numerous plant species with high recognizability/variety GOOD: Presence of numerous plant species but in limited, circumscribed places SUFFICIENT: Presence of widespread plant species but lacking recognizability/variety INSUFFICIENT: Absence of plant species
	12. Fragmentation	**URGE**	Measures the fragmentation of green spaces. Relationship between the area of patches divided by their circumference or perimeter	AP = Area of patches C o P = circumference or perimeter	F = AP/C o P	Scale from lacking to good	<0.07 Lacking 0.07–0.10 Average >0.10 Good

	13. Isolation of urban green areas	**URGE**	Measures the level of isolation of green areas in the city	*D* = Average distance between patches (inter-patch distance)	m	Scale from scarce to good	Good: <500 m Moderate: 500–1000 m Scarce: >1 km
	14. Connectivity	**URGE**	Assesses the capacity of the green urban system to increase the migration of species between green patches	*C* = Number of existing connections	No.	Scale from none to optimal	No connectivity: 0 Modest connectivity: 1–2 Good connectivity: 3–5 Optimal connectivity: >5
	15. RIE—Index of building impact reduction	**SAAD—City of Bolzano**	An index of environmental quality that certifies the quality of the building intervention with respect to land permeability and green areas	*Svi* = *i*th surface area that is permeable, impermeable, or marked "treated as green" *Sij* = *j*th surface area that is permeable, impermeable, or marked "not treated as green" ψ_i = *i*th outflow coefficient ψ_j = *j*th outflow coefficient Se = Equivalent tree-covered surface area	$\dfrac{\sum_{i=1}^{n} SVi \dfrac{1}{\Psi_{\mathrm{i}}} + (Se)}{\sum_{i=1}^{n} SVi + \sum_{j=1}^{m} S_{ij} \Psi_j}$		Limiting values for surface areas: https://www.comune.bolzano.it/UploadDocs/3180_Nuove_Schede_superfici_RIE_Ital.pdf

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	16. Territorial Biopotential (BTC)	**SAAD—Arpa**	An indicator of the state of energy metabolism of vegetation systems. Represents the capacity of an ecosystem to conserve and maximize energy use, capable of identifying the evolution/involution of the landscape in relation to the degree of conservation, recovery, or transformation of the environmental mosaic	Land-use map	Calculation of the surface area for individual areas in m^2	$Mcal/m^2$ of territory for each type of use	A (low) Prevalence of systems with energy subsidies (industries and infrastructure, built areas) or with low metastability (bare areas, rocky outcrops) $\ll 0.5$ B (average-low) Prevalence of agricultural/technological systems (pasture or arable land, sparse building), natural degraded biotopes or those with average resilience (wild grasses, sparse shrubs, treeless riverbanks) 0.5–1.5 C (average) Prevalence of seminatural agricultural systems (arable land, grasslands, orchards, vineyards, hedges) with average metastability 1.5–2.5 D (average-high) Prevalence of natural biotopes with average resistance and metastability (climate-adapted shrubs, pioneer species, rows of plants, urban green areas, reforestation, tree farms, poplar plantations) 2.5–3.5 E (high) Prevalence of biotopes without energy subsidies, seminatural (forests, copses) or natural areas with high resistance and metastability (low plain and foothill forests, humid zones) $\gg 3.5$
1.2. Landscape perception	1. Presence of areas of landscape/ environmental use	**PRIN**	Assesses the quality of a place according to the presence of routes of architectural and landscape value	Landscape assessment of the current and designed states	Qualitative judgement	Scale from insufficient to optimal	OPTIMAL: Widespread presence with high interest GOOD: Concentrated presence with high interest SUFFICIENT: Concentrated presence with medium interest INSUFFICIENT: Concentrated presence with low or no interest

	2. Presence in panoramic views	**PRIN**	Assesses the quality of the landscape perceived from residences present in the study area	Landscape assessment of the current and designed states	Qualitative judgement	Scale from insufficient to optimal	OPTIMAL: Presence in important panoramic areas, presence of panoramic sites of particular interest GOOD: Presence in panoramic areas with a limited number of views, but interesting for their originality SUFFICIENT: Presence in panoramic areas that are interesting but compromised by careless human intervention on the landscape INSUFFICIENT: Presence in panoramic areas of low landscape interest
	3. Presence of elements that impact the visual quality of the study area (perception of the site)	**PRIN**	Assesses the weight of elements that negatively influence the value of the landscape containing the study area, e.g., viaducts or general infrastructures lacking adequate landscape insertion, oversized buildings, decommissioned areas, etc	Landscape assessment of the current and designed states	Qualitative judgement	Scale from insufficient to optimal	OPTIMAL: Total absence of detracting elements GOOD: Presence of detracting elements that can be circumscribed and partially mitigated and which, due to their location and/or size, can be overlooked in the view SUFFICIENT: Presence of a few small detracting elements INSUFFICIENT: Consistent presence of detracting elements

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	4. Presence of elements that detract from the visual relationship with the context (obstructions, perception from the site)	**PRIN**	Assesses the weight of elements found outside the study area that are perceived as factors detracting from the landscape quality of the site	Landscape assessment of the current and designed states	Qualitative judgement	Scale from insufficient to optimal	OPTIMAL: Total absence of detracting elements GOOD: Irrelevant presence of detracting elements that can be overlooked in the viewing impact due to location and/or size SUFFICIENT: Presence of a few small detracting elements INSUFFICIENT: In this case the presence of detracting elements is numerically important, such that they cannot be overlooked, even if they are small
	5. Perceptibility of the site from streets	**PRIN**	Assesses the visibility and therefore the recognizability of places such as streets and railways from which the perception of the study area should be immediate given the speed of travel	Landscape assessment of the current and designed states	Qualitative judgement	Scale from insufficient to optimal	OPTIMAL: Clear recognizability of the set of distinctive elements within the site, with resulting well-being due to the user's optimum orientation GOOD: Clear recognizability of some distinctive elements within the site, with resulting well-being due to the user's optimum orientation SUFFICIENT: Recognizability compromised by multiple signs but still present INSUFFICIENT: Recognizability compromised by multiple signs that cause user disorientation
1.3. Urban form and identity	1. Building density	**SAAD** Meta Berghauser Pont and Per Haupt (2011)	Describes the building intensity. Relates the amount of built surface area to the total surface area considered	De = building density; Slp = gross paved surface area; St = territorial surface area	De = Slp/St	m^2/m^2	–

	2. Settlement mix	**PRIN**	Assesses the distribution uniformity of different functions present within the study site	Assessment of the current and designed states	Qualitative/ quantitative judgement	Scale from insufficient to optimal	OPTIMAL: 30% of the site destined for functional mixing; historical centres with widespread commerce and services, zones with complex, multi-functional urban restoration, parks and villas of historical/environmental interest where tourist, residential, or service designations are permitted; former urban industrial areas converted into commercial areas. Traffic in the areas is well organized in a hierarchical network of streets GOOD: 20–30% of the site destined for functional mixing; historical centres with widespread commerce and services, zones with multi-functional urban restoration, parks and villas of historical/environmental interest where tourist, residential, or service designations are permitted; former urban industrial areas partially converted into commercial areas. Traffic in the areas is well organized in a hierarchical network of streets SUFFICIENT: 10–20% of the site destined for functional mixing; historical centres with limited areas for commerce and services concentrated in a few dedicated structures, residential areas being completed or expanding with limited, concentrated parts destined for services. Traffic in the areas is limited, even if the road network is not completely hierarchical INSUFFICIENT: 0–10% of the site destined for functional mixing; settlement mix with reduced non-residential functions and/or concentrated in limited structures on the site. Congested traffic concentrated near the structures

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	3. Elements of the historical settlement structure and consistency of the historical/monumental heritage	**PRIN**	Assesses the presence and importance of elements of the historical/ architectural heritage to the territory in question	Assessment of the current state	Qualitative judgement	Scale from insufficient to optimal	OPTIMAL: Presence of historical/monumental heritage and persistence of traces or plans, or persistence of traces or plans GOOD: Presence of historical/monumental heritage, without persistence of traces or plans SUFFICIENT: Presence of historical/monumental heritage with prevalence of minor works, without traces or plans INSUFFICIENT: Absence of historical/ monumental heritage
	4.Skyline: recognizability and symbolic value	**PRIN**	Assesses the quality of a place as a function of the recognizability of its formal structures	Assessment of the current and designed states	Qualitative judgement	Scale from sufficient to optimal	OPTIMAL: High architectural quality of the individual elements that define the skyline, as well as the entire skyline, which provides a clear, formally recognizable image of the settlement GOOD: High architectural quality of the individual elements that strongly characterize the city but which are not strongly represented in the city as a whole SUFFICIENT: Recognizability of the urban landscape readable as a whole. In this case, the urban landscape arouses a sense of belonging due to the visual relationships and architectural quality of the individual cases inserted within a fabric that however lacks an identity
	5. Presence of buildings characterized by particularly prestigious architectural solutions (e.g., lesser architecture) or qualifying contemporary architectural elements for the urban context of reference	**PRIN**	Assesses the presence within the site of places or recognizable elements. High construction prestige for the architectural solutions used	Assessment of the current and designed states	Qualitative/ quantitative judgement	Scale from irrelevant to optimal	OPTIMAL: Consistent presence (>20% architectural heritage) GOOD: Discrete presence (10–20% architectural heritage) SUFFICIENT: Reduced presence (5–10% architectural heritage) IRRELEVANT: Irrelevant presence (<5% architectural heritage) or absent

	6. Presence of structures with architectural characteristics that are inappropriate for the urban context—detracting elements from the language point of view	**PRIN**	Assesses the negative influence that elements with architectural/construction characteristics inappropriate for the context have on the area in question	Assessment of the current and designed states	Qualitative/quantitative judgement	Scale from irrelevant to optimal	OPTIMAL: Absence of detracting buildings or irrelevant presence (<5% architectural heritage) GOOD: Reduced presence (5–10% architectural heritage) SUFFICIENT: Discrete presence (10–20% architectural heritage) IRRELEVANT: Consistent presence (>20% architectural heritage)
	7. State of housing conservation—degree of global maintenance of buildings and the historical/cultural heritage	**PRIN**	Assesses the state of conservation of structures present within the site in question	Assessment of the current and designed states	Qualitative/quantitative judgement	Scale from insufficient to optimal	OPTIMAL: Functional buildings in optimal state of conservation, new construction, or recently restored/recovered buildings GOOD: Functional buildings in good state of conservation excluding new constructions or those recently restored/recovered SUFFICIENT: Functional buildings without important superficial instabilities and with localized, reduced presence (<5% architectural heritage) of buildings requiring recovery/restoration INSUFFICIENT: Functionally obsolete buildings, but which can still be used with exclusively superficial instabilities; functionally unusable or abandoned buildings with superficial and structural instabilities

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	8. Overall colour impact, identification of façade colour with local tradition, and overall building harmony (materials, paving, openings, proportions)	**PRIN**	Assesses the quality of a site in reference to the pertinence of finishing materials to the building tradition of the place in which they are used (colour and type of materials)	Assessment of the current and designed states	Qualitative judgement	Scale from insufficient to optimal	OPTIMAL: Optimal overall harmony of buildings that enhances the compositional characteristics and urban decor of individual buildings and their combination, protection of the material and colour qualities of traditional materials and techniques, use of archival colours compatible with the urban and environmental context; building façades that are organically uniform for their type and construction chronology from a chromatic point of view, free of differences between treated and non-treated parts with the use of adequate similar hue scales; non-uniform building façades pertaining to structures that are not organically consolidated, chromatically distinct but with similar historical and constructive characteristics, but free of excessive light and dark or colour contrasts Correlation between buildings without excessive chromatic uniformity, gaudy differentiation, or interruptions with showy chromatic incidences in the hierarchy between serial and monumental buildings GOOD: Good overall harmony of buildings that protects the material and colour quality of traditional materials and techniques with the use of colours that are not necessarily archival, but compatible with the urban and environmental context Correlation between buildings without excessive chromatic uniformity, gaudy differentiation, or interruptions with showy chromatic incidences in the hierarchy between serial and monumental buildings SUFFICIENT: Average overall harmony of buildings that protects the material and colour quality of traditional materials and techniques but with a widespread presence of chromatic uniformity or a localized, limited presence of excessive light and dark or colour contrasts INSUFFICIENT: Absence of enhancement of the compositional characteristics and urban decor of individual buildings and their combination for showy differentiation, excessive chromatic uniformity, or incidences of showy colours with the use of colours incompatible with the urban and environmental context

	9. Architectural quality (street furniture, presence of artistic installations) and degree of maintenance of public spaces in relation to open spaces	**PRIN**	Assesses the quality and presence of street furniture	Assessment of the current and designed states	Qualitative/ quantitative judgement	Scale from insufficient to optimal	OPTIMAL: Most outdoor gathering spaces (>70%) present quality street furniture and/or art installations. They are also well maintained, accessible, and functional GOOD: A good part of outdoor gathering spaces (>50%) present quality street furniture and/or art installations. The maintenance, accessibility, safety, and functionality do not present negative elements SUFFICIENT: Some outdoor gathering spaces (>30%) present quality street furniture. Maintenance is not constant or distributed uniformly, but this does not influence the accessibility or functionality INSUFFICIENT: Low presence of quality elements, or existing ones are not easily accessible, not functional, or unsafe
	10. Presence of decommissioned or very degraded areas	**PRIN**	Assesses the quantity of decommissioned areas and the influence they have on the interpretation and quality of life within the site in question	Assessment of the current state	Qualitative/ quantitative judgement	Scale from insufficient to optimal	OPTIMAL: Surface area occupied by decommissioned or degraded areas <5% of site surface area GOOD: Surface area occupied by decommissioned or degraded areas between 5 and 10% of site surface area SUFFICIENT: Surface area occupied by decommissioned or degraded areas between 10 and 20% of site surface area INSUFFICIENT: Surface area occupied by decommissioned or degraded areas >20% of site surface area
	11. Unused spaces (residence or service)	**PRIN**	Identifies unused existing or future areas or buildings, even if in good condition	Assessment of the current state	Qualitative/ quantitative judgement	Scale from insufficient to optimal	OPTIMAL: Volume of unused areas <5% of overall built volume of the site GOOD: Volume of unused areas between 5 and 10% of overall built volume of the site SUFFICIENT: Volume of unused areas between 10 and 20% of overall built volume of the site INSUFFICIENT: Volume of unused areas >20% of overall built volume of the site

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1.4. Gathering places	1. Presence of spaces for meeting and socialization	**PRIN**	Assesses the presence and usability of meeting and socializing places present in the site under study	Assessment of the current and designed states	Qualitative/ quantitative judgement	Scale from insufficient to optimal	OPTIMAL: Widespread places for gathering and socializing rooted in the territory (both public and private), daytime and night-time use, differentiated by type of use (elderly or young people, sports, children, etc.) GOOD: Numerous gathering places, even if not completely uniform with respect to the functions, category of use, or daytime or night-time use SUFFICIENT: Gathering places present even if inuniform with respect to the use (daytime/ night-time, public/private management) or unbalanced use between daytime and night-time functions INSUFFICIENT: Few gathering places present in the territory, or strongly unbalanced with respect to user and use
	2. Presence of open public places used by the population	**PRIN**	Assesses the presence and usability of public open spaces present in the study site	Assessment of the current and designed states	Qualitative/ quantitative judgement	Scale from insufficient to optimal	OPTIMAL: Numerous widespread public spaces creating a system of connections even to areas outside the area in question. Functions and uses integrated with the territory GOOD: Significant presence of public open spaces, not used uniformly SUFFICIENT: Public spaces present, but inuniform throughout the territory or little used INSUFFICIENT: Lack of public spaces, with strong repercussions for their use

	3. Presence and use of buildings of social interest	**PRIN**	Assesses the presence and usability of functions of social interest present in the study area	Assessment of the current and designed states. Structures of social interest can be distinguished as follows: – Social-assistance structures and services for youths and elderly people – Social/ educational structures and services – Social-assistance structures and services for disabled people – Social-assistance structures and services for poor people – Social-assistance structures and services to support large families and pregnant women – Emergency structures and services	Qualitative/ quantitative judgement	Scale from insufficient to optimal	OPTIMAL: Presence on the site of more than 6 types of structures, with pedestrian access within 300 m from the closest public transport station/ stop, with total absence of architectural barriers and hills, public pedestrian areas free of disconnections, presence of devices to facilitate usability of the structures GOOD: Presence on the site of 4–6 types of structures, with pedestrian access within 300 m from the closest public transport station/stop, with absence of architectural barriers and minimal hills, public pedestrian areas with irrelevant disconnections, presence of devices to facilitate usability of the structures SUFFICIENT: Presence on the site of 2–3 types of structures, with pedestrian access within 300 m from the closest public transport station/stop, with absence of architectural barriers. Presence of hills, public pedestrian areas with some disconnections, limited presence of devices to facilitate usability of the structures INSUFFICIENT: Presence on the site of 1 type of structure, with pedestrian access within 300 m from the closest public transport station/stop, with presence of architectural barriers and hills, public pedestrian areas with disconnections, absence of devices to facilitate usability of the structures. Total absence or presence on the site of non-functional structures or with accessibility more than 300 m from the closest public transport station/stop

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	4. Quality of community areas in public housing	**PRIN**	Measures the architectural quality and degree of maintenance of community areas present within low-cost public housing areas	Assessment of the current and designed states	Qualitative/ quantitative judgement	Scale from insufficient to optimal	OPTIMAL: Presence of design solutions that allow for a ratio between the outdoor walkable permeable surface area and the outdoor surface area pertaining to the site of >50%. Presence of street furniture spread throughout functional spaces, safe, with elevated sunlight that can be shaded, appropriate night-time illumination. Prevalence of functional open and green spaces in optimal state of conservation, newly constructed, or the object of recent architectural restoration GOOD: Presence of design solutions that allow for a ratio between the outdoor walkable permeable surface area and the outdoor surface area pertaining to the site of 30–50%. Presence of street furniture spread throughout functional spaces, safe, with elevated sunlight that cannot be shaded completely, appropriate night-time illumination. Prevalence of functional open and green spaces in good state of conservation, excluding new constructions or recent architectural restorations SUFFICIENT: Presence of design solutions that allow for a ratio between the outdoor walkable permeable surface area and the outdoor surface area pertaining to the site of 20–30%. Presence of street furniture spread throughout functional spaces, relatively safe, with average sunlight or elevated sunlight that cannot be shaded, reduced night-time illumination. Prevalence of relatively functional open and green spaces, presence of localized superficial imbalances and zones requiring architectural restoration INSUFFICIENT: Presence of design solutions that allow for a ratio between the outdoor walkable permeable surface area and the outdoor surface area pertaining to the site of <20%. Absence of street furniture. Absence of green spaces or prevalence of functionally obsolete open and green spaces that are unsafe or unusable

Annex B: Efficient and Nice

CAT.	Indicator	Reference system	Description	Required data	Calculation method	Unit	Threshold
2.1. Uses and forms of the city	1. Ratio of land coverage	**SAAD** Meta Berghauser Pont and Per Haupt (2011)	Describes the ratio of surface area covered by buildings to the total surface area considered	Rc = ratio of coverage; Sc = covered surface area; St = territorial surface area	Rc = Sc/St	%	25% < Rc < 30%
	2. Living density of the study area	**PRIN**	Indicates the living density of the site in terms of inhabitants/km^2. Expressed for considerations referring to whether the settlement characteristics of the site pertain to those of a typical Italian city	Assesses the current and designed states	Qualitative/quantitative judgement	Scale from insufficient to optimal	OPTIMAL: Density between 2000 and 2500 inhabitants/km^2 GOOD: Density between 2500 and 3000 inhabitants/km^2 or between 1000 and 2000 inhabitants/km^2 SUFFICIENT: Density between 3000 and 5000 inhabitants/km^2 or between 500 and 1000 inhabitants/km^2 INSUFFICIENT: Density greater than 5000 inhabitants/km^2 or less than 500 inhabitants/km^2
	3. Average building height	**SAAD** Meta Berghauser Pont and Per Haupt (2011)	Describes the impact of the morphology of the area anayzed within the context	Am = average height; Ve = built volume; Sc = covered surface; n_ed = number of buildings	Am = [(Ve/Sc)/n_ed)]	m	Am ≥ 11.15 m
	4. Degree of privacy (living and associated spaces)	**PRIN**	Qualitatively assesses the level according to which the living and associated spaces guarantee resident privacy	Assesses the current and designed states	Qualitative/quantitative judgement	Scale from insufficient to optimal	OPTIMAL: Greater than 15 m GOOD: Between 10 and 15 m SUFFICIENT: Between 5 and 9 m INSUFFICIENT: Less than 5 m or greater than 50 m

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	5. Settlement mix	**PRIN**	Assesses the distribution uniformity of the different functions present within the study site	Assesses the current and designed states	Qualitative/quantitative judgement	Scale from insufficient to optimal	OPTIMAL: 30% of the site destined for functional mixing; historical centres with widespread commerce and services, zones with complex, multi-functional urban restoration, parks and villas of historical/environmental interest where tourist, residential, or service designations are permitted; former urban industrial areas converted into commercial areas. Traffic in the areas is well organized in a hierarchical network of streets GOOD: 20–30% of the site destined for functional mixing; historical centres with widespread commerce and services, zones with multi-functional urban restoration, parks and villas of historical/environmental interest where tourist, residential, or service designations are permitted; former urban industrial areas partially converted into commercial areas. Traffic in the areas is well organized in a hierarchical network of streets SUFFICIENT: 10–20% of the site destined for functional mixing; historical centres with limited areas for commerce and services concentrated in a few dedicated structures, residential areas being completed or expanding with limited, concentrated parts destined for services. Traffic in the areas is limited, even if in a road network that is not completely hierarchical INSUFFICIENT: 0–10% of the site destined for functional mixing; settlement mix with reduced non-residential functions and/or concentrated in limited structures on the site. Congested traffic concentrated near these structures
	6. Corrected compactness	**BCN**	Measures the pressure exerted by the built area on the pedestrian public space (pedestrian streets, pedestrian tree-lined boulevards, parks and gardens, internal courtyards, areas of local use, squares > 1000 m^2; surfaces do not include streets for public and private transport, parking areas, and surfaces of length less than 2.50 m)	Cc = corrected compactness; Ve = built volume in the urban mesh considered; Sp.a. = pedestrian public space	Cc = Ve/Sp.a	m^3/m^2	–

	7. Diversity of building type	**BCN**	Measures the entropy of building types in the radius of influence (400 m)	Dt = diversity of types; fi = building type; *n* = number of building types	Dt = Sni = fi log(fi)/log(*n*)	–	Reference values
	8. Percentage of conservation of existing buildings	**BCN**	Defines the degree of sensitivity towards conserving the building heritage and therefore the energy encompassed in existing structures	%Ce = existing conservation; SLPc = Gross surface area of conserved pavement; SLPtot = Gross surface area of total pavement	%Ce = SLPc/SLPtot	%	Ce ≥ 60%
	9. Urban complexity	**CAT**	Provides information regarding the diversity of combinations of uses and services, which represents one of the axes of the model of the compact, complex Mediterranean city	*n* = the number of different activity types (species richness); Pi = the relative abundance of each species, the proportion of entities of a given species or activity type to the total number of activities existing; $Log_2(Pi)$ = the logarithm of the relative abundance of each species	$-\sum_{i=1}^{n} Pi \times Log_2(Pi)$	Entropy (Shannon index H)	Desired level between 4 and 6 starting from where the urban structure presents a sufficient level of urban complexity and diversity
2.2. Metabolism and urban comfort	1. Ratio of surface area to volume	**SAAD** Baker and Steemers (1992)	Describes the ratio of surface area to volume and represents the form factor of the building; changes with the building dimensions	Si = Building surface area; Ve = Building volume	Sv = Si/Ve	m^2/m^3	Sv ≥ 0
	2. South-facing vertical surfaces	**SAAD** Baker and Steemers (1992)	Represents the possibility for good energy savings due to the possibility of using light and heat from the Sun	% Svs = % of south-facing vertical surfaces; Svs = south-facing vertical surfaces; Sv = vertical surfaces	%Svs = (Svs/Sv)%	%	–

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	3. Southeast- and southwest-facing vertical surfaces	**SAAD** Baker and Steemers (1992)	Represents the possibility for good energy savings due to the possibility of using light and heat from the Sun	% Svs-e = % of southeast- and southwest-facing vertical surfaces; Svs-e = southeast- and southwest-facing vertical surfaces; Sv = vertical surfaces	%Svs-e = (Svs-e/Sv)%	%	–
	4. Ratio of passive to non-passive zones	**SAAD** Baker and Steemers (1992)	Highlights the possibility of decreasing energy demands for lighting and heating	Zp = ratio of passive zones; Ap = passive area; Anp = non-passive area	Zp = Ap/Anp	–	Zp ≥ 100%
	5. Sky-view factor (SVF)	**SAAD** Morello and Ratti (2009)	Expresses the portion of sky visible from each point of the study area. Calculation is independent of the Sun's path in that the SVF depends solely on the urban geometry	SVF = sky-view factor; A.a. = area of analysis; So = obstructed area	SVF = Aa – So	–	–
	6. Green areas on the ground	**SAAD** Morello and Ratti (2009)	Calculates the form, position, and size of breathable green areas present per unit of surface area	Ic = heat island; Sv = green spaces on the ground; Stot = reference surface area	Ic = (Sv/Stot) · 100	%	–
	7. Percentage of shade per hour generated in open spaces on the summer and winter solstices	**SAAD** Morello and Ratti (2009)	Calculates the effective solar radiation received by urban surfaces	Ca = comfort of open spaces; So = shaded surface area; h = hour	Ca = So/h	m^2/h	–
	8. Percentage of permanently shaded open spaces on the summer and winter solstices	**SAAD** Morello and Ratti (2009)	Calculates the effective solar radiation received by urban surfaces, giving an energy quality to the original concept of *solar envelope* (Ralph L. Knowles, 1981–2003)	Ca = comfort of open spaces; So = shaded surface area; Sa = total surface area of open spaces	Ca = (So/Sa) · 100	%	–

	9. Degree of winter radiation and level of natural lighting in the buildings	**PRIN**	Describes the number of hours of sunlight reaching the living room in the housing unit. The type of housing in winter, in which the inclination of solar rays is lowest during the year. The goal is to assess whether the prevalent exposition of the building on a site produces a healthy and therefore better-quality environment for users	Assessment of the current state	Qualitative/quantitative judgement	Scale from insufficient to optimal	OPTIMAL: Housing with high degree of winter radiation >370 h/**sole** and optimal direct solar lighting GOOD: Housing with winter radiation of about 370 h/**sole** and good direct solar lighting SUFFICIENT: Housing with winter radiation <370 h/**sole** and sufficient direct solar lighting INSUFFICIENT: Housing with winter radiation much less than 370 h/**sole** and no direct solar lighting
	10. Possibility of effective natural ventilation as a function of the building distribution (e.g., absence of obstructions)	**PRIN**	Measures the effectiveness of natural ventilation in residential buildings	Assessment of the current state	Qualitative/quantitative judgement The unit of measurement is the percentage of accommodations in which ventilation is guaranteed	Scale from insufficient to optimal	OPTIMAL: Total absence of obstructions with optimal settlement distribution GOOD: Presence of obstructions that affect natural ventilation and good settlement distribution SUFFICIENT: Presence of obstructions or settlement distribution that affect natural ventilation INSUFFICIENT: Consistent presence of obstructions or poor settlement distribution that negatively affect natural ventilation
	11. Average distance between buildings	**PRIN**	Assesses the average distance between buildings, dividing it into 4 classes. Thresholds are identified to define the best quality perceived by an inhabitant of the site	Assessment of the current and designed states	Qualitative/quantitative judgement	Scale from insufficient to optimal	OPTIMAL: >15 m GOOD: 10–15 m SUFFICIENT: 5–9 m INSUFFICIENT: <5 m or >50 m

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	12. Adaptation of the building type and architectural character to the local climate	**PRIN**	Assesses the presence of buildings with architectural characteristics that are adapted to the climate present in the site under investigation. Highlights whether a building belongs to the typical constructive traditions of the place relative to the typological elements related to the climate aspects of the zone	Assessment of the current state	Qualitative/quantitative judgement	Scale from insufficient to optimal	OPTIMAL: Cold zone: square floor plan (L/L = 1:1–1.3, optimum = 1.1) and compact shape. Temperature region: free floor plan and elongated shape (L/L = 1:1–2.4, optimum = 1.6) along the EW axis. Hot, dry region: square floor plan (L/L = 1:1–1.6, optimum = 1.3) and compact shape, with a shaded patio. Hot, humid region: free floor plan, narrow elongated shape (L/L = 1:1–3, optimum = 1.7), pilotis, porticoes, and shading systems. Optimal coherence of the architectural type with the local climate with respect to roof type and related materials, attachment to the ground, profiles, building alignment, ratio between openings to solid surfaces, accessories (balconies, loggias, shading systems), façade finishing GOOD: Cold zone: slightly elongated floor plan and compact shape. Temperate region: free floor plan and slightly elongated shape with main exposition along the EW axis. Hot, dry region: slightly elongated floor plan and compact shape, with shaded patio. Hot, humid region: free floor plan and slightly elongated shape, pilotis, porticoes and shading systems. Good coherence of the architectural type with the local climate with respect to roof type and related materials, attachment to the ground, profiles, building alignment, ratio between openings to solid surfaces, accessories (balconies, loggias, shading systems), façade finishing SUFFICIENT: Cold zone: elongated floor plan but compact shape. Temperate region: free floor plan and slightly elongated shape with main exposition slightly off the EW axis. Hot, dry region: slightly elongated floor plan and compact shape, with shaded patio. Hot, humid region: free floor plan and slightly elongated shape, pilotis, porticoes and shading systems. Average coherence of the architectural type with the local climate with respect to roof type and related materials, attachment to the ground, profiles, building alignment, ratio between openings to solid surfaces, accessories (balconies, loggias, shading systems), façade finishing INSUFFICIENT: Cold zone: elongated floor plan and shape (1 > L/L > 1.3). Temperate region: free floor plan and compact shape (1 > L/L > 2.4), main alignment along the NS axis. Cold, dry region: elongated floor plan and shape (1 > L/L > 1.6). Hot, humid region: free floor plan and narrow, elongated shape (1 > L/L > 3). Indifference to or lacking coherence between the architectural character and local climate in the type of roof and related materials, attachment to the ground, profiles, building alignment, ratio between openings and solid surfaces, accessories (balconies, loggias, shading systems), façade finishing

2.3. Degradation and land consumption	1. Presence of decommissioned or very degraded areas	**PRIN**	Assesses the quantity of and influence that decommissioned areas have on the interpretation and quality of life within the site	Assessment of the current state	Qualitative/quantitative judgement	Scale from insufficient to optimal	OPTIMAL: Surface area occupied by decommissioned or degraded areas <5% of site surface area GOOD: Surface area occupied by decommissioned or degraded areas between 5 and 10% of site surface area SUFFICIENT: Surface area occupied by decommissioned or degraded areas between 10 and 20% of site surface area INSUFFICIENT: Surface area occupied by decommissioned or degraded areas >20% of site surface area
	2. Unused volumes (residence or service)	**PRIN**	Identifies new or existing unused areas or buildings, even if well maintained	Assessment of the current state	Qualitative/quantitative judgement	Scale from insufficient to optimal	OPTIMAL: Volume of unused spaces <5% of overall built volume of the site GOOD: Volume of unused spaces between 5 and 10% of overall built volume of the site SUFFICIENT: Volume of unused spaces between 10 and 20% of overall built volume of the site INSUFFICIENT: Volume of unused spaces >20% of overall built volume of the site
	3. Percentage of conservation of existing buildings	**SAAD** Puerari (2011)	Defines the degree of sensitivity towards conserving the building heritage and therefore the energy encompassed in existing structures	%Ce = existing conservation; SLPc = Gross surface area of conserved pavement; SLPtot = Gross surface area of total pavement	%Ce = SLPc/SLPtot	%	Ce ≥ 60%
2.4. Social and economic aspects	1. Population density	**CAT**	Number of inhabitants per hectare. Gives an approximate idea of the configuration of the city and the related territorial organization. Yields an initial idea of the level of urban expansion in the territory and helps to define more organized urban planning	Georeferenced population census	Population density = (Number of inhabitants)/(Urban surface area)	Inhabitants/ha	Population density per hectare can vary significantly as a function of the typical or historical characteristics that configure the city territory. Determining an optimal value for the population density of a city is therefore not easy because there is a strong dependence on the predominant urban model in the city or its historical configuration, as well as the influence of certain economic or social aspects, migratory processes, or the presence of economic imbalances. However, for a city with an average surface area of public space and green zones, a minimum density of 120 inhabitants/ha is recommended for the set of Mediterranean cities participating in the project

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	2. Employment and unemployment rates	**CAT**	Measures the percentage of the working-age population employed or unemployed and in search of work. The unemployment rate is the percentage of the unemployed active population	Statistics related to the active and population and unemployment	Percentage of active population = (Number of active people)/(Number of working-age people) · 100 Unemployment rate = (Number of unemployed people)/(Number of active people) · 100	%	A percentage less than 10% is desired for the set of Mediterranean cities
	3. Average family income	**CAT**	Average income indicates the tenor of life in a territory	Statistical data	Average income declared per unit of consumption	Euro	Scale of reference: Malaga: €13,128 Marseilles: €15,811 Agglomeration Community of Pays d'Aix: €21,470
	4. Poverty threshold	**CAT**	The poverty rate indicates the percentage of families below the poverty threshold. The threshold corresponds to 50% of the average national family income	Statistical data	(Population below the poverty threshold)/(Total population) · 100	%	Scale of reference: Malaga: 21.25% Marseilles: 25.30% Agglomeration Community of Pays d'Aix: 15.88%
	5. Income inequality	**CAT**	Highlights the difference between the maximum and minimum in the distribution. Higher values represent greater income inequalities in the population. Allows income disparity per consumption unit to be studied in a determined zone, but also between different zones	Statistical data	(Income of the 10% richest)/(Income of the 10% poorest)	Not applicable	Scale of reference: Marseilles: 14.1 Agglomeration Community of Pays d'Aix: 4.7

	6. Evolution of tourist frequency	**CAT**	Measures the evolution of tourist frequency in relation to the number of tourists and nights booked per year and the level of tourism seasonality	Number of tourists and nights booked per year. Amount of seasonality per month	Degree of seasonality (tourists) = (Number of tourists per month)/(Total number of tourists) · 100 Degree of seasonality = (Number of booked rooms per month)/(Number of total nights) · 100	Number of tourists and booked rooms per month and per year. % seasonality per month	Intervals of percentages of tourists and booked rooms per month between 6 and 11% is recommended for the set of Mediterranean cities
2.5. Usability, accessibility, public transport	1. Accessibility to street-level public transport stops	**BCN**	Measures the area served by different public transport stops by calculating the radius of influence (400 m)	Accts = Accessibility of the public transport stop; Ai = distance of influence of the public transport stop; Ats = area served by street-level public transport; Atot = total area	Accts = (Ats/Stot) · 100	%	Dist. < 400 m = 1 min by bike = 5 min on foot
	2. Accessibility to the network of biking paths	**BCN**	Measures the area served by different public transport stops by calculating the radius of influence (400 m)	Accc = Accessibility of the public transport stop; Ai= distance of influence of the biking path; Apc = area served by the biking path; Stot = surface area of reference	Accc = (Ac/Atot) · 100	%	Dist. < 400 m = 1 min by bike = 5 min on foot
	3. Accessibility to green spaces	**BCN**	Measures the area served by green spaces in relation to their extent	AccV = Accessibility to green spaces; Ai= distance of influence of the green spaces; AV = area served by the green spaces; Atot = total area	AccV = (AV/Atot) · 100	%	Green spaces > 1000 m^2 dist. < 200 m Green spaces > 5000 m^2 dist. < 750 m Green spaces < 1 ha and to a green corridor at a distance of <2 km green space > 10 ha at a dist. < 4 km

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	4. Provision of neighbourhood services	**SAAD** LEED 2009 for neighbourhood development	Calculates the mix and diversity of services present in the neighbourhood	Ai = area affected by the service (between a range of 300 and 400 m); *n* = number of services considered; A.a. = surface area analyzed	Ds = Si Ai/*n*	%	Ic ≥ 100%
	5. Diversity of functions	**SAAD** LEED 2009 for neighbourhood development	Measures the entropy of functions within new urban fabrics	Df = functional mix; fi = functions; *n* = number of functions	Df = Sni = fi log(fi)/log(*n*)		
	6. Presence of primary roads in the site	**PRIN**	Assesses the presence of primary roads near the site as added value in that it forms part of a large-scale system necessary for the mobility of those who live in the study area	Assessment of the current and designed states	Qualitative/quantitative assessment	Scale from insufficient to optimal	OPTIMAL: Presence of primary roads at a distance between 300 m and 1 km GOOD: Presence of primary roads at a distance of 2 km SUFFICIENT: Presence of primary roads at a distance of 4 km INSUFFICIENT: Presence of primary roads at a distance less than 300 m or greater than 4 km
	7. Quality of connections between main roads in the site and flow between neighbourhoods	**PRIN**	Assesses the intelligibility and degree of safety of connections between the main roadway network within the site and the secondary network that accesses the different sub-environments or housing units (local or inter-neighbourhood network)	Assessment of the current and designed states	Qualitative assessment	Scale from insufficient to optimal	OPTIMAL: Smooth traffic throughout the day, clear markings for the street, direction, and flow, dangerous intersections are well regulated if present BUONO: Often smooth traffic even with imperfect markings, irrelevant presence of dangerous intersections, and most of those are well regulated SUFFICIENT: Smooth traffic except for some particular times of the day, presence of sufficiently regulated dangerous intersections, in at least half of cases INSUFFICIENT: Often heavy traffic, presence of dangerous intersections that are not always sufficiently regulated, unclear markings

	8. Accessibility of the site on the urban level	**PRIN**	Describes the degree of accessibility of the study site under as a function of the urban context	Assessment of the current and designed states	Qualitative assessment	Scale from insufficient to optimal	OPTIMAL: Site accessible from a high number of local, uncongested, safe roads BUONO: Site accessible from local roads with smooth, safe traffic SUFFICIENT: Site accessible from local roads that are safe but congested at rush hour INSUFFICIENT: Site accessible from local, congested, dangerous roads
	9. Density of biking paths (length/surface area or length/inhabitant)	**PRIN**	Considers the degree of accessibility of the study area to a non-polluting mode of transport	Assessment of the current and designed states	Qualitative/quantitative assessment	Scale from insufficient to optimal	OPTIMAL: Ratio of biking path length to number of inhabitants is >0.7 m/inhabitant GOOD: Ratio of biking path length to number of inhabitants is 0.54–0.7 m/inhabitant SUFFICIENT: Ratio of biking path length to number of inhabitants is 0.36–0.53 m/inhabitant INSUFFICIENT: Ratio of biking path length to number of inhabitants is 0.18–0.35 m/inhabitant
	10. Linear urban density of public transport	**PRIN**	Assesses the distance of public transport in terms of maximum length a resident can walk to a stop relative to the site in question	Assessment of the current and designed states	Quantitative assessment	Scale from insufficient to optimal	Unit of measurement: linear km/100 km^2 Reference values OPTIMAL: >500 km/100 km^2 (e.g., Torino, Cagliari, Frosinone) GOOD: 300–500 km/100 km^2 (e.g., Milan) SUFFICIENT: 200–300 km/100 km^2 INSUFFICIENT: <200 km/100 km^2
	11. Effectiveness and quality of public transport	**PRIN**	Synthetically analyzes the effectiveness of public transport in terms of number of routes/day, coverage of rush hour, and type of connection (urban and suburban)	Assessment of the current and designed states	Quantitative assessment	Scale from insufficient to optimal	OPTIMAL: Presence of public transport stops at a distance <200 m, with high frequency for the type of transport GOOD: Presence of public transport stops at a distance <300 m, with high frequency for the type of transport SUFFICIENT: Presence of public transport stops at a distance <300 m, with varying or non-uniform frequency throughout the day or during the heaviest hours INSUFFICIENT: Absence of public transport lines within a distance of <300 m, with gaps in frequency

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	12. Percentage of residents with walking access to areas of collective interest within 300 m (5 min) of green areas. Maximum walking distance to collective spaces and/or services	**PRIN**	Describes the accessibility (walking or public transport) to places in which collective life occurs, such as parks, recreation, culture, and information exchange centres	Assessment of the current and designed states	Qualitative/quantitative assessment	Scale from insufficient to optimal	Accessibility is described by establishing an optimal balance in a maximum distance of 300 m, which can be walked in an average time of 5 min OPTIMAL: Accessibility for 70% of residents of the site in question GOOD: Accessibility for 50–70% of residents of the site in question SUFFICIENT: Accessibility for 30–50% of residents of the site in question INSUFFICIENT: Accessibility for <30% of residents of the site in question
	13. Availability of pedestrian zones and restricted traffic zones per inhabitant in m^2	**PRIN**	Defines a hierarchy between cars and pedestrians, establishing a high quality of life in urban contexts where clear value is added to the availability of places limited entirely or partially to pedestrians	Assessment of the current and designed states	Qualitative/quantitative assessment	Scale from very bad to optimal	Places should be easy to access and, for an optimal ratio of proximity to the number of residents, be found within 400 m (equal to about 5 min walking) OPTIMAL: Number of pedestrian zones greater than 2 m^2/inhabitant. Number of restricted traffic zones greater than 20 m^2/inhabitant GOOD: Number of pedestrian zones 1.2–2 m^2/inhabitant. Number of restricted traffic zones 12–20 m^2/inhabitant SUFFICIENT: Number of pedestrian zones 0.4–1.2 m^2/inhabitant. Number of restricted traffic zones 4–12 m^2/inhabitant VERY BAD: Number of pedestrian zones less than 0.4 m^2/inhabitant. Number of restricted traffic zones less than 4 m^2/inhabitant
	14. Maximum walking distance to school for children	**PRIN**	Represents high quality if nursery and primary schools can be reached by walking less than 150 m	Assessment of the current and designed states	Qualitative/quantitative assessment	Scale from insufficient to optimal	OPTIMAL: Maximum distance to reach nursery and/or primary schools less than 150 m GOOD: Maximum distance to reach nursery and/or primary schools between 150 and 200 m SUFFICIENT: Maximum distance to reach nursery and/or primary schools between 200 and 300 m INSUFFICIENT: Maximum distance to reach nursery and/or primary schools greater than 300 m

	15. Degree of accessibility for disabled and elderly people	**PRIN**	Establishes the importance of building cities that can be used independently by weak subjects such as disabled or elderly people	Assessment of the current and designed states	Qualitative assessment	Scale from insufficient to optimal	OPTIMAL: Total absence of architectural barriers and hills, well-built walking surfaces free of disconnections, presence of devices to ease use by disabled and elderly people GOOD: Absence of architectural barriers, presence of small disconnections on walking surfaces, presence of devices to ease use SUFFICIENT: Absence of architectural barriers, presence of inadequately resolved hills, walking surfaces with some disconnections, presence of devices to ease use INSUFFICIENT: Presence of architectural barriers and inadequately resolved hills, walking surfaces with significant disconnections, absence of devices to ease use
	16. Presence and usability of public functions	**PRIN**	Assesses the presence and use of public functions present within the study site. Structures with public functions can be divided as follows: – Public safety (police headquarters, *Carabinieri*, local police station, etc.) – Municipal offices – Sports centres and gyms – Non-commercial services (banks, public offices, etc.) – Newsstands	Assessment of the current and designed states	Quantitative assessment	Scale from insufficient to optimal	OPTIMAL: Presence of 5 different types of functional structures with walking access within 100 m from the closest public transport station/stop, total absence of architectural barriers and hills, walking surfaces free of disconnections, presence of devices to facilitate use of the structures GOOD: Presence of 4 different types of functional structures with walking access within 100–200 m from the closest public transport station/stop, structures without architectural barriers, minimal hills, public walking surfaces with irrelevant disconnections, presence of devices to facilitate use of the structures SUFFICIENT: Presence of 2–3 different types of functional structures with walking access within 200–300 m from the closest public transport station/stop, absence of architectural barriers, presence of hills, public walking surfaces with some disconnections, limited presence of devices to facilitate use of the structures INSUFFICIENT: Presence of 1 type of functional structures with walking access within 300–500 m from the closest public transport station/stop, presence of architectural barriers and hills, public walking surfaces with disconnections, absence of devices to facilitate use of the structures. Total absence or presence of non-functional structures or with walking access greater than 500 m from the closest public transport station/stop

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	17. Presence and use of community functions	**PRIN**	Assesses the presence and use of community buildings within the study site. Community structures can be divided as follows: – Structures for childhood and required education (day care, nursery schools, primary and middle schools, etc.) – Structures for secondary schools and universities – Multi-purpose halls and theatres – Structures for local and supra-local bodies and associations to protect, enhance, and develop the local cultural heritage – Libraries – Museums/exhibit halls—Student residences – Religious services	Assessment of the current and designed states	Quantitative assessment	Scale from insufficient to optimal	OPTIMAL: Presence of more than 6 different types of functional structures with walking access within 300 m from the closest public transport station/stop, total absence of architectural barriers and hills, public walking surfaces free of disconnections, presence of devices to facilitate use of the structures GOOD: Presence of 4–6 different types of functional structures with walking access within 300 m from the closest public transport station/stop, absence of architectural barriers, minimal hills, public walking surfaces with irrelevant disconnections, presence of devices to facilitate use of the structures SUFFICIENT: Presence of 2–3 different types of functional structures with walking access within 300 m from the closest public transport station/stop, absence of architectural barriers, presence of hills, public walking surfaces with some disconnections, limited presence of devices to facilitate use of the structures INSUFFICIENT: Presence of 1 type of functional structures with walking access within 300 m from the closest public transport station/stop, presence of architectural barriers and hills, public walking surfaces with disconnections, total absence or presence of non-functional structures or with walking access within a distance greater than 300 m from the closest public transport station/stop

	18. Presence/use of basic health services	**PRIN**	Assesses the presence/use of health services within the study site. These include: – Basic medical offices – Paediatricians – Specialized medical offices according to the specialization – Pharmacies – Outpatient clinics – Protected residences – Assisted health residences – Retirement homes	Assessment of the current and designed states	Qualitative/quantitative assessment	Scale from insufficient to optimal	OPTIMAL: Presence of 5 types of services with walking access within 100 m from the closest public transport station/stop GOOD: Presence of 4 types of services with walking access within 100–200 m from the closest public transport station/stop SUFFICIENT: Presence of 2–3 types of services with walking access within 200–300 m from the closest public transport station/stop INSUFFICIENT: Presence of 1 type of service with walking access within 300–500 m from the closest public transport station/stop. Presence of non-functional structures or with walking access more than 500 m from the closest public transport station/stop

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	19. Presence/use of social buildings	**PRIN**	Assesses the presence/use of social functions present on the study site. These can be subdivided as follows: – Social assistance structures and services for minors and elderly people – Social/educational structures and services – Social assistance structures and services for disabled and invalid people – Social assistance structures and services for poor people – Social assistance structures and services to support large families and pregnant women – Emergency structures and services	Assessment of the current and designed states	Qualitative/quantitative assessment	Scale from insufficient to optimal	OPTIMAL: Presence of more than 6 different types of functional structures with walking access within 300 m from the closest public transport station/stop, total absence of architectural barriers and hills, public walking surfaces free of disconnections, presence of devices to facilitate use of the structures GOOD: Presence of 4–6 different types of functional structures with walking access within 300 m from the closest public transport station/stop, absence of architectural barriers, minimal hills, public walking surfaces with irrelevant disconnections, presence of devices to facilitate use of the structures SUFFICIENT: Presence of 2–3 different types of functional structures with walking access within 300 m from the closest public transport station/stop, absence of architectural barriers, presence of hills, public walking surfaces with some disconnections, limited presence of devices to facilitate use of the structures INSUFFICIENT: Presence of 1 type of functional structures with walking access within 300 m from the closest public transport station/stop, presence of architectural barriers and hills, public walking surfaces with disconnections, total absence or presence of non-functional structures or with walking access within a distance greater than 300 m from the closest public transport station/stop
	20. Commercial surface area per inhabitant and proximity	**PRIN**	Assesses the presence and use of commercial structures within the study area	Assessment of the current and designed states	Quantitative assessment	Scale from insufficient to optimal	OPTIMAL: Optimal presence and distance of necessary shops <100 m GOOD: Good presence and distance of necessary shops between 100 and 150 m SUFFICIENT: Sufficient presence and distance of necessary shops between 200 and 300 m INSUFFICIENT: Low presence and distance of necessary shops >300 m

	21. Commercial façades present in the city fabric	**PRIN**	Assesses the presence, use, and quality of commercial façades within the study area	Assessment of the current and designed states	Qualitative/quantitative assessment	Scale from insufficient to optimal	OPTIMAL: Widespread presence and ease of accessibility GOOD: Widespread presence but not always good accessibility SUFFICIENT: Concentrated presence only in particular areas but with good accessibility INSUFFICIENT: Concentrated presence only in particular areas and often-poor accessibility
	22. Quality and degree of parking area maintenance	**PRIN**	Assesses the architectural and urban measures to minimize the impact of parking areas on the context	Assessment of the current and designed states	Qualitative assessment	Scale from insufficient to optimal	OPTIMAL: Significant presence of underground public parking with spaces with well-designed surface area GOOD: Ground-level parking with good use of greenery and materials and correct insertion in the morphological fabric of the site SUFFICIENT: Ground-level parking with good insertion in the morphological fabric but created with sometimes inadequate materials INSUFFICIENT: Ground-level parking with clear lack of mitigation elements and absence of maintenance
	23. Presence of areas for unexpected, unregulated stops	**PRIN**	Assesses the presence of areas throughout the site in which an unexpected, unregulated vehicle stop occurs, creating problems for traffic flow (double parking), which also compromises the safety of the street network	Assessment of the current state	Quantitative assessment	Scale from insufficient to optimal	OPTIMAL: Total absence or irrelevant presence GOOD: Presence that slightly influences traffic flow SUFFICIENT: Concentrated presence in some portions of the road network which influences traffic flow INSUFFICIENT: Widespread presence in the site's road network
	24. Assessment of parking presence in busy areas	**PRIN**	Analyzes the number of public parking spaces in busy areas	Assessment of the current and designed states	Quantitative assessment	Scale from insufficient to optimal	OPTIMAL: Number of parking spaces always appropriate for the number of users GOOD: Number of parking spaces inadequate only during particular events SUFFICIENT: Number of parking spaces inadequate at least one day per week INSUFFICIENT: Number of parking spaces very inadequate

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	25. Public kerbside parking spaces per inhabitant	**PRIN**	Analyzes the number of public parking spots in order to assess eventual shortages that can negatively influence the perceived urban quality and traffic safety	Assessment of the current and designed states	Quantitative assessment	Scale from insufficient to optimal	Taking an average of ISTAT data referring to the Italian cities with the best quality of life, a reference value equal to the number of parking spaces per 100 inhabitants is equal to 2.3 OPTIMAL: Number of spaces >2.3 per 100 inhabitants GOOD: Number of spaces between 1.8 and 2.3 per 100 inhabitants SUFFICIENT: Number of spaces between 1.3 and 1.8 per 100 inhabitants INSUFFICIENT: Number of spaces <1.3 per 100 inhabitants
	26. Private parking spaces per inhabitant	**PRIN**	Analyzes the number of private parking spaces in order to evaluate possible shortages that can negatively influence urban quality as perceived by residents	Assessment of the current and designed states	Quantitative assessment	Scale from insufficient to optimal	Taking an average of ISTAT data referring to the Italian cities with the best quality of life, a reference value equal to the number of parking spaces per 100 inhabitants is equal to 1.4 OTTIMO: Number of spaces >1.4 per 100 inhabitants GOOD: Number of spaces between 1.2 and 1.4 per 100 inhabitants SUFFICIENT: Number of spaces between 1.0 and 1.2 per 100 inhabitants INSUFFICIENT: Number of spaces <1.0 per 100 inhabitants
2.6. Quality of spaces and public services	1. Quality and degree of walking and cycling path maintenance	**PRIN**	Assesses the architecture, maintenance, and coherence of walking and biking paths in reference to the overall design of the study area. Possible criteria for evaluation include: quality, accessibility, and condition. Maintenance should be constant	Assessment of the current and designed states	Qualitative judgement	Scale from insufficient to optimal	OPTIMAL: High, uniform quality throughout the territory, constant maintenance GOOD: Good quality, even if not completely uniform. Maintenance is uniform, even if not exemplary, but does not affect the integrity of the paths SUFFICIENT: Non-uniform quality of paths, but overall sufficient and/or spotty maintenance INSUFFICIENT: Poor quality of paths and/or maintenance
	2. Quality of lighting in open spaces and buildings during the day and at night	**PRIN**	Assesses systems for solar shading during the day both in open spaces and buildings, as well as night-time illumination	Assessment of the current state	Qualitative judgement	Scale from insufficient to optimal	OPTIMAL: Sunny spaces throughout the day, with elements for protection during the day and efficient illumination systems at night GOOD: Sunny spaces a good part of the day, with shading elements and uniformly present night-time illumination SUFFICIENT: Sunny spaces at some points of the day, with somewhat ineffective shading elements and night-time illumination INSUFFICIENT: Scarce sunlight during the day, without shading or night-time illumination (e.g., suburban neighbourhoods with tall, close-set houses, little greenery, and poor lighting)

	3. Architectural quality (street furniture, presence of art installations) and degree of public open-space maintenance	**PRIN**	Assesses the quality and presence of street furniture	Assessment of the current and designed states	Qualitative/quantitative judgement	Scale from insufficient to optimal	OPTIMAL: Most outdoor gathering spaces (>70%) have quality street furniture and/or art installations. Also well maintained, accessible, functional GOOD: Many outdoor gathering spaces (>50%) have quality street furniture and/or art installations. Maintenance, accessibility, safety, functionality have no negative elements SUFFICIENT: Some outdoor gathering spaces (>30%) have quality street furniture. Maintenance is constant or uniform, but does not influence accessibility or functionality INSUFFICIENT: Lacks quality street furniture or it is not easily accessible, non-functional, or unsafe
	4. Quality and degree of parking maintenance	**PRIN**	Assesses the architectural and urban measures to minimize the impact of parking areas on the context	Assessment of the current and designed states	Qualitative judgement	Scale from insufficient to optimal	OPTIMAL: Significant presence of underground public parking with spaces with well-designed surface area GOOD: Ground-level parking with good use of greenery and materials and correct insertion in the morphological fabric of the site SUFFICIENT: Ground-level parking with good insertion in the morphological fabric but created with sometimes inadequate materials INSUFFICIENT: Ground-level parking with clear lack of mitigation elements and absence of maintenance

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	5. Quality of community areas in public housing	**PRIN**	Measures the architectural quality and degree of maintenance of community areas present within low-cost public housing settlements	Assessment of the current and designed states	Qualitative/quantitative judgement	Scale from insufficient to optimal	OPTIMAL: Presence of design solutions that allow a ratio of exterior permeable walkable surface area and the exterior area of the site >50%. Presence of street furniture widespread in functional, safe spaces, with ample but shaded sunlight, appropriate night-time illumination. Prevalence of functional open and green spaces in an excellent state of conservation, newly constructed, or recently restored GOOD: Presence of design solutions that allow a ratio of exterior permeable walkable surface area and the exterior area of the site between 30 and 50%. Presence of street furniture widespread in functional, safe spaces, with ample but not completely shaded sunlight, appropriate night-time illumination. Prevalence of functional open and green spaces in a good state of conservation, excluding new or recently restored areas SUFFICIENT: Presence of design solutions that allow a ratio of exterior permeable walkable surface area and the exterior area of the site between 20 and 30%. Presence of street furniture widespread in functional, relatively safe spaces, with average or high, unshaded sunlight, low-intensity night-time illumination. Prevalence of relatively functional open and green spaces with localized surface instabilities and zones that require architectural restoration INSUFFICIENT: Presence of design solutions that allow a ratio of exterior permeable walkable surface area and the exterior area of the site <20%. Absence of street furniture. Absence of green spaces or prevalence of open and green spaces that are functionally obsolete and unsafe or unusable

	6. Quality and level of maintenance of public-housing buildings	**PRIN**	Measures the architectural quality and degree of maintenance of low-cost public housing buildings	Assessment of the current and designed states	Qualitative judgement	Scale from insufficient to optimal	OPTIMAL: Buildings that satisfy more than 60% of the following requirements: modification and qualification of consolidated and/or degraded fabrics, conservation and enhancement of historical fabrics, modification with functional integration, renovation of the urban space, bioarchitecture and urban ecology, resource savings, improvement of environmental quality, accessibility, visibility and adaptability (DM 236/89), flexibility, new modes of life and housing use, weak social users. State of maintenance: functional buildings in optimal state of conservation, newly constructed, or the object of recent restoration GOOD: Buildings that satisfy 40–60% of the following requirements: modification and qualification of consolidated and/or degraded fabrics, conservation and enhancement of historical fabrics, modification with functional integration, renovation of the urban space, bioarchitecture and urban ecology, resource savings, improvement of environmental quality, accessibility, visibility and adaptability (DM 236/89), flexibility, new modes of life and housing use, weak social users. State of maintenance: functional buildings in good state of conservation that do not require outstanding maintenance, recovery/restoration; excludes new constructions, or the objects of recent restoration SUFFICIENT: Buildings that satisfy 30–40% of the following requirements: modification and qualification of consolidated and/or degraded fabrics, conservation and enhancement of historical fabrics, modification with functional integration, renovation of the urban space, bioarchitecture and urban ecology, resource savings, improvement of environmental quality, accessibility, visibility and adaptability (DM 236/89), flexibility, new modes of life and housing use, weak social users. State of maintenance: no functional buildings with significant superficial instabilities or buildings that require outstanding maintenance or recovery/restoration INSUFFICIENT: Buildings that satisfy <30% of the following requirements: modification and qualification of consolidated and/or degraded fabrics, conservation and enhancement of historical fabrics, modification with functional integration, renovation of the urban space, bioarchitecture and urban ecology, resource savings, improvement of environmental quality, accessibility, visibility and adaptability (DM 236/89), flexibility, new modes of life and housing use, weak social users. State of maintenance: functionally obsolete buildings with exclusively superficial instabilities or functionally unusable or abandoned buildings with superficial and structural instabilities

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	7. Degree of maintenance and quality of public green spaces	**PRIN**	Assesses attention to the design and maintenance of public green spaces	Assessment of the current and designed states	Qualitative judgement	Scale from insufficient to optimal	OPTIMAL: Presence of parks and gardens with great architectural/landscape quality, realized with compositional, botanical coherence and a richness of natural elements, where the greenery is correctly maintained GOOD: Presence of parks and gardens designed to consider aesthetic factors and where the greenery is correctly maintained SUFFICIENT: Presence of parks and gardens with sufficient attention to architectural/landscape aspects and sufficient maintenance INSUFFICIENT: Absence of architectural quality and unmaintained greenery
	8. Degree of maintenance and quality of green spaces in mostly residential and public city blocks	**PRIN**	Assesses the quality, presence, and maintenance of green areas found within mainly residential city blocks. Index is extrapolated from previous indicators due to the particularity of the physical/ socioeconomic context that characterizes these neighbourhoods	Assessment of the current and designed states	Qualitative judgement	Scale from insufficient to optimal	OPTIMAL: Presence of well-designed, well-maintained green areas that are often used GOOD: Presence of green but unused areas SUFFICIENT: Partial presence of unusable green areas (trees, hedges) INSUFFICIENT: Total absence of green areas

Annex C: Clean and Healthy

CAT.	Indicator	Reference system	Description	Required data	Calculation method	Unit	Threshold
3.1. Biodiversity and natural resource management	1. Territorial biopotential (BTC)	**SAAD—Arpa**	Indicates the state of energy metabolism of vegetation systems and represents the capability of an ecosystem to conserve and maximize the use of energy, capable of identifying the evolution/involution of the landscape in relation to the degree of conservation, recovery, or transformation of the environmental mosaic	Land-use map	Calculation of the surface area for individual areas in m^2	$Mcal/m^2$ of territory for each type of use	A (low) Prevalence of systems with energy subsidies (industries and infrastructure, built areas) or with low metastability (bare areas, rocky outcrops) $\ll 0.5$ B (average-low) Prevalence of agricultural/technological systems (pasture or arable land, sparse building), natural degraded biotopes or those with average resilience (wild grasses, sparse shrubs, treeless riverbanks) 0.5–1.5 C (average) Prevalence of seminatural agricultural systems (arable land, grasslands, orchards, vineyards, hedges) with average metastability resistance 1.5–2.5 D (average-high) Prevalence of natural biotopes with average resistance and metastability (climate-adapted shrubs, pioneer species, rows of plants, urban green areas, reforestation, tree farms, poplar plantations) 2.5–3.5 E (high) Prevalence of biotopes without energy subsidies, seminatural (forests, copses) or natural areas with high resistance and metastability (low plain and foothill forests, humid zones) $\gg 3.5$

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	2. Presence of ecological areas (agricultural, green permeable)	**PRIN**	Presence of agricultural areas in peri-urban bands around the city. These areas are often part of ecological networks that allow a network of green areas protected on the supra-local scale to be constructed. In addition, the maintenance of green areas is guaranteed by agricultural workers, with minimum expenses for public administrations	Surface area of agricultural/ecological areas	(Σ ecolog. and agric. areas)/(Σ total area)	%	OPTIMAL: Widespread presence of ecological areas over >20% of the site GOOD: Widespread presence of ecological areas over in 15–20% of the site SUFFICIENT: Widespread presence of ecological areas over 10–15% of the site INSUFFICIENT: Total absence of ecological areas
	3. Presence of areas of natural or landscape interest	**PRIN**	Assesses the presence and extent over the site of areas of natural or non-anthropized landscape interest	Landscape assessment of the projects; SIC; ZPS; Agenda 21	Qualitative judgement	Scale from insufficient to optimal	OPTIMAL: Widespread presence with high interest GOOD: Concentrated presence with high interest SUFFICIENT: Concentrated presence with medium interest INSUFFICIENT: Concentrated presence with low or no interest
	4. Permeability	**BCN**	Level of waterproofing of the land and its impact on the occupied territory	IP = index of permeability; Ft = surface-type factor; At = area of the type of surface; *S* = surface of reference	IP = [*S*(Ft × At) (m^2)/At (m^2)] · 100 (*) (*) of the analyzed area	%	Min. 30%
	5. Fragmentation	**Urge**	Measures the fragmentation of green spaces. Ratio between the extent of patches and their circumference/perimeter	AP = Area of patches C o P = circumference or perimeter	F= AP/C o P	Scale from lacking to good	<0.07 Lacking 0.07 < 0.10 Average >0.10 Good
	6. Isolation of urban green areas	**Urge**	Measures the level of isolation of green areas in the city	D = Average distance between patches (inter-patch distance)	m	Scale from scarce to good	Good: 500 m Moderate: 500 < 1000 m Scarce: >1 km

	7. Connectivity	**Urge**	Assesses the capacity of the green urban system to increase the migration of species between green patches	C = Number of existing connections	No.	Scale from none to optimal	No connectivity: 0 connections Modest connectivity: 1–2 connections Good connectivity: 3–5 connections Optimal connectivity: >5 connections
	8. RIE—Index of building impact reduction	**SAAD**—City of Bolzano	An index of environmental quality that certifies the quality of the building intervention with respect to land permeability and green areas	*Svi* = *i*th surface area that is permeable, impermeable, or marked "treated as green" *Sij* = *j*th surface area that is permeable, impermeable, or marked "not treated as green" ψ_i = *i*th outflow coefficient ψ_j = *j*th outflow coefficient *Se* = Equivalent tree-covered surface area	$\frac{\sum_{i=1}^{n} SVi \frac{1}{\Psi_{i}} + (Se)}{\sum_{i=1}^{n} SVi + \sum_{j=1}^{m} S_{ij} \Psi_{j}}$		Limiting values for surface areas: https://www.comune.bolzano.it/UploadDocs/3180_Nuove_Schede_superfici_RIE_Ital.pdf
3.2. Air and water quality and management, energy consumption	1. Presence of congested intersections and streets that influence the smells and sounds of the site	**PRIN**	Monitors the level of noise and air pollution at rush hour on the main roads within the study area, with effects on traffic-planning and public-transport policies	Current and designed state	Qualitative judgement	Scale from insufficient to optimal	OPTIMAL: Absence of intersections and roads with intense traffic (>1500 vehicles/h) GOOD: Presence of intersections and roads with intense traffic that does not influence the senses SUFFICIENT: Presence of intersections and roads with intense traffic and perception of smells or sounds INSUFFICIENT: Presence of intersections and roads with intense traffic and perception of smells and sounds

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	2. Deficient sections of the sewer system	**PRIN**	Assesses the presence and spread of deficient sections of the sewer network, which can influence the smell of a site	Current state	Qualitative judgement	Scale from insufficient to optimal	OPTIMAL: Absence of deficient sections GOOD: Instances of limited deficiency in the sewer network in case of rare/exceptional events SUFFICIENT: Occasional events related to deficient sections without significant discomfort related to flow, hygiene, and direct or indirect damage INSUFFICIENT: Presence of deficient sections
	3. CO_2 emissions	**CAT**	Measures the CO_2 equivalent emissions produced within the local area	Air-quality data	This indicator corresponds to European Common Indicator 2: local contribution to global climate change. This considers local activities that entail the use of fossil fuels (carbon, petroleum, natural gas) for energy (including transport) and waste management. Methods and calculation available at: http://ec.europa.eu/environment/urbana/common_indicadors.htm	Tons per year	As with other indicators, the indicator of CO_2 emissions per inhabitant generated in a city depends on various factors, such as the level of economic or industrial development, but also on other questions such as the degree of business competitiveness, inefficiencies in energy consumption, or transport systems Following the proposals established by the European Commission in the energy/climate package, the desired reduction can be fixed at 20%/inhabitant/year by 2020 Examples of reference: Malaga: Emissions of CO_2 (tons/year) = 2,156,399 Emissions per inhabitant = 3.74 Marseilles: Emissions of CO_2 (tons/year) = 2,666,000 Emissions per inhabitant = 3.17 Turin: Emissions of CO_2 (tons/year) = 5,079,607 Emissions per inhabitant = 5.59
	4. Energy consumption	**CAT**	This indicator estimated urban energy consumption per inhabitant, considering both energy consumption and fuel consumption	– Data related to annual energy consumption (electricity, natural gas, hydrocarbons, and LPG) – Population census (number of inhabitants)	(Electricity + Natural gas + Hydrocarbons + LPG consumption)/(No. of inhabitants)	Toe (tons of oil equivalent) per inhabitant per year	As with the previous indicator, a desired reduction can be fixed at 20% by 2020

	5. Water consumption	**CAT**	This indicator measures the daily amount of water consumed by a city inhabitant	– Information regarding annual consumption of domestic and total water – Population census (number of inhabitants)	(Volume of domestic water consumed)/(No. of inhabitants · 365)	Litres per person per day	Following recommendations from the WHO, a desired reference level can be set at 100 L per person per day for domestic water consumption for Mediterranean cities participating in the project
	6. Waste collection and management	**CAT**	This indicator measures the volume of urban solid waste generated daily per inhabitant and the percentage of waste that is recycled	– Total volume of urban solid waste generated – Volume of recycled urban waste – Population census (number of inhabitants)	Volume of urban solid waste (Total volume of urban solid waste per year)/(No. of inhabitants · 365) % of recycled material = (Volume of recycled waste · 100)/(Total volume of urban solid waste)	Kilograms per inhabitant per day Percentage of recycled waste	Ranges of 1.2–1.4 kg per inhabitant per day are established, along with a desired level of recycling of about 50% in the set of Mediterranean cities participating in this project
	7. Air quality	**CAT**	This indicator represents the number of days per year in which poor air quality was registered, considering the most important pollutants	Data recorded for each pollutant (SO_2, CO, NOx, O_3, PM10)	SO_2: Number of days in which the 125 μg/m^3 limit is exceeded CO: Number of days in which the 10 mg/m^3 limit is exceeded NOx: Number of days in which the 50 μg/m^3 limit is exceeded O_3: Number of days in which the 120 μg/m^3 limit is exceeded PM10: Number of days in which the 50 μg/m^3 limit is exceeded	Number of days per year in which the level is exceeded	Desired levels in this set of indicators are defined on the European level: SO_2: Daily limit: 125 μg/m^3, which should not be exceeded more than 3 times per year CO: Daily limit: 10 mg/m^3, which should never be exceeded NOx: Hourly limit: 200 mg/m^3, which should not be exceeded more than 18 times per year. Annual limit: 40 mg/m^3 O_3: Daily limit: 120 mg/m^3, which should not be exceeded more than 25 times per year PM10: Daily limit: 50 μg/m^3, which should not be exceeded more than 35 times per year
	8. Quality of drinking water	**SAAD** Efficient cities	European Directive 98/83/EC on the quality of water intended for human consumption			%	

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	9. Quality of silence	**CAT**	Percentage of the population exposed to unrecommended high noise levels, considering noise during both the day and night	– Georeferenced noise map – Georeferenced city street map – Georeferenced population census	Quality of silence (day) = (Number of people exposed to more than 65 dB during the day)/(Total number of inhabitants) · 100 Quality of silence (night) = (Number of people exposed to more than 55 dB at night)/(Total number of inhabitants) · 100	Percentage of population	Desired levels of about 25% of the population during the day and about 15% at night in the set of Mediterranean cities participating in this project
	10. Coastal erosion	**SUS**	Evolution of the coastline	% of eroded coastline			
	11. Percentage of artificially protected coastline	**SUS**	Measures works for coastal protection (embankments, dams, breakwaters, or other stable structures)	% of coastline with stable defences			
3.3. Natural and manmade risks	1. Presence of at-risk activities	**PRIN**	Assesses the presence and spread of these activities within the study site	Census of at-risk activities	Qualitative and quantitative index	Number of at-risk activities per surface area	OPTIMAL: No at-risk activities in the area in question, or <1/100 km^2 GOOD: Limited presence of at-risk activities, but without interfering with the remaining area, or between 1 and 2 per 100 km^2 SUFFICIENT: Presence of multiple at-risk activities that interfere only occasionally with the study area, or between 2 and 3 per 100 km^2 INSUFFICIENT: Presence of at-risk activities that interfere with the remaining area, or >4/100 km^2
	2. Presence of areas at risk of flooding	**PRIN**	Assesses the presence and degree of danger and the presence of areas subject to flooding within the site, in reference to the indications given in the current PAI (Hydrological Plan) of the area	Census of floodplains	Qualitative and quantitative index	Scale from insufficient to optimal	For Italy: OPTIMAL: Not included in areas of possible flooding GOOD: Project area partially included in areas of band C SUFFICIENT: Project area partially included in areas of band B INSUFFICIENT: Project area partially included in areas of band A

	3. Light pollution	**PRIN**	Defined as any form of artificial light that spreads outside its functionally dedicated areas and, particularly, if oriented above the horizon	Current and designed state	Lombardy Regional Law no. 17 of 27/03/2000 "Misure urgenti in tema di risparmio energetico ad uso di illuminazione esterna e di lotta all'inquinamento luminoso" [Urgent measures regarding energy savings related to external lighting and combating light pollution], and the specific "VISUAL" directive, implementation regulation of LR 17/00		With respect to the viewpoint, the project should be inserted in the landscape in order to favour its perception from within and from outside, avoiding elements with negative visual impact but not renouncing its recognizability, promoting areas of landscape/environmental use The project is judged positively if placed in continuity with the contextual ecological network, completing and implementing it through plantings and the creation of green spaces. It should focus particularly on the geomorphological characteristics of the area where it is inserted, characterized by agriculture, and placed in continuity in the design of open spaces. Finally, it should avoid becoming a point of discontinuity with respect to areas of natural or landscape interest
3.4. Waste collection and management	1. Density of urban waste bins per inhabitant	**PRIN**	Assesses the density of containers for waste collection, the frequency of emptying, the uniformity of container distribution in the study area, the presence of systems to collect various materials and recycling, and at-home collection	Statistical data according to municipality	Qualitative and quantitative index	Number of containers (recycling + regular waste) per km^2 of municipal surface area	OPTIMAL: Uniform, widespread presence in the territory (>300/km^2). Correct management and maintenance GOOD: Widespread presence in the territory, even if not always uniform (>200/km^2). Correct management and maintenance SUFFICIENT: Non-uniform presence in the territory (>100/km^2). Management and maintenance with occasional instances of degradation INSUFFICIENT: Low presence in the territory (<100/km^2) or evident instances of degradation in management and maintenance

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	2. Percentage of landfilled urban waste	**SAAD**	Yields the percentage of landfilled urban waste	Eurostat sources		%	In the 28 states of the EU, 28% of managed urban waste is recycled (average of 131 kg/inhabitant/year) and 15% is composted (71 kg/inhabitant/year), while 26% (122 kg/inhabitant/year) and 31% (147 kg/inhabitant/year) is incinerated or landfilled, respectively. While the European average is 204 kg/inhabitant/year for landfilled waste, there are percentages less than 1% in Belgium, Germany, and Sweden, while another three countries (Austria, Denmark, the Netherlands) landfill less than 5% The Italian Waste Prevention Program, implemented under the Ministry of the Environment and the Protection of Land and Sea with decree no. 2 from 7 October 2013, identifies the production of urban waste per unit GDP as one of the parameters to be monitored to evaluate the effectiveness of various measures taken. For this parameter, a reduction of 5% from the 2010 level was fixed for 2020
	3. Percentage of recycled urban waste	**SAAD**	Yields the percentage of recycled urban waste	Eurostat sources		%	Data from European references: Recycling and composting (which includes both aerobic and anaerobic treatment of the biodegradable fraction) is more widespread in older member states (152 and 84 kg/inhabitant/year for recycling and composting, respectively) than in newer member states (47 and 19 kg/inhabitant/year, respectively)

3.5. Safety	1. Safety of the road network (vehicular traffic)	**PRIN**	Considers the dangerousness of the road network due to vehicular traffic and regarding weak users	Current state	The ratio of the number of annual accidents (total number, with wounded, with victims) involving vehicles or motorcycles per km of road and the ratio between the number of annual accidents involving pedestrians or bicycles per km of road		OPTIMAL: Optimal roadway maintenance, numerous clear, well-located signs GOOD: Good roadway maintenance, signs are clear and well located SUFFICIENT: Sufficient roadway maintenance, signs are sufficiently clear and well located INSUFFICIENT: Roadway maintenance scarce, signs are unclear and not always well located
	2. Safety of the road network (pedestrian and bike paths)	**PRIN**	Assesses the safety of pedestrian and biking paths through the presence of fixed devices, borders, or street signs that can protect walkers and bikers from traffic	Current state	Qualitative and quantitative assessment including the number of devices to protect pedestrians and also their effectiveness		OPTIMAL: Constant presence of signs and protection at critical points and along the path GOOD: Widespread but incomplete presence of horizontal and vertical signs and protection (e.g., at intersections and not along straight paths) SUFFICIENT: Protective elements present only at some very critical points, non-uniform markings (e.g., lacking horizontal or vertical signs, pedestrian and biking paths not differentiated) INSUFFICIENT: Scarce, wrong, or excessive markings (e.g., unclear signs, conflicting indications). Presence of protective elements

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	3. Quality and degree of maintenance of pedestrian and bike paths	**PRIN**	Assesses the architecture, maintenance, and coherence in reference to the overall design of biking and walking paths in the study area. Possible evaluation criteria include: quality, state, and accessibility. Maintenance should maintain a constant level of perceived quality on the paths, in their material and chromatic integrity	Current state			OPTIMAL: High quality and uniform throughout the territory, constant maintenance GOOD: Good quality, even if not completely uniform. Uniform maintenance, even if not perfect, but does not influence path integrity SUFFICIENT: Non-uniform quality, but sufficient overall and/or inconstant maintenance INSUFFICIENT: Low quality and/or lacking maintenance
	4. Quality of lighting in open spaces and buildings (both daytime and night-time)	**PRIN**	Assesses the solar shading systems during the day both in open spaces and buildings, as well as night-time illumination	Current and designed state	Qualitative assessment that considers, in addition to the sunlighting characteristics during the day (the more sunlight, the higher the score), the possibility of shading buildings and open spaces with street furniture or plants (like for sunlighting, the score is higher for systems that offer the best protection). For night-time illumination, the presence of artificial lighting systems and their effectiveness is evaluated		OPTIMAL: Sunlit spaces throughout the day, with daytime shading elements and effective night-time illumination GOOD: Sunlit spaces a good part of the day, with shading systems and uniform night-time illumination SUFFICIENT: Sunlight spaces in some parts of the day, with not completely effective shading or night-time illumination INSUFFICIENT: Scarce daytime sunlighting, low possibility of shading or scarce night-time illumination (e.g., peripheral neighbourhoods with tall, close-set houses, few green areas and lack of lighting)

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Part III
Contributions for the Evaluation of Urban Policies and Quality of Life

Chapter 6
Distinctive and Pleasant – Transformative Concepts in Landscape Ecology: Social Ecological Green Spaces (SEGS)

Marco Cervellini, Giandiego Campetella, Stefano Chelli, and Roberto Canullo

Landscape means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors (European Landscape Convention 2000). Unfortunately, this definition hides different criticalities in relation to spatial scales and organism-centred perspectives. Gustafson (1998) in particular emphasizes that the distinction between what can be mapped and measured and the patterns that are ecologically relevant to the phenomenon under investigation or its management is sometimes blurred. These critical aspects are reflected in landscape analyses and consequently in landscape ecology, which emphasizes the interaction and dependence between spatial patterns and ecological processes, that is, the causes and consequences of spatial heterogeneity across a range of scales (Turner et al. 2001). Furthermore, a disruption in landscape patterns or, indirectly, an alteration of the main agents influencing the pattern formation (i.e. physical templates, biotic processes, and disturbance regimes) may compromise its functional integrity by interfering with the critical ecological processes necessary for populations to persist and to maintain biodiversity and ecosystem health (McGarigal et al. 2012). Although epidemiological studies have provided evidence of a positive relationship between human longevity and access to green space, and between green space and self-reported health, the functionality of corridors in ecological networks is still contested or controversial. However, in the absence of alternative strategies to address the ecological impact of fragmentation, ecological networks have become a popular element of urban planning (Tzoulas et al. 2007). For these and other reasons, much emphasis has been placed on developing methods to quantify landscape patterns, which are considered a prerequisite to the study of pattern-process relationships. One efficient free spatial pattern analysis software for quantifying the

M. Cervellini (✉) • G. Campetella • S. Chelli • R. Canullo
School of Biosciences and Veterinary Medicine – Plant Diversity and Ecosystems Management Unit, University of Camerino, Camerino, Italy
e-mail: marcocervellini@gmail.com; diego.campetella@unicam.it; stefano.chelli@gmail.com; roberto.canullo@unicam.it

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structure and heterogeneity of landscapes is FRAGSTATS (McGarigal et al. 2012). In this tool, landscape pattern metrics focus on the spatial character and distribution of patches in the neighbourhood of each cell or across the landscape as a whole. Four landscape metrics can be defined on four levels of heterogeneity:

(a) Cell-level metrics
(b) Patch-level metrics
(c) Class-level metrics
(d) Landscape-level metrics

The first level provides the finest spatial unit of resolution for characterizing spatial patterns in categorical maps. The second level defines individual patches and characterizes the spatial character and context of the patches. The third level integrates over all patches of a given type (class), and the final level integrates over all patch types or classes over the full extent of the data (i.e. the entire landscape). At the class and landscape level, some of the metrics quantify landscape composition, while others quantify landscape configuration. Considering that landscape composition and configuration can affect ecological processes independently and interactively, by analysing vector or raster datasets, it is possible to compare urban development and vegetation landscape changes over different periods using fragmentation and connectivity indexes or aggregation metrics (McGarigal et al. 2012). Recent research work with FRAGSTATS focused on the Mediterranean coastal landscape showed, for example, that road density is significantly related to forest and scrubland fragmentation, while population density and proximity to urban areas had no significant effect on these plant communities (Hepcan and Hepcan 2015).

Considering what is described above, problems of representation could be useful in moving away from the classical definition of landscape ecology based on spatial patterns and ecological processes and begin reflecting that the concept behind human-nature systems and ecosystem health also includes the perception and quality of life for humans in an urban environment. In this perspective, landscape ecology should begin to consider both visible and invisible elements such as ownership types, labour relations, and social perceptions of quality of life, moving towards a concept that can be defined as *social ecological green spaces* (SEGS).

The need for a change in perspective when analysing landscape ecology fits well with the Adriatic City, which is characterized by a highly fragmented and heterogeneous landscape where man-made infrastructures, urban green spaces, urban agriculture, and natural areas interweave, generating a complex mosaic (Canullo et al. in Sargolini 2013). After quantifying the surfaces and distribution of each category of green space in this complex system as well as their patterns and related spatial and temporal connections, it may be possible to assess whether there is a relationship between the types and quality of green infrastructures and the perceived quality of life.

In fact, although research has already demonstrated the general relationship between green spaces and human physical health (Maas et al. 2006)—focusing particularly on green space buffers and health (Van den Berg et al. 2010), green spaces and mental health (Fuller et al. 2007), or sociality (Maas et al. 2009)—gaps are still present when building an integrated model capable of considering

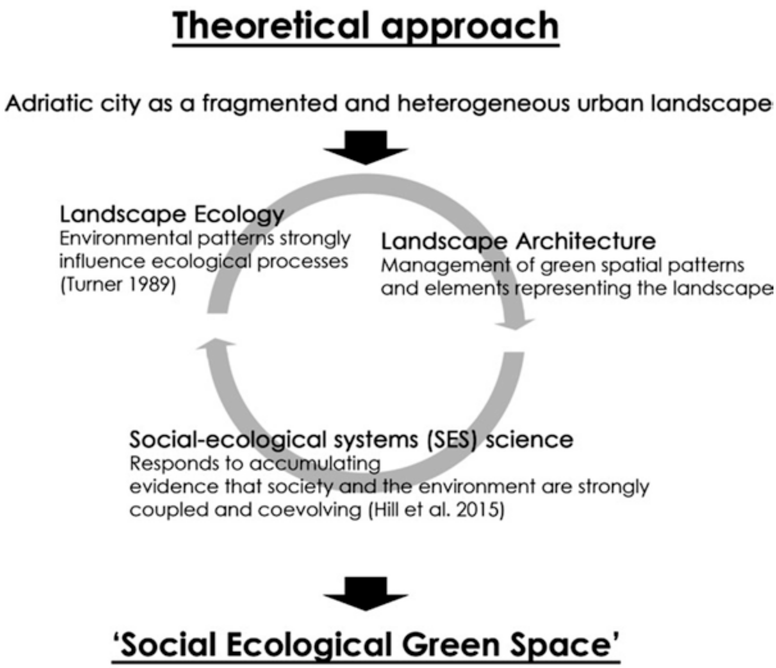

Fig. 6.1 Theoretical approach to defining a social ecological green space

contemporary types, spatial patterns, and the quality of green infrastructures in relation to different aspects of perceived quality of life (i.e. the presence of green space and allergy-free zones, public accessibility, or enhanced perceived quality of life in participatory planning).

To define SEGS (Fig. 6.1) starting from a multidisciplinary theoretical approach, it may be useful to investigate how patterns strongly influence ecological processes (i.e. landscape ecology; Turner 1989) with landscape architecture—defined as the management of green spatial patterns—and social ecological systems, responding to accumulating evidence that society and the environment are strongly coupled and coevolving (Hill et al. 2015).

In moving from theory to practice, it might be interesting to relate spatial pattern analysis indices on the landscape scale and indices for reducing building impact (i.e. RIE Index 2007) on the urban scale to the quantification of perceived quality of life (e.g. the aesthetic, allergenic, and emotional components of urban vegetation) or to the degree of participatory effort made by public bodies in planning and building green infrastructures. To gather this multidisciplinary dataset, it is necessary to gather styles and projecting approaches from landscape architecture, data from landscape ecology, and finally, associated local and regional social surveys on the human perception of interventions and planning directions. This set of integrated data could allow a multidisciplinary map representing the SEGS structure of the selected study area to be built.

Table 6.1 The negative relationship between PPD and RIE indices

PPD	RIE
80.07	3.51
42.24	4.02
5.03	6.00

Five percent PPD is the lowest PPD that can be achieved practically since providing an optimal thermal environment for every single person is not possible

An initial attempt to create an integrated index has been made in the QLandQLife project. In fact, the RIE index for the city of Ancona was related to the PPD index (predicted percentage dissatisfied, International Organization for Standardization 1994), which describes the percentage of occupants that are dissatisfied with the given thermal conditions (in QLQL).

PPD

$\mathrm{PPD} = 100 - 95 \bullet \mathrm{Exp}(-0.03353 \bullet \mathrm{PMV}^4 - 0.2179 \bullet \mathrm{PMV}^2)$

where PMV is the predicted mean vote.

RIE

$$\mathrm{RIE} = \frac{\sum_{i=1}^{n} S_{Vi} \frac{1}{\Psi_i} + (Se)}{\sum_{i=1}^{n} S_{Vi} + \sum_{j=1}^{m} S_{ij} \Psi_j}$$

S_{vi} = ith permeable, impermeable, or sealed green surface
S_{ij} = jth permeable, impermeable, or sealed nongreen surface
ψ_i = ith outflow coefficient
ψ_j = jth outflow coefficient
Se = equivalent tree-covered surface area

The initial results show a negative relationship between PPD and RIE, suggesting a decrease in dissatisfaction related to an increase in reduced building impact (Table 6.1).

It is important to specify that PPD is set to define the “thermal environment”. People’s perception is therefore strictly related to thermal conditions. This is accepted as an important factor in determining the quality of life in urban environment and is strictly related to the physical elements capable of reducing outdoor temperature such as green areas, green canopies, highly retroreflective materials, and urban shading. Therefore, when addressing green surfaces to improve the perception of quality of life and considering only the relationship between PPD and RIE, it seems sufficient to increase the surface area of urban vegetation to achieve a positive improvement in thermal comfort. But in order to build a multidisciplinary model, it is necessary to relate the aesthetic, health, and emotional components of the urban quality of life to the shape, distribution, and species composition of green areas.

Through structured or unstructured social surveys (e.g. open-ended interviews or close-ended questionnaires, Bengston et al. 2011), it may be possible during city planning to characterize different zones with preference values that quantify aspects such as distance from or accessibility to green spaces, the aesthetic needs of the population, or compositional aspects useful for defining more sensitive allergenic zones. This multidisciplinary approach will help to characterize what could be defined as SEGS covering different types of green urban infrastructures, such as lines of trees (characterized by high historical and emotional value), parks (human physical and psychological health), and urban protected areas (e.g. Natura 2000 Network Directive 92/43/EEC).

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Chapter 7
Distinctive and Pleasant – Urban morphology and urban identity: landscape perception

Chiara Camaioni

When we think about the concept of *form*, which the traditional city heralds, we commonly think about a finite design, a compact, organized space composed of elements and components that over time have generated interactions and defined social structures and lifestyles. New urban forms instead go beyond the concept of form intended as "finiteness" (Benevolo 2011). In fact, the modern city expands over the territory, and its borders are pushed beyond the "physical confines" and administrative limits of the consolidated settlement structure.

The form of the city represents the final result of the transformations and changes that have occurred in Europe and the United States since the end of the twentieth century. The speed and extent of these changes have had a profound impact on each aspect of the city, starting with its formal organization, generating a loss of coherence and diversity with respect to traditional spatial structures. The main forces of change are related above all to socioeconomic (weakening of agriculture production and industrialization, market economy, globalization, etc.), technological (information technologies, transport development, etc.), political (weakness or absence of tools effective for territorial government, etc.), natural (climate change, soil characteristics, etc.), and cultural processes (desire for individual freedom, expectations for more evolved building and housing standards, etc.).

The change in city morphology is therefore a long, complex process, for which it is difficult to establish how the driving forces have interacted with and influenced each other. The form is not only a physical dimension but also involves the social and identifying structure. The modern city is denoted by the presence of a mass of heterogeneous components and functions, which follows a complex order and is articulated by the overlapping of networks and fluxes. It is a system of complex relationships among physical characteristics of the city and its citizens that generates original and multiform spaces. While the physical dimension of the city (buildings, open spaces,

C. Camaioni (✉)
School of Architecture and Design, University of Camerino, Ascoli Piceno, Italy
e-mail: chiara.camaioni@unicam.it

R. Cocci Grifoni et al., *Quality of Life in Urban Landscapes*,
The Urban Book Series, https://doi.org/10.1007/978-3-319-65581-9_7

streets, etc.) is shaped and formed under the influence of its inhabitants, its form is characterized by continuously changing lifestyles and social relationships. This is the product of the continuous interaction between physical space and citizens, and it reflects the experiences of the communities. As a consequence, the urban identity is the result of relationships created between individuals and urban space and is therefore strictly influenced by the set of physical and social characteristics of a place. According to Kevin Lynch in his *The Image of the City* (Lynch 1960), urban morphology and identity are closely correlated, and even if the image of a city does not necessarily reflect its identity, it is physically the most immediately reflected perception of it.

Identity is one of the criteria of the urban form that defines the characteristics of a place: the recognizable, memorable, and vivid character that distinguishes it from other places. In this regard, Lynch proposes a method to construct an environmental image aimed at urban design that allows the cognitive processes of the inhabitants, their urban uses, and their habits to be understood with the aim of making the city more readable (Liu et al. 2016). The construction of the image of the city by those living in and moving through it starts by recognizing five basic elements—paths, edges, districts, nodes, and landmarks—in that most of these elements can be easily perceived in the urban environment. Through these elements, people interpret the urban space they frequent or in which they live with mental elements and schemes and create their "mental maps". The visual form of the city for Lynch is not the sum of its individual parts but rather the way in which these are united and integrated in the mental image, which is retained by the city's inhabitants (Lynch 1990).

The basic visual quality is the "legibility" of the urban landscape, that is, the ease with which the different parts can be identified and organized into a coherent scheme. A legible city is one in which zones, nodes, and streets can be easily identified and grouped into a general model. The urban identity depends on the ease of identifying these elements and their interaction (Lynch 1984). Streets, squares, buildings, urban empty spaces, green spaces, but also historical elements such as buildings, sites, and monuments are the irreplaceable components of this model. When these components are configured as a true distinctive character in a city and when the individuals perceive them as such, it is possible to speak of an influential identity of a given place.

Since the contemporary city is undergoing continuous change and many places are starting to look similar (Augé 2009), it is necessary to analyse the concept of identity in depth, as a characteristic that allows one space to be differentiated from another. To do so, the use of indicators may be very useful. These should allow us to measure and reconstruct the morphology of the elements and components of the city and to monitor the ecological phenomena and human activities that are seen (Zhou et al. 2014).

Moving in this direction, a series of indicators useful for assessing urban identity was identified the QLandQLife project. In particular, the indicators identified can be grouped into three families: functional, spatial, and perceptual. The first family is composed of the set of indicators generated by human activities (functions) and the relationships that occur between them. The more functions present in a city, the greater the degree of complexity of the urban form. The spatial indicators are represented instead by the elements of the built assets (fabrics, roads, buildings, etc.) within which the urban functions and fluxes of connection and communication are inserted. While the first family of indicators evolves rapidly towards increasing complexity as a consequence of the increasing number of relationships and the creation of new urban functions, the second is distinguished by its static nature. This determines the appearance of contradictions, malfunction, and changes in the spatial form of the city and therefore the loss of urban identity.

The perceptual indicators, which are of more direct interest, are composed of elements that allow the urban dimension to be perceived by citizens, users, administrators, etc. The indicators also include the image of the city that each individual has and which grows out of the mutual relationship established between the "physical system" and the "functional system". Along these lines, the perception of the visual form, which constitutes the physical form of the city, strongly influences the way in which we use the city. It refers to indicators such as building and living density, elements of the historical settlement structure and consistency of the historical monumental heritage, the presence of buildings of particular prestige, the presence of decommissioned or degraded areas, the colour of the buildings, the quality of public spaces, points of reference, skyline, etc (PRIN 2004–2007).[1] These indicators allow the specific identity of different forms of city to be described. Below, we present a list of some of the indicators identified by the research that allowed us to assess the form and urban identity.

Elements of the Historical Settlement Structure and Consistency of the Historical/Monumental Heritage

This indicator assesses the territorial presence and importance of the elements constituting the historical/architectural heritage, intended as buildings with excellent monumental value and a documented history. The assessment is qualitative and quantitative in that it determines not only the interest of the individual monumental elements but also how many there are and how they are distributed within the territory. It refers to the evident persistence of monuments and physical signs of the past but also to the persistence of traces and plans. At the same time, they are considered legitimate elements of expression in minor works.

Judgement scale:

[1] A lot of current research relates to the analysis and definition of indicators, the objective of which is to quantitatively measure qualitative parameters referring to the built environment, including subjective and contextual factors. Among these, the study proposed refers to important research of substantial national interest (MIUR-PRIN), which grew out of a collaboration between the School of Medicine at the universities of Genoa and Pavia on the theme of urban quality and the perception of health (PI Prof. P. Olando, Genova).

Optimal: Presence of historical/monumental heritage and persistence of traces or plans or persistence of traces or plans

Good: Presence of historical/monumental heritage, without persistence of traces or plans

Sufficient: Presence of historical/monumental heritage with prevalence of minor works, without traces or plans

Insufficient: Absence of historical/monumental heritage

Skyline: Recognizability and Symbolic Value

This indicator assesses the quality of a place as a function of the recognizability of its formal structures. The character of artificiality, in the urban environment in particular, leads to the question of the recognizability of the entire context and whether it knows how to use the harmony of its parts to construct a definite entity capable of evoking a reference to the memory of places. The formation and legibility described by Kevin Lynch become fundamental categories in order to understand this qualitative index.

Judgement scale:

Optimal: High architectural quality of the individual elements that define the skyline, as well as the entire skyline, which provides a clear, formally recognizable image of the settlement.

Good: High architectural quality of the individual elements that strongly characterize the city but which are not strongly represented in the city as a whole.

Sufficient: Recognizability of the urban landscape readable as a whole. In this case, the urban landscape arouses a sense of belonging due to the visual relationships and architectural quality of the individual cases inserted within a fabric that however lacks an identity.

Presence of Buildings Characterized by Particularly Prestigious Architectural Solutions (e.g. Lesser Architecture) or Qualifying Contemporary Architectural Elements for the Urban Context of Reference

This indicator assesses the presence within the site of recognizable places or elements of great construction prestige due to the architectural solutions used (language, type, morphology, and dialogue with the context in which it is inserted), capable of giving greater perceptive quality within the context under study. The evaluation is qualitative and expresses particular attention for the morphological/structural assessment, tending to enhance the characteristics that allow for greater readability and recognizability of particularly prestigious systems.

Judgement scale:
Optimal: Consistent presence (>20% architectural heritage)
Good: Discrete presence (10–20% architectural heritage)
Sufficient: Reduced presence (5–10% architectural heritage)
Irrelevant: Irrelevant presence (<5% architectural heritage) or absent

Presence of Structures with Architectural Characteristics that are Inappropriate for the Urban Context: Detracting Elements from the Language Point of View

This indicator evaluates the negative influence that some elements with architectural/construction characteristics inappropriate for the context induce in the area under study. The assessment is qualitative and quantitative in that an index of quality is expressed for quantitative percentages that identify buildings with negative impact present within the site.

Judgement scale:
Optimal: Absence of detracting buildings or irrelevant presence (<5% architectural heritage)
Good: Reduced presence (5–10% architectural heritage)
Sufficient: Discrete presence (10–20% architectural heritage)
Irrelevant: Consistent presence (>20% architectural heritage)

State of Housing Conservation: Degree of Global Maintenance of Buildings and the Historical/Cultural Heritage

This indicator evaluates the state of conservation of structures present within the site in question. The assessment refers to the buildings in their entirety, whether they hold architectural prestige or are "ordinary" buildings. The assessment is qualitative and expresses the influence that the good state of conservation of the buildings of a site can give to the overall quality of the site.

Judgement scale:
Optimal: Functional buildings in optimal state of conservation, new construction, or recently restored/recovered buildings
Good: Functional buildings in good state of conservation excluding new constructions or those recently restored/recovered
Sufficient: Functional buildings without important superficial instabilities and with localized, reduced presence (<5% architectural heritage) of buildings requiring recovery/restoration

Insufficient: Functionally obsolete buildings, but which can still be used with exclusively superficial instabilities; functionally unusable or abandoned buildings with superficial and structural instabilities

Overall Colour Impact, Identification of Façade Colour with Local Tradition, and Overall Building Harmony (Materials, Paving, Openings, Proportions)

This indicator assesses the quality of a site in reference to the pertinence of finishing materials to the building tradition of the place in which they are used (colour and type of materials). The assessment is qualitative and expresses the influence that the use of some finishing materials and their related colours can give to the overall quality of the site.

Judgement scale:

Optimal: Optimal overall harmony of buildings that enhances the compositional characteristics and urban decor of individual buildings and their combination, protection of the material and colour qualities of traditional materials and techniques, and the use of archival colours compatible with the urban and environmental context; building façades that are organically uniform for their type and construction chronology from a chromatic point of view, free of differences between treated and non-treated parts with the use of adequate similar hue scales; non-uniform building façades pertaining to structures that are not organically consolidated, chromatically distinct but with similar historical and constructive characteristics, but free of excessive light and dark or colour contrasts. Correlation between buildings without excessive chromatic uniformity, gaudy differentiation, or interruptions with showy chromatic incidences in the hierarchy between serial and monumental buildings

Good: Good overall harmony of buildings that protects the material and colour quality of traditional materials and techniques with the use of colours that are not necessarily archival but compatible with the urban and environmental context. Correlation between buildings without excessive chromatic uniformity, gaudy differentiation, or interruptions with showy chromatic incidences in the hierarchy between serial and monumental buildings

Sufficient: Average overall harmony of buildings that protects the material and colour quality of traditional materials and techniques but with a widespread presence of chromatic uniformity or a localized, limited presence of excessive light and dark or colour contrasts

Insufficient: Absence of enhancement of the compositional characteristics and urban decor of individual buildings and their combination for showy differentiation, excessive chromatic uniformity, or incidences of showy colours with the use of colours incompatible with the urban and environmental context

Presence of Buildings with Architectural Characteristics Inappropriate for the Urban Context: Detracting Elements Due to their Scattered Types

This indicator evaluates the negative influence that some elements with architectural/construction characteristics inappropriate for the context induce in the area in question. This refers in particular to those elements that present a completely different type with respect to its surroundings. The assessment is qualitative and quantitative in that the index of quality is expressed regarding quantitative percentages that identify buildings with negative impact present within the site.

Judgement scale:

Optimal: Absence of detracting buildings or irrelevant presence (<5% architectural heritage)

Good: Reduced presence (5–10% architectural heritage)

Sufficient: Discrete presence (10–20% architectural heritage)

Irrelevant: Consistent presence (>20% architectural heritage)

Architectural Quality (Street Furniture, Presence of Artistic Installations) and Degree of Maintenance of Public Spaces in Relation to Open Spaces

This indicator assesses the quality and presence of urban décor (lighting, benches, bollards, pavement, tree grates, fountains, bicycle stands, fences, presence of art installations, etc.) from the point of view of both design and the usability by the population. Possible evaluation criteria include maintenance, accessibility, location, functionality, and safety. The assessment is both quantitative and qualitative.

Judgement scale:

Optimal: Most outdoor gathering spaces (>70%) present quality street furniture and/or art installations. They are also well maintained, accessible, and functional.

Good: A good part of outdoor gathering spaces (>50%) present quality street furniture and/or art installations. The maintenance, accessibility, safety, and functionality do not present negative elements.

Sufficient: Some outdoor gathering spaces (>30%) present quality street furniture. Maintenance is not constant or distributed uniformly, but this does not influence the accessibility or functionality.

Insufficient: Low presence of quality elements or existing ones are not easily accessible, not functional, or unsafe.

The form of the city is therefore a complex system, the result of the interaction between the built environment and the perceived environment, including the social, cultural, and economic dimensions. The urban form is structured mainly under the influence of human activities, so it inherits the values and symbolic meanings of the communities, which change over time. It is the physical reflection of the identity, which is flexible and undergoing continuous change. The question is therefore how to manage transformations of the form and urban identity in the modern city. In this sense, the indicators of urban sustainability should not be limited only to physical resources but should include urban identity as cultural heritage. For this reason, it was necessary in this research to identify a method to analyse and assess the indicators of urban identity. The main objective of urban planners and city designers is to create liveable places for people. This liveability can be determined only through the physical characteristics of an environment, but it also involves subjective factors like the social and mental dimensions of the urban environment (Kaymaz 2013).

In conclusion, the relationship between morphology and urban identity should be well understood and interpreted in order to create recognizable, quality urban forms. For this, it is important to identify indicators of the form that consider the above-mentioned relationship (between morphology and identity) on which to construct plans and policies capable of adapting to change.

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Chapter 8
Efficient and Nice – Dimensions, Characteristics, and Forms for an Inclusive, Responsible City

Maria Federica Ottone

> *"Cities are a product of time. They are the molds in which men's lifetimes have cooled and congealed, giving lasting shape, by way of art, to moments that would otherwise vanish with the living and leave no means of renewal or wider participation behind them" (Mumford Lewis, 1938)*

The interpretation of urban phenomena was interrupted abruptly in the 1970s and 1980s with the publication of the most important works on the city by urban-planning theorists such as Aldo Rossi (1966) and Carlo Aymonino (1976) in Italy, Frampton (1983) and Robert Venturi (1966) in the United States, and Rem Koolhaas (1978). In other words, this was a quick change in direction towards new hypotheses of reading and interpretation dictated by the new-found awareness of having to face a new and important challenge: reducing the impact of cities in the planet's rapid course towards self-destruction. The history of this challenge for the sustainability of our cities is presented brilliantly by a certain collection of essays (Wheeler and Beatley 2014), which traces the complexity and multidisciplinary character, as well as the origins, hidden in some prophetic works predating the books by the authors mentioned above.

Therefore, mentioning the urban form today can seem like a return to concepts based primarily on the observation of the city as an abstract, ideal phenomenon (linear, concentric, block city, etc.) or a functional type of interpretational criteria. In effect, the parameter "urban form", intended as the integration between the footprint of the buildings on the ground and the spaces between them, cannot immediately be associated with the idea of sustainability.

On the other hand, if we look at current theory and research on urban transformations, the contributions are clearly fragmented along disciplinary lines. It is not just architects or urban planners who have the best skills; ecological challenges have

M.F. Ottone (✉)
School of Architecture and Design, University of Camerino, Ascoli Piceno, Italy
e-mail: mariafederica.ottone@unicam.it

R. Cocci Grifoni et al., *Quality of Life in Urban Landscapes*,
The Urban Book Series, https://doi.org/10.1007/978-3-319-65581-9_8

also involved analysts who look at the phenomena from physical and environmental, social, and economic points of view. The form of the city today interacts with these disciplines in that, if we are fortunate, the structure of the city will be conditioned to more effectively achieve the goals of greater energy efficiency and better quality of life.

If the study of the urban form can be re-evaluated from a different perspective—in a social, environmental, energy-efficient, or landscape key, for example—one can investigate the historical city, the city of the streets and squares, avenues and alleys, and parks and gardens. This includes consolidated but different categories and dimensions to understand how and to what extent the model is still valid and if it can constitute a credible hypothesis to read, select, and understand the city's dimensions, ratios, and relationships. The ultimate aim is to identify new prospects for the quality of life within a historical model.

As is clear from the contributions presented in this book, the indicators that can determine urban quality and sustainability constitute an extremely complex framework. The category "Efficient and nice" includes the theme of uses and the form of the city, whose main indicators include the following:

City Uses and Form

– Building density
– Living density
– Average building height
– Compactness
– Urban complexity

In the recent classification of the quality of life in Italian cities (*ItaliaOggi* 2016) made by the Sapienza University of Rome, an important fact emerges: the largest city (Milan) is in 56th place, while average-sized cities appear at the top. Therefore, urban size seems to be a parameter that, while not an object of assessment in the research, notably influences the quality of life.

More than medium/small cities, the shortcoming of large cities is the urban form usually referred to as *periphery*, in which pockets of degradation, poverty, social discomfort, and a lack of safety are hidden. However, there are still those today who debate the periphery's real existence as a physically recognizable phenomenon—beyond the most famous and widely cited examples such as the Vele in Naples, the Corviale in Rome, or the Zen in Palermo—and how it can rather be attributed to a situation of social marginalization, which is sometimes independent of its location.

The periphery is seen as "the spatial indicator of unease created by distance from the centre, lack of services and infrastructure, slowness of integration, social tension, and a sense of marginalization". Today, after the era of large public residential works, "the utopia of capitalism has been realized without places of conflict and that terrible theatre of juxtaposition between classes, cultures, ethnicities, generations, and ideas as the city was historically understood, and has been progressively replaced by a shapeless fabric of individual minicities, the place of a changeable and all-inclusive suburban middle class in which everyone chooses or constructs a house where and how they can according to their economic standing" (Ciorra 2010).

Building Density

The complexity of the periphery therefore makes it difficult to understand the quality that densification can generate over the dilution of built spaces and the consequent compression or permeability of the open space. Open space today certainly holds strategic importance because it can serve as a prime place for compensation and new opportunities.

Therefore, if the urban density of consolidated peripheries can generate quality in relationships in the sense of a greater propensity to be "communities" and turn an uncomfortable situation into the potential for proactive capability and urban efficiency, a corresponding lack of density can generate isolation and marginalization. Today, however, it represents the physical and social terrain to propose actions for reconversion and transformation according to criteria closer to contemporary needs.

The question therefore relates to identifying a participatory mechanism that can trigger a reaction to the state of apathy and immobility of some periphery conditions due mainly to low construction density and the dilation of spaces for interaction. Places like these are very often unsafe because they lack the attention of the inhabitants and urban administrators.

Collaborative strategies (Ottone 2015) should mainly grow out of the communion of primarily economic interests or interest motivated by the need for greater security and well-being in the perception and use of urban spaces. In this sense, the ability to establish these synergies can arise from the permanent interaction between administrators and citizens according to a well-defined working method and a range of innovative ideas on which an operational discussion can be established. This should necessarily be free of demagogy or political apathy, in which each person is aware of the consistent benefits obtained through his or her own participation.

In this framework, the discontinuity of the urban fabric can allow functions to be inserted that give meaning and value to the place, favouring variety rather than uniformity in the choices. Seen, like a house, as a place for living, the city should therefore be equipped with apparatus to obtain climate comfort and reduce greenhouse gas emissions in order to be safe at all hours of the day and night.

Living Density

The indicator "living density" coincides only in part with the population density in a specific city or urban settlement. By extending the concept of living to the city and not just the buildings, housing density serves as a measure of the effective presence of people, both residents and daily users of a place and a neighbourhood, including all the closed and open spaces.

In this sense, we can indicate how housing density means not only the presence of residential buildings but, in general, the concentration of people that spend many hours of the day carrying out different functions in a neighbourhood or a part of the city. In this sense, the presence of schools, offices, and stores, in addition to housing, which is generally referred to as “functional *mixité*”, determines the living density in a given urban place. In general, this type of density represents an indicator of the quality of life in that it represents a certain inclination for the life of interaction and exchange between people.

In contrast and despite other urban functions, the prevalence and/or concentration of residential buildings has for some time had a negative connotation. In *The Condition of Postmodernity* (Harvey 1993), the author represents the postmodern city as a juxtaposition with the modern city, using the critical position of Jane Jacobs (1961): “But look what we have built with the first several billions: Low-income projects that become worse centers of delinquency, vandalism and general social hopelessness than the slums they were supposed to replace. Middle-income housing projects which are truly marvels of dullness and regimentation, sealed against any buoyancy or vitality of city life. Luxury housing projects that mitigate their inanity, or try to, with a vapid vulgarity. Cultural centers that are unable to support a good bookstore. Civic centers that are avoided by everyone but bums, who have fewer choices of loitering place than others. Commercial centers that are lackluster imitations of standardized suburban chain-store shopping. Promenades that go from no place to nowhere and have no promenaders. Expressways that eviscerate great cities. This is not the rebuilding of cities. This is the sacking of cities”. This harsh portrait of the monofunctional city is contrasted with a typical attitude of the deconstructivist postmodern culture: “Fiction, fragmentation, collage, and eclecticism, all suffused with a sense of ephemerality and chaos, are, perhaps the themes that dominate in today's practices of architecture and urban design. And there is, evidently, much in common here with practices and thinking in many other realms such as art, literature, social theory, psychology, and philosophy” (Harvey 1993). This counterposition embraces a new vision that does not attribute a functional value to living density but rather defines it as a more or less intense way of living in a neighbourhood—or the entire city in the case of average town centres—without necessarily having to cross its borders in order to carry out regular daily activities.

If living density is considered an indicator of quality, this does not mean it undervalues a paradoxical phenomenon that city administrators do not seem to realize, especially when it relates to medium-sized cities and those with a prestigious historical centre: the progressive transformation of historical centres, deemed warehouses of quality, into tourist “treasures”. This progressive genetic mutation has strongly discouraged the acquisition or permanence of housing, while the latter has been distanced from the original centre, scattered over a thousand lots or concentrated in monofunctional quarters (Gabrielli 2015). This phenomenon affects many small centres in central Italy, such as Perugia, where only 6.3% of the population lives in the historical centre (www.regioneumbria.it, 2011), or Siena, which, in just

5 years, from 2010 to 2015, the population of the historical centre fell by about 500 (about 5% of the population, www.comune.siena.it). The same phenomenon is witnessed in extreme form for small towns, which are often totally abandoned or transformed into luxury resorts, or large cities with totally gentrified historical neighbourhoods.

The progressive transformation of the historical centres of many small and medium Italian towns surrounded by "aesthetic" landscapes has led to the partial failure of meticulous renewal carried out by institutions and supervisors. This regeneration has distanced the main protagonists: the inhabitants.

Urban Complexity (and Integration)

As mentioned in the section above, the loss of complexity strongly characterized the urbanization of large cities throughout the first half of the last century, generating problems related to physical and social integration. The urban complexity indicator, which is associated with the parameter of multifunctionality, therefore seems to be one of the main factors due to which integration and safety are obtained in urban centres, whether small or large.

In this sense, Jacobs' intuitions (op. cit. 1961) regarding some typical phenomena of the complex, integrated city can still be considered not free of value, especially when associated with a progressive technological evolution connected to the theories of the "smart city", for example, "eyes on the street". "Nobody enjoys sitting on a stoop or looking out a window at an empty street. Almost nobody does such a thing. Large numbers of people entertain themselves, off and on, by watching street activity". This relates to natural control of the city by its citizens, which reveals the state of efficiency, a typical condition of a complex city. On the contrary, monofunctional neighbourhoods entrust safety to remote control, via cameras in the best of cases.

In this sense, the theme of control and social safety appears as one of the most important needs to satisfy: a need that has represented one of the main motivations for most people to live within the urban centre rather than isolated in the country.

At the same time, complexity generates the need for integration devices that could express all their efficiency if only they were invested in technologies oriented at implementing the network of mobility, organizing waste disposal, services for disabled or elderly people, etc. Complexity and integration technologies can create a combination of value and efficiency in the contemporary city.

Average Building Height, Building Density, and Compactness

By combining these three indicators, one of which was already examined above, the aim is to highlight their influence from the environmental point of view. Contemporary urban planning, with its abstract, undifferentiated standards, has contributed to the progressive dilation of open urban spaces, without which they would be attributed with a particular urban value as public spaces. We can think, for example, about limits on the distance between the street and borders, private parking, and street width in relation to the building fronts. A zoning project seems to contain the same prescriptions in Lombardy as in Sicily. If today environmental questions are posed as reducing greenhouse gas emissions and countering climate change and the urban heat island, legislators and public administrations should be encouraged to consider parameters that better adhere to today's needs, with reference to some historical cities that have followed these indicators in the conformation of their urban layout, in harmony with climate conditions.

The factors of average building height, building density, and compactness are closely connected to regulations that today seem inadequate for establishing a project that should necessarily be aimed at resolving problems on the urban scale. A new way of approaching the urban project should be found in technologies oriented at mitigating climate change and in materials that can reduce the impact of heat on urban surfaces.

In visiting parts of the diffuse Adriatic city or offshoots of the consolidated city, zoning designed with these regulations has produced an impressive amount of impermeable urban surfaces. There is widespread negligence in private areas and the spaces adjacent to housing such as sidewalks, clearings, and parking lots, which in many cases act as open-sky heaters. It is not surprising if today the difference in temperature in summer between an urbanized centre and the surrounding country is very stark. "The United States Environmental Protection Agency (2012) estimates that the annual mean air temperature differences between the canters of large regions and the rural periphery can be as much as 1.8 and 5.4 °C. The evening temperature differences between the urban centre and rural periphery can be as much as 12 °C (EPA 2012). Urban heat islands increase demands for energy and result in higher levels of heat-related illnesses". The sum of this idleness is addressed today through a different approach, which is necessarily measured in each individual situation and each individual space.

In this sense, the waivers in general regulatory plans seem to be the only tool currently available to reconsider the quality of the urban space within areas lacking urban quality. This tool is mainly used to resolve economic/financial problems during public/private agreements to create public works. The same exercise is also initiated in the experimental phase for private works, with the goal of directing the interventions and making them fit within a defined environmental context, for which an operation to improve the climate and living well-being is necessary.

A recent regional law in Piedmont sanctions the principle of dispensing with general regulatory plans by private parties with the aim of renewing and rationalizing the existing building heritage (Regione Piemonte 2012). This dispensation also intervenes on the density, compactness, and building height, facilitating works for harmonization with pre-existing buildings. With this important methodological step, measures aimed at incentivizing materials and technologies that offer possibilities for energy efficiency and savings, climate comfort, and the quality of internal and external spaces would likewise be identified. Within urban strategies, the technological quality of buildings and open spaces in the future will be a discriminating factor in achieving "efficient and nice" cities.

To reach the difficult but necessary objective of disciplinary integration, the creation of participatory and collaborative urban laboratories is therefore desired. These may trigger a continual mechanism of reconversion/regeneration capable of overturning current regulatory principles to identify new forms of the project that affect not only the built area but also its "proximities". It is important to understand how the latter interact with the relative private spaces and how they influence the quality of life and the economy of a city.

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Chapter 9
Efficient and Nice – Urban Metabolism and Outdoor Comfort

Monica Rossi

> "Urban metabolism is […] the sum total of the technical and socio-economic processes that occur in cities, resulting in growth, production of energy, and elimination of waste". (Kennedy et al. 2007)

The concept of urban metabolism was introduced in 1881 by Karl Marx, who used the term to describe material and energy exchanges between nature and society in his critique of industrialization. In the 1960s, this concept was reintroduced in response to deteriorating air and water quality in American cities (Wolman 1965).

The word *metabolism* is defined as "the physical and chemical processes that occur within a living organism in order to maintain life". In these processes, material substances are produced, maintained, and destroyed, and energy is made available. The adjective *urban* means "relating to a city or town". The combination of these two terms as *urban metabolism* implies a city of living, dynamic, constantly changing ecosystems. "Cities are born, grow up, change, sometimes decay and die or are stillborn" (Mackillop 2011).

In organisms, metabolism consists of two different metabolic reactions: anabolic reactions, which use energy and create new cellular materials, and catabolic reactions, which consume material and release energy and/or waste. The same dynamics can also be seen in the city's development: cities grow and produce synergies but at the same time use resources and produce refuse. In contrast to organic metabolism, which is usually able to "naturally recycle" its waste, urban metabolism cannot cope with natural resources and often has a critical and destructive acceptance. Indeed, [big] modern cities are generally resource intensive, inefficient in energy use, and inadequate in waste elimination. City metabolism is a consequence of several human decisions, most of which are related to the built environment and networks that transform and transport resources long distances to and from the city (Mackillop 2011). By working with these parameters, it may be possible to enhance the

M. Rossi (✉)
Faculty of Civil Engineering, Leipzig University of Applied Sciences HTWK Leipzig, Germany
e-mail: monica.rossi@htwk-leipzig.de

R. Cocci Grifoni et al., *Quality of Life in Urban Landscapes*,
The Urban Book Series, https://doi.org/10.1007/978-3-319-65581-9_9

metabolism, but given the complexity of the urban system and the many factors involved, it is not easy to achieve this objective (Landsberg 1981; Baccini 2007).

Since the oil crisis in the 1970s, different methods to describe complex material and energy flows in the city—especially between natural systems and man-made systems—have been developed. The main approaches are the energy method and material flow analysis. The first, introduced in 1970 by Howard T. Odum, emphasizes dependence on the Sun as the source of almost all the energy on the planet (Kennedy et al. 2011). The second is based on the "measures of the material flowing into a system, the stocks and flows within it, and the resulting outputs from the system to other systems in the form of pollution, waste, or exports" (Pincetl et al. 2012). This material-flow-analysis approach is common to several recent lines of research that ultimately aim to improve mathematical models for social, environmental, and economic analysis and the sustainable development of cities.

The concept of sustainable development was defined for the first time in 1987 by the Brundtland Commission of the United Nations as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". Therefore, a city has sustainable metabolism if it does not use more resources than the environment can provide and does not produce more waste than the environment can absorb. In order to properly evaluate the "metabolic balance" of a city, it is very important to define exactly which areas and which means are involved (or should be involved) in providing resources for and disposing waste from the entire city.

The 2005 World Summit on Social Development identified sustainable development goals such as economic development, social development, and environmental protection. Only targeted actions regarding these three aspects can effectively enhance the metabolism of a complex system like a city, minimize the impact on the environment, reduce the waste of resources, limit greenhouse gas emissions, and improve the quality of life of the inhabitants.

To achieve these goals, appropriate political strategies and a sustainable urban and building design are necessary. These should cover, among other aspects, issues such as urban morphology, mobility and services, urban cohesion, landscape/green areas, the design of public spaces, etc. Because of the large number of aspects involved, however, it is not easy to simultaneously consider all the consequences, both direct and indirect, that design choices at different scales have on urban metabolism.

One aspect—which is often underestimated in the design of public spaces and precisely for this reason is the topic of this chapter—is the level of comfort in outdoor public spaces. This feature is frequently neglected because projects mainly focus on the buildings and not on the "empty spaces between the buildings" and because the design of outdoor spaces generally serves aesthetic or functional purposes and is not tied to energy savings or environmental comfort. However, the design of outdoor spaces close to buildings is a key issue in resource use on the urban scale in environmental sustainability and in inhabitants' quality of life. In particular, a temperate outdoor microclimate reduces the energy demand for heating, cooling, and lighting in adjacent buildings and encourages outdoor social life and relationships between people (Rossi et al. 2013). To achieve this goal, it is necessary to "design the climate" of outdoor spaces using architectural elements (urban furniture, surfaces, materials, water, green, lights, sunshades, micro wind turbines, characteristics of the surrounding buildings, etc.) as tools—that is, as "adaptive climate mitigation devices" (Bonvini et al. 2015)—in order to obtain a high level of environmental comfort.

Comfort is the state of mind that expresses satisfaction (neutrality) with the environment, and it is assessed through subjective evaluation. It is possible to identify different categories of comfort: hydrothermal, acoustic, visual, olfactory, and psychological. For example, thermal comfort is calculated via a heat-transfer/energy balance. Heat transfer through radiation, convection, and conduction is balanced with the subject's metabolic rate. Thermal comfort is achieved when "the heat generated by human metabolism is allowed to dissipate, thus maintaining thermal equilibrium with the surroundings" (ANSI/ASHRAE Standard 55 2013). If the heat leaving the human body is greater than the heat entering it, the person feels "cold".

The level of comfort is influenced not only by climatic and physical conditions like temperature, humidity, wind speed, and solar radiation but also by inhabitants' physiological, social, and cultural conditions, such as clothing, activity, adaptability, state of health, level of nutrition, etc. Inhabitants' perception of comfort is evaluated and quantified based on two principal parameters: predicted mean vote (PMV) and predicted percentage dissatisfied (PPD). These parameters consider six factors: metabolic rate (the energy generated from the human body), clothing insulation (the amount of thermal insulation the person is wearing), air temperature (temperature of the air surrounding the occupant), radiant temperature (the weighted average of all surface temperatures surrounding the occupant), air speed (distance per unit time), and relative humidity (percentage of water vapour in the air). The first two are personal factors, and the other four are environmental factors.

ASHRAE Standard 55 (Thermal Environmental Conditions for Human Occupancy) defines PMV as an index that predicts the mean value of thermal sensation votes (self-reported perceptions) of a large group of persons on a sensation scale (dimensionless) expressed from −3 to +3 corresponding to the categories cold, cool, slightly cool, neutral, slightly warm, warm, and hot. PPD describes the percentage of occupants that are dissatisfied with the given thermal condition. Since it is not possible to create a comfort condition that satisfies 100% of people, the acceptable PPD range for thermal comfort for an interior space recommended from ASHRAE 55 is less than 10% dissatisfaction. Given that in a situation of discomfort people will generally change their behaviour and act in a way to restore their comfort (e.g., take off clothing, reduce activity levels, or open windows), it is possible to refer to an adaptive-comfort model. The main effect of such a model is to increase the range of conditions that designers can consider as comfortable because occupants have a greater degree of control over their thermal environment.

Even if the parameters described above were developed for indoor spaces, they can also be used to estimate outdoor comfort levels. The major difference between indoor and outdoor comfort is that in evaluating the former, only a well-defined space needs to be analysed, and energy exchanges with the exterior occur only through well-defined surfaces. In analysing outdoor comfort, there are more direct and indirect factors involved, and there is less control over energy exchanges.

Although up to a few years ago, the level of environmental comfort was not considered an important goal to achieve when designing outdoor spaces, several recent studies, design projects, and teaching activities have focused on outdoor comfort (Landsberg and Mackillop 2013). The main topics of investigation are development of calculation models of the urban environment (Orosa 2009) and analysis of the effects that specific “climate mitigation devices” have on outdoor hydrothermal comfort (Chiri and Giovagnorio 2015). Factors that influence the level of outdoor comfort can be divided into two categories: those that cannot be influenced and depend on the characteristics of the site (e.g., climate conditions, latitude, height above sea level, etc.) and those that strongly depend on urban planning and building design. The main climate mitigation devices investigated in recent research are urban geometry (Krüger et al. 2011), the orientation of urban streets (Ali-Toudert and Mayer 2006), the presence of trees (Vos et al. 2013), evaporative cooling with water (Transolar 2017), and flooring materials (Lauster and Olsen 2008). In outdoor comfort analysis, it is not possible to consider every element of the urban project separately (Yang et al. 2012), so it is important to understand the (direct and indirect) relationships between the various design choices and the climate (Cocci Grifoni et al. 2016).

To achieve this goal and make a prediction of future development (also in relation to climate changes), all design choices on all design scales should be founded on accurate climate and micro-climate analyses based on actual climate data collected from weather stations over a period of many years. This climate data can be extracted by special software such as Meteonorm, which is equipped with a vast database. This tool is also able to interpolate data from multiple weather stations located near the area of interest and can develop possible scenarios for the future (Meteonorm, 2016). These climate data can be used as input data for computational fluid dynamics (CFD) software. One of the most common of these, explicitly developed for outdoor spaces, is ENVI-met. This is a three-dimensional non-hydrostatic computational fluid dynamics program for analysing small-scale interactions between buildings, surfaces, plants, and air in urban environments. “The model calculation includes: shortwave and long wave radiation fluxes with respect to shading, reflection, and re-radiation from building systems and vegetation, transpiration, evaporation, and sensible heat flux from vegetation into air including all plant physical parameters, surface, and wall temperature for each grid point and wall, water, and heat exchange inside the soil system and bio-meteorological parameters” (ENVI-met 2017). This software allows for the evaluation of several parameters (operation temperature, absolute and relative humidity, air velocity, PMV, PPD, etc.) in each of the three-dimensional modules in the model at a precise time (selected year, month, day, and time). The 3D model can be analysed with horizontal sections as shown in Fig. 1 (Rossi et al. 2013) and vertical sections as shown in Fig. 2 (Ottone and Cocci Grifoni 2012 and Bonvini et al. 2015). Another interesting simulation software is TownScope. This analyses solar access (direct, diffused, and reflected solar radiation), thermal comfort level (human thermal comfort in an urban open space), and sky opening (view lengths and visibility analyses provide perceptive qualities of urban open spaces) of a neighbourhood or city (TownScope 2017). The program UrbaWind is a wind-flow modelling tool especially developed for urban areas. It determines possible areas of wind discomfort and computes all wind characteristics—mean speed, direction, and turbulence—with a 3D model.

This working method based on simulations has led to the design and implementation of many comfortable outdoor spaces. A good example of this is the Austrian Pavilion at EXPO 2015 in Milan, Italy, designed by Team Breathe Austria and the climate-engineering experts Transsolar, which developed its own simulation tool. "To reproduce the sensation of being in an Austrian forest, an active evaporative cooling system with complementary forced air is used. Sensors embedded amongst the vegetation allow precise control of high-pressure nozzles and fans, which allow the production of fine ground-level mist or cool air curtains. The fans are juxtaposed with the trees, deliberately exposed to the visitors" (Transolar 2017).

Another interesting design example is the renovation of Place de la République in Paris, France, by TVK Trévelo & VigerKohler, with climate-design by Transsolar. In this case, the summer climate mitigation devices implemented include reflective ground surface to minimize solar absorption, trees to provide shade and optimize air quality, and water features to provide additional evaporative cooling and ensure acoustic comfort. The cooling effect is also increased by air movement. In the winter, the leafless trees allow sunlight to reach the ground to create a warm, sunlit space (Transolar 2017).

With the goal of supporting urban planners and building designers in improving urban metabolism and outdoor comfort levels, 17 indicators were identified in the research presented in this book. These indicators can be classified in three categories: (1) inhabitants' perception of comfort, (2) urban planning, and (3) building design. The indicators regarding inhabitants' perception of comfort are the predicted mean vote and predicted percentage dissatisfied. Indicators included in the category urban planning are sky view factor (SVF), green areas on the ground, percentage of shade per hour generated in open spaces on the summer and winter solstices, percentage of permanently shaded open spaces on the summer and winter solstices, possibility of effective natural ventilation as a function of the building distribution (e.g., absence of obstructions), and average distance between buildings. Indicators regarding building design include ratio of surface area to volume, south-facing vertical surfaces, southeast- and southwest-facing vertical surfaces, ratio of passive to non-passive zones, degree of winter radiation and level of natural lighting in the buildings, and adaptation of the building type and architectural character to the local climate.

It is obviously impossible to evaluate all of the above-mentioned indicators in every project, but the common objective of designers should always be to attain good levels of indicators related to inhabitant comfort (PMV and PPD). To achieve this goal and according to the results of the weather analysis and the characteristics of the specific project (project type, project scale, budget, possibility to change/design the surrounding buildings, customer will, etc.), designers should decide which indicators are important to consider for the specific project. In conclusion, to give an appropriate "design answer" to a constantly changing "question", such as a high level of outdoor comfort, it is not possible to use ready-made answers; it is necessary to develop the best solution for the specific case. In this perspective, the proposed indicators provide a useful tool for checking the quality of the project. However, these indicators should be used consciously, and the range of indicators should be expanded and adapted with respect to the specific project.

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Chapter 10
Efficient and Nice – Land Consumption and Urban Decay

Ilenia Pierantoni

It is now commonly accepted that urban degradation is one of the aspects that most affect the quality of life and, more generally, the quality of the urban landscape. It is very difficult to say with certainty whether the phenomenon of degradation in urban areas is an independent phenomenon or whether it is closely linked to other external factors, such as the decline in average per-capita income levels, the crisis in economic-productive sectors, the ineffectiveness of urban plans and policies, or even in relation to specific sectoral policies.

There is general agreement that, over time, urban degradation has become one of the elements contributing to widespread social malaise, with consequences for the safety and security of the population as well. Different approaches to the study of this phenomenon can be found in the literature. Some analyse the phenomenon of degradation from the point of view of the factors causing it; others study the phenomenon in relation to the different contexts in which it manifests itself; still others try to relate it to the phases of the urbanization process; and finally, some analyse it only in relation to its effects, both in terms of health and quality of life and in terms of urban organization and security.

A very interesting aspect of interpreting this phenomenon concerns the effects of urban degradation on the local community's perception of the urban landscape (and its quality) and the effects that perception may have on the quality of life, behaviour, and lifestyle of the inhabitants. Underestimating this aspect can significantly limit the understanding of a city, and the design choices that are made are therefore often partial or even ineffective (Bonomi and Abruzzese 2004).

Within the QLandQLife research project, a careful selection of useful indicators has been made to evaluate degradation levels according to a quantitative type of reading.

Below is a detailed look at each of the indicators that allow us to evaluate these aspects.

I. Pierantoni (✉)
School of Architecture and Design, University of Camerino, Ascoli Piceno, Italy
e-mail: ilenia.pierantoni@unicam.it

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Presence of Decommissioned or Very Degraded Areas

This indicator assesses the quantity of decommissioned areas and the influence they have on the interpretation and quality of life within the site in question. Evaluation with this indicator is qualitative and quantitative because the quality index is expressed as quantitative percentages that identify the abandoned areas within the site under review. In determining the quality, the percentage of site land occupied by decommissioned or very degraded areas is evaluated; higher percentages correspond to lower quality values:

Threshold:
Optimal: Surface area occupied by decommissioned or degraded areas <5% of site surface area
Good: Surface area occupied by decommissioned or degraded areas between 5 and 10% of site surface area
Sufficient: Surface area occupied by decommissioned or degraded areas between 10 and 20% of site surface area
Insufficient: Surface area occupied by decommissioned or degraded areas >20% of site surface area

Unused Spaces and "Empty Buildings" (Residence or Service)

This parameter is similar to the previous one, but it identifies unused existing or future areas or buildings, even if they are in good condition. In this case as well, the qualitative and quantitative evaluation relates to a quality index expressed via quantitative percentages that identify the unused areas present within the site. When determining the quality, the percentage of unused volume is compared to the overall volume of the entire site, and higher percentages correspond to lower quality values:

Threshold:
Optimal: Volume of unused areas <5% of overall built volume of the site
Good: Volume of unused areas between 5 and 10% of overall built volume of the site
Sufficient: Volume of unused areas between 10 and 20% of overall built volume of the site
Insufficient: Volume of unused areas >20% of overall built volume of the site

Percentage of Conservation of Existing Buildings

This parameter defines the degree of sensitivity towards conserving the building heritage and therefore the energy encompassed in existing structures. It seeks to avoid the waste of energy and materials used for the demolition and reconstruction of parts of the city to ensure the preservation of a good part of existing buildings.

$$\%Ce = SLP_c \,/\, SLP_{tot}$$

where

$\%Ce$ = existing conservation

SLP_c = gross surface area of conserved ground

SLP_{tot} = gross surface area of total ground

Land Consumption and Urban Sprawl

This refers to the percentage of surface area affected by urban sprawl over the total regional surface. While it is easy to identify and quantify the indicators above, it is far more difficult to define an objective approach to quantify the urban sprawl indicator. The easiest solution is to assess land consumption as

$$LC\% = \frac{\text{Consumed Land}}{\text{Reference Area}} \times 100$$

where

Consumed Land (Built Area) = km^2 occupied by buildings and infrastructures (CLC class 1)

Reference Area = km^2 (generally referring to NUTS3 divisions)

But urban sprawl is a complex phenomenon that merits broad understanding and analysis.

The European Environment Agency (EEA) has described sprawl as "the physical pattern of low-density expansion of large urban areas, under market conditions, mainly into the surrounding agricultural areas" (EEA 2006). Urban development with low-density, widespread, self-dependent, and environmentally and socially impacting characteristics is also often referred to as *urban sprawl*.

The literature provides a variety of definitions for urban sprawl, and their comparison reveals that there is no general agreement about a common definition of the expression. As Calthorpe and Fulton noted, "Sprawl means different things to different people". As a resu lt, many evaluation methods and the resulting measures of urban sprawl are affected by a pattern of differing and sometimes contradictory interpretations. Findings from different studies cannot usually be compared, and it may therefore be difficult to interpret the issue consistently.

Galster et al. (2001) suggest the following complex conceptual definition: "Sprawl is a pattern of land use in an urban area that exhibits low levels of some combination of eight distinct dimensions: density, continuity, concentration, clustering, centrality, nuclearity, mixed used, and proximity". Sprawl was defined by the authors as a condition with low values on one or more of the eight dimensions.

But in the statement, it is implicit that the eight variables imply different possible combinations that reflect the complexity of the phenomenon. These dimensions

Table 10.1 The eight dimensions of urban sprawl (referring to Galster et al.)

(Urban) density	The percentage of "covered" land (buildings, infrastructures) per square km
(Settlement) continuity	The amount of "leapfrog" development (continuous urban fabric—buildings, roads, and artificially surfaced areas cover almost all of the ground and non-linear areas of vegetation and bare soil are exceptional; discontinuous urban fabric—most of the land is covered by buildings, roads, and artificially surfaced areas associated with vegetated areas and bare soil, which occupy discontinuous but significant surfaces)
(Urban) concentration	Whether land use and development is strongly concentrated in one "core" area or in several locations
Clustering	Whether development and built areas have been tightly bunched in order to maximize the conservation of open space
Centrality	Whether most development is close to the central district of an urban area/city or far away.
Nuclearity	Whether an urban area tends towards a monocentric/mononuclear (as opposed to polycentric/polynuclear) pattern of development
Mixed used	Whether land uses are mixed within the same urban areas
Proximity	Whether different land uses are close to each other within a urban area

(Table 10.1) are usually measured and evaluated by dividing urban areas into grids (Galster et al. used half-mile grids) using a combination of geographical information systems and (hopefully) field surveys. However, some variables determine risks and limitations: (1) by analysing the variables in different ways, one can misunderstand the real, effective dimension of sprawl by assuming that everything can be interpreted as sprawl; (2) there could be differing views about whether certain effects of urban sprawl are positive or negative; and (3) there could be differences in the quantification of external costs or economic benefits.

Independent of the physical configuration of the phenomenon, it is a common idea that the negative impacts of urban sprawl are numerous and severe on several urban dimensions. In fact, most of the malfunctions that occur in urban settlements are a direct or indirect consequence of urbanization processes or, more specifically, a consequence of urban sprawl.

The overview in the following table (Table 10.2) represents a synthesis of the most relevant effects of urban sprawl on urban landscapes and contributes to understanding and better using the urban sprawl indicator in evaluating a certain context.

Conclusions

The presence of degraded areas and the urban sprawl phenomenon could consistently affect the quality of the urban landscape, not only in its multiple dimensions (economic, social, environmental, etc.) but also in the quality of life of city inhabitants.

In order to guarantee a good quality of life, it is therefore necessary to implement projects and plans that are well aware of the risks and impacts of certain urban dynamics on the urban environment (and the level of quality of life). Current urban

Table 10.2 Effects of urban sprawl on the urban dimension (revised synthesis based on EEA Report No. 11/2016)

Theme	Consequences/impacts of urban sprawl	Sources
Environmental impacts		
Land cover	Land uptake for buildings and related infrastructure facilities and loss of farmland	Camagni et al. (2002a, b), Eigenbrod et al. (2011), Wilson and Chakraborty (2013)
	Removal and alteration of vegetation over larger areas	Pauleit et al. (2005)
	Soil compaction, sealing of soil surfaces, loss of ecological soil functions, loss of water permeability, reduction of groundwater regeneration, and reduced evapotranspiration, desertification	Ewing (1994), Siedentop and Fina (2012)
Geomorphology	Local alterations to geomorphology (e.g. cuts, stabilization of slopes) over larger areas	
Local climate, energy consumption, and global climate change	Changes in microclimate conditions as a result of the urban heat island effect, which leads to reduced vegetation cover, reduced albedo, warming of surface temperature, and increased variability in temperatures	Cocci Grifoni et al (2016), Calthorpe (2011), Stone et al. (2010)
	Climatic thresholds and the modification of wind conditions as a result of the removal of vegetation and the construction of buildings	Stone et al. (2010)
	Higher energy consumption and higher greenhouse gas emissions per person; reduced carbon dioxide uptake as a result of the removal of vegetation such as forest and grassland over large areas	Borrego et al. (2006), Waitt and Harada (2012)
Air, noise, and light pollution	Higher air pollution per capita as a result of vehicle exhaust, fertilizing substances, dust, particles, road salt, oil, fuel, and other substances that cause air and water pollution and eutrophication	Borrego et al. (2006), Rich and Loncore (2006), Bart (2010)
Water	Modification of surface watercourses and hydrological alterations of watersheds as a result of a reduction in the quantity and quality of groundwater and the raising or lowering of the groundwater table	Jat et al. (2008), Wilson and Chakraborty (2013)
	Diminished hydrological dynamics of wetlands around city sprawl, drainage, faster removal of water, and increased risk of flooding (e.g. because of sealed surfaces)	EEA (2006) Wilson and Chakraborty (2013)

(continued)

Table 10.2 (continued)

Theme	Consequences/impacts of urban sprawl	Sources
Flora and fauna	Loss of habitats for native species, loss of soil biodiversity, reduction of habitat areas below the required minimum, and the loss of species and biodiversity	Alberti (2005), EEA (2006), Cinquini et al. (2006)
	Reduced resilience of ecosystems and impoverishment or alteration of species communities, higher numbers of invasive species and the spread of invasive species as a result of changes in climate conditions	McKinney (2006, 2008), Cinquini et al. (2006), Shochat et al. (2010)
	Increased landscape fragmentation: barrier effects, habitat fragmentation, disruption of migratory pathways, impediment of dispersal, increased road mortality of wildlife, isolation of populations, degradation of ecological networks, and loss of existing green infrastructures	Alberti (2005), EEA (2006), Cinquini et al. (2006)
Landscape scenery and land use	The increasing penetration/fragmentation of the landscape by built-up areas; changes in the character and identity of the landscape	EEA (2006), Sargolini (2013), Müller et al. (2010)
	Loss of agricultural land and highly fertile soils (non-renewable resources) and intensification of agricultural production	Eigenbrod et al. (2011), Wilson and Chakraborty (2013)
	Reduced recreational quality of natural and semi-natural areas	White et al. (2013)
Economic impacts	Higher costs for transport associated with commuting for households	Camagni et al. (2002a, b), Bento et al. (2005), Travisi et al. (2010)
	Higher demand for transport, increased car use, and a higher cost for construction and maintenance of infrastructures for private and public transport (roads, electricity, water provision pipes, wastewater collection pipes, municipal garbage collection, snow removal, etc.)	Ewing (1994)
	Higher costs associated with traffic congestion and the extension of urban infrastructure in newly developed regions	Hortas-Rico and Solé-Ollé (2010), Klug and Hayashi (2012), Cinyabuguma and McConnell (2013)
	Higher material use for construction per housing unit and higher costs as a result of higher energy consumption per person	Roy et al. (2015)
	Reduction in food production and self-sufficiency and a higher dependence on imported food	Haber (2007), Wilson and Chakraborty (2013)

	Increased demand for raw materials, such as concrete, the expansion of quarries, and the overextraction of gravel from river beds	EEA (2006)
	Changes in the distribution of populations relative to the locations of ecosystem service supplies, which can reduce the per-capita supply and increase the costs of providing services	Eigenbrod et al. (2011)
	The degradation or loss of various ecosystem services and higher costs for their technological substitution or restoration	Cumming et al. (2014)
	Economic losses in tourist areas where the landscape scenery has been degraded	EEA (2006)
Social impacts and quality of life	Desired place to live for many people because low-density housing offers more privacy and larger garden areas than dense parts of cities	Bruegmann (2005), Gavrilidis et al. (2016)
	A higher proportion of single households, which leads to a more resource-intensive living style	Dura-Guimera (2003), Howley (2009)
	Longer commuting times and a reduction in social interaction	Putnam (2000)
	Health problems such as increased obesity, stress, and decreased physical activity; insomnia; respiratory problems (e.g. asthma); and other effects on health as a result of higher air and noise pollution and the heat island effect	Costal et al. (1988), Ewing et al. (2003), Frumkin et al. (2004), Garden and Jalaludin (2009)
	Perception of landscape quality and urban security: the size, density, and particular chaotic urban configuration and physical environment affect psychological and social experiences and the behaviour of urban dwellers	Sargolini (2013)

forms are the result of successive planning and governance choices that only looked at the demands of the moment and did not consider the complexity of the urban systems and the effects of urban development on the quality of the environment and the quality of life of the population. On the contrary, future planning strategies will have to cope with different types of land-use conflicts in order to ensure the sustainability of cities and the improvement of relationships among communities. Planning is a necessary measure for the sustainable future development of cities, but it can be the other way around if planning activities are not focused on (or not fully aware of) decreasing the effects of contemporary issues such as climate change, social imbalances, cultural segregation, pollution, or urban sprawl phenomena.

The selection of indicators and the qualitative/quantitative methodology proposed in this book can be used as a useful tool to define realistic visions for the effective sustainability of future settlement configurations and urban development scenarios.

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Chapter 11
Efficient and Nice – Urban Sustainability and Quality of Life: The Socioeconomic Perspective

Massimo Battaglia and Nora Annesi

The concept of quality of life has changed in both significance and signifiers in recent years. Global, national, or regional problems have time and time again influenced the quality of life and well-being (Velardi 2007). A greater knowledge of environmental issues and/or a greater sensitivity regarding certain social issues has led to the consideration of additional elements that can contribute to increasing the quality of life. Following the realization that economic growth is unsustainable (Meadows et al. 1972; IUSN, UNWP, WWF 1980), the concept of *quality of life* has become strongly linked to that of sustainable growth. In the long term, current needs cannot ignore the effect that satisfaction of them can have on future generations (WCED 1987: Brundtland Report).

In this perspective, a community capable of measuring its own economic, social, and environmental needs with short-, medium-, and long-term visions would be able to ensure a higher quality of life. With these premises, it is interesting to consider how the quality of life and its components are treated differently depending on the scale of analysis.

The European Commission (2015) defines the role that territorial and administrative entities play in generating the actual quality of life and that of future generations. Analysing the urban metabolism and its individual components, the European Commission underlines how sustainability and well-being are two parallel and dependent concepts. The main challenge for today's cities is to manage a heavy dependence on ecosystem services, which results in the depletion of natural resources, biodiversity, and efforts to mitigate and adapt to climate change while prioritizing public health and the quality of life. It continues by explaining how, in aiming for a better quality of life, it is necessary to measure and evaluate politics, resources, emissions, and socioeconomic factors, among others. This concept

M. Battaglia (✉) • N. Annesi
Institute of Management, Sant'Anna School of Advanced Studies of Pisa, Pisa, Italy
e-mail: massimo.battaglia@sssup.it; n.annesi@sssup.it

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authorizes researchers and administrations to play an active role not only in measurement but especially in critically evaluating the results.

Urban analysis has, over time, begun to link itself with the concept of numerical measurement of the dynamic and statistical phenomena that are manifest in determined portions of the territory. This numerical approach aims to transform intangible phenomena into possible manageable entities. In the knowledge that we cannot manage what we cannot measure, and that we cannot measure what we cannot describe (Kaplan and Norton 2004), it is necessary to initiate a process of urban accountability.

A strategy to evaluate urban quality resides in the development of a model that can incorporate the highest number of urban components while evaluating their weight and interactivity. Evaluation of the urban context, understood as a complex system, can be simplified through the use of numerical models. As stated by McLoughlin (1969), advances in computing and mathematical modelling enable the planner to simulate the behaviour of cities and to anticipate its responses to a wide variety of stimuli (McLoughlin 1969). The authors further anticipate that in time, planning models based on the physical design of the territory will be replaced by an approach composed of socioeconomic evaluations that can respond to the needs of the community.

With these premises, our contribution analyses those elements of the socioeconomic circle that are key in accounting for quality of life in the urban environment. The claim of building such a model of socioeconomic analysis provided by the FAR project QLand/QLife—Quality of the Landscape and Quality of Life in the Sustainable Adriatic City—has led to initiatives and reflections on the role and measurement of these variables in the research.

The project has brought into play aspects linked to the quality of the urban environment and has proposed an unconventional understanding of quality of life. The model, which is based on the study of the three aspects "Distinctive and pleasant", "Efficient and nice", and "Clean and healthy", aims to expand the more classical and objective indicators of quality of life with other aspects that are more subjective in nature and related more appropriately to qualitative measurement (Easterlin 1974; Strümpel and Scitovsky 1976; Glatzer 1984).

Within the project, the socioeconomic dimension assumes strategic value, covering two of the three dimensions of sustainability. In a complete analysis of the quality of life, a clear identification of the socioeconomic framework in question acts as a basis on which we can weigh the results derived from the measured indicators. Analysing the quality of life through the lens of such social and economic phenomena entails the use of a reasonable and suitable number of indicators. In fact, a suitable number of indicators can paint a clear and balanced coherent picture of the real situation and can be verified in a well-defined geographical territory. In this perspective—well-being in an urban space—indicators that identify and measure social and economic changes find their most suitable field of action.

From the viewpoint of sustainable development, the study of social factors is absolutely fundamental in defining the actual conditions of the quality of life. The numerical and demographic data of a community constitute not only the base on which to define the dimensionality of the future, in both the short and long terms, but also the numerical image of the city with all of its more or less cyclical dynamics, which indicates the key strengths and weaknesses and the trends to take into account.

On the other hand, the importance of understanding the purely economic framework is strategic, not only in contributing to the dimension of well-being but also for the peculiarities that tie the growth of the gross domestic product (and thus the growth indicator *par excellence*) to happiness and, consequently, to a more subjective view of perceived well-being (Stevenson and Wolfers 2008). This is a concept that has both a global dimension, a macroeconomic nature concerning the measurement of well-being in a country or region, and a smaller dimension shifting the logic of the measurement beyond GDP to a strictly local, and possibly urban, scale.

In the following sections, we discuss which sources are the best to consider for a socioeconomic analysis, which methodology to adopt for their measurement, and which possible indicators to use. In the last section, we reflect on the results and their utility in socioeconomic analysis aimed at supporting political choices.

The Sources

What constitutes a key element for good analysis of the urban context is surely the identification of the most suitable sources. The perimeter of the geographical context where we want to begin the analysis and the social and economic factors manifested therein need to be described by data with a clear geographical reference. The judicial and administrative entities constitute the primary sources of a correct data set usable for research. The entities proposed for the collection and elaboration of the data can be divided into three categories:

- Local administrations, for example, the municipal, provincial, and regional. These bodies are equipped with official databases referring to demographic trends, age and sex distribution, and the family structure of the population, as well as the spatial distribution of different social and economic phenomena, etc.
- Public bodies and public service providers. This includes institutions and agencies that primarily manage banks of sectoral data or those specifically referring to social phenomena (employment, health, etc.). This group includes, for example, tourist and agricultural agencies.
- Industrial consortia, chambers of commerce, social security institutions, health agencies, and health societies.
- Research bodies, including those that study themes related to local development. These include both regional and provincial thematic observers, Istat (Italian National Institute of Statistics), Istituto Guglielmo Tagliacarne (training and research institute), ENEA (Italian National Agency for New Technologies, Energy and Sustainable Economic Development), regional institutes of economic planning, etc.

The measurement makes use of qualitative/quantitative evaluation tools from which we derive the indicators. Their ongoing measurements over time can create a historical series that is useful for verifying the evolution of the state of a phenomenon. In the same way, use of the same variables in different urban contexts can enrich the research with comparative benchmarking analysis.

For 23 years, the Report of Urban Ecosystems, published annually by Legambiente, has compared the state of environmental livability of the main Italian cities. By measuring 18 indices and 71 indicators, Legambiente has created a database to compare the quality of life in the same city over the years and of different cities in the same historical period. The use of multiple indicators to measure the quality of life has often highlighted a decoupling between the technical data and what individuals or communities actually perceive (Battaglia et al. 2014). Elements that can be evaluated positively on numerical scales can instead be perceived by the people as negative or average. Related to this, Martincigh (2003) defines urban quality as a relative value because it is subjected to the individuals' judgements and their needs. Furthermore, this varies not only in time with respect to the evolution of the community and its needs but also changes over time and depending on specific phases that lead individuals to evaluate different tangible and intangible needs.

According to a study by Campbell et al. (1976), quality of life and individual satisfaction can be calculated as the separation between the individual's own ideal vision of quality and the reality of the situation. We can thus assume that the value that reflects individual perception becomes much higher when the city in which an individual lives is capable of responding to the individual's own ideal model of services and overall performance. In the same vein, Brusa (2008) addresses the collective value obtained from the urban and social components of communities. Analysing the perception of value as a variable to consider for the quality of life, Brusa concentrates on the identification of an index of urban quality (Indice di Qualità Urbana, IQU) that takes into account the reality of the perception.

When identifying human needs in an urban context, Brusa underlines the need to know how to measure the social and economic state of the city in question. Besides socioeconomic contexts, numerous other indicators are used to complete the framework of urban quality of life. The value judgement on behalf of the individual therefore plays a fundamental role in establishing policies that rebalance reality with the ideal scenario. In the research-planning phase, it is therefore crucial to include a phase to select measurements for the investigation and the instruments that are capable of measuring the indicators.

In the scope of the evaluation process, the set of indicators chosen has to adhere to specific requirements that enhance the level of credibility and reliability in the evaluation process. In particular, it is important that the method used is able to survey the differences, variables, and changes in the system. In this sense, the indicator must be characterized with this requirement of sensibility and calibrated on the size of the system of analysis.

In order to ensure precision and exactness of the analysed phenomenon, the indicator must adhere to the criteria of specificity. In fact, in the context of urban analysis, overlapping social phenomena have to be evaluated individually so that the results of one specific phenomenon are not contaminated by those of a contingent one.

Finally, in the outlook of benchmarking discussed above, the ability to ensure the comparability of data tested in similar complex systems, both in time and space, is necessary (Zajczyk 1997). One interesting goal is therefore to guarantee the comparability of measurements of the quality of life in every city that has a specific productive vocation (e.g. tourism) or at least among the cities along the Mediterranean coast (which share specific geolocational characteristics). On the continental scale, the Eurobarometer uses this type of analysis to evaluate the state of health of various European countries and the cities therein. Since 1974, with a set of indicators calibrated for each of these national contexts, the European Commission has evaluated the quality of the European territory over time and in different contexts, thereby facilitating benchmarking.

The Indicators

In this section, we explain which indicators constitute the structure of evaluating the quality of life in the FAR project, with specific reference to the socioeconomic dimension.

This dimension has been of fundamental importance as an inspiring model promoted by the European Commission in the context of European Common Indicators (AmbienteItalia, 2003). The methods and variables used by the Information System Consortium (Consorzio per il sistema informativo, CSI) were further analysed when the Piedmont region developed the Index in Urban and Territorial Quality (Indice Sintetico della Qualità Urbana e Territoriale, IQUT) in 2013. Lastly, the indicators and methodologies applied in the study "Changing the Mediterranean Metropolis around Time" were assessed in a search for sustainable urban models promoted by the EU-MED "Urban Empathy" project.

Overall, the socioeconomic portrait of the territory analysed by the FAR project was described through the measurement and interpretation of 31 indicators.

Social Indicators

Aimed at interpreting the heterogeneity of society and the dynamics of the community, social indicators gained relevance during the 1970s. The new awareness of unsustainable economics has restricted these measures to describing the population and the distribution of resources among individuals. In this perspective, social mapping can be composed of a single instrument for resource management (both natural and man-made) based on reconciling the needs of the community and environmental rhythms.

From the objective indicators, it is possible to obtain a territorial distribution of the population, calculating the housing density in the entire urban area and in specific sections. The observation of different housing-density and employment-density values in specific urban areas allows us to outline the presence of demographic trends, contingent factors, or urbanization and/or urban-planning phenomena. The study of population growth or decline can be analysed through both the observation of natural growth rates and dynamics related to temporary or long-term migration phenomena.

After having highlighted the trends of the population under consideration, it is necessary to produce a profile of its composition in terms of the age, sex, and education level distribution. The steps described are fundamental in correctly interpreting data related to both the employed and unemployed populations. A comparison between the unemployment rate and that of the demographic characteristics in the urban area provides a measure of urban labour activities and, in a way, even the economic well-being of the community.

The scale with which well-being is measured is twofold: individual and family. On the one hand, we can calculate per-capita income and consumption, as well as the number of subjects with an income below the poverty threshold. On the other hand, we can consider data related to the composition of family units and average income in order to define a standard of living for the territory.

The observation of these two values allows us to understand how economically independent and sustainable family units are compared to the average individual citizen. In the context of the FAR project, other than the size of income, as described above, income inequality was also analysed, assessing the difference between the maximum and minimum values of registered income. This observation allows us to understand the distribution of inequality on an urban scale, at a social and economic level. A value of this type, with a geographical reference, allows us to identify areas within cities that have more or less poverty. Such a fact is particularly interesting when cross-referenced with indicators of urban form and identity as analysed in the "Distinctive and pleasant" section. In this way, in fact, we can understand how certain urban contexts are more attractive or repulsive according to specific sectors of the population, with the possibility of creating situations of marginality and greater risks of social conflict.

Other information that may be useful in defining social well-being concerns the availability of specific services for citizens and their families. In the FAR research, one indicator investigated relates to the availability of places in nursery schools per 1000 inhabitants. The value emerging from this observation allows us to evaluate indirectly how much social policies support families, with particular reference to opportunities for continued employment for both parents (with reflections on the theme of equal opportunities as well). The availability of treatment and health services was also analysed, as well as the availability of sports complexes and libraries with respect to the population. These two indicators aim to interpret the territorial coverage of health and cultural services and thus relate to a measure of accessibility to these services with respect to the minimum distance necessary to reach them.

Finally, the last theme relevant on the urban scale from the social point of view is that of urban safety. This relates to investigating and measuring phenomena such as thefts and criminal acts that occur annually. Through the definition of crime provided by Eurostat (2010), it is possible to report both the number of generic crimes committed in urban areas, as well as the percentage of minors involved in these activities. Even in this case, the values are very interesting when compared to other indicators such as the percentage of children attending school.

Economic Indicators

The economic indicators address the dynamics of the urban economy through a detailed study involving the financial characteristics of both private and public entities. Economic vitality can be analysed through the percentage of public and private works of collective interest. Along with this information, we can compare the calculation of the expenditure with investments in research and development (R&D) companies. The percentage derives from the expenditure of companies invested in R&D divided by the total expenditure of companies in the regional territory. When cross-referenced with the number of employees involved in R&D activities, the measure shows the dimension of capital investment in human capital compared to the total expenditure.

Furthermore, an element of economic interest for the territory is the measurement of stamina and vitality of the companies with regard to individual sectors. This measure yields the vitality of the companies per sector, calculating the relationship between company opening and closing rates. In this respect, it is interesting to compare the result of this measure with values resulting from the indicator "Company Start-ups in the ICT Sector" to have a clearer picture of the role that ICT companies play in the context of company vitality.

Finally, in the FAR research, special attention is given to the elements of attractiveness of a city as well as the level of investment in tourism businesses. The goal is to evaluate the attractiveness of investments with regard to the possibility of creating a cluster of related industries. The measurement entails a comparison between the number of elements of attractiveness present in the territory and the weight that these elements exercise on the economy according to economic journals and as reported by specific rating agencies (parameters provided by "Il Sole 24 Ore").

Regarding the aspect of touristic attractiveness, we calculated the evolution of tourist presence in relation to the number of tourists that book an overnight stay per year, as well as the level of seasonal tourism. Monthly tourism was calculated as a percentage of the number of tourists per month compared to the total number of tourists, as well as the relation between the number of overnight stays per month and the total number of overnight stays. An increase in tourism can be an element of strength for urban well-being if viewed from an economic point of view, but it requires comparison with the variation of environmental performance in the tourist period with specifics regarding the social aspects that seasonality can produce.

Conclusions

Within the present contribution, starting from the concept of quality of life and its undeniable link with the theories of sustainable growth, we have analysed the reasons why the community and the territory need to be directed down the path of shared development. In parallel, the contribution has explained how conscious planning ought to be based on data that can explain the actual state of affairs, as well as predicting the scenarios of social and economic development in a specific territory.

First, as described in the introduction, the possibility of numerically describing an observable phenomenon that is not necessarily tangible allows us to manipulate it and manage its balances. The supranational scale of the Eurobarometer shows us how it is possible to create a model that describes the state of various countries using both a collective image and one that is comparable between the individual states. Going down in scale, it is possible to describe a complex model such as the urban one and the way in which it identifies indicators and indices that can measure the magnitudes of both social and economic aspects in an integrated manner. The role played by the indicators is thus a double one acting as a measure of the state of affairs, that is, the key to understanding future political decisions that reflect social and economic needs in a given context.

An additional key strength of a socioeconomic investigation has to do with the possibility of being able to identify the precise geographical reference of balances and imbalances within a parametrically defined space. Understanding the overall dynamics of an individual suburban area allows us to identify phenomena of ghettoization, rather than generic inequality.

Moving observation and analysis to the supranational and suburban scale acts as a sort of fractal study of the territory in question, without omitting any details.

The tendency to distance ourselves from urban planning based on city design, as well as increasing awareness of the difficulty and inaccuracy of methods of participation in the planning phase, has resulted in more room left for qualitative/quantitative analysis.

The accountability of the state of affairs and the implications for future dynamics, which can be understood from such facts, represent a new basis for planning. The state of a city's socioeconomic health provides policymakers with a powerful tool to support both technical choices and choices related to location. If correctly analysed and managed, the quality of life and sustainability of the urban organism, with its inflows and outflows, can therefore favour harmonious overall development. Finally, an additional way to interpret the socioeconomic analysis is represented by the possibility of using the results as an evaluation tool before and after policies are implemented in a determined context. As a forecasting tool, the study of the quality of life can thus become an instrument of complex and sectoral monitoring that can exert individual pressures, points of concentration, and strengths and weaknesses of the complex urban system.

In order to guarantee a good quality of life, it is therefore necessary to implement projects for sustainable development that are well aware of both resources and consumers. The analysis proposed could be considered an instrument to understand urban needs and define urban policies that are better targeted and respect the expectations of the collective population on the socioeconomic plane. Lastly, we recall the weight of perception in the evaluation of quality of life on behalf of the single individual. The qualitative/quantitative study can be used as a tool to decrease the distance between ideal and realistic visions of the urban situation in which individuals carry out their daily lives and activities, within a policy perspective that combines technical and perceptive information.

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Chapter 12
Efficient and Nice – Urban Accessibility and Public Transport

Andrea Renzi and Piersebastiano Ferranti

Accessibility and Urban Quality

In common sense, there is already a widespread awareness that the quality expressed by a city corresponds to a sum of its intrinsic values (Cassatella and Peano 2011). These can be grouped synthetically into the presence of memories and pre-existing history, the concentration of economic fluxes, the concentration of political and administrative powers, the variety of educational opportunities, the presence of areas for free time and recreation, and the level of guaranteed safety. Following an increase in the fluxes—both inflow and outflow—that involve the urban environment on a daily basis, one of the factors that profoundly affects the sense of quality perceived by citizens and periodic or occasional users of the urban environment is the degree of ease in using and crossing the city with different types of mobility (Leed Reference Guide For Neighborhood Development 2014). *Accessibility* can therefore be defined as "the ease in meeting one's needs in locations distributed over space for a subject located in a given area" (Cascetta et al. 2013), and it is playing an increasingly important role in defining the image that the city projects to the external world. Based on these premises, it is clear that the accessibility a city offers its users through its forms, urban furniture, and the system of public transport can directly impact the perception of quality and the sense of well-being for individuals that live in and cross the urban environment (Rode and Floater 2014).

A. Renzi (✉) • P. Ferranti
Terre.it srl, Spin Off of the University of Camerino, Sarnano, Italy
e-mail: andrea.renzi@unicam.it; piersebastiano.ferranti@unicam.it

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Urban Accessibility and Sustainable Mobility in Planning Tools

For some decades now, urban mobility and the theme of public transport have played a well-defined role within analysis and forecasts in urban and territorial plans. Many public entities (local, supralocal, and regional) have created specific sector plans related to the theme of mobility and transport in order to optimize and improve the mobility services offered to citizens and, more generally, for users of the city and territory. But while urban mobility has been at the centre of urban policy choices for some time, often with results that do not meet expectations, aspects concerning accessibility and the ease of use for all individuals have still not been the guiding focus of urban policies. In Italy, only in a few sporadic cases can we recognize the attitude of administrators in increasing the ease of movement for all individuals within the city. Milan is one of these cases. In 2016 the city won the Access City Award, an important recognition from the European Commission for the city's 5 years of dedication to improving accessibility for tourists with disabilities. Milan has created accessible tours for vision- and hearing-impaired people at numerous city monuments, defined ten tours for disabled people, and created a website called "Accessible Milan".

In Italy, regulations in this sector have been in development since 1986, when the first attention was aimed at eliminating architectural barriers, but only more recently have some important cities (Brescia, Ravenna, Turin, etc.) made urban management tools available to gradually make public spaces and buildings accessible to people with disabilities. In other cases, instead, forms of managing sustainable mobility have been developed by drafting sectoral plans (urban sustainable mobility plans) that, by defining strategic objectives, move the view of traditional sectoral tools (traditional transport planning) away from the mere management of "traffic" to a broader vision in which individuals and their choices for movement define the means of developing the city. The emphasis is therefore no longer on a plan where flows, traffic capacity, and travel times are managed exclusively but on new forms of plans that include objectives regarding development and the integration of means of transport and sustainable use. Infrastructure no longer constitutes the centre of development forecasts but represents the selection of a range of integrated solutions that generate effective, economically sustainable solutions. In addition, there has been a shift from planning related to a defined administrative area (often coinciding with municipal borders) to the definition of a territorial layout with a variable geometry based above all on commuting between home and work. Finally, in recent plans, clear importance is placed on the monitoring phase, which is carried out using assessment indicators defined by an interdisciplinary working group through a structured learning process. This type of monitoring also allows objectives to be redefined based on the assessment of the indicators (Böhler-Baedeker et al. 2014).

The Dimensions and Metrics of Urban Accessibility: Indicators to Assess the Use and Accessibility of the Urban Environment

The European Commission has promoted and financed many studies and research projects centred on the theme of the sustainability of public transport and urban accessibility. Among these, the "Study on urban mobility—Assessing and improving the accessibility of urban areas" (Brannigan et al. 2017) was recently published. This study aimed to implement data and results to increase knowledge of the different levels and expectations that characterize the theme of urban accessibility. The general scope is to improve the quality of urban areas and introducing the theme of efficiency in the transport system. The study encompassed five key aspects: a review of the state of the art in the field of urban accessibility, an estimate of the costs of congestion in the European street network, the degree of efficiency of transport on the urban scale, the promotion of good practices for urban accessibility, and orientations on the policies. In particular, within the first key aspect, the identification of the dimensions and metrics that distinguish the theme of accessibility is particularly noteworthy.

The different “dimensions” of accessibility include the “transport dimension”, which includes the various options available for the user; the “land-use dimension”, which corresponds to the number, quality, and spatial distribution of the destinations that users want to reach; and the “individual dimension” of accessibility, which is tied to the needs and perceptions of the individuals, who can directly influence the different transport possibilities and the choice of different options (Ferranti and Renzi 2014). The “temporal dimension” of accessibility is crucial in that the options and opportunities for travel are available only at determined times, for example, based on the different climate conditions. Beyond the dimensions of accessibility, different measures are also suggested that could be grouped into the following categories: (1) “infrastructure-based”, which quantifies the capacity of the transport system, levels of congestion, and the availability of biking paths; (2) “location-based”, which defines the theme of accessibility according to the quantification of people and merchandise loads that can reach a destination or the number of destinations that an individual or delivery truck may reach; (3) “person-based”, which defines aspects tied to the ease of use in terms of temporal physical-ability restrictions; and (4) “utility-based”, the focus of which is to verify the quality of accessibility with respect to the ease of accessing the activities, destinations, and opportunities distributed within the urban space.

During the QLandQLife research, numerous indicators were identified and selected within national and European research projects that investigate the theme of use and accessibility through both qualitative parameters and others that are dimensional or quantitative. The first four quantitative indicators descend from international research called “Plan Especial de Indicadores de Sostenibilidad Ambiental de la Actividad Urbanistica de Sevila” [Special Plan for Environmental

Sustainability Indicators of Urban Activity of Seville] developed by the Barcelona Urban Ecology Agency (BCN Ecologia) in 2008. The second group of indicators, which are qualitative, was introduced within PRIN research from 2004 called "Qualità urbana e percezione della salute" [Urban Quality and the Perception of Health] carried out by the University of Genoa.

In addition to a geographical determination, the indicators selected by BCN Ecologia also introduce elements regarding proximity and are therefore closely related to the theme of accessibility. In the case of the indicator related to the accessibility of citizens to green space, for example, it consists in determining a percentage of inhabitants with access to resources, determined over the total resident population in the area analysed (Cocci Grifoni and Ferranti 2015).

The indicators defined in the PRIN research are represented by scalar or physical quantities and can be grouped into two sets of references. On the one hand, they express values regarding the presence or absence of an aspect related to the concept of *site* or *place*. On the other hand, they refer to expert qualitative judgements regarding accessibility, privacy, historical architectural heritage, the conditions of the built area, the recognizability of the skyline, colours, presence of detractors, urban décor, the presence and accessibility of public functions, the efficiency of public transport, the presence and quality of parking, the adequateness of sewers, public lighting, etc. (Cocci Grifoni and Ferranti 2015).

In the following pages, we aim to describe in detail the set of indicators identified:

- Accessibility to street-level public transport stops

This indicator measures the area served by the different public transport stops by calculating the area of influence (400 m), and it also assesses the integration of the surface public transport network.

$$\mathrm{Acc}\mathbf{TS} = \frac{\text{length of street covered by public transport}\,(\mathrm{m})}{\text{total street length}\,(\mathrm{m})} \times 100$$

Acc**TS** = Accessibility of the public transport stop

This measure serves to design a city composed of “short distances” (in terms of time) to be covered on foot, where the population’s access to public transport is a priority. In general, the time required to access the public transport network should be less than 5 min (about 300 m in spatial terms).

- Accessibility to the network of biking paths

This indicator measures the area served by the different public transport stops by calculating the area of influence (400 m), and it also assesses the integration of the public transport network with the network of biking paths.

$$\mathrm{Acc}\mathbf{C} = \frac{\text{length of street covered by biking / walking paths}\,(\mathrm{m})}{\text{total street length}\,(\mathrm{m})} \times 100$$

Acc**C** = Accessibility to the network of biking paths

This indicator serves to design a city in which it is easy to reach the network of biking paths. In general, the maximum time to reach the biking path should be about 1 min by bike and 5 min on foot (covering about 300 m in spatial terms).

- Accessibility to green spaces

This indicator measures the area served by green spaces in relation to their extent, and it assesses the availability of free open spaces for citizens' well-being in spatial and dimensional terms.

$$\mathrm{Acc}\mathbf{V} = \frac{\text{length of street with access to green areas}\left(\mathrm{m}\right)}{\text{total street length}\left(\mathrm{m}\right)} \times 100$$

Acc**V** = accessibility to green spaces

This indicator serves to design a city in which it is easy to reach green areas. In general, a good level is considered to be one green space of 1000 m^2 within a distance of about 200 m.

- Provision of neighbourhood services

This indicator identifies the mix and diversity of services present within the neighbourhood.

$$\mathrm{DSQ} = \frac{\text{length of street with access to multiple basic services}\left(\mathrm{m}\right)}{\text{total street length}\left(\mathrm{m}\right)} \times 100$$

DSQ = provision of neighbourhood services

This indicator serves to design a city in which it is easy to reach services within a short distance.

In the following set of indicators, the assessment and judgement are defined via a scale of reference ranging from Optimal to Insufficient.

- Presence of primary roads within the site

This indicator assesses the presence of primary roads near the site as added value in that it forms part of a large-scale system necessary for the mobility of those who live in the study area.

- Quality of connections between main roads in the site and flow between neighbourhoods

This indicator assesses the intelligibility and degree of safety of connections between the main roadway network within the site and the secondary network that accesses the different sub-environments or housing units (local or inter-neighbourhood network).

- Accessibility of the site on the urban level

This indicator describes the degree of accessibility of the study site as a function of the urban context.

- Effectiveness and quality of public transport

This indicator synthetically analyses the effectiveness of public transport in terms of the number of routes/day, coverage at rush hour, and type of connection (urban and suburban).

- Availability of pedestrian zones and restricted traffic zones per inhabitant in m^2

This indicator defines a hierarchy between cars and pedestrians, establishing a high quality of life in urban contexts where clear value is added to the availability of places limited entirely or partially to pedestrians.

- Degree of accessibility for disabled and elderly people

This indicator assesses the level of accessibility in the city for socially weak subjects, such as disabled or elderly people.

- Presence and usability of public functions

This indicator assesses the presence and use of public functions present within the study site. Structures housing public functions can be divided as follows:

  – Public safety (police headquarters, *Carabinieri*, local police station, etc.)
  – Municipal offices
  – Sports centres and gyms
  – Non-commercial services (banks, public offices, etc.)
  – Newsstands

- Presence and use of community functions

This indicator assesses the presence and use of community buildings within the study site. Community structures can be divided as follows:

  – Structures for childhood and required education (day care, nursery schools, primary and middle schools, etc.)
  – Structures for secondary schools and universities
  – Multipurpose halls and theatres
  – Structures for local and supralocal bodies and associations to protect, enhance, and develop the local cultural heritage
  – Libraries
  – Museums/Exhibit halls
  – Student residences
  – Religious services

- Presence/use of basic health services

This indicator assesses the presence/use of health services within the study site. These include:

  – Basic medical offices
  – Paediatricians
  – Specialized medical offices according to the specialization
  – Pharmacies

– Outpatient clinics
– Protected residences
– Assisted health residences
– Retirement homes

• Presence/use of social buildings

This indicator assesses the presence/use of social functions present within the study site. These can be subdivided as follows:

– Social assistance structures and services for minors and elderly people
– Social/educational structures and services
– Social assistance structures and services for disabled and invalid people
– Social assistance structures and services for poor people
– Social assistance structures and services to support large families and pregnant women
– Emergency structures and services

• Assessment of parking presence in busy areas

This indicator analyses the number of public parking spaces in busy areas.

• Public kerbside parking spaces per inhabitant

This indicator analyses the number of public parking spots in order to assess eventual shortages that can negatively influence the perceived urban quality and traffic safety.

Perspectives for Research: Between Planning and Improving Accessibility and the Use of the Urban Environment

The definition of indicators through greater spatial specification, which for the urban scale can refer to the size of the city block, is a fundamental step in placing data of different sources and types on the same plane. Many of the indicators selected are characterized by an exclusively geographical connotation and therefore tie into the definition of place. In addition, the complexity of studies related to accessibility assumes the use and implementation of computational analyses regarding networks. In this case, the use of new open-source, continuously updated databases can open innovative scenarios and approaches for study. From a thematic point of view, the growth in the number of individuals that enter and leave urban areas on a daily bases means focusing on improving the state of accessibility as an aspect that, increasingly often, can permeate and direct urban policies and territorial provisions (D'Onofrio et al. 2015). The trend to analyse is to give all individuals maximum ease in choosing how to move through the different forms of mobility, contextually guaranteeing maximum use—at least of public spaces and buildings—for all potential users while minimizing pollution and energy consumption. The theme of accessibility therefore plays a central, complex role in territorial and urban management policies, which should recognize the demand for mobility and infrastructure development, incentivizing the coexistence of forms of transport and different means of movement with low environmental impact (Ferranti 2013). The approach proposed for both research and governance is to institute relationships and coherence between provisions in the plan, especially where new residences are expected, and the grid of public transport, biking/walking paths, and transport hubs. Local administrations should adopt incentivized forms within the scope of concentrating public resources on investments related to the development of innovative urban infrastructures, possibly introducing (as, e.g. is done for waste and for automobile taxes) the principle of “he who pollutes pays”. In this sense, one could define modes and mechanisms for integration and exchange among the design of new forms of accessibility, the choice of different transport possibilities, and the design of the urban and territorial form.

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Chapter 13
Efficient and Nice – Social Capital and Services of Public Interest: The Quest for a Metric for Urban Quality of Life

Luca Cetara

Social Sustainability and Quality of Life: The Search for a Methodology

Social sustainability has only occasionally been examined in urban studies. In sociology and economics, social concepts (particularly "social capital") are discussed in reference to actual civic participation, community empowerment, social interactions, and the development of a "sense of community" among residents (Putnam 2000; Mitlin and Satterthwaite 1996). This may be one of the leading reasons for uncertainty concerning social indicators here and in other studies.

Since the social dimension of sustainable development is still a major issue for both the science and policy communities, a well-defined methodological approach would help to maintain focus amid an endless list of indicators.

Ideally, four steps may be followed to measure the quality of life (QoL) in a city:

1. Collect available evidence from studies on the effect of social conditions and policies on the subjective well-being and economic performance of countries or territories.
2. Identify a set of suitable indicators for measuring the effect of social conditions and policies (Sachs 2015) on individual and aggregate well-being (including economic performance).
3. Identify the mutual interactions among different indicators and the "net effect" on the QoL (Stiglitz et al. 2009).
4. Identify the intrinsic limits of the approach and room for future improvements (in metrics and efficacy) in measuring social performance.

L. Cetara (✉)
Eurac research, Bolzano/Bozen (Italy)
e-mail: luca.cetara@eurac.edu

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The QoL framework collects indicators covering several social dimensions and policies. In particular, we focus on three main groups of indicators:

1. The dimensions of social capital, since these social conditions are directly connected to the QoL
2. The delivery of public services, which support or create proper social conditions and social capital connected to the QoL
3. The building and physical features of infrastructures, which support social conditions for the QoL and are indirectly connected to the QoL

In the following sections, we discuss social indicators, the typology used in the QoL framework, and its limits.

Visions of Well-Being

According to an operational definition (Stiglitz et al. 2009), the QoL includes the full range of factors that make life worth living, going beyond its material aspects. Many of the determinants of well-being are neither economic nor physical resources but aspects of people's lives with no imputable prices, even if people trade off among them. Moreover, it is especially true in the social dimension of sustainable development that resources can be transformed into well-being in ways that differ among individuals. Greater capacities for enjoyment or greater abilities for achievement in some domains of life may help attain a higher QoL, even if few economic resources are available.

Research has shown that QoL and its evaluation are typically shaped by:

(a) Individual factors, such as personal characteristics and beliefs (Stiglitz et al. 2009; Helliwell et al. 2015)
(b) Contextual factors, such as macroeconomic or aggregate effects (e.g. unemployment, economic growth, legal frameworks)
(c) Cross-cutting issues that are hard to address under the other two categories

Individual and context factors are often related to each other since the same condition can increase both personal well-being and the economic performance of a society (Sachs 2015). Some effects under (b) can impact the objective social conditions and the context where people live.

The approach applied to the Adriatic city does not clarify in detail the vision of well-being that it embraces nor the particular concept of social QoL sought as a target of the policy actions to be implemented, though it does include social indicators based on the mentioned categories.

Considerable literature and practice have developed on the dimensions of well-being (Istat and CNEL 2015), i.e. the elements influencing the QoL of individuals or a community. International practice recognizes the importance of delivering policies that increase human well-being. Novel tools have been tested, allowing for a multidimensional, weighted assessment of policies on the basis of their impact on well-being and their distributional consequences.

Since QoL depends to some extent on subjective perceptions and views of the "good life", metrics for subjective well-being are particularly relevant. Assuming that people's well-being is central when measuring the QoL in a society, individuals are the preferred units of analysis in terms of both preferences over alternative options and personal satisfaction with their own degree of well-being. In contrast with neoclassical economics, since it focuses on the allocation of goods and services as objective determinants of well-being, this interpretation looks at the individual perception of a certain allocation, which may differ among people based on feelings, current situations, or capabilities (Frey 2008). The resulting vision is a subjective interpretation of well-being.

However, since it is also concerned with the progress of a society as a whole, this vision is a sensible option, too. Such progress can be measured by using objective facts that improve the QoL by means of an expansion of people's opportunities into domains seen as intrinsically important for personal life. This is the case with Sen's capability approach, according to which people should be given the freedom to choose among a set of achievements ("functionings") in their own lives. People who are able to self-determine their own development are seen to enjoy a higher QoL than those enjoying the same benefits but, for instance, under "benevolent dictatorship" (Sen 1987, 1993). Here, a significant role in determining QoL is left to policy. Objective domains represent dimensions of social well-being; some describe people's states (e.g. health), while others provide information about the freedoms that people have to pursue the goals they value. These measures make it clear that the way in which societies are organized has an effect on people's QoL. Dimensions under this domain include health, education, personal activities (how people spend their time and the features of people's personal activities), political voice and governance, and social connections. Some of the indicators of QoL in a society are thus inspired by a more objective approach for measuring well-being, independent of their effect on individual perceptions (Sen 1985; Acharya and Wall 1994; UNDP 1999; Fukuda-Parr 2003). The resulting vision is an objective (or contextual) interpretation of well-being.

Finally, some indicators address a few cross-cutting issues that act significantly to determine the QoL in a community. These include inequalities in the dimensions of well-being that rely on individual conditions and cannot be captured by an average value. If economic inequality is relatively easy to measure, social and nonmonetary aspects are more elusive. However, socioeconomic inequalities can be the object of policy action and measuring them can be helpful for decision-making purposes. Another two cross-cutting issues (not analysed in this study) are the possible complementarities between different dimensions of the QoL and the way in which the development or worsening of the performance in some dimensions may affect others and the parsimonious aggregation of QoL measures into a single or a few comprehensive indices. This vision, complementary to the subjective and the contextual visions, is a cross-cutting interpretation of well-being.

A further issue (often measured independently from QoL) is the delivery of services of public interest in a community. All these categories can be found in the set we examine here.

Some Evidence of the Relationship Between Social Capital, Services of Public Interest, and QoL

In the QoL framework examined, the category of social indicators is wide and varied. In broad terms, the indicators refer to the two concepts of social capital and delivery of services of public interest, both of which participate in shaping the QoL of a community in an urban environment, although in different ways.

Social capital has been defined (Foley and Edwards 1997; Adler and Kwon 2002; Robison et al. 2002; Dolfsma and Dannreuther 2003) as an applied informal norm that promotes cooperation between two or more individuals (from reciprocity between friends to complex doctrines) and must be observed in an actual human relationship. They are typically related to traditional virtues like honesty, maintaining commitments, reliable performance of duties, and reciprocity (Fukuyama 1999). Thus, trust, networks, civil society, and the like often associated with social capital arise as a result of social capital but do not constitute social capital itself. The term *social* emphasizes that these assets are not personal; no single person owns them. Rather, they reside in networks of relationships (Baker 2000). An operational definition refers to social capital as the extent of trust, social support networks, and pro-sociality and can be said to include a few variable social conditions (Sachs 2015).

It would thus be useful to understand how the constituent dimensions of social capital participate in delivering both subjective well-being and economic development in a society and how high social capital is achieved through investment with measurable returns. Research outcomes can help to establish these relationships (Sachs 2015). Some dimensions of social capital ideally measured through indicators are suggested in Table 13.1.

A service of public interest can be defined as one whose provision is usually granted by the government to the members of a community living within its jurisdiction. Thus, any study of these services will rely on institutional analysis and assume some regulation. Service performance indicators can refer to the efficiency of a service, its existence, or its effectiveness. In the first case, it is questionable that they provide information consistent with the goal of increasing the QoL of a community.

The public sector often supplies firms and households with services such as health, education, housing, transport, electricity, and security through direct provision and funding. It manages infrastructures and other public investments (which the private sector may be unable or unwilling to bear the risk of) and uses regulation to steer social and economic behaviour. It can set conditions to generate economic growth and introduce regulations for directly or indirectly delivering public and personal services aimed at increasing citizens' well-being (OECD 2013). It may

Table 13.1 Dimensions of social capital and possible indicators of prosociality conducive to social capital (literature review)

Dimension of social capital	Literature reference	Possible indicators of prosociality conducive to social capital
Personality traits	Van Lange et al. (2013) (social value orientation theory), Haidt (2013), Iyer et al. (2012)	Moral training courses and life-skills curriculum in schools (Layard and Hagell 2015)
		Specialized training in compassion, meditation, and mindfulness
General education, ethical instruction, specialized compassion training	Etzioni (2015), Davidson and Schuyler (2015)	Universal access to different levels of education for all citizens
Professional in-group cultures and norms for/against social capital	Cohn et al. (2014)	Professional and business codes of ethics emphasizing prosociality
Social conditions increasing social capital: voluntary participation in civic groups, honesty in public administration (low corruption and adherence to the rule of law), income and socioeconomic status inequality, political democracy, ethnic homogeneity	Putnam (2007), Rothstein (2005, 2011), Uslaner (2002), Uslaner and Rothstein (2016), Bjornskov (2006), Della Porta (2000), Ljunge (2013)	State regulations against anti-social behaviour (financial frauds, pollution, etc.) (Rothstein 2004)
		Corruption practices in the public sector (Rothstein 2005; Knack and Zak 2002)
		Income and wealth inequalities and correlated policies (Knack and Zak 2002; Rothstein and Uslaner 2005)
		Adoption of universal safety nets (Rothstein 2005)
		Practices of deliberative democracy (Hauser et al. 2014)
		Reporting of prosocial behaviour

also play an active role by developing and managing policies and methods to address emerging socioeconomic challenges and setting sector policy targets in coherence with the political goals of the government.

Consistent with the subjective interpretation of well-being, the public sector could aim to achieve a perception of "being well-governed" as a policy outcome: the way in which public services are delivered is a factor in determining the perceived level of well-being (World Bank 2012). Perception has been considered as mediation between subjective experience and collective values, conveying a social meaning and including both cultural and use values (Cassatella 2011).

Due to the high level of expenditure entailed, the public sector contributes remarkably to growth and social welfare, which are basic components of any function of societal or economic well-being. Achievements in the public sector can be assessed based on the quality and nature of the services provided, the infrastructure financed or guaranteed, the quality of social and economic regulations enforced, and its policy objectives. Public-sector management can thus be seen as a variable of development (World Bank 2012). Notwithstanding the contribution of the high-quality delivery of services of public interest to subjective well-being, the quality of management (particularly the method of provision and the level of efficiency attained) is regularly analysed but scarcely weighted in frameworks for assessing societal QoL (Istat and CNEL 2015). There is often a close relationship between institutions acting on behalf of a political community for the public interest (i.e. the public sector) and the exceptional value of landscape as the object of administrative acts (e.g. use restrictions, building codes and regulations, designation of protected areas). This relationship has been acknowledged by the category of ratified value, which is defined as a social acknowledgement of the landscape (Cassatella 2011). It could act as a proxy for the more classical dimension of identity value, which is often mentioned but not quantified in analyses.

A problem with using separate categories when addressing social aspects is that a clear-cut categorization is necessarily inaccurate, since some dimensions contribute simultaneously to both the creation of social capital and the delivery of services of public interest (e.g. education).

Indicators of Social QoL in an Urban Environment

Faced with the challenge of assessing QoL in an urban environment, the studies examined for the purposes of this research use composite sets of indicators covering a range of features expected to determine sustainability or QoL in a geographically concentrated community in a city.

Social indicators should use a metric with practical purposes:

1. Measuring a social condition or practice contributing to the creation of a social capital
2. Measuring the efficiency or effectiveness of a service of public interest provided in the city

In order to achieve these purposes, dimensions of social well-being can be surveyed according to the function they perform in society. The list of indicators in the set for the Adriatic city can be divided into three sections according to the purpose: social capital dimensions, services of public interest, and a residual one (Table 13.2).

Different motives can support the final set, which results from a regulatory choice depending on value judgements regarding which components are more important in the situation under investigation. These may be determined by deliberative processes in the community or from expert opinion. In both cases, those aspects that more directly bear on a community's living conditions should be considered.

Consistent with the objective interpretation of well-being in the field of public services, the main categories usually measured include health, education, personal or daily activities (work, commuting, leisure time, housing, etc.), political processes, social capital and connections, and the environment (Stiglitz et al. 2009). A certain uniformity in the topics covered can be perceived in the literature surveyed and in practice. The social indicators are distributed across all three major groups in

Table 13.2 Social indicators by section of the QoL framework

Social capital	Services of public interest	Other social or economic aspects
1. Active population rate	1. No. of places in kindergartens per inhabitant	1. Population density
2. Employment rate	2. No. of sports facilities per inhabitant	2. Population growth rate
3. Unemployment rate	3. No. of bookshops per inhabitant	3. Evolution of tourist presence
4. Youth unemployment rate	4. Availability of healthcare services	4. Tourist intensity
5. Dependency ratio	5. Public and private healthcare institutions	5. Vitality of businesses by sector
6. Years of schooling of population	6. Accessibility to surface public transport (stops)	6. Start-up businesses
7. Employment in R&D	7. Accessibility to bicycle tracks	7. Diversity of functions
8. Share of employed people commuting outside the urban centre	8. Restaurants, bars, and other retail businesses	8. Economic attractiveness in the areas creating income and other economic activities
9. Average household income	9. Accessibility of inhabitants to green areas	
10. Poverty threshold	10. Borough/district services endowment	
11. Income inequality	11. Accessibility of a site of public interest on the urban level	
12. Average no. of household members	12. Share of residents with walking access to public interest areas in 300 m	
13. Income p.c.	13. Availability of walking islands and LTZ per inhabitants	
14. Consumption p.c.	14. Presence and ease of access to public services	
15. Share of one elderly-person households	15. Presence and ease of access to public interest services	
16. Thefts	16. Presence and ease of access to basic healthcare services	
17. Youth crime rate	17. Presence and ease of access to social interest building	
18. Crime rate	18. Commercial surface per inhabitants and accessibility	
19. Max walking distance from and to school, for children	19. Shopping areas in the urban areas	
20. Walkability by people with disabilities	20. Quality and level of maintenance of pedestrian and cycling tracks	
21. Presence of activities exposed to risk	21. Quality of open spaces and buildings lighting during day and night hours	
22. Presence of areas exposed to flood risks	22. Quality and level of maintenance of parking lots	
23. Population exposed to flood risks	23. Quality of collective areas in council housing sites	
24. Population exposed to landslide risks	24. Quality and level of maintenance in council housing buildings	

(continued)

Table 13.2 (continued)

Social capital	Services of public interest	Other social or economic aspects
25. Sites under remediation	25. Share of homes of public residential council housing	
26. Light pollution	26. Level of maintenance and quality of green areas	
27. Noise pollution	27. Level and maintenance of quality of green areas in boroughs with mainly public housing/building	
28. Safety of road network (vehicle traffic)	28. Density of urban waste containers per inhabitants	
29. Safety of road network (walking and cycling)	29. Share of landfilled urban waste	
30. No. of road accidents per inhabitant	30. Share of recycling of urban waste	
31. No. of visitors in museums	31. Share of population with access to recycling	
32. No. of volunteering organizations/charities	32. Public expenditure for cultural heritage management	
33. No. of artistic/recreational organizations	33. No. of theatre performances	
34. Meeting and socialization sites	34. Cinema shows	
35. Presence of public open spaces used by population		
36. Presence and fruition of local interest buildings		
37. Architectural quality (street furniture, arts installations) and level of maintenance of open public spaces		

which the study is organized*:* “Distinctive and pleasant”, “Efficient and nice”, and “Clean and healthy”. Some refer to social conditions, and some refer to the provision and availability of services of public interest, but only a fraction of them can be said to properly contribute to attaining collective and individual well-being in a community.

Directions for Future Research

Some “crucial enabling element(s)” beyond income (health, environment, employment and work, education, and life satisfaction) could be included in a comprehensive set of outcome indicators on the individual or household levels. Information about the joint distribution of these elements across population groups could also offer new insights on people’s conditions that are not based on income level alone (OECD 2015). International standards exist for measuring inputs and outcomes for sectors held as “fundamental to citizens' well-being and to countries' economic and social development” traditionally managed by the government (e.g. education and health), so consistent assessments of their effectiveness are possible (OECD 2013).

Promoting effective urban governance is critical for improving well-being, promoting economic growth, and fighting social exclusion. Ensuring that relevant decisions are taken on the urban or metropolitan scale may allow cities to better exploit the benefits of agglomeration and reduce social exclusion by moderating the negative effects of social stratification of neighbourhoods (Revi and Rosenzweig 2013). Among other ways, this may include decreasing disparities in the provision of services of public interest, which already represent a significant share of the set. Indicators of physical-constructive variables and the maintenance of public spaces and infrastructure should be studied further in order to quantify the possible effects of the measured variables on the well-being of citizens and users.

Such a theoretical approach could be further explored when applying the set, which could expand existing work on:

1. Inequality and well-being, particularly the inequalities of non-income dimensions, such as health and employment
2. The measurement of stocks of resources including social capital, its determinants, and social conditions specific to an urban environment
3. The features shaping a good urban community such as the conditions at the basis of the EU policy interpretations of “sustainable communities” contributing to social capital creation and development (needs of existing and future residents, environmental sensitiveness, contribution to QoL, health, inclusiveness, social contact, social cohesion (Dempsey 2008), pride and sense of place, planning and management, inequality of opportunity and services, participation in collective groups and networks, community stability, safety, and security) (Dempsey et al. 2009; Burton and Mitchell 2006; Forrest and Kearns 2001).

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Chapter 14
Clean and Healthy – Protected Areas, Biodiversity, and Management of Natural Resources

Paolo Perna and Roberta Caprodossi

Urban and Protected Areas

The rapid growth of urban areas seen in recent decades has led those dedicated to protecting biodiversity to focus on the problem of the possible effects of urbanization on protected areas (Güneralp and Seto 2013). Created to protect territories in which anthropic pressure was absent or at least modest, protected areas have always been considered, along a scale of attention to the needs of biodiversity, as the polar opposite of urban areas and in some way substantially incompatible with them. In reality, this view of two separate worlds, beyond being irreconcilable, reached a crisis when expanding urban areas began to approach protected areas ever more closely. At the same time, often heightened value is recognized in biodiversity connected to traditional anthropic activities for which, in some way, protected areas reached the urban areas (Trzyna 2014).

The need to address the management of territories in which human presence, either historically consolidated or more recent, is very high has led the Convention on Biological Diversity (CBD) to define not only the "conservation of biological diversity" as a main objective but also "the sustainable use of its components" and "the fair and equitable sharing of the benefits arising out of the utilization of genetic resources" (Art. 1—Objectives).

This evolution has opened new opportunities with respect to the possible relationships between protected areas and urban areas. These should be explored both to reduce the negative effects that the latter can have on the former and to ensure that the protected ecosystems can fully carry out their responsibilities, which now include the development and well-being of local communities (Millennium Ecosystem Assessment 2005).

P. Perna (✉) • R. Caprodossi
Terre.it srl, Spin Off of the University of Camerino, Sarnano, Italy
e-mail: paolo.perna@unicam.it; roberta.caprodossi@unicam.it

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However, it is necessary to point out that this phenomenon is not homogeneous throughout the world but assumes different forms and intensities and that conflicting growth is especially concentrated in developing areas (Seto et al. 2013). The situation is slightly different in Europe, where, on the one hand, urbanization is decidedly slower and, on the other hand, the consolidated spread of people throughout the territory has led to a relevant fraction of protected areas in relation to urban contexts (Seto et al. 2013).

The importance of this phenomenon, in both its current and future states, has grown so much that it has become an important theme under the CBD (Secretariat of the Convention on Biological Diversity 2012), while the IUCN (International Union for Conservation of Nature) has created an Urban Specialist Group within the World Commission on Protected Areas.

The IUCN's concept of *urban protected area,* while inevitably based on a margin of uncertainty (Trzyna 2014), is extremely useful in establishing some fixed points with which to evaluate the possible interactions between protected areas and urban areas. To achieve this and to use it to define a set of indicators to accompany decision-making processes, it is perhaps useful to analyse the main pressures that urban areas exert on the institutional objectives of protected areas and, vice versa, which of these objectives are useful for satisfying the needs of urban populations. Table 14.1 lists the guidelines identified by the IUCN for the management of urban protected areas (Trzyna 2014).

The Pressures Exerted by Urban Areas on Protected Areas

In contrast to most of the contributions in this volume, the theme presented here is not to evaluate a series of sectoral variables (e.g. biodiversity, climate, etc.) with respect to planning and managing urban areas. Rather, the goal is to compare the needs and objectives of two management directions that seem irreconcilable at first glance but which necessarily should and can find a way to be integrated for mutual benefit. The indicators should therefore also be designed on the basis of this need and should above all allow the impact of choices made by protected-area and/or urban-area managers on the objectives and strategies of the other to be foreseen and monitored.

Assessing the reciprocal relationships between protected areas and urban areas is not simply because these can be very numerous, occur on completely different scales, and often be unclear in their mechanisms and the effects (Hansen and DeFries 2007; McDonald et al. 2013). Some of the effects can even be felt at large distances, like, for example, the increasing pressure of agriculture on protected areas, which is favoured by an increase in consumption often associated with urbanization, or the effects of climate change on the ecosystems. Others instead develop on a strictly local scale, like, for example, the transformation of the land for settlement expansion (McDonald et al. 2009).

It is clear that on the global scale, it is impossible to define the contribution of a municipality's individual decisions on the resources of a protected area, which are assessed within an overall framework; this, however, lies beyond the scope of the

Table 14.1 IUCN guidelines for urban protected areas (Trzyna 2014)

Guidelines: urban protected areas and people	
1.	Provide access for all; reach out to diverse ethnic groups and the underprivileged
2.	Engender a local sense of ownership
3.	Take advantage of volunteers and support groups
4.	Communicate carefully and use a range of communication technologies
5.	Demonstrate, facilitate, and promote good environmental behaviour
6.	Demonstrate, facilitate, and promote the health benefits of contact with nature and of good eating habits
7.	Prevent littering
8.	Prevent and prosecute crime against people and property
9.	Reduce human/wildlife interaction and conflict; keep aware of emerging infectious diseases
10.	Control poaching
11.	Control invasive alien species of animals and plants
Guidelines: urban protected areas and places	
12.	Promote connections to other natural areas
13.	Help to infuse nature into the built environment and break down the cultural barriers between the "natural" and "urban" aspects
14.	Control encroachment
15.	Monitor and manage water
16.	Manage wildfires
17.	Reduce impacts of noise and artificial nighttime light; keep aware of research on electromagnetic fields
Guidelines: Urban protected areas and institutions	
18.	Cooperate with agencies that have shared or adjoining jurisdictions
19.	Cooperate with institutions that have complementary missions
20.	Cast a wide net for advocates and allies
21.	Cooperate with universities in training managers for urban protected areas; facilitate use of these areas for academic research and advanced learning
22.	Learn from others' experience with collaboration; pay careful attention to structure and process, as well as to substance
Guidelines: promoting, creating, and improving urban protected areas	
23.	Promote and defend urban protected areas
24.	Work to make urban protected areas national and global conservation priorities
25.	Create and expand urban protected areas
26.	Promote rules and organizational cultures that respect the differences between urban and more remote protected areas
27.	Recognize that political skills are critical to success; strengthen them and build political capital
28.	Seek funding from a wide range of sources
29.	Take advantage of international organizations and exchanges
30.	Improve urban protected areas through research and evaluation

present volume. What is of interest, instead, is to identify a virtuous path that allows the relationships between the city and the closest protected areas to be managed so that the protected biodiversity can help to provide the ecosystem services indispensable to guaranteeing an adequate level of quality of life for the citizens.

For this reason, we concentrate solely on local relationships, the only ones for which a direct link between management choices and impacts on individual resources can be identified.

The clearest impact is the reduction of natural habitat surface caused by the increase in artificialized surfaces for the expansion of urban areas. On the global scale, this phenomenon has grown worryingly in recent decades, even if, as mentioned above, at very different rates between developing and developed countries (e.g. Europe), where urbanization processes are now consolidated and any increases are decidedly more modest. Other more local differences can be added to these global differences, making the framework decidedly more complex and therefore manageable only through an appropriate reduction in scale. In particular, it is evident that the pressure of urbanization on different types of habitats has not been and is not homogeneous. It is instead concentrated primarily on habitats that develop in contexts favourable to human settlement, such as along the coasts or in the plains (McDonald et al. 2013), for which the risks of further surface erosion are much greater than for ecosystems that are already rare or threatened. The contraction of natural formations in contexts that are already strongly artificialized obviously leads to a further reduction in ecosystem services available to urban populations. People here are therefore forced to either diminish their standards of living or look for resources farther from the urban centre, with a consequent increase in mobility and its related pressures, in particular greenhouse gas emissions or pollution. Another potentially negative effect is the movement of flows of users towards areas that are more remote and of greater biological value; these flows are often enough to exceed the carrying capacity.

The theme of use is certainly central in the relationship between protected areas and cities. It is increasingly evident that the availability of green spaces where contact with nature can be found is essential for the quality of life, with direct effects on the state of health (Bratman et al. 2012; Hartig et al. 2014; Thompson Coon et al. 2011). The increase in "environmental" tourism recorded in recent years (Holden 2016) testifies to this growing need for contact with nature, which is a direct consequence of the progressive urbanization of the population that, moving to the city, loses touch with the outdoors. Urban protected areas are obviously select places for satisfying this need, as they combine two essential characteristics: environmental quality and proximity to the city.

Managing this phenomenon is not simple, however, because although they are attracted by the quality of the environment, users' attitudes can be very different, with potentially contrary effects on the conservation of biodiversity. In this respect, Raina (2005) proposed a classification of the types of tourists in relation to the attitude they have towards the environment they are using (Table 14.2).

The least attentive users, who need to carry out activities in the open, are often not aware of the biological value of the environments they are using, nor is this a determining factor in their satisfaction; they are simply following their needs. For example, the uncontrolled development of infrastructures and services can be extremely damaging for biodiversity and is consequently not in line with the objectives of protected areas. On the other hand, favouring more responsible forms of use

Table 14.2 Types of tourist, based on their level of interest in the environment (Raina 2005)

Type	Level of environmental commitment
Special ecotourist	High. Wants to be involved with and protect nature
Eco-aware	Interested in the environment for its own value rather than how it can be used
Users	Interested in the environment to the extent that it possesses special characteristics to pursue a particular type of activity
Loungers	Low. Emphasis is placed on recreation and enjoyment. Therefore there is no requirement apart from it looks pleasant

or promoting awareness in the remaining mass of users is one of the objectives of urban protected areas. The goal is to favour the conservation of natural resources, which contribute to a growing global awareness of the need to protect biodiversity (Trzyna 2014).

Beyond other negative effects of the disturbance urban areas create on the closest ecosystems, there is a series of pressures that, if not modifying the type of land use, can significantly alter the composition of biological communities. The most evident is the increase in alien invasive plant species within flora communities (Spear et al. 2013). This phenomenon, which is seen around the world, is considered one of the main global threats to biodiversity (CBD 2001; Millennium Ecosystem Assessment 2005) and due to numerous causes, including the disturbance vegetation, is subject to in the most anthropized areas (D'Antonio et al. 1999). Not only do these areas favour the most adaptable taxa, such as many alien species, many of these species are also used as ornamental species that then could escape the cultivated area and enter natural biocenoses (Smith et al. 2006).

Another pressure typical of urban areas is the disturbance provoked by noise and the increase in mortality due, for example, to street accidents or the impact of transparent or reflecting building surfaces. These are phenomena that while appearing marginal, cause many tens of millions of deaths every year of individuals pertaining to numerous systematically different groups (Erickson et al. 2005; Forman 2003; Klem 2008).

The increase in mortality due to traffic accidents is closely connected to another typical pressure exerted by urbanization—the fragmentation of habitats, which forces individuals to cross streets and settlements to satisfy their needs. When the occlusive capacity of infrastructures and built areas isolates the remaining natural fragments and their surface area is reduced below a certain threshold, the progressive extinction of the populations present is only a question of time (Hanski and Gilpin 1997).

Proximity to urban areas exerts yet another pressure on the landscape and the biodiversity of protected areas. In search of a better quality of life and greater contact with nature, many people move to rural areas, leading to changes in the settlement structure that, even if not necessarily leading to an increase in built areas, substitute residents connected to agriculture with new citizens who use rural areas only for leisure. The link between territory and farmers is thus broken. This connection is essential in conserving quality cultivation, which can protect the landscape and guarantee the biodiversity of rural areas that, at least in Europe, face great threats (European Commission 2011). The two typical outcomes of this resident replacement are, on the one hand, the abandonment of cultivation and, on the other hand, the intensification of agricultural practices given that the fields are leased to third parties whose only goal is to maximize profits.

The Indicators

The multitude of possible relationships between protected areas and urban areas can be managed only by developing policies based on the sharing of objectives and collaboration between different experts. In this sense, our area of study presents a case study, the Conero Natural Park and the city of Ancona, which are described in detail in the attached box.

Given the complexity of the themes addressed, the possibility of enacting effective strategies can only be based on an adaptive approach (Holling 1978). This requires, among other things, the identification of a set of indicators that allow the system to be monitored and the effectiveness of actions to be assessed.

By applying the DPSIR model (Smeets and Weterings 1999), the indicators can be referred to each element making up the framework: driving forces, pressures, states, impacts, and responses. Their choice is a key part of the planning phase and is closely conditioned by the results of the interpretational analysis of the system, for which their a priori definition is, beyond being difficult, methodologically incorrect. In what follows, therefore, we briefly mention the possible indicators useful for monitoring the most important problems that emerge from the analysis of our case study.

We maintain that the essential idea a protocol to monitor the relationships between protected areas and urban areas is that the presence of the protected area permits the activation of policies that can respond more effectively to citizens' requests for environmental quality. It is clear that in this reasoning, all the indicators analysed in the present volume can be used for evaluation if there are differences between what occurs in the parts of the city that lie within or outside the protected areas. The scope of our work is therefore to define a possible set of indicators appropriate for monitoring the reciprocal influences between protected areas and urban areas, and to this end, we identify two main objectives. The first is to verify if the actions implemented in protected areas reduce the effect of pressures exerted by urban areas on biological resources. The second is to assess whether the policies implemented in protected areas provide a response to environmental questions relevant to citizens' quality of life. It is clear that such an approach begins with the requirement that the monitoring should compare what occurs in the protected area with what occurs outside.

The first aspect that should be considered relates to direct pressure from the settlement system. In this case, the indicators should be able to monitor both the possible expansion of urban areas and the pressures exerted by them on the main environmental factors. With regard to the first aspect, simple state indicators such as the surface area of urban areas may be sufficient. In the second case, it may be more interesting to use response indicators that can allow the level of application of management policies to be assessed. The indicators should therefore be closely connected to the actions undertaken and refer to those construction techniques that have positive environmental effects: the number buildings built according to the criteria of green buildings, the number of environmentally certified buildings, the production of renewable energy with domestic systems, populations connected to purifiers, etc.

As we have seen, the effects of urbanization on biodiversity are complex and related to very different factors. For this reason, it is also necessary to identify state indicators that allow the overall state of animal and plant communities to be monitored constantly. In this case, the literature contains many indicators that have been widely experimented with. At least three primary aspects should be analysed.

The first regards the status of plant communities and the rarest ones in particular. In this case, the indicators should evaluate the surface area covered by the type of plant and its state of conservation. This is similar, for example, to what was established by the EU with Directive 92/43/EC to monitor habitats. Given the relevance of the theme, the monitoring of flora components should be integrated with at least one indicator capable of assessing the extent of the spread of invasive alien species (EEA 2012a).

With regard to animal communities, beyond monitoring the populations of species of particular interest that are possibly present, it is now widely accepted that the groups most adapted to large-scale monitoring programmes are birds and Lepidoptera. In this sense, the abundance and distribution of common bird and butterflies, proposed by the EU to monitor biodiversity (EEA 2012b), are also to be preferred due the availability of comparative data. For birds, the Common Birds Index (CBI) can be used to define subsets of species linked to specific environments and particular areas that can be monitored in detail (e.g. the Common Farmland Bird Index and the Common Forest Birds Index).

Favouring quality agriculture with a low environmental impact is among the institutional objectives of protected areas and may have a direct impact on urban populations. On the one hand, aesthetically and ecologically integral rural landscapes have the possibility to expand their leisure possibilities, with the advantage that the pressure on natural ecosystems is reduced. On the other hand, the availability of quality agricultural products allows a larger number of citizens' access to increasingly requested goods, which may also represent greater profits for agricultural businesses. The indicators therefore should be able to monitor these aspects, considering, for example, the surface area dedicated to organic agriculture, the amount of quality products pertaining to local food and agricultural industries, or the number of businesses participating in them.

Lastly, an essential function of protected areas falling within urban areas or areas with high tourism pressure is to favour use that minimizes the pressure on the environment and contributes to increasing the level of citizen awareness with respect to the need to protect the environment and the landscape. Within this scope, indicators

13 and 14 “recreational and educational services” and indicators 22 and 23 “education and awareness” from the Singapore Index on Cities’ Biodiversity made available under the CBD (Kohsaka et al. 2013) may be applied. Any strategy to prepare the system for use should also reduce the impact of tourist structures on the environment and cannot overlook the application of protocols for sustainable tourism (e.g. European Charter for Sustainable Tourism in Protected Areas (http://www.europarc.org/nature/european-charter-sustainable-tourism/), for which the use of an indicator capable of monitoring the number of tourist structures with environmental certification is fundamental.

Conclusion

In conclusion, it is clear that the presence of protected areas near urban centres represents a large opportunity for urban centres to develop policies that can guarantee the provision of essential ecosystem services to provide adequate levels of quality of life for citizens. With this in mind, it is, however, necessary that the objectives of protecting the environment and the landscape—institutional goals for protected areas—be created precisely by the municipality and that the planning tools of different territorial subjects coordinate with the objectives and strategies. Only in this way can protected areas, which are occupied only by environmental questions, go from being passive subjects concentrated on defensive strategies, to active subjects taking charge of the actions necessary to achieve the goals of sustainability in urban areas, as established, for example, in the guidelines for urban protected areas by the IUCN (Trzyna 2014).

A Case Study: Ancona and the Conero Natural Park

The city of Ancona is an ideal case study area for analysing the possible interactions between protected areas and urban contexts. In fact, the Conero Natural Park, the first created in the Marche Region, lies within the city.

Established in 1987, the protected area covers about 5983 ha in the cities of Ancona, Camerano, Numana, and Sirolo, four communities with a total resident population (as of 1 January 2016) of 116,009 spread over an area of 172.46 km^2, for a population density of 672.67 inhabitants/km^2. This includes the entire Riviera del Conero, one of the most important tourist destinations in the Marche Region, with an annual presence in tourist structures in the four communities of more than 1,400,000, in addition to private houses and residents (Marche Region Tourism Observatory: http://statistica.turismo.marche.it/DatiTurismo). There are clearly strong pressures on the park’s ecosystems, and their management requires close collaboration among all interested subjects.

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For this reason, since its institution, the protected area has not been able to limit itself to a "defensive" function but had to promote a change in models of local development. With respect to the four themes analysed above, we briefly show how the presence of the protected area has allowed for the activation of strategies functional for the sustainability of development and the protection of environmental resources while also benefitting resident populations.

Settlement Pressure

The presence of urban areas and their location along the coast has for decades placed the Conero at the centre of intense settlement development, related in part to the increase in resident population and in part to the construction of hotels and vacation homes in particular. The creation of the park was largely justified by the need to halt this uncontrolled expansion, and from the beginning, the conflict between conservation needs and economic interests has been strong. Park planning clearly shows the signs of this tension. While it has not managed to completely stop settlement expansion, thanks to interaction with the administration and attention focused on the environment and the landscape, it has managed to limit expansion and, thanks to zoning, to direct it towards areas where it would create less of an impact. It should be added that the park action has initiated a path on which criticalities such as the protection of bats that use the buildings or mortality provoked by glass walls or pools are becoming common themes in building design.

Biodiversity Conservation

Biodiversity conservation is obviously central in the park's strategies, but in this case as well, its proximity to urban areas and the pressures they exert have also pushed the protected area to experiment with forms of collaboration with the other territorial subjects on this theme. Therefore, combined with "traditional" activities such as projects for habitat renewal, in particular coastal habitats, which are more subject to tourism pressure or to regulating the use of plants in gardens to counter the risk of expansion of invasive alien species, broader strategic programmes have also been developed. From our point of view, the most interesting is the Conero Marche Ecological Network, which, through an agreement with the Marche Region and the communities of the park and surrounding areas, proposes an increase in the ecological connections between the park with the remaining part of the Marche Ecological Network, which in its current state are weak (Terre.it srl 2011). The project is based on the hypothesis that interventions made for other objectives of primary importance for citizens, such as the use of rural areas or reducing hydrogeological risks, can, if designed carefully, contribute to increasing ecological connections. Another extremely interesting element is that, by involving local entities, the project allows the park to address ecological criticalities whose effects are seen in the territory but whose origin lies outside its borders.

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Use

Use represents a fundamental element in managing protected areas near urban areas. As already seen, making areas available for citizens to enjoy nature is among the objectives of the protected area. On the contrary, careless management can become a threat to biodiversity conservation. In the Conero area, resident use is augmented by tourists, who stay there particularly in summer. The park strategy, in agreement with local entities and tourism operators, is organized on two levels. The first, through implementation of a tourist system (paths, informational points, etc.) that enhances the natural, landscape, and cultural resources of the territory, aims to favour conscious use by residents and allows tourist flows to be spread throughout the year, whereas they are now largely attracted by the use of well-equipped beaches. The other path aims to ecologically enhance the tourism offer. In particular, this aspect led EUROPARC to insert the park, together with other protected areas in the Marche Region, in its 2013 List of Sustainable Destinations for its adherence to the European Charter for Sustainable Tourism in Protected Areas (http://www.europarc.org/nature/european-charter-sustainable-tourism/), a tourism-management tool based on the sharing of objectives and strategies for sustainability with all interest holders.

Agriculture

A significant part of the park is affected by cultivation, a part of which is highly valuable, such as the vineyards of DOC Rosso Conero. The search for forms of sustainable agriculture and even those capable of contributing to the protection of the landscape and biodiversity is therefore essential for the park. Among the many initiatives implemented over time, we highlight two that are deemed possible only by the ability of the park to involve and support farmers. The first, whose aim is closely connected to biodiversity conservation and the Natura 2000 network in particular, with funds from the EU (Rural Development Programmes 2007–2013), has allowed farmers to agree on an action plan to reach the objectives of the "Habitat" and "Birds" European Directives 92/43/EC and 09/147/EC, respectively.

The second, which is aimed at promoting sustainable local cultivation, has led to the creation of a quality agro-foodstuff production chain (Terre del Conero http://www.terredelconero.org/), which includes about 60 businesses. The availability of a significant local market composed of tourism activities and residents in the surrounding urban areas represents an element of strength on which the possibility of the project's success is based.

From this brief note, it is clear how park activities are not limited to the simple passive protection of environmental resources but rather address other themes relevant to citizens' quality of life. They demonstrate how the relationships between protected areas and urban areas, while without hiding existing difficulties, can be marked by fertile collaboration.

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Chapter 15
Clean and Healthy – Built Environments and Health: Quality of Life in an Urban Context

Iolanda Grappasonni

It has been observed that about 54% of the world's population lives in urban areas and, by 2050, 66% of the world's population is projected to be urban. As population growth and urbanization continues, sustainable development challenges will be increasingly concentrated in cities (United Nations 2014).

The quality of life in urban areas is influenced by multiple factors such as home quality, the availability of means of transport, water quality, solid and liquid waste disposal services, communication routes, public transport, green areas, the availability of pubs and leisure spaces, etc. All of these factors can impact not only the quality of life but also the health status of people living in these areas.

The World Health Organization (WHO) has defined health as "state of complete physical, mental and social well-being, and not merely as being the absence of disease or infirmity".

Attention should therefore be paid not only to the indoor environment but also to outdoors. Consequently, to ensure health, it is essential to orient choices towards improving the overall conditions of urban areas and the buildings they contain (D'Alessandro and Faggioli 2013).

Air, water, and land are important components of the urban environment. Environmental prevention and the reduction of pollutants can increase the quality of the urban environment.

Taking these considerations into account, the main indicators useful to evaluating whether health can be protected and promoted are the following:

– Water consumption
– Water quality (quality for human consumption and quality of surface water)
– Air quality

I. Grappasonni (✉)
School of Medicinal and Health Products Sciences, Center for Hygiene and Public Health, University of Camerino, Camerino, Italy
e-mail: iolanda.grappasonni@unicam.it

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Water Consumption

It is well-known that water is essential to all known forms of life, ensuring the proper hydration and maintenance of all vital functions.

The importance of adequate water intake for human health has been recognized for many years, and there has been an extensive debate about the relative importance of water quantity, water quality, sanitation, and hygiene in protecting and improving health (WHO 2003).

People use water for a wide variety of activities (such as drinking, cooking, personal hygiene, domestic uses, sanitation and waste disposal, recreational uses, manufacturing, irrigation, etc.).

The WHO indicates 100 l per capita per day as the optimal average quantity of water used for domestic purposes. It is also necessary to consider additional uses (industry, services, agriculture, recreational uses, etc), which cause consumption to grow, reaching up to 300 l per day (WHO 2003).

To calculate water consumption, we need to know the number of inhabitants and the annual data of domestic and total water consumption (CAT MED-Change Mediterranean Metropolis Around Time 2012).

The calculation is the following:

$$\text{water consumption}\left(\text{litres / inhabitant / day}\right) = \frac{\text{volume of domestic water consumption}}{\text{no.of inhabitants}^{*}\,365}$$

According to socio-demographic and environmental statistics from Istat (Italian National Institute of Statistics), in 2012 the daily supply of water for drinking purposes was equal to 241 l per inhabitant (ISTAT 2016).

The OECD (Organisation for Economic Co-operation and Development) stated that by 2050 water demand will increase by 55% and that water quality is projected to deteriorate in the coming decades (OECD 2011).

For these reasons it is very important to use this resource rationally to avoid water scarcity.

Water Quality

Water for human consumption must meet the requirements of drinking water. Therefore, water must be usable (suitable, e.g. for domestic use), pleasant (organoleptic characteristics), but above all, harmless (not dangerous to the health of those who use and consume it). The WHO has stated that water provided for direct consumption and ingestion via food should be of a quality that does not represent a significant risk to human health (WHO 2003). In fact, water represents an important

Table 15.1 Main contaminants and possible harm to human health

Bacteria	Numerous infectious diseases (spread by faecal-oral route)
Viruses	
Protozoa	
Helminths	
Metals	Toxic and/or carcinogenic effects
Organohalogenated compounds	
Pesticides	
Nitrates	Methemoglobinemia Tumours
Fluorides	Dental injuries for excess and/or deficiency
Iodine	Goitre
Radioactive substances	Carcinogenic action

transmission route for infectious diseases in both developed and developing countries. Water also acts as a vehicle for numerous chemical contaminants (e.g. metals, halogenated organometallic compounds, pesticides, nitrates, radioactive substances, etc.), which are responsible for numerous pathologies that can arise in humans (toxic effects, carcinogenic action, etc.) (see Table 15.1).

In Italy, the protection of human health from the adverse effects of any contamination of water intended for human consumption is regulated by Legislative Decree No. 31/2001 (D.Lgs. 2 Febbraio 2001, n. 31 2001; Council Directive 98/83/EC of 3 November 1998).

The parameters to be used and their limits are indicated in the Decree (see Tables 15.2, 15.3, and 15.4; for complete tables, with notes, refer to the Decree).

In addition to the list of parameters assessed and their parametric values, the frequency with which sampling and analysis should be performed is also specified.

Surface Water Quality

Surface waters are an important water supply. They are used not only as communication and transport routes but also for energy production, irrigation, rearing livestock, and finally, in recent years, after treatment, as drinking water.

As a result, surface waters play an important role in human health. The good quality of rivers, lakes, and seas can ensure achievement of a good health status. Therefore, in considering the role of the city on well-being, these characteristics must also be taken into account.

Decree no. 260/2010 lays down criteria for classifying surface water bodies. The decree implements the regulations of Directive 2000/60/EC of the European Parliament and Council of 23 October 2000, establishing a framework for European action in the field of water policy (D.M. 08 November 2010 n. 260).

Table 15.2 Parameters and parametric values—microbiological parameters

Parameter	Parametric value
Escherichia coli (E. coli)	0/100 mL
Enterococci	0/100 mL
Parameter applied to water offered for sale in bottles or containers	
Escherichia coli (E. coli)	0/250 mL
Enterococci	0/250 mL
Pseudomonas aeruginosa	0/250 mL
Colony count 22 °C	100/mL
Colony count 37 °C	20/mL

Table 15.3 Parameters and parametric values—chemical parameters

Parameter	Parametric value
Acrylamide	0.10 μg/L
Antimony	5.0 μg/L
Arsenic	10 μg/L
Benzene	1.0 μg/L
Benzo(a)pyrene	0.010 μg/L
Boron	1.0 mg/L
Bromate	10 μg/L
Cadmium	5.0 μg/L
Chromium	50 μg/L
Copper	2.0 mg/L
Cyanide	50 μg/L
1,2-dichloroethane	3.0 μg/L
Epichlorohydrin	0.10 μg/L
Fluoride	1.5 mg/L
Lead	10 μg/L
Mercury	1.0 μg/L
Nickel	20 μg/L
Nitrate	50 mg/L
Nitrite	0.50 mg/L
Pesticides	0.10 μg/L
Pesticides—total	0.50 μg/L
Polycyclic aromatic hydrocarbons	0.10 μg/L
Selenium	10 μg/L
Tetrachloroethene and Trichloroethene	10 μg/L
Trihalomethanes—total	100 μg/L
Vinyl chloride	0.50 μg/L

The decree states that monitoring should be conducted in order to provide a complete and comprehensive overview of the status of surface water, groundwater, and waters in protected areas, providing for the assessment of ecological status in conjunction with the assessment of chemical status.

Table 15.4 Indicator parameters (information on organoplectic and microbiological quality, and on efficacy of treatments)

Parameter	Parametric value
Aluminium	200 µg/L
Ammonium	0.50 mg/L
Chloride	250 mg/L
Clostridium perfringens (including spores)	0/100 mL
Colour	Acceptable to consumers and no abnormal change
Conductivity	2500 µS cm^{-1} at 20 °C
Hydrogen ion concentration	≥6.5 and ≤9.5 pH units
Iron	200 µg/L
Manganese	50 µg/L
Odour	Acceptable to consumers and no abnormal change
Oxidizability	5.0 mg/L O_2
Sulphate	250 mg/L
Sodium	200 mg/L
Taste	Acceptable to consumers and no abnormal change
Colony count 22 °C	No abnormal change
Coliform bacteria	0/100 mL
Total organic carbon (TOC)	No abnormal change
Turbidity	Acceptable to consumers and no abnormal change

An assessment of the ecological status should include macroinvertebrates, fish fauna, macrophytes, and diatoms.

In support of biological communities, elements of hydro-morphological and physical-chemical nature, and specific pollutants must also be studied. After all the tests have been carried out, it is possible to proceed with an ecological status classification using five different quality classes: high, good, moderate, poor, and bad.

A status of "good", for example, can be assigned to a body of water when it presents low levels of pollution and a healthy ecosystem.

Air Quality

As the WHO has stated, "air pollution is a major environmental risk to health". In 2012, outdoor air pollution was estimated to have caused 3 million premature deaths worldwide. Deaths due to cancers, respiratory diseases, and cardiovascular diseases are especially attributed to exposure to particulate matter (WHO 2016).

As further reported by the European Environment Agency (EEA), in 2012, $PM_{2.5}$ concentrations, long-term exposure to NO_2, and short-term exposure to O_3 were responsible for a large number of premature deaths in Europe (432,000, 75,000, and 17,000, respectively) (EEA 2015).

Table 15.5 Limit values to ensure the protection of human health

SO_2	
1 h	350 μg/m^3, not to be exceeded more than 24 times a calendar year
1 day	125 μg/m^3, not to be exceeded more than 3 times a calendar year
NO_2	
1 h	200 μg/m^3, not to be exceeded more than 18 times a calendar year (limit value entered into force on 1 January 2010)
Calendar year	40 μg/m^3 (limit value entered into force on 1 January 2010)
Benzene	
Calendar year	5 μg/m^3 (limit value entered into force on 1 January 2010)
CO	
Calendar year	10 mg/m^3
PM_{10}	
1 day	50 μg/m^3, not to be exceeded more than 35 times a calendar year
Calendar year	40 μg/m^3
Ozone[a]	
Information	180 μg/m^3 (averaging period 1 h)
Alert	240 μg/m^3 (averaging period 1 h)

[a]WHO sets the guidelines for ozone levels at 100 μg/m^3 for an 8-h daily average and states that this value adequately protects public health (WHO 2016)

To evaluate air quality, it is necessary to define the number of days per year on which daily limit values have been exceeded, considering data related to the most relevant contaminants.

The calculation requires data on recorded levels of contaminant. The number of days per year with bad air quality must be selected according to European legislation (Directive 2008/50/EC 2008). European Directive 2008/50/EC Annex XI indicates the limits for the protection of human health (see Table 15.5). In Italy, this European legislation was adopted with D.Lgs. 13 August 2010, no. 155 2010.

Among the various contaminants considered, it should be emphasized that benzene can contaminate water sources by way of industrial effluents, fuel spillage, and atmospheric pollution. Concentrations in drinking water, when present, are generally less than 5 μg/L. Acute human exposures to high concentrations have a negative effect on the central nervous system. At lower concentrations, toxicity to the haematopoietic system can be observed. The International Agency for Research on Cancer (IARC) classifies benzene in Group 1 due to its carcinogenicity (both when inhaled and when ingested) (WHO 2011). As result, D. Lgs. no. 31/2001 concerning the quality of water intended for human consumption defines the parameter value for benzene as 1 μg/L (D.Lgs. 2 February 2001, n. 31 2001). This parametric value refers to the residual monomer concentration in the water as calculated according to specifications for the maximum release from the corresponding polymer in contact with the water.

Finally, it is also relevant to consider that housing and built environments have a profound impact on human health.

Table 15.6 Aims and design specifications for a healthy housing

Environmental comfort, wellbeing, and environmental protection
– Usability and flexibility of spaces – Thermal comfort and air changes – Quality of space: size, orientation, lighting, views – Compatibility between different functions in the building – Design of green spaces – Protection of environmental resources
Safety of occupants
– Plant safety and evacuation systems of indoor pollutants – Air pollution prevention – Water safety – Prevention of domestic accidents – Protection from ionizing and nonionizing radiation – Intrusion detection systems and escape routes

According to the WHO, to be considered healthy, a home must promote the physical, social, and mental well-being of its occupants through its design, construction, maintenance, and territorial location, which should ideally be able to support a sustainable environment and a cohesive community (Buffoli et al. 2016).

It is known that in developed countries, about 90% of the day is spent in built environments. With this amount of time spent indoors, one of the main purposes of buildings is to provide healthy and comfortable environments for working, living, learning, healing, etc. (Capolongo et al. 2013).

In the indoor environment, people are exposed to contaminants that are generated both outdoors (then entering the indoor environment) and indoors (through heating, cooking, use of solvents, furniture, etc.). In addition, scientific evidence demonstrates that indoor environments represent a major cause of bad health due to exposure to numerous negative factors (e.g. chemical substances, radon, poor water and sanitation, noise, proximity to pollution sources, etc.) (WHO 2010a).

Among available strategies to improve health in urban areas, the Italian Society of Hygiene (Società Italiana Igiene Medicina Preventiva e Sanità Pubblica, SItI) has proposed a guideline document that identifies fundamental aspects for healthy, safe, and sustainable housing with reference to documents issued by the WHO, the EU, and other international bodies. Table 15.6 illustrates design specifications for healthy housing (Signorelli et al. 2016).

For this reason, indoor air characteristics should also be studied.

Indoor Air Quality

In its guidelines for indoor air quality, the WHO has declared that an essential determinant of a healthy life and well-being is represented by indoor air quality (in homes, schools, and other public buildings), that is, those places where people spend a large part of their time (WHO 2010b).

People can be exposed to health risks in several situations (e.g. cleaning products, carpets and furnishings, cigarette smoke, microbial growth, outdoor pollutants, etc.). Individual responses to the indoor environment can be also influenced by microclimate properties (temperature, relative humidity, ventilation) (CDC 2015).

Health damage (such as, for example, allergies, asthma, respiratory disorders, toxicity, cancer) resulting from exposure to a variety of contaminants (gases and particles) can be observed, particularly in vulnerable population groups such as children, pregnant women, the elderly, and people suffering from cardiovascular or respiratory diseases.

The following contaminants (such as benzene, polycyclic aromatic hydrocarbons, radon, etc.) are known for their hazardousness to health and are often detected in concentrations that pose a health concern. Below we provide some information.

Benzene is a recognized genotoxic carcinogen (Group 1), and evidence shows it is linked to acute myeloid leukaemia (IARC 1987). For this reason, it is not possible to indicate safe levels of exposure. It is only possible to suggest some ways to reduce exposure, for example, by reducing or eliminating some human activities that release this substance (smoking, the use of solvents in cleaning or hobbies, etc.). In addition, depending on the location of the building, adequate ventilation could be useful in reducing exposure (WHO 2010b).

Carbon monoxide: its dangerousness is linked to hypoxia resulting from the binding of carbon monoxide to haemoglobin, forming COHb. As a result, the oxygen-carrying capacity of blood is reduced, and, at the same time, the dissociation of oxygen into extravascular tissue decreases. The speed of binding for carbon monoxide is 245 times as strong as that for oxygen and results in arterial hypoxaemia. The WHO recommends a series of guidelines relevant to typical indoor exposures (WHO 2010b):

- *100 mg/m^3 for 15 min* and *35 mg/m^3 for 1 h* (assuming light exercise and that such exposure levels do not occur more often than once per day)
- *10 mg/m^3 for 8 h* (arithmetic mean concentration, light to moderate exercise)
- *7 mg/m^3 for 24 h* (arithmetic mean concentration, assuming that exposure occurs when people are awake and alert but not exercising)

Formaldehyde: its effects on human health include sensory irritation to the eyes and upper airways, lung effects (asthma and allergy), and eczema. In addition, the IARC has classified formaldehyde as a human carcinogen (Group I) (IARC 2006). The WHO recommends a short-term (30-min) guideline of 0.1 mg/m^3 to prevent sensory irritation in the general population (this concentration will also prevent long-term health effects, including cancer) (WHO 2010b).

Naphthalene: the main evidence of its harmful properties comes from animal studies (in which respiratory tract lesions, including tumours, have been observed). The IARC has classified naphthalene as possibly carcinogenic in humans (Group 2B, sufficient evidence of carcinogenicity in experimental animals, but inadequate evidence in humans) (IARC 2002). A guideline value of 0.01 mg/m^3 has been established (as an annual average) (WHO 2010b).

Nitrogen dioxide: in indoor environments, the damage caused by nitrogen dioxide is represented by respiratory symptoms, increased bronchial reactivity, bronchoconstriction, inflammation of the airways, and increased susceptibility to respiratory infections due to the reduction of immune defences. The WHO recommends a guideline of 200 μg/m^3 (1 h) and underlines that "at about twice this level, asthmatics exhibit small pulmonary function decrements". In addition, the WHO recommends an annual average indoor guideline of 40 μg/m^3 (WHO 2010b).

Polycyclic aromatic hydrocarbons (PAHs): the importance of polycyclic aromatic hydrocarbons - particularly benzo[*a*]pyrene (B[*a*]P) - is linked to their carcinogenicity (IARC, Group 1) (IARC 2004). Lung cancer is the most serious health risk from exposure to PAHs in indoor air. For this reason, all indoor exposures are considered relevant to health, and no safe threshold can be indicated (WHO 2010b).

Radon is a radioactive inert gas of natural origin that diffuses through soil into homes. The IARC has classified radon as human carcinogen (Group I) (IARC 1988). In indoor air, radon has been associated with lung cancer. The absolute risk of lung cancer at any given radon concentration is much higher in current smokers than in lifelong non-smokers. A reference level of 100 Bq/m^3 to minimize health hazards due to indoor radon exposure has been proposed by the WHO. Where it is not possible to respect this limit, levels should not exceed 300 Bq/m^3 (WHO 2009).

Trichloroethylene (TCE) has been classified by the IARC as a probable carcinogen (Group 2A) and by the EU as a carcinogen (category 2, risk phrase R45—may cause cancer) (IARC 1995; European Commission 2004). Recent data from a mechanism of action (not species specific), evidence of weak genotoxicity, and the consistency between certain cancers observed in animals and in humans indicate a risk-estimation approach over the recommendation of threshold levels (all indoor exposures are considered relevant). For this reason, the WHO has selected carcinogenicity (with the assumption of genotoxicity) as the endpoint for setting the guideline value. The WHO has proposed the unit risk estimate of 4.3×10^{-7}/μg/m^3. The concentrations of airborne TCE associated with an excess lifetime cancer risk of 1:10,000, 1:100,000, and 1:1,000,000 are 230, 23, and 2.3 μg/m^3, respectively (WHO 2010b).

Tetrachloroethylene: local irritation (eyes, mucous membranes, airways, and skin), cancer, and effects on the central nervous system, the liver, and the kidneys are the main health risks linked to exposure to tetrachloroethylene. The IARC has classified tetrachloroethylene as probably carcinogenic to humans (Group 2A), concluding that the results obtained so far provide sufficient evidence for carcinogenicity in animals (IARC 1997). The WHO has established a recommended guideline of 0.25 mg/m^3 for annual exposure based on the overall health risk evaluation (WHO 2010b).

Conclusion

Most elements of urban organization influence human health. Health is a central element, and planning for health and well-being represents a priority objective.

The considerations illustrated here show how essential it is to move towards focusing on an approach of systemic prevention. This includes contributions from various professionals (architects, urban planners, naturalists, psychologists, and public health experts) in order to provide all the information necessary to plan an urban area so that it ensures complete well-being and promotes public health.

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Chapter 16
Clean and Healthy – Natural Hazards and Resources

Carlo Bisci, Bernardino Gentili, Alessio Acciarri, Gino Cantalamessa, Giorgio Di Pancrazio, Massimiliano Fazzini, Alessandro Fusari, Matteo Gentilucci, and Maria Chiara Invernizzi

Data Sources

To identify natural hazards and resources, we used publicly available data with good homogeneity. In particular, we used:

– vector Regional Technical Maps (CTR), 1:10,000: http://www.ambiente.marche.it/Territorio/Cartografiaeinformazioniterritoriali/Archiviocartograficoeinformazioniterritoriali/Cartografie/CARTATECNICANUMERICA110000.aspx
– raster Regional Geological Maps (CARG), 1:10,000: http://www.ambiente.marche.it/Territorio/Cartografiaeinformazioniterritoriali/Archiviocartograficoeinformazioniterritoriali/Cartografie/CARTAGEOLOGICAREGIONALE110000.aspx
– raster Regional Geomorphological Maps (CARG), 1:10,000: http://www.ambiente.marche.it/Territorio/Cartografiaeinformazioniterritoriali/Archiviocartograficoeinformazioniterritoriali/Cartografie/CARTAGEOMORFOLOGICAREGIONALE110000.aspx
– raster Regional Soil Maps (ASSAM) 1:50,000: http://suoli.regione.marche.it/ServiziInformativi/Cartografia.aspx
– Landsat 7 multispectral imagery; http://earthexplorer.usgs.gov/
– vector Land Use Map CORINE, 2012, level 3: http://www.sinanet.isprambiente.it/it/sia-ispra/download-mais/corine-land-cover/corine-land-cover-2012/view;
– climatic records from SIRMIP: http://84.38.48.145/sol/indexjs.php?lang=it.

C. Bisci (✉) • B. Gentili • A. Acciarri • G. Cantalamessa • G. Di Pancrazio • M. Fazzini
A. Fusari • M. Gentilucci • M.C. Invernizzi
School of Science and Technology, University of Camerino, Camerino, Italy
e-mail: carlo.bisci@unicam.it; bernardino.gentili@unicam.it; alessio.acciarri@gmail.com; gino.cantalamessa@unicam.it; giorgio.dipancrazio@unicam.it; massimiliano.fazzini@unicam.it; alessandro.fusari@unicam.it; matteo.gentilucci@unicam.it; chiara.invernizzi@unicam.it

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Natural Hazards

Natural hazards are weaknesses and threats that limit land use and transformability and negatively influence the quality of life, both directly and indirectly.

Floods

Following intense rainfall (and/or fast snowmelt), rivers may overflow, inundating part of the neighbouring plains. This natural behaviour may result in a locally high hazard rate.

As a rule, flood-prone areas are identified based on the maximum flood in the last century, possibly applying a safety margin. Unfortunately, in recent decades, many streams have been rectified, narrowed, and/or diverted (mostly in their mid/final reaches) by building levees, thus strongly modifying flood dynamics and the geometry of flood-prone areas. Moreover, land-use modifications in river basins have changed both ground permeability and runoff features, while interventions along the streams have modified the flooding behaviour. In addition, narrow bridges often constitute an important obstacle to the free flow of debris (mostly tree trunks) carried by floods, thus causing upstream overflows. Anthropogenic modifications accompanied by climate change have resulted in an increase in both frequency and intensity of heavy rainfall. As a consequence, historical climate records should be used while considering recent trends.

Based on these considerations, flood-prone areas were identified based on their elevation above the levees and on the elevation of the levees over the thalweg, classifying them according to the presumed water depth.

Mass Movements

The potential energy of a terrain derives from its relief (i.e. elevation over the valley bottom). This is naturally transformed into kinetic energy (i.e. down-slope movement) whenever resistant forces are weak.

Therefore, potential slope instabilities should be studied based on detailed analyses of both the spatial distribution of the mechanical properties of terrains and their variations deriving from other factors (e.g. water saturation, seismic shocks, etc.). Unfortunately, this approach was not affordable in this project. The analysis was therefore based on available geological and geomorphological maps, digitizing the polygons corresponding to the landslides identified, maintaining their classification (Cruden and Varnes 1996), and merging active and dormant phenomena.

The danger and possibility of stabilizing the mass movements were evaluated based on their speed (inferred from their type and slope) and dimension (surface area, since no thickness data is available).

Soil Erosion

Runoff deriving from intense precipitation causes the removal of material (mostly fine grained) from the uppermost soil layer, resulting in thinning and a local reduction in crop productivity.

To evaluate the rate of this phenomenon, we adopted the RUSLE (Revised Universal Soil Loss Equation; USDA, 2014), simplified according to the available data. An evaluation of slope angle was based on the TIN, calculated based on the CTR (manually corrected where appropriate). Soil types were inferred based on the regional maps produced by ASSAM (2006), redrawing the boundaries according to local topographic and geological features. Due to a lack of better maps, vegetation and crops were evaluated based upon the CORINE (EEA, 2010) level 4 map, attributing an average index of the most common local crops to arable areas. Precipitation was regionalized starting from the SIRMIP records, and topography was also considered.

Only areas with a high erosion rate were included in the hazard evaluation.

Coastal Erosion

Sea waves reshape beaches, transporting finer sediments offshore during severe storms. If these sediments are not replaced (mostly with debris carried by rivers as solid load), shorelines retreat, exposing inland areas to storms and locally undermining cliffs, thus inducing slope instability.

The study area has been affected by shoreline retreat in the last century as a result of many natural factors (the current wet, warm climate favours vegetation growth, thus reducing soil erosion and, in turn, the solid load of streams) and anthropogenic factors. In recent decades, dams and check dams have been built, blocking debris upstream; fields were also abandoned, thus reducing soil erosion. Moreover, until the late 1970s, debris was dug up from riverbeds, reducing the solid load and locally reaching the (mostly pelitic) bedrock. As a result, severe shore retreat has been counteracted locally by adopting different types of countermeasures (transverse barriers, breakwaters, groynes, artificial nourishment, etc.). However, most of these measures interfere with shore dynamics, making the study of evolutionary beach trends more complex and locally worsening the situation.

Continuous, long-term monitoring of beach profiles accompanied by an accurate analysis of local wave climates and the features of neighbouring river basins is required to accurately evaluate local trends. Since this procedure is beyond the scope of this project, we have simply distinguished between artificially protected and "natural" beaches (delimiting the latter), taking into account the average features of local storms.

Seismic Shocks

As in most of Italy, the study area is tectonically active. Based on the available instrumental data, it was possible to define the range of earthquake intensities that could be possible in the future.

Since the area is quite small, the intensity of such a seismic shock can be taken to be homogeneous throughout the area. Therefore, to evaluate seismic risk, we based the analysis upon scenarios capable of increasing the vulnerability of exposed artefacts and buildings.

For conditions inducing an increase in shaking, the DEM was used to map the morphological irregularities (scarps, peaks, and ridges) and loose granular terrains (sand and gravel) based on the geological maps. With the same geological maps, stratigraphic contacts and tectonic lines, which could potentially result in differential shaking, were identified, along with the areas where saturated sands may lead to liquefaction (i.e. alluvial deposits).

Climate

Climate has always profoundly influenced urbanization and land use, as well as the quality of life. Particularly relevant aspects include extreme precipitation, droughts, severe sea storms, very high summer temperatures, and gusts of wind. Statistics demonstrate that on average, all these phenomena have become increasingly frequent and intense almost everywhere (IPCC 2014). Global climate change has a high spatial and interannual variation, thus making the analysis of local time series more complicated, since short- and midterm trends need to be identified for every parameter investigated. It is also necessary to recognize that older structures were often built based on the distinctly different needs of the Little Ice Age, which ended in the eighteenth century. Similar considerations can be applied to trees that are more than a hundred years old.

Considering the climate of the area of interest, the study of climatic hazards was limited to identifying potentially vulnerable sites and areas where heat peaks may be higher and evaluating the probability of particularly strong sea storms. All the studies above were based on climate records available at the SIRMIP website, yielding an acceptable assessment of the study area. Since the area is quite small, precipitation was considered to be homogeneous throughout.

Flood-prone areas were based on the DEM, mapping hollows (both natural and anthropic), and bottlenecks located at the foot of a sufficiently wide catchment area. To evaluate heat peaks, the spatial distribution of theoretical insulation was calculated using the DEM once more and compared with local albedo and vegetal biomass deriving from multispectral remote-sensing imagery (Landsat 7/8 TM). Particularly strong potential sea storms were examined to analyse possible shoreline retreat.

Volcanoes

Volcanoes are among the most dangerous natural phenomena. However, since volcanism has never affected the area under consideration, we have disregarded this type of hazard.

Glaciers

Ice and frost significantly influence land use and the quality of life, but considering the climate of the area, they were not taken into account.

Natural Resources

Natural resources represent strengths and opportunities. When used and managed wisely, they may significantly contribute to enhancing the value of territory and improve the quality of life.

Water

Water is the main source of life, not just for humans; it is also a source of socioeconomic development. Therefore, it is instrumental to identify and characterize, as well as enhance and protect, water resources, particularly those offering high-quality drinking water.

The study area encompasses both large (Monte Conero) and minor but non-negligible calcareous aquifers housed within coarse-grained turbidite levels (sandstones and conglomerates) lying between predominantly pelitic levels, as well as (often polluted) sand-gravel alluvial deposits, and ancient beaches. Given the type of research, individual aquifers were not studied or evaluated. Instead, these three types of reservoirs were merely distinguished based on the geological maps.

Seas/Lakes

Seas and lakes represent remarkable natural resources. They constitute a very important line of transportation, provide food through fishing and fish farming, generate wealth through the tourism industry, offer recreational opportunities to inhabitants, and represent strong landscape value.

All sea and lake evaluations were based on the topographic map and the DEM. The port area was not classified according to its use (commercial, touristic, etc.), since this matter is more typical of urban analyses. As for fishing, only areas offering the opportunity to fish from the shore were mapped. Touristic attractiveness and recreational potential were evaluated by mapping all accessible beaches without marking distinctions. The landscape value of the sea was evaluated among the landscape resources.

Landscape

The physical environment may hold primary landscape value. Therefore, the presence of relevant sites (geosites, relevant geological and geomorphological features, etc.) may not marginally increase the quality of life besides representing a noticeable natural resource.

In the study area, all the relevant sites were mapped based on the geological and geomorphological maps. Moreover, based on the DEM, an intervisibility analysis was performed to identify all the places from which they are visible.

Climate

A sound knowledge of the climate is instrumental for urban planning and evaluating the quality of life, especially in this period of rapid change.

Potentially "favourable" climatic features such as natural resources were therefore considered, mapping (using criteria similar to those adopted for the climate hazards) all the areas deemed "fresh" on summer days and those considered to have a milder climate in winter. Based on the annual and seasonal distributions of insulation, we also mapped the most productive potential sites for solar energy. Unfortunately, without detailed data regarding wind distribution, it was not possible to make a similar study for the installation of wind generators.

Geothermal Energy

In a general context of being increasingly aware of problems connected to the production of greenhouse gases and other pollutants, alternative eco-friendly sources of energy should be strongly encouraged. Within this framework, the study of anomalous geothermal gradients is particularly relevant.

This type of investigation, however, requires detailed temperature data taken in perforations at different depths. Lacking these, we could only reconstruct a geological structural model according to which it would be possible to more accurately interpolate any geothermal data produced in the future.

Minerals

Humans have always extracted from the Earth the elements needed to develop and adopt technologies. The presence of this type of usable resource is therefore a very relevant natural resource for the economy of any area. Unfortunately, to our knowledge, no relevant deposit has ever been found or hypothesized in the study area, and this important theme was therefore not addressed.

Classification

Classification of the various phenomena was simplified as much as possible, reducing the number of hazard classes to six and resource classes to four.

Natural Hazards

Disregarding their typology, dimension, and genesis, potentially hazardous phenomena were classified into three merely qualitative classes of increasing potential hazard ("high", "intermediate", and "low", corresponding to codes "A", "B", and "C", respectively). In turn, each of these classes was divided into two subclasses according to the possibility of reclaiming or recovering the area affected by the phenomenon, assigning a second digit to the code: "1", for areas where recovery is unlikely or impossible, and "2", where its substantial recovery could be possible (Table 16.1).

Floods

Hazards deriving from potential flooding were assessed by evaluating the maximum possible level reached by cresting water, using the following codes: "A", where it is more than 1 m above ground level; "B", where it is between 30 cm and 1 m; and "C", where it is less than 30 cm. Wherever it appears possible to build an adequate levee, the second digit "2" was applied, otherwise it was "1".

Mass Movements

High hazard values were attributed both to fast landslides (only rock falls in the study area), because of their danger for people, and to presumably thick slower ones (only rotational slides in the study area), capable of severely damaging most structures. An intermediate value was attributed to other non-superficial mass

Table 16.1 Classification codes and representation for natural hazards

Code	Hazard	Raclaim / Recover
A1	High	No
A2		Yes
B1	Intermediate	No
B2		Yes
C1	Low	No
C2		Yes

movements (minor rotational slides in this area), which can damage structures that are not particularly resistant. The lowest value was assigned to surface phenomena (earth flows in this area) and plastic deformations. Only for larger rock falls and deep-seated landslides do present-day techniques not reasonably allow for reclamation.

Soil Erosion

Where the erosion rate (in T ha-1 y-1) exceeds 6 (OCSE 2001), the hazard was considered to be intermediate, and where it ranges from 2 to 6 mm/year, it was considered to be low. Since agricultural practices can significantly reduce erosion, wherever the slope angle is lower than 20%, the area was classified as recoverable.

Coastal Erosion

Lacking any long-term monitoring of beaches, we were unable to evaluate their actual erosion rate. Therefore, an intermediate hazard value was assigned to non-protected beaches, extending up to 20 m inland. All of them were classified as recoverable, since both relatively simple interventions (artificial nourishment) and more intensive engineering works can always be carried out.

Seismic Shocks

We assigned a high hazard level to the 10-m-wide belts running along lithologic boundaries and tectonic discontinuities; all other scenarios were classified as intermediate. Only highly hazardous areas were classified as non-remediable, since technical measures are always viable for the remaining situations.

Climate

All climate hazards were classified as low, since flooding phenomena are not expected to result in severe damage and heat peaks are never extreme. All the situations above were considered to be remediable since for flood-prone areas, drainages and/or sewage systems can solve the problem, and “hot” sites can be cooled with shading devices or vegetation.

Table 16.2 Classification codes for natural resources

Code	Relevance	Exploitable
a1	High	Yes
a2		No
b1	Moderate	Yes
b2		No

Natural Resources

Natural resources were classified into two levels of relevance ("high" and "moderate", coded "a" and "b", respectively). The second digit of the classification indicates the possibility of exploiting the resource (1 for exploitable ones; 2 for weakly exploitable ones) (Table 16.2).

Water

High relevance was attributed to the calcareous and larger turbidite aquifers (i.e. those potentially providing a noticeable amount of water throughout the year). Low relevance was assigned to minor turbidite aquifers and those located in suspended alluvial deposits because of their reduced volume. This group also includes those directly in contact with rivers, because of the very low water quality. Present-day beaches were disregarded because of the presence of salt water close to the ground surface. Lacking systematic data on the depth of and seasonal fluctuations in the water tables, as well as the chemical properties of the water, all aquifers were classified as exploitable.

Sea

Except for the harbour area, the entire 5-m-wide belt bordering the shoreline was classified as adequate for fishing, attributing a low relevance to it. All accessible beaches were classified as highly relevant. Both were classified as exploitable whenever they can be easily accessed from inland.

Landscape

All natural peculiarities were classified as highly relevant. Low relevance was attributed to the sites from which they are visible. All accessible sites were classified as exploitable.

Climate

Both areas identified as “fresh” in summer or “warm” in winter were considered to have a low relevance, since thermal differences are not very high. Similarly, sites characterized by a theoretically higher insulation were considered to have low relevance, since again, the differences are not striking. The exploitability of these sites was also based upon accessibility.

Database and Mapping

All the basic information layers were stored in a geodatabase (georeferencing and digitizing them when necessary). Natural hazards and resources, classified as briefly described above, were stored in the same geodatabase as vector layers with an associated attribute table describing whatever was deemed important for the project in each situation. Points and polygonal chains were converted into polygons by applying an adequate buffer depending on the potential area of influence of each.

Each of the above polygon layers was then rasterized according to a regular grid (cell size 5 m) containing the code attributed to each type of phenomenon. From these rasters, two maps portraying the overall hazards and resources were created, attributing to each cell the maximum value present in any of the source maps. These maps were then converted into polygonal maps with representations according to Tables 16.1 and 16.2.

The map of natural resources (varying shades of green) was then superimposed on the map of natural hazards (full colours, shades from yellow to red) to obtain a synthetic map representing the spatial distribution of the influence of the physical environment on the territory and the quality of life. This map can be easily superimposed on other maps produced by other working groups within the framework of this project.

All steps in this study were carried out using ESRI ArcGIS ArcInfo (Lab of GIS and Computer-Assisted Mapping, University of Camerino, principal investigator: Prof. C. Bisci).

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Chapter 17
Clean and Healthy – Waste Collection and Waste Management

Barbara Fenni

"Sustainable development" can be defined as the basic principle of environmental rights (Fracchia 2010). Appearing for the first time in 1987 in the report "Our Common Future", it is defined as development that "…meets the needs of the present without compromising the ability of future generations to meet their own needs". Since this definition is based on needs, which are naturally changeable and destined to expand throughout space and time, sustainability, in fact, does not only apply to the environmental/ecological level but also to the economic and social levels. This aspect has certainly contributed to moving from an idea of sustainability as "need for" to one of "right to" (Gilli 2010).

The expansion experienced by sustainability has rendered the concept extremely generic, enough to inspire doctrine and define it as a sort of "social construction" or, rather, an ideology (Semplici 2004; Vallega 2004) and to push public entities, the OECD[1] in particular, to intervene in defining particular indicators.[2] However, the selection of these indicators alone is not enough to make the general concept of sustainability more concrete, unless they are accompanied by the identification of

[1] Organisation for Economic Co-operation and Development.

[2] There is a wide range of literature related to sustainability indicators, including P. Tenuta, *Indici e modelli di sostenibilità*, Franco Angeli, (2009); F. Chelli, *Indicatori di sviluppo sostenibile e qualità della vita*, available at http://docs.dises.univpm.it/web/quaderni/pdf/195.pdf; S. Bell, S. Morse, *Sustainability indicators. Measuring the immeasurable*, London, Earthscan, (2008).

B. Fenni (✉)
School of Law, University of Camerino, Camerino, Italy
e-mail: barbarafenni2@gmail.com

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specific areas of application. One area is the city,[3] and the indicators of reference are those that measure urban sustainability.[4]

There are many characteristics that any indicator of sustainability should have. It should be valid—capable of effectively understanding the objective—and trustworthy, capable of providing the same answer when applied to the same situation at different times. In addition, it should be measurable, aggregative, but also understandable, objective, and scientific.[5]

These characteristics are common to all indicators, but those that should be used concretely to define the sustainability of a city are not always the same. In fact, each city, as a microenvironment equipped with its own territory and social fabric, presents characteristics that make it unique and distinct from any other.[6] This means that when faced with completely different urban contexts, it does not make sense to use a single set of indicators or to always attribute the same weight to each indicator (Barredeo and Demicheli 2003). In careful doctrine, the choice of the set of indicators should always be related to urban specifics, just as their definition should come only after a careful assessment of the main problems of sustainability seen in the city of interest, even through the direct involvement of the stakeholders.

Once it is clear that the definition of these indicators is a variable procedure both in space and in time, the literature (Astleithner et al. 2004) can be used to introduce the indicator related to waste production and management. The indicators of urban sustainability are organized into three large groups—ecological, economic, and social—and waste production and management presents points of contact with all three categories.

Correct waste management, according to the hierarchical scale referred to in Art. 4 of European Directive 2008/98/EC, produces a series of environmental benefits. It is enough to recall, for example, actions to reduce and minimize waste in which its quantity or its dangerousness is reduced or, from another perspective, the natural resources that can be saved by using the full potential of by-products and secondary raw materials.[7]

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[3] In 1994, the European Conference on Sustainable Cities and Towns marked the signing of the "Charter of European Sustainable Cities and Towns Towards Sustainability", better known as the Aalborg Charter, which recognized the fundamental role of the urban environment on the process of change in lifestyle, production, and consumption.

[4] The European Common Indicators (ECI) are available at http://europa.eu.int/comm/environment/urban/common_indicators.htm. Studies related to the indicators of urban sustainability include M. L. M. Graymore, N. G. Sipe, R. E. Rickson, *Regional sustainability: how useful are current tools of sustainability assessment at the regionale scale*, in *Ecological Economics*, 2008; E. M. Tacchi, *Gli indicatori socio-ambientali*, in A. Augustoni, P. Giuntarelli, R. Veraldi, *Sociologia dello spazio, dell'ambiente e del territorio*, Franco Angeli, 2007.

[5] For characteristics of the indicators of urban sustainability, see M. Lehtonen, *Mainstreaming sustainable development in OECD through indicators and peer reviews*, in *Sustainable Development*, 2008, 16, 241–250.

[6] This does not by any means exclude the fact that some cities have similar characteristics and that the indicators necessary to develop a model of urban sustainability are identical or at least largely similar.

[7] There is ample literature in this respect, including, among others, P. Giampietro, *Quando un residuo produttivo va qualificato "sottoprodotto" (e non "rifiuto") secondo l'art. 5, della Direttiva*

In addition, waste management is an economic indicator whose measurement concerns the cost of the service and the resulting financial economic plan. It is also a social indicator if one evaluates the demographics of a city, the incidence of production compared to domestic activities, and the type of territory where the service is provided. Furthermore, the social character of this indicator is made even more evident by the close link between it and the protection of health.[8] As such, health is recognized in Art. 32 of the Italian Constitution as a "fundamental individual right and interest of the community".

In this contribution, the indicator "waste production and management" was considered in light of technical parameters such as overall production, the production of marine debris, and the percentage of recycled waste[9] for the target city of Ancona. The aim was to monitor the trends and respect for what is expected by European and national regulations regarding the best options for waste management.[10] This is also viewed in light of the 2015 Communication by the European Commission, "Closing the loop – An EU action plan for the Circular Economy". This document underlines the fundamental importance of correct waste management in favouring the circular economy (Bompan and Brambilla 2016; Peter et al. 2016): the more waste is recycled, the more valuable material re-enters the circular economy and the more resources are saved.

The Communication also contains proposals to review the main related directives.[11] For example, it proposes an increase to 60% in the percentage of preparation for reuse and recycling by 2025, reaching 65% by 2030. The current objective is set at 50% by 2020, an objective that the Marche Region already achieved in 2014.

2008/98/CE, available at www.lexambiente.it; D. Röttgen, *La nozione di rifiuto e di sottoprodotto*, in *Commento alla direttiva 2008/98/CE sui rifiuti*, IPSOA, Milan, 2011.

[8] The relationship between health and waste has been recognized by legislators for some time. Already in 1934 the Royal Decree 27 July 1934 No. 1625, in which Art. 217 gave mayors the responsibility of indicating the necessary measures to prevent, or at least limit, damage to public health caused by vapour, gas, fumes, draining water, and solid and liquid waste from manufacturing or factories. There are also endless studies that have dealt with the health/waste relationship. These include, for example, a 2004 publication by the Istituto Superiore di Sanità entitled *Valutazione del rischio sanitario e ambientale nello smaltimento di rifiuti urbani e pericolosi*, available at www.iss.it.

[9] For an exhaustive list of the data collected, see *Settimo rapporto regionale annuale sui Rifiuti urbani*, available at www.regione.marche.it.

[10] This refers to Art. 4 of European Directive 2008/98 and to Art. 179 of D. Lgs. 152 of 2006, as replaced by Art. 4 of D. Lgs. 205/2010. These standards refer to a hierarchical scale containing the best environmental options in matters of waste production and management. Prevention, intended as both a decrease in the amount produced and its dangerousness, is situated at the top, followed by preparation for reuse, recycling, and other types of recovery. Disposal is situated at the bottom. Related references include A. Muratori, *Gerarchia dei rifiuti: le diverse "anime" della prevenzione e la "società del riciclaggio"*, in *Commento alla direttiva 2008/98/CE sui rifiuti*, IPSOA, Milan, 2011; M. L. Nepi, *Dalla prevenzione all' "end-of-waste", le nuove strategie europee per la riduzione e la valorizzazione dei rifiuti,* in *Rifiuti Bollettino di informazione normativa*, n. 180/181 (01-02/11); P. Dell'Anno, *Diritto dell'ambiente*, CEDAM, 2011.

[11] Waste Directive 2008/98/EC; Landfill Directive 1999/31/EC; Packaging and Packaging Waste Directive 1994/62/EC

Starting from the first data point in question, which is related to the production of urban waste on a regional level, the year 2015 confirmed the positive trend begun in 2008: a decrease was recorded in the amount of overall waste produced, equal to 11 kg per inhabitant with respect to the previous year.[12] This decreasing trend in production is the result of a combination of different factors: a greater culture towards smart purchasing,[13] thanks also to kerbside collection service, the economic crisis which contracts family consumption and modifies the choices made, and a reduction in handicraft and commercial production, which negatively affects the amount to waste absorbed. On the level of overall waste production, the greatest effect has been seen in the Province of Ancona, which contributes 30%[14] to regional production, with a per-capita amount below the regional average but greater than the amount registered in 2014.

Moving from the provincial to the municipal scale, the data are much more mixed. This means that production varies greatly from one town to the next, depending on factors such as population and habits, tourism,[15] the presence of urban greenery requiring periodic mowing and pruning, and the degree of assimilation organized by the city. These multiple factors make it difficult to effectively understand the dynamics of waste production.

The city of Ancona is included among those with an annual per-capita production that varies from 361 to 460 kg, with an average of 451 kg,[16] noticeably lower than the regional average of 499 kg.

These data do not include marine debris,[17] a type of waste that is growing increasingly and which affects coastal areas. This is the object of specific discipline on the European level, with the Marine Strategy Framework Directive, 2008/56/EC. For the city of Ancona, a coastal city and home to one of the main ports on the Adriatic, a survey related to marine debris cannot be ignored. The data emerging from the latest

[12] More specifically, in 2015, 774,036 tons of waste were produced with a per-capita average of 499 kg, compared to a per-capita average of 509 kg in 2014.

[13] The practice of "kilometre zero", or purchasing local products, comes to mind. This results in a reduction of packaging used to avoid the negative consequences associated with transporting the merchandise from the production site to the point of sale. It has also resulted in the spread of shops selling products in bulk.

[14] In 2015, the population of the Province of Ancona was nearly 480,000, compared to Pesaro, which is about 363,000, affecting overall production by 26%.

[15] The two regional reports on waste from 2014 to 2015 do not contain data related to the effect of tourism on the overall and per-capita production of waste registered in Ancona. A town is considered "touristic" when the indicator "equivalent tourist presence/residents" is greater than 10% and is therefore not applicable to Ancona.

[16] This data is taken from the 2015 regional report on waste, published in 2016 at www.regione.marche.it. A comparison with the corresponding data provided in the previous year's report shows a notable reduction in per-capita production, corresponding to 41 kg/person.

[17] Of interest in this respect is the "beach litter" investigation made by Legambiente, which considered 54 beaches: 29 in Italy and 25 throughout the rest of the Mediterranean. In particular, more than 500 pieces of synthetic foam (insulating material used in construction) were found on the Palombina beach in the city of Ancona, equal to 63% of the total marine debris. The results can be accessed at www.legambiente.it.

regional report on waste is entirely positive: for 45.35 km of shoreline, marine debris amounted to 16.324 kg/km of coastline, for a per-capita average of 7 kg/year.[18]

Finally, regarding recycling, the positive regional trend seen from 2001 to 2015 has not stalled but rather continues to increase, although more slowly than in the past.[19] For example, for the first time since the system was implemented, the per-capita amount recycled decreased from 309 kg in 2014 to 304 kg in 2015.

The same positive trend in recycling can be seen not only on the provincial level, where both the Province of Macerata and the Province of Ancona have exceeded the threshold of 65%,[20] but also at the municipal level, where 126 towns have reached and exceeded this threshold (123 towns had exceeded it in 2014). The regional capital is not, however, included among the 35 municipalities in the Province of Ancona that have surpassed this objective. In recent years, it has experienced a negative trend, not to the point of being alarming, but one that is certainly worrying. Limiting the analysis to the last 5 years, the amount of recycling recorded in 2011, equal to 60.58%, experienced a positive change from 2012 to 2013 (to more than 62%), falling in 2014 (to 60.80%), and stalling below the 2011 percentage in 2015 (at 60.49%).[21]

The first part of this work confirmed that, given their relevance, those related to the production and management of waste should also be included among the indicators of urban sustainability. The effect these have on a city's sustainability can be negative or positive according to how much is produced or, rather, is prevented and how the amount produced is managed. While limited to overall production, the production of marine debris, and the percentage of waste recycled, the data collected for the city of Ancona allow us to make an initial balance, even if it is incomplete.

With regard to overall production, the assessment is certainly positive, especially when compared to the regional average. This marks the increasing sensitivity of citizens towards making sustainable purchases and consequently reducing waste. Data regarding the percentage of marine debris is also very encouraging, with a per-capita average far below the average of many other communities along the Marche coast.

The most perplexing result is instead related to the percentage of recycled waste, which is still far from the 65% objective fixed for 2016. In particular, if it is true that

[18] The positive nature of the data, which is clear, is even more evident when compared with data from other coastal communities in the same region: in less than 15 km of beach in the city of Senigallia, the total amount of marine debris in 2015 reaches 18,474,460 kg, equivalent to a per-capita average of 410 kg. On the Gabicce Mare beach, a little longer than 4 km, the total amount of waste was 2,369,225 kg, for an average of 408 kg/inhabitant.

[19] From 2001 to 2007, annual increases in the percentage of recycled waste were on average less than 3%, followed by a consistent increase of more than 6% from 2008 to 2012, followed by a return to the 3–4% level in 2012–2014. The last data available, from 2015, show an increase from the previous year of only 0.84%, for an overall value of 64.21%. The objective fixed for 2016 was to recycle at least 65% of waste. For more information, see the new Waste Plan for the Marche Region ((DAAL no. 128 of 4 April 2015).

[20] It should be noted that the Province of Macerata has already notably exceeded the objective fixed for 2020 to recycle 70% of its waste, in that it already reached 74% in 2015.

[21] Data available online at www.atarifiuti.an.it and www.regione.marche.it

from 2010 to 2015 the city of Ancona registered an increase of 10% in the amount of waste recycled, it is likewise certain that in the last 2 years, the trend has been negative: from 62.90% in 2013 to 60.49% in 2015, i.e. slightly lower than the 2011 average.

With these data, it is hoped that the current setback in the process to increase the amount of recycling, which lies at the basis of implementing recycling policies, is only a transitory phase and that renewed initiatives to involve and inform citizens can mark an immediate change in this trend.[22]

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[22] A new citizen awareness campaign was launched in 2016 by the city administration entitled "Oggi esco solo io. Guida alla raccolta differenziata", which aims to help citizens understand the importance of urban décor and the ethical, and not just economic, value of urban spaces and objects.

Part IV
A Decision-Support System

Chapter 18
The DSS and Its Possible Applications

Rosalba D'Onofrio, Massimo Sargolini, and Michele Talia

Acting amid uncertainty is a perennial situation in territorial planning, having always dealt with the inevitable relativity of assessments and choices regarding settlement transformations (Camagni and Lombardo 1999). Today, however, the complexity of territorial government when facing insecurity on different scales characterizes the historical period in which we live and requires a rethinking of the ways of carrying out territorial government activities that must deal with a continuous evolution situation. This not only requires rapidity and a capacity for updating and deciding between different options but also the willingness to address a multitude of new actors that have recently entered the decision-making process.

To reuse an appropriate definition by Ulrich Beck (1986), we can say that the systematic crisis triggered by the terrorist attacks of 11 September 2001 and the failure of Lehman Brothers Holdings Inc. in 2007 have definitively immersed the world in a "global risk society". As a consequence, the strongly perturbed season we are experiencing starting at least from these dramatic events tends to be increasingly characterized by spreading awareness that resounding changes continue to come, although the direction of these changes is destined to remain almost always undetermined.[1]

The environmental and territorial changes underway and the consequent criticalities for which the territorial government should respond in a timely manner can be traced to some main categories:

- The absence of updated cognitive frameworks related to the current changes, with criticalities particularly evident in the case of climate change

[1] An investigation of the possible implications of the advance of the *risk society* and the effects it has had on the decision-making process is contained in Michele Talia's contribution to this volume ("Urban-Planning Tactics and Strategies in New Decision-Making Process"), as well as in Beck's essay cited in the Bibliography.

R. D'Onofrio (✉) • M. Sargolini • M. Talia
School of Architecture and Design, University of Camerino, Ascoli Piceno, Italy
e-mail: rosalba.donofrio@unicam.it; massimo.sargolini@unicam.it; michele.talia@unicam.it

R. Cocci Grifoni et al., *Quality of Life in Urban Landscapes*,
The Urban Book Series, https://doi.org/10.1007/978-3-319-65581-9_18

- The lack of a full awareness of the negative consequences that public policies can produce on territorial and landscape systems
- Insufficient consideration of the negative effects related to land consumption (which in turn lead to other effects/impacts such as compromising air quality or weakening drainage capacity, etc.)
- An inability to carefully monitor the territorial and social imbalances determined by the urbanization process
- The difficulty of making a rigorous, updated account of resource waste associated with new lifestyles and the consumption that results from it
- A tendency to underestimate growing inequalities in the distribution of wealth and access to urban services
- The weakness of public policies in considering the growing dissatisfaction of citizens about the widespread quality of the landscape, the quality of life, and the services that the city is capable of guaranteeing

In addressing such marked criticalities, of which landscape degradation is only the most evident manifestation of the current crisis in this development model, it is rather probable that the theory of decision-making, at least in its most traditional form, can be rather ineffective. In fact, until recently, it was represented as a framework of knowledge and related methodologies capable of making a careful decision starting with the comparison of different alternatives and considering the possible consequences. By virtue of this formulation, the decision moved within a "context of stability" in which each choice led to a determined consequence and received, according to the case, full legitimacy or explicit confutation. Today, this problem/decision/action sequence has changed profoundly, if not only because a single decision-maker can be subject to multiple problems and concurring options and a single problem can be perceived in different ways by different decision-makers. It follows that we are no longer faced with a linear decision-making sequence but a cyclic learning path; the subject follows an iterative path leading from the problem to solutions, which in turn preclude new questions and possible further problems.

In this perspective, the "decision-making arena" is much more crowded than in the past. In fact, public decision-makers are accompanied by many subjects (experts in different sectors, private businesses, investors, public entities, citizens, trade associations, etc.), which, when participating in the discussion, act as players in the process. Bringing the theory of decision-making alongside the implementation of planning processes, it is possible to highlight a close network of interactions that can be recomposed and summarized into four main activities:

(a) Framing the problem and the policies, plans, or projects to be addressed
(b) Developing a structured, calibrated system of indicators to estimate the effects due to each decision and to motivate the selection of priorities
(c) Construction/implementation of alternative scenarios in order to recover the integrated worth of the different lines of intervention
(d) Reformulating the plan's objectives in light of the changes seen (reframing), with the scope as well as of activating decision-making processes and obtaining profitable interaction between medium- and long-term choices

The procedural character of implementing the decision-making "path" in this way within the planning process is seen in the possibility of knowledge being "renewable" and therefore not exhausted when developing a preliminary interpretational protocol. On the contrary, it precludes an iterative use once the decision-support system is fully implemented (Talia 2003).

In applying this decision-making model, one must deal with a high degree of administrative, managerial, economic, social, and environmental complexity and with the need to initiate a path for involvement and mediation among different groups of public and private subjects. The aim is to assess the possible solutions not only in terms of satisfying the predetermined objectives but also in relation to the different impacts that these intervention paradigms can have when interacting more directly with the actors and contexts. Therefore, for example, a process to construct environmental and landscape policies for a determined territory will lead to the definition of a set of actions/reactions/interactions within which different types of logic and interests from the different actors involved are compared. This can generate unintended, even positive, conflicts and effects (Hirschman 1991).

Even before being generated by the juxtaposition of actors involved in the concluding stages of the decision-making process, the conflict can anyway trigger the same means of reading and interpreting a territory, which often highlights a contrast between local and expert knowledge. Combining these two sources of the cognitive process implies the conviction that technical problems are hardly ever disconnected from the social context that generated them. It is likewise appropriate to ensure that most participants in the process are actively involved and contribute to forming collective decisions that, precisely in this way, are legitimate from different points of view.

Due to this *modus operandi*, there is not only a greater possibility of eliminating conflict and finding effective solutions to the problems but also of increasing citizens' trust and renewing the credibility of public institutions. Broad involvement can in many cases favour the same applicability and acceptability of assessment procedures in the case of sensitive questions. Allowing citizens to intervene in choosing the sets of indicators used to assess policies and projects, for example, can help local administrations to better define the problems and find adequate solutions. As well, the citizens themselves can better represent their requests following this solicitation. In this particular case, well-structured involvement is even more important when the planning process should be renegotiated and/or reconsidered in view of unexpected events or modifications occurring in the list of priorities stated by the government institutions.

Where inevitable, the conflict should be understood in a proactive and creative key, disconnected from the destructive or paralysing logic that may characterize it (Nel lo 2007). This can be thought of as an open discussion that leads to the development of a territorial project starting from the shared cultural concept of the context. On the one hand, a conflict may generate a discussion and the possibility of bringing the population to questions that pertain more directly to the formulation of resource-management policies. On the other hand, a permanent widespread state of hostility and mistrust may lead to an inability to control local power and, consequently, to the deterioration of management policies with the resulting degradation of resources available to the subjects of the plan (Castro and Nielsen 2003). To avoid this trend, the daily involvement of institutional actors and politics (in the most general sense) is necessary; they should be ready to welcome ideas and the push for proposals from local communities.

The idea supporting this involvement is based on a "win-win" formula according to which each actor participating in the conflict, despite the type of interest he defends or the content of her request, can draw benefits from the conflict itself or, even better, from the negotiating process. The negotiation phase, in fact, aims to reach an agreement among the parties that guarantees advantages and opportunities for all (proponents and opponents) and which motivates actors in the conflict to reason, within a real debate, about the interests in play.

Using formulations from game theory, it is convenient to remember that, to lead to a positive outcome for all participants (or at least most of them), each transaction should translate into a non-zero sum. This means entrusting planning with the task of promoting measures and interventions to produce considerable added value, which could be redistributed during negotiation. This in turn means reaching a compromise, setting aside the initial questions that often generate prejudicial juxtaposition—and therefore conflict—and basing the decision exclusively on the possibility of obtaining advantages that, without an agreement among the parties, would not be obtained.

A decision-support system that expects the involvement of all parties to attenuate conflicts should be able to develop intelligent tools capable of "dealing with knowledge" (Fig. 18.1) and the relationships generated in a multiplayer environment. Recourse to shared indicators for interpreting the territory, policies, and projects moves precisely in this direction, even if the choice of indicators corresponds to uncertain interpretational models that can often lead to discordant interpretations. This does not mean they can be overlooked.

Inconvenient setbacks can arise when using one system of indicators rather than another; promoting decisions without preventive information is like flying blind. Faced with this risk, it is necessary to avoid any rigidity and plan by "learning on the job". In fact, a complex system suggests the application of procedures imprinted with enhancing experience and pragmatism but leads to errors and failures that can be limited, thanks to learning, which is developed starting from a rigorous cost-benefit assessment for each intervention.

Bossel, a member of the Balaton Group, i.e. an international group of experts that has worked to favour sustainable development since 1981, maintains that organizations that depend on the consensus of their members mostly tend to select long lists of indicators. These lists contain, in extraordinary detail, questions on which they agree while mostly leaving out controversial questions, thus losing the extreme richness of cognitive processes that in many cases are entrusted to the many-sided, varied content of different, if not outright diverging, orientations.

Following the same approach for this research, the choice was made to include not only the indicators of urban quality and the landscape which are entrusted to registering physical parameters and on which there is now reasonable consensus but

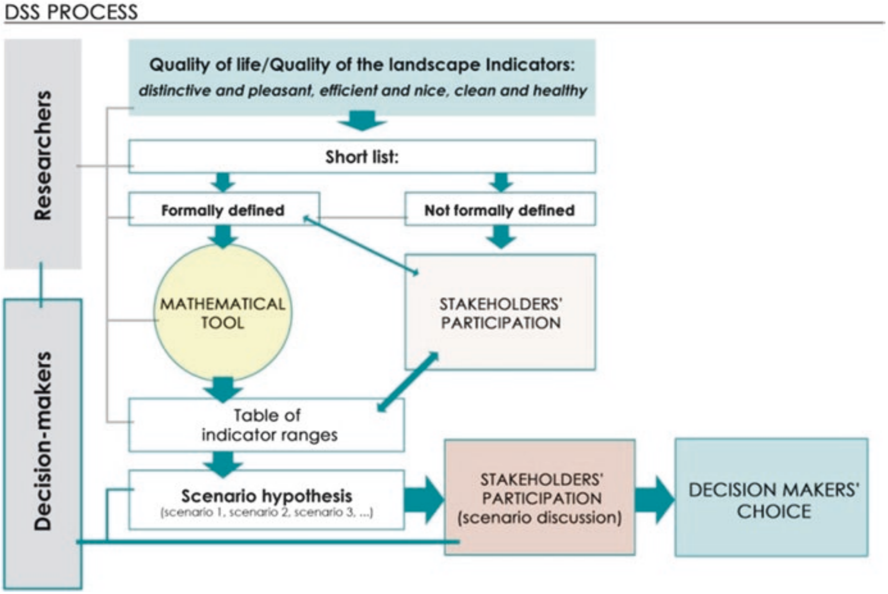

Fig. 18.1 The DSS process

also indicators of a different nature, based on the subjective perception of phenomena for which it is possible to estimate quality rather than quantity.

If, in fact, it is now certain that physical variables can also contribute to the qualitative definition of a territorial context, it is likewise unquestionable that the same indicators cannot "read" certain factors of quality of life such as harmony, beauty, balance, satisfaction, health, the sense of safety, or well-being. To the many people who usually object that the parameters used to analysed these fundamental questions are neither trustworthy nor replicable, one can respond that this is an error of reduction: no individual judgement will be equal for all, but the judgement of all members in a community will be solid, stable, and repeatable, assuming the same authority as a physical measurement. In addition, the assessments that can be expressed on this apparently unstable basis become dynamic for this reason. They acquire a capacity to adapt and evolve and a sensitivity to changes that measurements related to the physical state of a determined settlement context are not capable of expressing.

The choice made in this research, which is illustrated in detail in Chap. 5, is related to building a system of indicators capable of satisfactorily and synthetically representing the "measure" of quality of life. The construction proceeds via a top-down approach whereby various experts select some indicators suitable for parameterization, as well as a bottom-up approach to integrate and combine the indicators that, on the level of phenomenology of the relevant processes, are deemed by the local community to be important for the quality of life of the urban landscape. In the current state of the research presented in this volume, the relevant investigations regarding these non-formalizable indicators have not been made.

The initial selection (Chap. 5) was followed by a further selection that can be implemented with the contribution of local communities and which will relate to the policies, plans, and projects that were selected by the research group through a specific forum. A sort of combined top-down and bottom-up approach is therefore proposed, which is also capable of embodying a long-term vision of the development model. The active involvement of local communities will be fundamental in responding effectively to the needs of the places, thereby avoiding recourse to external or even self-referential logic.

Up to now, this model has been applied only to the city of Ancona (Italy). However, with the appropriate optimization and recalibration, it can be applied to other medium-sized cities in Europe, constituting valid support to allow public administrations, planners, and local communities to evaluate the impacts of different policies on the quality of life in the city and the quality of the landscape and to optimize the results obtained by its application.

The development of the model was organized into four large fundamental areas (D'Onofrio and Talia 2014):

1. Framing the problem through the selection of policies, plans, and projects expressed by the urban system studied within institutional planning documents, plans, and projects being activated (see Chap. 23).
2. Developing a structured, calibrated system of indicators of urban quality, as described in Chap. 2.
3. Constructing/implementing alternative scenarios by verifying possible development paths and lines of action deriving from the programming tools promoted by the cities or other proposals emerging from the interaction with the public administration through:

   (a) An evaluation system relying on a mathematical algorithm that simultaneously and contextually assesses different indicators (composed of multiple variables) that can be formally defined and represented. For brevity, we refer to this first part of the output as the *Tool*.

   (b) An interpretation and assessment system that relies on the active participation of local communities and "interested populations" (European Landscape Convention/ELC 2000, Florence) and uses indicators that cannot be formalized in a mathematical algorithm. For brevity, we refer to this second part of the output as the *Forum*. The Tool uses indicators that evaluate the environmental performance of the city. The mathematical algorithm within the Tool relates the different indicators (by pairs) in order to identify a range of possible balances among them, which could orient a wide range of different possible scenarios. The indicators selected regard the "environmental performance" of the city, which influences the quality of the urban landscape and the quality of life of city inhabitants. In the Forum, indicators pertaining to the stratified values and symbols of the places, the imagination, and collective identification are "chosen" and "presented" to the stakeholders, local community representatives, and the "interested population". This second family regards the "performance" of the city and influences the quality of the landscape and of life. They cannot be formalized, and they are not considered by the mathematical algorithm in the Tool. By "going back to go forward", their use allows points of contact and sets of possible scenarios to be established with the Tool.

4. Reformulating the objectives and choices made (reframing). This methodological setting, which works by formulating development scenarios in relation to the effects on the quality of life and the landscape, makes clear that the choices made regarding policies and projects expressed by a given territory should not be assimilated in a conclusive act or a current state of equilibrium. Rather, it should be an open process that can be modified based on the behaviour of the actors in play and their changing needs, and it should be ever ready to explore new hypotheses according to that same elasticity that allows us to understand the territory as a continuum, which is also made of juxtapositions and discord. The landscape in this context becomes an opportunity for communication between the population and the territory, where the transition from reading and knowledge of the places to defining the objectives of quality of life is translated into a conscious, shared act that is refined through expert knowledge and the expectations and desires of the local communities.

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Chapter 19
The QLandQLife Tool

Mariano Pierantozzi and Roberta Cocci Grifoni

The City as a Complex System

In recent decades, the city and the broader concept of the territory have experienced a metamorphosis: from usable physical resources and controllable, designable space to a new interpretation of the urban system. This system is complex, so the inadequacy of linear planning becomes clear when faced with an increasingly strong need for multiple intelligible responses. The ideal of the city as a "single element" has been substituted by the concept of "system city", going beyond the model of a city that can be decomposed and simplified to attain an interpretation of the system as a "complex unit".

By definition, the system is composed of elements and relationships, connections, interactions, and interrelationships. It follows that the rules of composition cannot be guided by the simple property of addition (as in the case of a set) but, to respect the connections among multiple elements, these rules must be relational in order to also consider the limits and conditions of the environment of which the system forms a part. The study of the city and territory therefore needs a systemic approach capable of contemporaneously expressing units and multiplicities, diversities, totalities, organization, and complexities. From an operational point of view, it is necessary to intersect different areas of knowledge, creating a short circuit among various disciplines that come together with regard to the urban dimension. The theoretical short circuit necessarily implies an operational short circuit, which is even more difficult, since it calls for the efficient interaction of professional figures that have always been widely separated and noninteracting. These include urban planners, ecologists, designers, architects, energy technicians, engineers, legal experts, sociologists, entrepreneurs, economists, etc. The need to proceed through a transdisciplinary approach, crossing the borders between the different

M. Pierantozzi (✉) • R.C. Grifoni
School of Architecture and Design, University of Camerino, Ascoli Piceno, Italy
e-mail: mariano.pierantozzi@unicam.it; roberta.coccigrifoni@unicam.it

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areas of scientific knowledge in the field of urban sustainability, means closing the persistent strong caesura between scientific knowledge and the other types of skills that “city users” possess (citizens, professionals, public administrators).

Current urban complexity therefore means choosing an approach that can propose new interpretive modes, such as the analysis of cycles and environmental networks in relation to infrastructure, energy, and settlement networks in the city, the limits of urban growth in relation to the carrying capacity applied in the urban area, environmental comfort in relation to the quality of life in the urban area, the unbalanced “open city” thermodynamic system, climate change, and related consequences on the local scale. To this end, it seems particularly useful to experiment with integrated dynamic models alongside operational planning tools by characterizing the weather/climate of the city and its different parts, analysing the city as a function of its geometrical factors, and assessing land permeability, its use, and perceived thermal comfort (Cocci Grifoni et al. 2011). Beyond making the process of correct planning more effective in preventing negative impacts tied to extreme weather events from repeating themselves, these models aim for a more systematic integration of environmental, technological, and socioeconomic components along a path of developing databases and available resources on the local level.

It is good to favour an approach that can identify the best compromise between needs that cannot all be maximized at the same time. The best solution will be chosen by the decider, who deems it closest to the “ideal” for that space-time context, which “encompasses” all the different objectives and leads to a level that is deemed satisfactory. In fact, it is evident that the simultaneous maximization of all the objectives of urban sustainability will never be possible because maximizing one objective leads to the simultaneous minimization of others. Therefore, it is necessary to compare multiple alternatives in order to identify the best compromise (a dynamic equilibrium) among needs which cannot be maximized simultaneously: functionality, visual/perceptive quality, landscape quality, energy efficiency, environmental quality, energy savings, construction/maintenance/management costs, outdoor thermal comfort, etc.

Parametric Optimization

In many research fields, mathematical optimization implies identifying the best element (with some reference criteria) selected from sets containing possible alternatives. For this reason, the first step in the optimization process is to choose the objective function. The objective function can be maximized or minimized and indicates how much each individual variable influences the optimization problem.

Any optimization problem is fundamentally composed of three parts: the simulation model, one or more objective functions, and an optimization algorithm. In our case, we used two tools that allowed the model to be constructed: a multiplatform symbolic and numerical calculation environment (Wolfram Mathematica) for the simulations and a platform for the multi-objective and multidisciplinary optimization based on determining the Pareto frontier (ModeFRONTIER, Esteco) for the minimization algorithms.

Mathematica is a symbolic computation model used in various fields such as engineering, mathematics, physics, etc. It is a powerful and versatile tool that allows objective functions to be calculated. ModeFRONTIER was used instead for the parametric simulations. This is a multidisciplinary, multi-objective platform capable of performing both preliminary statistical analysis and analysis related to the optimization.

In the series of operations, Mathematica calculates all the objective functions defined within the case study, for example, comfort (predicted percentage dissatisfied, PPD), urban density (compacity), and land use (building impact reduction, RIE). This data flow is sent to ModeFRONTIER, which optimizes the various functions with its own minimization algorithms. The two programs therefore work in parallel and communicate via internal protocols.

The optimization phase may be either single- or multi-objective. The attempt to use any single-objective problem or system of problems can be reduced to applying an algorithm that investigates the gradient of a function to establish its minimum or maximum. The multi-objective case is different; here the optimization algorithm should identify not only one solution but a set of solutions along a trade-off curve known as the *Pareto frontier*.

The Pareto frontier is defined as the set of best solutions that are not strictly dominated by other solutions, as represented in Fig. 19.1 (solution A dominates solution B if it performs better than B). Optimization using the Pareto frontier can be seen as a concept that formalizes the trade-off among different possible objectives, even when they are mutually contradictory. A solution is Pareto-optimal when Pareto improvement of the system is not possible, i.e. when one objective cannot be improved without worsening at least one of the others. A set of Pareto-optimal solutions constitutes the Pareto frontier, and all movements along the frontier represent the trade-off between objective functions.

In general, the set of solutions along the Pareto frontier can be composed of an infinite number of points, but the optimization should be restricted so that solutions can be chosen. It is also possible to consider a range of variability to identify the best solution that also considers other conditions and limits not considered within the optimization process. The choice of the best solution is not always simple and varies from case to case, but there are different techniques to select the representative points of the frontier. One common strategy that is also used here is a non-dominated genetic algorithm, for example, NSGA II (Deb et al. 2002). This algorithm was developed as an improvement over the preceding NSGA, one of the first multi-objective genetic algorithms, to resolve some of its weakest points, e.g. the enormous computational complexity, the lack of elitism, and the need to specify a sharing parameter.

For our research, multi-objective optimization was fundamental since multiple parameters pertaining to different fields of research (architecture, physics, biology, psychology, etc.) were considered. These parameters are often contradictory in that it is sometimes necessary to maximize one and minimize another. For example,

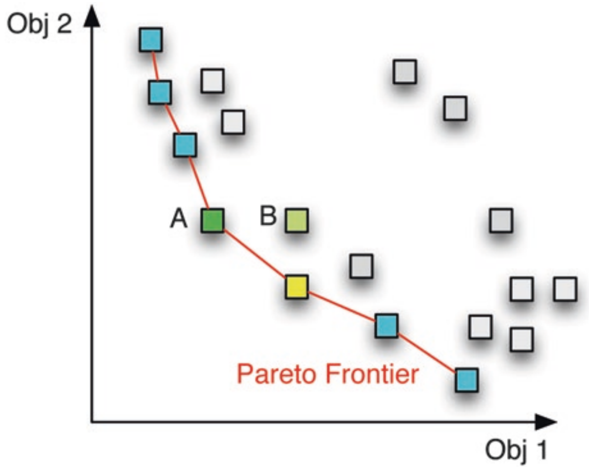

Fig. 19.1 Example of a Pareto frontier

environmental comfort should be maximized by minimizing land consumption and energy use. This is why it is necessary to build a model with different objectives and to be able to parameterize them with mathematical functions. If the objectives cannot be parameterized through mathematical functions (formalizable), it is necessary to use another approach based on a range of possibilities, indications that can be translated into quantitative levels (e.g. pleasant, unpleasant, safe, unsafe, etc.) in order to be able connect/correlate these levels with values of formalizable parameters through neural network algorithms.

The initial goal of our research was to identify which of the multiple parameters in play among the various disciplines could be expressed using mathematical functions and interrelationships. The initial screening required a lot of time, but it served to relate the various disciplines and all the players in the system. In the case of Ancona (as illustrated in Part IV), this development led to the identification of two fundamental parameters: environmental comfort and sky view factor. The first is calculated keeping in mind all the thermal/environmental parameters and the physical state of the person. *Environmental comfort* is defined as the particular condition of well-being (as a function of sensory perception of an individual in an environment) determined by temperature, radiant temperature, and the physical activity of the person.

Environmental comfort is identified with the mental/physical well-being of people living in an environment and is a sensation that depends on determined environmental conditions that are in large part modifiable and therefore fall under the responsibility of the designer, for example, in the design, realization, and management phases of a green building. This parameter is very useful since it can be quantified numerically using normalized mathematical algorithms. It is defined by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) as the particular state of mind that expresses satisfaction with the surrounding environment.

According to Fanger's studies and theories (Fanger 1970), thermal hygrometric well-being in an environment is described according to relationships established between the subjective and environmental variables. The subjective variables relate to the activity that the individual does within the environment, the type of clothes, and his or her metabolic activity, which transforms the chemical energy produced by food into thermal energy. All of these values are set by UNI EN ISO 7730.

One factor closely related to predicted mean vote (PMV) is the predicted percentage of dissatisfied people (PPD), a numerical index from 0 to 100 that measures the degree of dissatisfaction of an individual in an environment. Since the PMV is centred on an ideal value (zero), the PPD increases immediately, providing a degree of percent dissatisfaction. These two indices allow one to understand whether an environment is welcoming and satisfying or not.

Going further, this mainly physical index is closely related to a geometric parameter that considers the environmental conformation: the sky view factor (SVF). This is a dimensionless parameter whose value ranges from 0 to 1. It indicates the portion of sky visible from a given observation point. Different SVFs indicate different radiation and energy budgets. In this way, the distance between buildings, their height, and the disposition of the various buildings can be related. This parameter therefore encompasses the urban conformation of the partition of the city analysed.

The relationship between environmental comfort and sky view factor therefore relates parameters that are apparently very different but which together can provide very interesting information. By varying the geometrical conformation, the environmental comfort of the surrounding space is modified, thereby allowing choices to be made that consider the complexity of feeling comfortable in a space.

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Chapter 20
The QLandQLife Forum

Rosalba D'Onofrio and Massimo Sargolini

The expectations and desires of populations regarding the quality of their living environment place them in a strategic position to plan urban choices in their territory. It is extremely important that actions to protect and enhance the landscape and to improve the quality of life in urban areas fall within an overall strategy of local development that identifies the priorities for intervention and the consequent actions to perform with the community's contribution.

There are various ways to involve citizens in public choices. Participation has myriad faces and tends to be situated along a continuum represented by two poles that Luigi Bobbio defines as the model of "pressure" and the model of "debate" (Bobbio and Pomatto 2007). The pressure model considers participation as a tool designed to give to social subjects who are weak or traditionally excluded the chance to speak, mostly through social movements or associations that represent them. The relationship that forms is substantially twofold. On one end are the citizens, or their less privileged counterparts, whose interests are assumed to be generally homogeneous; public administrators are on the other end. In the participatory process, public administrations are asked to respond to the needs of the weakest social groups. The debate model starts instead from the assumption that society is pluralist. In this case, participation is a confrontation—dialogic in nature—among citizens that have differing or contradictory ideas, viewpoints, or interests. The goal is to develop common solutions, find points of understanding, or at least clarify the terms of the conflict and find common ground.

This second approach is what was used in the QLandQLife research. It approached the ideal of "deliberative democracy" according to which the essence of democracy does not consist in counting votes among pre-constituted positions but in a *discussion* based on arguments (deliberation) among all the subjects involved.

R. D'Onofrio (✉) • M. Sargolini
School of Architecture and Design, University of Camerino, Ascoli Piceno, Italy
e-mail: rosalba.donofrio@unicam.it; massimo.sargolini@unicam.it

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This approach ensures both the use of "reasoned debate" and the inclusion of all interested parties and viewpoints that are touched on by the topic of discussion.

However, participation does not consist only in a relationship between citizens and public decision-makers. Another important relationship is the one established between citizens and experts, between "lay people and specialists". In cases of urban renewal, for example, there is a constant interaction between citizens and planners (architects, urban planners, public administration technicians, experts in the sector, representatives from transport agencies, etc.). In consensus conferences, participants form an opinion by listening to and questioning the experts. A sort of "hybrid forum" therefore develops (Callon et al. 2001) in which the two types of knowledge come together and are integrated, thereby opening the possibility for reciprocal learning. On the one hand, lay people should relate data from their experiences to the most general and abstract categories of the specialists. On the other hand, experts should realize the practical knowledge that citizens possess. In addition, public administrators need experts, but they also need to listen to the potential targets of their policies: the citizens. Beyond often having a framework of the situation (direct knowledge of a certain problem) that is useful for orienting the choices, citizens are often capable of producing original solutions, implementing a sort of citizen expertise (Bulsei and Podestà 2014).

It is interesting to note that the relationships between specialists and lay people can be structured according to different means. The most traditional structure is the one in which there is a net division of tasks between lay people and specialists; the latter express a technical judgement of admissibility regarding the former's requests. A second means of relating, which is particularly widespread in urban renewal projects, consists of the technician-citizen-technician cycle. Technicians (in this case designers) develop the project, citizens discuss it, and the technicians rework the project in light of the observations made. Specialists are given the first and last word, and the capacity of citizens to affect planning choices is subject to the sensitivity of the designers, who must decide how and to what degree to integrate lay knowledge within their project.

The opposite structure is realized in "citizen juries" and "deliberative polling". In this case, the circuit is more of the citizen-technician-citizen type (Mansbridge et al. 2010). Citizens come together and ask questions, the technicians respond, and the citizens express their positions in light of the meeting with specialists; the last word is given to the lay people. In fact, it is the citizens who decide if and how to integrate the results of the technical expertise within their vision of the problem.

Both of these means are based on a net distinction of roles. Lay people and specialists interact but maintain some distance. There are, however, cases in which the relationship is closer and the interaction occurs within a single context. This is the case of numerous design laboratories that are being developed in urban renewal processes. This mixed structure is what most closely reaches the notion of *hybrid forum*.

Construction of the QLandQLife Forum

The first mechanism of the QLandQLife Forum consists in selecting the participants. Participation is free; the door is open. Any citizen can choose to enter the process or remain outside. This is certainly the form of selection that most respects individual freedom. However, the "open door" method encounters two large difficulties. The first regards the number of participants. Experience shows that people willing to participate are a miniscule fraction of the total population. But this is not mainly a problem of numbers; it is above all a problem of the non-uniformity of involvement (Vargas Céspedes and Zamuner 2006). In fact, despite the great freedom to enter the arena, it is probable that the threshold is crossed only by certain types of people: activists, citizens involved in specific friendship, political, or associative networks accustomed to participation (Röcke and Sintomer 2006). It is very probable that those with greater personal or work needs wind up self-excluding themselves, and it is therefore very difficult that a forum based on self-selection will reflect all the different points of view present in the population. But there is not only the risk of self-excluding passive citizens. There is also the more serious risk of political self-exclusion, in the sense that it discourages the participation of people pertaining to political networks different from the governing majority in the city in question.

Therefore, due to the inconvenience of self-selection, it is better to substitute "targeted selection". In this case, the area is not unconditionally open to all. Instead, a circumscribed space is identified that reflects as widely as possible the interests and viewpoints present in the society of reference. Sintomer speaks about a microcosm in this respect (Sintomer 2007). This choice, however, assumes the existence of an external agent that is interested in constructing this discussion site and disposed to tracking down, patiently and without prejudice, the different interests (even minor ones) that could contribute to addressing the problem. The result of this effort will always be imperfect, but there are cases in which the composition of the microcosm seems to be reasonably inclusive given the cultural and social conditions in which it operates. Numerous cases of stakeholder partnerships pertain to this type, in which subjects with contrasting visions or interests sit around a table to search for common solutions, for example, on thorny topics regarding the environment (Poncelet 2001; Innes and Booher 2003).

The microcosm can also be built in another way. It is possible to select a random sample of the population (Sintomer 2007, p. 103) or a mini-public (Fung 2003). In this case, we are no longer dealing with activists, natural leaders, or active citizens but with common citizens, including those that would never cross the doorway into an assembly or run for a social office. The extraction can occur through a random sample of citizens or by quotas that consider specific socio-demographic characteristics (e.g. sex, age, education level, zone of residence, etc.). If the group of participants chosen is rather large (on the order of hundreds), the criteria of legitimacy can be deemed to consist in an effective sociological representation of the population. If the aim is to give those who are normally excluded the chance to speak, there is no doubt that selection by random drawing constitutes a particularly pertinent answer. This system allows a mix of people that is particularly varied with respect to profession, age, and social environment (obviously ensuring equal numbers of women and men) to be united around a single table or in a single room, which is not a given in any other participatory type. The idea behind this approach is that any citizen in a position to interact with others and absorb the necessary information is able to express positions on any public problem and to build intelligent solutions with others.

The method of random selection (Carson and Martin 1999) is at the basis of many experiences: juries of peers, deliberative surveys, consensus conferences, etc. (Sintomer 2007). The different selection methods tend to generate different arenas. Some are mainly formed of active or competent citizens who express well-defined and knowledgeable positions and who sometimes have a constituency they must answer to (it is probable that this situation is more likely with focused selection or voluntary participation). On the other hand, some arenas are formed mainly of common citizens that express positions that are less determined and often less knowledgeable (as is more likely when the selection is random). According to the distinction made by Achong Fung (2003), the discussion will be "warm" in the first case and "cold" in the second. In any case, all selection methods have drawbacks; they are often combined in order to reduce problems.

The discussions held in the microcosm can be expanded upon with various means in order to involve, even if less intensely, the broader public, for example, the macrocosm formed of various associations present in the city (Podziba 2006). The act of involving tens, hundreds, or thousands of people, making them work together to dialogue and address conflicts, and creating a context in which they can freely express themselves and enrich their own points of view to eventually find common ground is not an easy thing to do. It is for this reason that participatory processes need to use specific methods to address these difficulties and create situations favourable to expressing needs and debating.

These methods assign a decided importance to the definition of specific rules of behaviours that participants in the decision-making arena should respect. The creation of circumscribed public spaces or specific deliberative arenas is suggested (Bobbio 2002), in which a reduced number of participants can interact in a direct, structured way. The deliberative setting can include different types of prescriptions, for example, a limited time for interaction, the way in which the problems are presented, the spatial position of the participants, the division of work into small groups and phases, communication among participants, etc. Deliberative methods are based on small group discussions in which people are not obliged to articulate interventions but can be limited to expressing their thought in a few words, counter what others say, have the floor many times in the same session, or interrupt at will.

The Phases of the Forum

To construct shared choices within the Forum, it is necessary to act in phases, integrating and synthesizing the methodologies of strategic and participatory matrices. We use a table to clarify the phases of initiating the forum (Fig. 20.1).

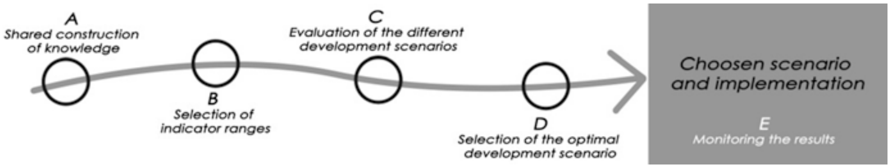

Fig. 20.1 The phases of the forum

Phase A

Shared construction of knowledge about the territory, programming, and current designs; the definition of planning themes emerging from the territorial investigation; and the selection of all interest holders and subjects interested in the territory

Phase B

Selection of non-formalizable indicators and the chosen ranges of formalizable indicators after consulting with the population. Formalizable indicators are indicators that evaluate the environmental performance of the city and influence the quality of the urban landscape and the quality of life of city inhabitants; they can be formalized in a mathematical algorithm. Non-formalizable indicators are "chosen" and "presented" to the stakeholders, local community representatives, and the "interested population". These also regard the "performance" of the city and influence the quality of the landscape and quality of life, but since they are based on metaphorical processes, they cannot be formalized or translated into measurements. By "going back to go forward", their use allows points of contact and sets of possible scenarios to be established with the Tool.

Phase C

Evaluation of the different development scenarios from existing planning and what emerges from the Forum.

Phase D

Selection of the optimal development scenario in which the results of the formally defined process (Tool) are combined with the expectations and desires of the community assessed based on non-formalizable indicators.

Phase E

Monitoring the results (reframing) by creating a permanent observatory to assess the effects of policies on the quality of life of the population.

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Chapter 21
For a New Urban Governance

Rosalba D'Onofrio, Massimo Sargolini, and Michele Talia

The economic/financial recession that has affected the cities and economy of the west is forcing a rethinking about the current model of development and planning a return to governance policies based on enhancing territorial, local, and urban capital. It is not possible for this to occur in terms of further growth, accumulation, and the consumption of scarce resources. Instead, it is necessary to design polycentric, denser cities, regulating the reuse of land to a multifunctional dimension, reconfiguring spaces, and producing more resilient, adaptive, and quality urban fabrics. Cities, in that they are social organizations created to be functional for humans' many needs, could become the space in which citizens find answers to their demands for well-being and quality of life. In this sense, cities have found it necessary to address some substantial questions in new and creative ways. These questions relate to:

– Waste reduction and a more efficient use of resources (human capital, land, landscape worth, environmental quality, energy)
– Conservation and the hydrogeological balance of the land
– Greater sobriety and effectiveness in urban planning
– Reorganization of material and immaterial infrastructure networks
– Involving a larger number of subjects and new players in transformation and regeneration processes
– Building ethics of collective goods to ensure real sustainability in enhancement processes and the use of these goods to block their irreversible consumption
– Redefining behaviours, habits, and lifestyles of inhabitants and operators imprinted with a more conscious, responsible use of their territory.

Faced with such difficult challenges, it is necessary to implement a vast range of skills and research orientations that can develop a shared, organic, and interdisciplinary vision. It is also necessary to redefine territorial and urban-planning tools capable of

R. D'Onofrio (✉) • M. Sargolini • M. Talia
School of Architecture and Design, University of Camerino, Ascoli Piceno, Italy
e-mail: rosalba.donofrio@unicam.it; massimo.sargolini@unicam.it; michele.talia@unicam.it

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addressing and resolving such articulated, complex questions, placing humans at the centre of development and the quality of living environments. To do this, the perspective of new urban governance should be adopted, as the result of institutional action of numerous actors with public authorities but also the result of the interaction among multiple actors (public, private, tertiary, etc.). The season of large transformation interventions having passed,[1] the future will see the activation of a few large works and a myriad of small projects that are feasible and on a scale appropriate for the partitioned multitude of economic, social, and public subjects that move in the urban arena amid a framework of scarce financial and environmental resources. In this situation, one should necessarily work with a skilled combination of numerous small-scale projects, but within definite strategies intended as systems of well-calibrated spatial and economic choices.

In this changing perspective, the urban-planning discipline is aiming for a resolute change in the planning system by virtue of which the most important goals can also be pursued without subjecting society and the urban environment to a high percentage of risk. There is therefore a need to use tactics capable of favouring the observation and monitoring of results produced by low-intensity exploratory actions before involving subjects and actors in more ambitious, long-term interventions (Talia 2016).

So that this scenario can be realized, it is necessary that the new urban governance be focused on some central aspects: the protagonism of the local community; the multidimensional vocation of the spaces; the sharing of a city and territorial project that acts as the glue among the different subjects involved in the name of "shared values" (Peraro and Vecchiato 2007); and the control of time, avoiding the lengthiness of recent urban renewal projects.

Starting from this premise, a model of multilevel, multi-stakeholder governance can grow, in which the institutions, businesses, civil society, and citizens come together daily to design the city around a shared paradigm aimed at increasing the quality of life of all. In this governance model, citizens not only have needs but also skills and resources (NextPolis 2015).

Numerous innovative ideas of the city have been developed in recent years: the smart city, the Goodcity, the solar city, Green Town, the City of Tomorrow, the resilient city, *Cittaslow* (slow city), and the SENSEable city. While developing socially and urbanistically innovative proposals that are also replicable and functional for the well-being of citizens, these models do not create a frame of reference for urban design that brings together all the actors in the urban scene to discuss and pursue common goals. In addition, strategies aimed a greater inclusion of citizens, and the expansion of the networks of players involved, in both a horizontal and vertical sense, tends to lead to a dispersion of decision-making power and the resizing of public authority. Instead, they should favour forms of participation on behalf of economic players, civil society, mayors, and chambers of commerce characterized by interdependence and non-vertex relationships that resemble a network.

[1] This development model was associated with the realization of large projects (Urban Development Projects, UDP) that affected the transformation of specific parts of the urban territory destined for prestigious residences, shopping centres, and exhibition centres in contrast to and separated from areas that were abandoned or of lower prestige.

It is likewise evident that the cooperative relationship can assume different modes based on the dominant, equal, or abstentious position assumed by the institutional actors with respect to coordinating the decision-making process. Kantor (2010) describes four cases: *coordination by authority*, which corresponds to a model with a strong central government; *market coordination*, regulated by incentives and sanctions that characterize economic competition; and *pluralist coordination*, based on the competition among groups that create strategic alliances to maximize their own interests, especially in contexts where the decision-making authority is very decentralized and distributed. In this case, incidentally, the local government, rather than managing the decision-making process, tends to second the configurations assumed by emerging interests, which therefore risks limiting the negotiation process. Finally, there is *consensual coordination*, in which relationships among the different actors are characterized by reciprocal trust and the sharing of ideas, norms, and values.

The characteristics of this last decision-making model would seem to directly favour the desired systematic results, allowing for (a) recourse to unanimous decisions and the consequent minimization of external costs and the need for coercion, with positive effects on the governability of the system; (b) recourse to the specific expert contribution of the different participating actors in order to facilitate the resolution of eventual problems; and (c) the promotion of the reciprocal recognition of actors and the improvement of interpersonal trust, with the consequent increase in social capital stock and legitimacy available to the democratic political system. In this situation, beyond identifying the actors (both collective and individual) taking part in the decision-making process, it is also strategic to reconstruct formal and informal relationships between the actors and the lines along which alliances are created. A good level of cooperation and its institutionalization are a function of the endurance of networks related to collective identity and the actions of individual actors that are inserted in these networks (Burroni et al. 2009).

As should now be evident, the prototype we have subject to verification in our research (QLandQLife) aims to contribute to building precisely this type of decision-making process. It learns from a vast range of actors in order to favour the representation of different interests, reducing the distance between government and the local environment and also allowing for the reduction of informational asymmetries (transparency) and the growth of responsibility and accountability. The advantages of applying this model could regard, firstly, the reduction of informational asymmetries that characterize the relationship between public entities, experts, and beneficiaries/users of the policies and the proposed and subsequently implemented projects.

Secondly, the attenuation or the effective treatment of conflicts may be even more important, considering that a certain level of territorial conflict is anyway functional to achieving correct spatial management. This is precisely due to the contradiction between different approaches that make projects and overall visions of the territory emerge and which, in a situation of generalized consensus, would struggle to be seen. Conflict about the territory therefore represents a virtual constructive situation in which the aspects to strengthen, integrate, or rather incentivize can be extrapolated from politics and technical knowledge.

Thirdly, it is possible that the correct application of the model presented in this volume can favour wider participation and the concrete involvement of interested subjects. The efficiency and effectiveness of urban policies and intervention projects are in fact directly related to the ability of actors to adapt their own actions to the situation they are called to discuss, with an awareness and responsibility that can be crucial in reinforcing community identity and belonging. In fact, local development, as well as the self-sustainability of the territory, requires the expression of active citizenship and an accentuated propensity for collaboration as the basis on which to express the founding principles of self-government.

Lastly, the presence of a plurality of interest holders called to comment on the different development scenarios tends to coincide with an increase in the capacity to control and self-control the organizational structures, which can therefore prevent the risk that interpretations and benefits of individual parts can prevail. For this reason, it is increasingly important to support learning processes by virtue of which the different actors can acquire skills and knowledge to survive and adapt in an increasingly complex, articulated, and dynamic environment.

It is likewise evident that the need for a multilevel, multi-stakeholder approach is more onerous when comparing more traditional models of decision-making; it is certainly appropriate to guarantee shared development strategies. In this way, the oppositional view of public/private tends to be abandoned in favour of the idea of community use of the city, creating at the same time the conditions for effective negotiation among different social groups and their respective agendas, through which new forms of social integration and cohesion are produced. Moving away from an idea of resilience exclusively or eminently focused on reducing disasters (UNISDR 2014) or adapting to catastrophes—which has seen wide national and international agreement in recent years—it is necessary to imagine broader strategies that include formulas capable of ensuring a more widespread sharing and a more marked social acceptability. The need to respond to social/environmental challenges with the creation of social processes and resilient urban planning structures indicates the road for fluid city governance. Through planning that starts with real needs and contexts, the concept of resilience itself can be reinterpreted.

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Chapter 22
Communication and Dissemination of the Model

Marta Magagnini

Taking my quarters
at coolness
I repose
(Bashō Matsuo)

In Japanese poetry, haikus are characterized by a precise technique for their composition. These guidelines/rules define a method to generate synthetic images of reality evoked by places and figures in nature. The choice of synthesis and attachment to the state of things are also at the basis of the QLandQLife project. The analogy is obviously a little forced, but it could, however, appear like a revelation reading Bashō's precise haiku, which echoes some keywords in the QLandQLife research: living, comfort, thermal hygrometric comfort. The use of the haiku as an epigraph to open this text is therefore a strategy to communicate the project, such that in the stupor due to the subversion of the language, the power of the image arrives strong and clear (Fig. 22.1).

The question of communication often erroneously constitutes the last "duty" of a scientific project, to be fulfilled diffidently almost outside the research process. In reality, nothing in the activity of science itself can be produced if the terms of communication are not introduced. First, this is because no discovery, or at least no result, that claims to be innovative makes sense if it cannot be divulged. Second, without a shared language, the research, intended as a continuous series of steps that witness the transformation of an updated result, is not possible in and of itself. This has always been valid, especially in complex, interdisciplinary projects, where everyone should share their own language and knowledge with colleagues in order to begin manipulating the largest amount of data possible to obtain innovative results.

M. Magagnini (✉)
School of Architecture and Design, University of Camerino, Ascoli Piceno, Italy
e-mail: marta.magagnini@unicam.it

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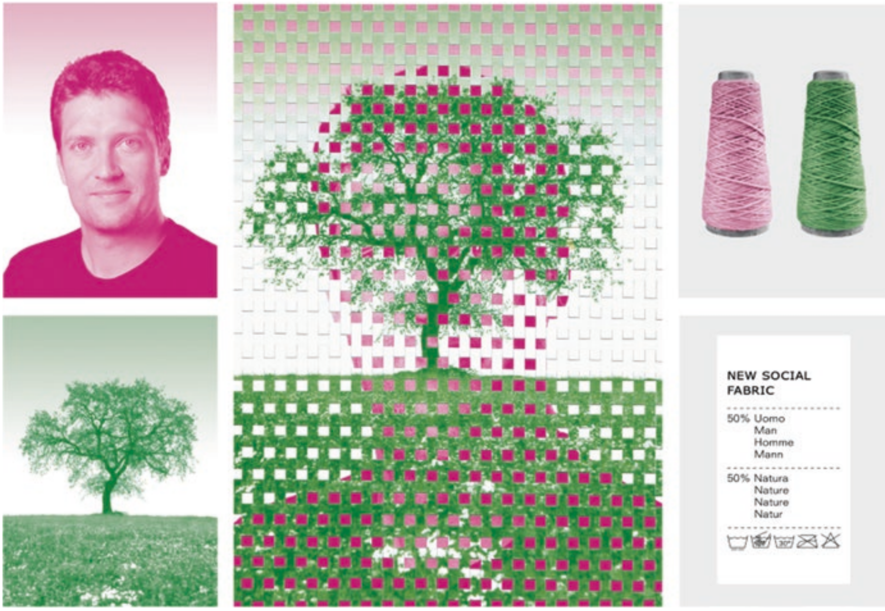

Fig. 22.1 Texture of the world, graphical project by the student Aleandro Romandini

The set of operations in "communicating" a scientific research project follows according to two main phases: (1) internal communication throughout the development of the project and (2) dissemination, i.e. the publication of the results outside the research group at the end of the project. There are also basically two models of communication: (a) unidirectional models of transmitting the content and (b) the system in which each participant "informs and reciprocates" as in Dolci's vision (1988) and in the English system of bidirectional communication of experiences.

For our transdisciplinary project, the first phase was fundamental in creating the necessary language to be shared by the different research groups. The individual languages were made explicit in order to "discretize" the terms of the conversation: the definition of indicators. Each research group selected, proposed, and described the basic parameters for their speculative activity in order to recognize the peculiarity that they did not overlap but rather interfaced with parameters in other research, thereby becoming, rightfully seen and shared, input for the general analysis model. Throughout the length of the project, internal meetings were held before and after important events in the project, both within the individual research groups and collectively with all participants. These were open to the outside, although always in an academic environment: an international seminar with internal and external speakers invited from foreign universities, which was useful for acquiring greater terms of comparison. The objective was mainly to overcome any perception of "otherness" among the different groups and to involve everyone in making what was heterogeneous uniform, in the awareness that everyone belonged to the same rather broad working table dedicated to the same fundamental theme.

The documents and video materials were shared online and made available for everyone in each phase of the work. The idea of sharing is at the basis of the entire communication process, which is inspired by participatory models that can be implemented due to the involvement of the user in the process of defining the model. “Curiously, today one speaks a lot about participation, meant as a tool of democratic development, but one rarely speaks about dissemination as an essential condition to understand and therefore to participate. Democracy cannot be based on the ignorance of problems, because one of its great objectives is precisely to make citizens responsible and aware, so they can exercise their rights, making the best use of their ability to understand” (Angela 1983).

Also in the phase of end communication, the task is to be inspired by participatory processes. Precisely for this reason, a forum was activated that involves (see Chap. 24) citizens, professionals, and administrations. The parametric model pursued by the QLandQLife project has an intrinsically participatory nature: its predictive attitude depends on the specific characteristics and interpretation of data that the user inserts. This iterative design is characterized by successive modifications based on feedback and the personalization of use (e.g. suggested by the Forum). The new computer-based tool requires that data input and output are modulated for each use before a run can begin. The procedure cannot begin without the intersection of the datum and its interpretation, the parameter, and the use that the user makes of it.

The nature of testing the procedure is also related to the logo, developed as an identifying image to synthetically communicate the project (Fig. 22.2). Already in and of itself, the choice of the project title contains an effective communication solution: alliteration. The QLandQLife logo could not help but recall the *Q* of “quality”, together with the *l* of both “land” and “life”, accompanied by a check on the intensity of “quality”.

The indicator of intensity contained in the *l* is an image that from electronics has moved to informatics: the moving symbol of loading a web page, software, videogame, or images and videos now pertains to the collective imagination. When viewing the logo of the project, even the uninformed observer intuitively recognizes the progress bar and assumes the presence of a computer-based object. Therefore, communication within the research groups began immediately with the project’s inception and has lasted throughout, with the possibility of future developments so plausible as to impose continued activity with constant, programmed periodicity in order to avoid interrupting the flow of information, which, by its nature, is continuously updated in the individual areas.

Significant communication towards the exterior, instead, still remains in the project phase, waiting to be activated, even in forms different from the traditional publication of monographs or scientific articles in the field. The project of communication outside the project therefore includes three types of products: (1) online and paper publication of all contributions, reports, and any other product of the project; (2) the creation of a user-friendly interface for the computer-based product that the QLandQLife project promotes for use by public administrations; and (3) the creation and spread of visual products for social media marketing, an aspect that also constitutes a strategy to verify and monitor the external validation of the project.

Fig. 22.2 Studies for the logo for the QLandQLife project

The language of dissemination has a hybrid nature: it remains in the area of scientific language but needs to be translated for communication, which requires figurative thought for it to be fixed in the listeners; it therefore necessarily flows into a form of visualization. This step is required by science itself, for example, in chemistry and the formulas that transform "methanol" into CH_4, and then into a series of signs that depict the intermolecular bonds, and again into the three-dimensional representation of the molecule. Another example is deoxyribonucleic acid, better known as DNA, which we all now recognize as a three-dimensional double helix (Pawels 2006). Historically, therefore, the publication of results cannot overlook the aid of graphical visualizations. The use of new technologies has expanded the offering of new media, while mass media have offered ad hoc platforms and palimpsests to publish scientific information (Cavallo and Spadoni 2010).

Which medium should be used to create visual products, documentaries, interviews, video lessons, or the products of representation? Any technique is valid, but according to Gombrich, design techniques constitute a more effective strategy than reproduction (photographs, videos) for scientific communication because "a selective representation that indicates its own principles of selection will be more informative than the replica. Anatomical drawings are a case in point. A realistic picture of a dissection not only would arouse aversion but also might easily fail to show the aspects that are to be demonstrated. […] Leonardo Da Vinci's anatomical studies are early examples of deliberate suppression of certain features for the sake of conceptual clarity. […] Such a rendering may be described as a transition from a representation to diagrammatic mapping, and the value of the latter process for the communication of information needs no emphasis". (Gombrich and Woodfield 1996, pp 51–52). Conversely, and precisely by virtue of our cognitive system based primarily on vision, realistic representation allows the observer to believe that we are dealing with real facts and to definitively recognize the narrative content.

The ideal for good communication would therefore appear to be a visual product that contains both characteristics: the synthetic selection of the drawing and the realism of the photograph. For this reason, one of the communication strategies most adopted currently (as an example, the videos for scientific popularization edited by the magazine *Internazionale*) is collage. The solution of collage as a technique to create static or animated images is also completely adequate for communicating the

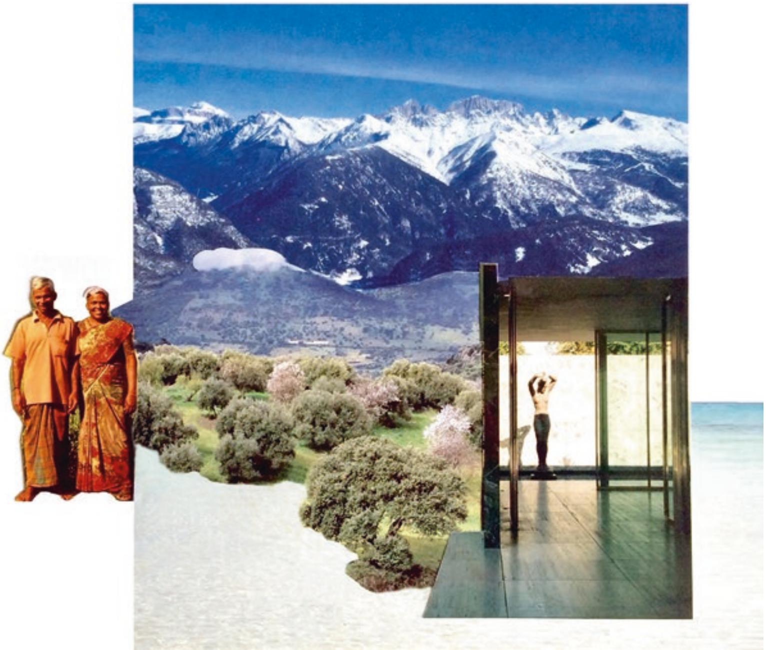

Fig. 22.3 Taking my quarters/at coolness/I repose. (Analogical collage, copyright courtesy Marta Magagnini 2014

QLandQLife project, not only for what was described above but also for another reason. With respect to the signifier/signified, the collage reflects the heterogeneous nature of the research groups, their scientific matter, and in particular the final indicators used by the model. The collage is none other than the realization of a unique image but starting from fragments and materials from different sources (Magagnini 2014).

In conclusion, where scientific communication historically made use of illustrations created with a welldefined technique, allowing for the description and narration of selected elements of the whole system (Tufte 1997), when the domain is a composition, the representation is also fragmented and opened to a dialogue among the elements. This text closes with an image (Fig. 22.3) that illustrates the initial epigraph, creating a further subversion of the language in the desire for a synesthetic synthesis of the intentions of our project.

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Part V
Application to the Adriatic City

Chapter 23
The Ideal Adriatic City

Chiara Camaioni, Lucilla Di Prospero, Rosalba D'Onofrio, Ilenia Pierantoni, Andrea Renzi, and Massimo Sargolini

This experimentation deals with the Adriatic city and the city of Ancona in particular, a city of about 100,000 inhabitants situated along the Adriatic coast in the Marche Region. This choice is related to the deep knowledge that the research group has of the territory and its landscape, which facilitated the collection of data and the understanding of characteristic phenomena. This does not mean that the research results are applicable only to this specific urban context. What we propose is a means of interpreting the city based on morphology, which can act as an intermediary between many other European urban contexts and as a point to begin applying the tool, as well as a basis on which the forum activities may be developed.

Ancona is the capital of the Marche Region. The city faces the Adriatic Sea and sits on a promontory formed by the slopes of Monte Conero, the site of a regional natural park. The ancient city has two different urban characteristics: the monumental part on the Guasco Hill, on which the ancient Greek acropolis was situated, and today the Cathedral of Saint Cyriacus. The more recent part, built at the end of the 1700s, lies in the valley. The port, which forms the heart of the city, is found at the foot of the Guasco Hill. In the first half of the 1800s, the physiognomy of the city changed. The new development urbanized an axis perpendicular to the arc of the port. In the 1900s, the city reinforced development along the east to west axis, perpendicular to the coast (Piazza del Teatro–Spina dei Tre Corsi–Piazza Cavour–Viale della Vittoria) and consolidated the Adriatic neighbourhood around the new Viale della Vittoria boulevard. The so-called second Ancona formed along the railway station—Piano San Lazzaro axis—has a distinctly popular character.

C. Camaioni • R. D'Onofrio (✉) • I. Pierantoni • A. Renzi • M. Sargolini • L. Di Prospero
School of Architecture and Design, University of Camerino, Ascoli Piceno, Italy
e-mail: chiara.camaioni@unicam.it; rosalba.donofrio@unicam.it; ilenia.pierantoni@unicam.it; andrea.renzi@unicam.it; massimo.sargolini@unicam.it; diprosperolucilla@gmail.com

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In the modern city, urbanization has fused together the first and second Anconas (whose centrality is confirmed by the backbone of the three main roads and Piano San Lazzaro). Connections to all peripheral areas begin here: those that in the modern city were outlying villages have today become consolidated neighbourhoods equipped with services. In Baraccola, the extreme peripheral area to the south of Ancona, near the entrance to the A14 motorway, a third pole has risen, where many commercial and administrative activities, which were once typically located in the city centre, are now located. The new shopping centre and sports centre, including the gym and stadium, have been created, in addition to other related services. This new centrality has led to an impressive renovation of the infrastructure, which radically changed access to the city from the south. The formal centralities of the pre-modern city are all located within the walled perimeter: the squares in the historical centre on the slopes of the Guasco Hill and the buildings rising from it (the Cathedral, the Cittadella, and the Lazzaretto) constitute formal points of reference in the city for those arriving from the sea, according to Vanvitelli's architectural project. The formal centres of the modern city have moved towards the new urban centre, created between the end of the 1800s and the beginning of the 1900s as the representative place of the emerging middle classes (merchants and employees): the "Spina dei Tre Corsi". This backbone constitutes the formal axis of reference in the city, which, from the port, stretches along the boulevard of the Viale Adriatico (today Viale della Vittoria), to the high eastern coast (the Passetto). In the contemporary city, new formal centres formed, on both the urban and territorial levels, with the reappropriation of military spaces (the only urban park surrounds the old military citadel) and the promenade on the slopes of the Cappuccini hill.

The port, which was already very important in ancient times, is today one of the most important in the Adriatic and has developed a flourishing market specializing in the construction of large yachts for CRN (Ferretti group) and ISA. The city has 6 km of beaches, some tracts of which are rocky, while others are sandy or pebbly. The city survives primarily on services, commerce, education, public administration, and, in part, tourism, with the presence of an important tourist and commercial port (passenger traffic, especially ferry connections with Greece, Croatia, and the entire Adriatic coast, has instituted a tourist stop known as the "Marina Dorica").

Its most important industries are metalworking, chemistry, and pharmaceuticals. There is also a traditional shipbuilding industry in the city. In the 2011 census, Ancona registered a resident population of 102,677 inhabitants, slightly higher than the previous decade (+2.4%). About 40 years after the earthquake of 1972, almost all private housing has been recovered. The two historical quarters of Guasco and Capodimonte have come to be characterized by a strong residential presence. In particular, in the last decade, Capodimonte has registered a population increase of 1.7% and Guasco 6.9%, consolidating the notable increase in the previous decade. Overall, between 1991 and 2011, the increases were 12.5 and 29.1%, respectively. The historical quarters have therefore been confirmed as residential neighbourhoods with an extraordinary increase in families that has nearly saturated the available housing. In addition to the population, families especially are increasing in the Guasco neighbourhood, with high points of 24% in the 2001–2011 decade and 66.7% in the period 1991–2011. In recent decades, the number of foreigners has increased notably, from 1496 in 2001 to 12,316 in 2011, an increase of 723%. With respect to the overall population, the presence of foreigners within the city is 12%, compared to 1.5% in 2001. The national rate is less than 8%. Most foreign residents are concentrated in the second Ancona (+1047%), with increases particularly high in the Archi, Palombella, and Corso C. Alberto-Piazza Bassi quarters (Comune di Ancona 2011).

A 2016 investigation conducted by the newspaper *Italia Oggi* and the Sapienza University of Rome on the quality of life in Italian cities classified Ancona in 35th place, higher than in 2015 (56th place). Various aspects were considered: tenor of life, criminality, business and work, environment, social and personal inconveniences, and financial and educational services.

From the environmental point of view, its main characteristics are as follows. The city of Ancona has a climate in the transition zone between the subcontinental climate of the upper edge of the Adriatic and a Mediterranean climate. Winter, which is generally mitigated by the presence of the sea, occasionally brings freezing temperatures that, in exceptional cases, can produce snow. Banks of fog are also frequent along the coast due to the thermal inversion, when the temperature remains constant and slightly higher than 0 °C throughout the day. Summer, which does not generally see a lot of rain, is characterized by a decent degree of humidity that tends to make the climate rather muggy, even if maximum temperatures are rarely higher than 35 °C. Within the municipal territory, some environmental and historical exceptions have been seen, and there is a diffuse presence of agrarian and river landscapes. In addition, 54% of the green permeable area is in the built city, and the per-capita provision of services exceeds 26 m^2 and nearly 18 m^2 of green areas.

However, the municipal area has some serious criticalities with regard to environmental risk: the area includes some of the most critical polluted and rundown sites in the region—Bassa Valle Esina, Falconara Marittima, and Ancona—which define an "area of elevated risk of environmental crisis" subject to specific environmental planning. In particular, the following are present:

– Areas at risk from both flooding and landslides indicated by the hydrogeological structure plan (*Piano di Assetto Idrogeologico*, PAI) related to the final tract of the Esino river
– The *Grande Frana* and the cliff of Ancona
– The port structure of Ancona
– The API refinery and another four businesses at risk of significant accidents
– Numerous technological and service infrastructures with heightened vulnerability
– Some coastal areas characterized by water pollution, coastal erosion, risk of significant accidents, and maritime navigational safety

Finally, the city of Ancona represents the largest centre of a vast area of about 470,000 inhabitants, encompassing 39 municipalities between Ancona and Jesi. The municipalities in this territory drafted a protocol of understanding in 2014 to constitute the Mid-Adriatic Metropolitan Area (AMMA). The protocol indicates guidelines to construct the strategy, which will be translated into a truly territorial project via a broad path of negotiation among local players (Fig. 23.1).

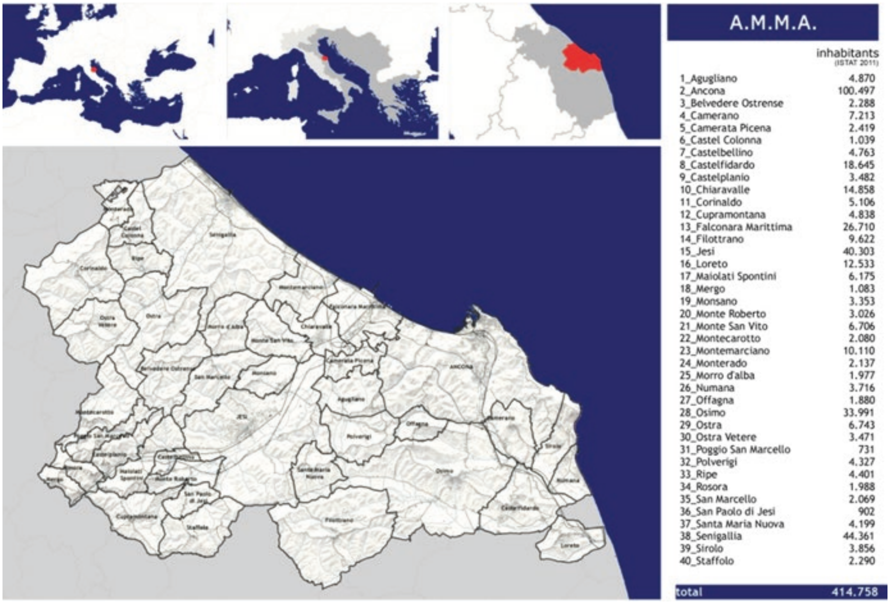

Fig. 23.1 The Mid-Adriatic Metropolitan Area (AMMA)

The Morphological Perspective in Reading Urban Quality

The choice of the morphological perspective as a criterion to investigate the city with the aim of evaluating urban quality through the landscape is based on the conviction that the quality of an urban system also derives from its being part of a context. It therefore serves as an opportunity to base each transformation project on a profound awareness of the nature and characteristics of the places in which it is inserted. The morphological approach therefore favours a careful reading of the urban space and its forms in the search for elements and indicators of quality and local identity to base the project on. The meaning of this reading consists in specifying the different urban forms that the history of the city has expressed over time and that the most recent transformations have in turned abandoned or strongly compromised in favour of atopic models lacking any relation to the context.

There is an awareness today that historical settlement models and the consolidated city cannot be proposed integrally and much less acritically. This is for several reasons: the deep historical stratification and high density that often characterizes them, a different concept of living comfort, and a different idea of safety, for example, from seismic risk. It is believed, however, that these models cannot be ignored—as unfortunately happens most of the time today—due to the high urban quality that they often possess, making them well understood in the view of pursuing the quality of the entire urban layout.

The urban fabrics identified in the research were organized into "recurring morphologies" based on the level of stratification and consolidation (e.g. historical and consolidated urban contexts) or, in contrast, on the presence of marginality and degradation or evolutionary trends with uncertain results (peripheral and marginal contexts, those due to diffusion and concentration).

To identify the recurring morphologies, keys to interpretation present in the indications for the local plans of the Apulia region (Italy) were used, which identify the following aspects emerging in the classification of fabrics (Apulia Region, 2010):

– Density
– Morphology
– Orientation
– Dimensions
– Functional mix
– The relationship with the open urban and rural space

The recurring morphologies are the following:

– Compact fabric with intricate mesh
– Compact network fabric
– Regular fabric with a fine mesh
– Compact radial fabric
– Fine-mesh fabric on hilly terrain
– Large-mesh fabric on hilly terrain
– Low-density residential fabric on hilly area
– Linear peri-urban fringe
– Pointlike peri-urban fringe
– Productive/commercial/directorial platform
– Mainly productive linear fabric
– Mixed
– Low-density linear urban and peri-urban fringe
– Large-mesh residential fabric
– Low-density residential fabric
– Tourism/accommodation/residential platform
– Urbanized country
– Inhabited country

Compact Fabric with Intricate Mesh

This fabric characterizes the oldest area of the city of Ancona and is distinguished by the direct complementarities between the building narrative, space for circulation, and gathering spaces. The layout of this fabric is irregular and does not echo a geometrical mesh model. The buildings composing this fabric are mostly built with load-bearing walls and have an average height of five storeys (Fig. 23.2).

Compact Network Fabric

The conformation of the street layout presents a network that defines the shape of the lots on which the buildings are situated, following the street layout. The mesh characterizing this category is composed of various sized buildings with courtyards that have an average height of four or five storeys. The ratio of coverage is high. The buildings occupy only part of the block, leaving space for green areas (Fig. 23.3).

Fine-Mesh Regular Fabric

This fabric is characterized by small lots that sometimes coincide with the size of a building. The mesh characterizing this fabric is fine and is composed of living units that follow the regular layout of the streets. The buildings occupy only part of the block, leaving space for green areas (Fig. 23.4).

Compact Radial Fabric

The presence of a morphological polarity/centrality determines the polarized conformation of the fabric. The density and ratio of coverage are high and the buildings are generally five storeys high (Fig. 23.5).

Fine-Mesh Fabric on Hilly Terrain

In this category, the street layout follows the orography of the terrain. The fabric is mostly composed of residential buildings with an average height of four storeys that are lined up along the streets. The percentage of free areas is reduced with respect to the built space (Fig. 23.6).

Large-Mesh Fabric on Hilly Terrain

Located on the edges of the consolidated urban fabric, this settlement type may be the result of a single project or of expansions. In both cases, there is consistent dilation of the open space, which is often abandoned. The layout of the streets and buildings follows the terrain and defines a broad urban mesh. The building fabric is composed of primarily residential buildings encircled by green areas that saturate the free space of the lots. The density is medium-high and most buildings have four storeys (Fig. 23.7).

Low-Density Residential Fabric on Hilly Areas

This settlement type is located on the edges of the consolidated city. It is characterized by the presence of single- or two-family homes of two or three storeys situated on a road system that follows the orography of the terrain. This type is characterized by low-density building and a high percentage of green areas (Fig. 23.8).

Linear Peri-urban Fringe

This broken fabric develops along the main roads leaving the city. It includes mixed building types and the ratio of coverage is low (Fig. 23.9).

Pointlike Peri-urban Fringe

These are areas of repetitive homogeneous aggregations on the city edges. The primary use is residential and the ratio of coverage is low (Fig. 23.10).

Productive/Commercial/Directorial Platform

This category contains areas for production, shopping or management centres, recreational areas and theme parks, areas destined for technological systems (purifiers, energy distribution centres), and airports. As a result of a unitary process, this fabric constitutes one of the hard elements of the urbanized territory and is discontinuous with the surrounding urban fabric (Fig. 23.11).

Mainly Productive Linear Fabric

This mixed type of building, which is mostly productive/commercial (market streets), is structured along a road axis connecting different centres. In some cases, the built lots are sparse and separated by free areas. In others, the disposition of warehouses along the road has thickened and generated an iteration of the main settlement until the lots have become saturated (Fig. 23.12).

Mixed Fabric

This type encompasses areas with mixed uses: commercial, residential, productive, sports, etc. The heterogeneity deprives the place of a strong sense of identity. The destination of these places is uncertain due to a stratification of the interventions, which have not always occurred according to common perspectives (Fig. 23.13).

Low-Density Linear Urban and Peri-urban Fringe

These areas are characterized by a low density and by residential buildings situated linearly along peri-urban roads. The ratio of coverage is low, and the percentage of green areas is greater than the percentage of built areas (Fig. 23.14).

Large-Mesh Residential Fabric

This fabric is characterized by its prevalently residential use. The buildings are situated in many directions, the ratio of coverage is low, and the buildings have three storeys. The percentage of private green areas is higher than the percentage of built space (Fig. 23.15).

Low-Density Residential Fabric

This residential fabric is characterized by single-family homes with private gardens. The settlement layout follows a predefined plan characterized by the organic form of the road network. The ratio of coverage is low and housing units mainly consist of two levels (Fig. 23.16).

Tourism/Accommodation/Residential Platform

These are enclaves for accommodation and/or residential use characterized by the uniformity of the building types resulting from a single building project. These platforms do not establish relationships with the surrounding fabric and are distinguished by selective access, which privatizes large parts of the territory that are often coastal (Fig. 23.17).

Urbanized Country

This relates to the spread of single homes, zonings, and sparse warehouses in rural territories. The category is characterized by a low-density fabric that includes mainly single- or two-family homes. In this case, the rural settlement fabric is "de-ruralized", that is, connections with the land are broken and the areas follow more urban social, building, and urban-planning models (Fig. 23.18).

Inhabited Country

This is a low-density building fabric in which one type of single- or two-family home is prevalent. The building fabric is integrated in the rural space due to the building type and treatment of related spaces. In this case, the residential community is still tied to agriculture/forest/pasture activities (Fig. 23.19).

Fig. 23.2 Compact fabric with intricate mesh

Fig. 23.3 Compact network fabric

Fig. 23.4 Fine-mesh regular fabric

Fig. 23.5 Compact radial fabric

Fig. 23.6 Fine-mesh fabric on hilly terrain

Fig. 23.7 Large-mesh fabric on hilly terrain

Fig. 23.8 Low-density residential fabric on hilly areas

Fig. 23.9 Linear peri-urban fringe

Fig. 23.10 Pointlike peri-urban fringe

Fig. 23.11 Productive/commercial/directorial platform

Fig. 23.12 Mainly productive linear fabric

Fig. 23.13 Mixed fabric

Fig. 23.14 Low-density linear urban and peri-urban fringe

Fig. 23.15 Large-mesh residential fabric

Fig. 23.16 Low-density residential fabric

Fig. 23.17 Tourism/accommodation/residential platform

Fig. 23.18 Urbanized country

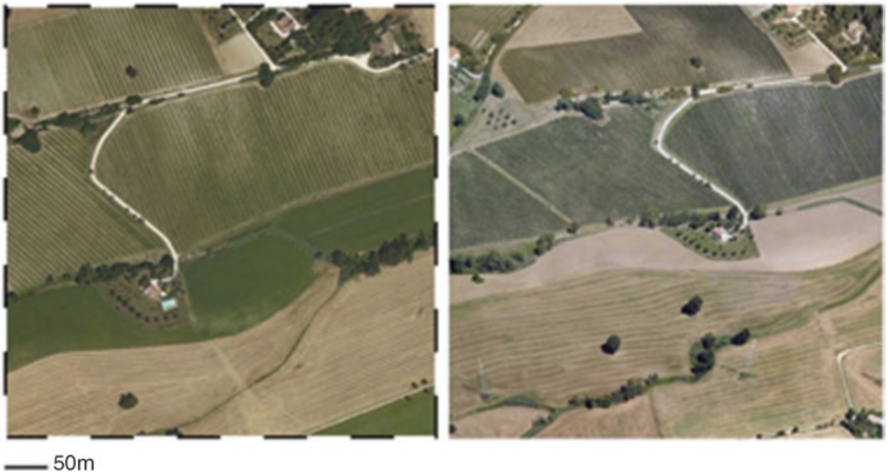

Fig. 23.19 Large-mesh residential fabric

Description of Current Programmes and Projects

It was deemed useful to identify the programmes and projects in the city of Ancona that should be considered when choosing the indices/indicators of urban quality within a landscape framework.

The system of governance in the city of Ancona is indicated within Ancona's governance directives for 2013–2018, which were approved by the city council in 2013. The system, which falls more generally under the strategic planning document, establishes the drafting of three tools that correspond to as many levels of territorial planning:

1. The development plan for the Mid-Adriatic Metropolitan Area (AMMA, 2016)
2. The Strategic Plan (SP) of Ancona (Comune di Ancona, 2014)
3. The Urban Agenda (UA) of the city of Ancona (Comune di Ancona, 2015)

The three tools/processes are strictly interrelated, even if they maintain precise individual characteristics deriving from the fact that they are found in different phases of realization. Both the AMMA and the Urban Agenda were used to identify the proposals and projects for city development in the coming years. The recognition of both allowed the selection of indicators to be refined; these indicators were then used in the tool and forum to assess the current state and trend scenarios. The procedure to draft the AMMA was financed by the Ministry of Infrastructure and Transport and began in 2012; the Metropolitan Conference opened in July 2016.

1. *The AMMA development plan*, which comprises 39 participating municipalities (including Ancona) for a total of about 470,000 inhabitants, defines the develop-

ment scenarios and trajectories for the territory and identifies strategic projects capable of promoting integrated urban policies to intensify sustainable urban development and reinforce the role of cities in the framework of cohesive politics. Six scenarios were identified to develop the AMMA. These were developed by imagining possible relationships between the strong points and the excellent aspects currently expressed by the territory that can potentially be enhanced in a perspective of territorial cohesion and political convergence.

(a) The metropolitan area as a context to support the production system
(b) The metropolitan area as an integrated cluster for logistics
(c) The metropolitan area as a chain for manufacturing and tourism
(d) The metropolitan area as a resilient territory
(e) The metropolitan area as a factory for culturally oriented development
(f) The metropolitan area as a laboratory for urban regeneration and social inclusion

In order to identify greater synergy with the Urban Agenda as well, we have concentrated our attention on elements 3, 5, and 6. For each of these scenarios, AMMA identifies the strategic lines of action (Fig. 23.20) and the relevant best practices (Fig. 23.21).

In addition to identifying scenarios, the construction of a metropolitan dimension for the AMMA began with an analysis of the criticalities and strong points, of which five possible development scenarios arose (and initial prefigurations of lines of action). Municipal planning was then studied in order to begin implementing a group of projects that were important for the metropolitan dimension and feasible with regard to the new 2014–2020 programming framework. The projects were therefore grouped within the so-called metropolitan project (MP) containers that connect the projects presented to a more complex planning scope related to the

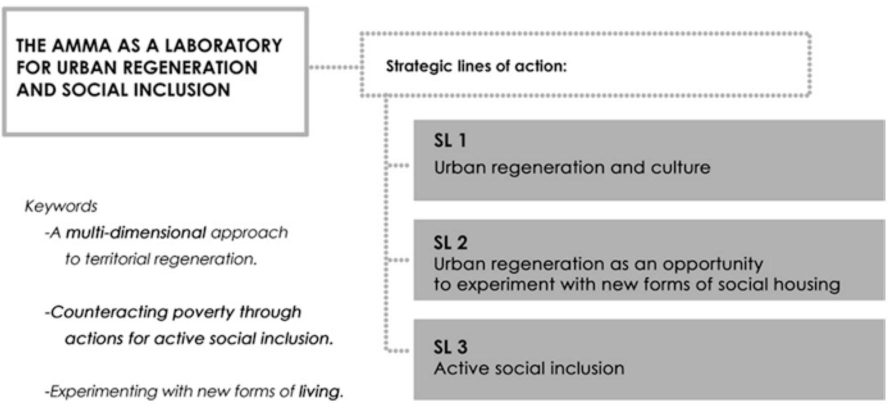

Fig. 23.20 Scenario 6 (Extract from the integrated territorial project for the Mid-Adriatic Metropolitan Area (AMMA))

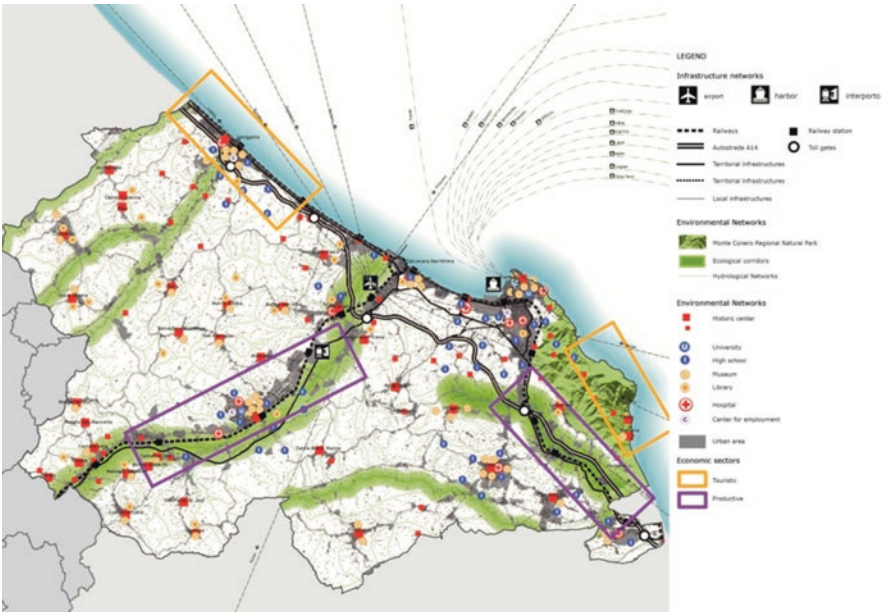

Fig. 23.21 Strategic development plan of the Mid-Adriatic Metropolitan Area (AMMA): territorial configuration

evolution of public action in the metropolitan sense. Ten MPs were identified as catalysts for a wide selection of interventions presented by the communities (also remodelling, integrating, and enriching them). These MPs include sheets that refer to projects to increase the potential of territorial resilience. In fact, these projects address different aspects of countering and adapting to risks.

The objectives pursued by the projects were identified as:

- Mitigation and adaptation to climate change
- The reduction of hydrogeological risks
- The promotion of resilience
- Reinforcement of positive connections between care for the landscape, enhancement of the excellent points, and securing the territory

Numerous types of works are included, the first of which is the dimension of physical works:

- Projects to secure hillsides or the coast
- Projects to renaturalize or recover critical situations
- Projects to control and drain water in order to avoid or reduce the danger of river flooding

The second is related to procedural aspects rather than focusing on the works themselves:

- Public information and awareness building about risk factors
- Promoting collective and personal responsibility
- Implementing monitoring and early warning practices

The third encompasses multidimensional projects:

- Those intended to reduce risks, but which are initially configured as initiatives created in other policy areas (e.g. tied to the operation of the Adriatic rail line around Ancona and its port as works to counter landslide movements)
- Those configured as projects to promote safety but which also intersect objectives to promote tourism and regenerate the city and the landscape

The fourth dimension presents projects that address the interdependence generated by risk factors:

- Projects for sustainable urban drainage
- Projects to recover agricultural practices to protect the historical landscape and therefore to renew balances and biodiversity
- Projects that use the opportunities provided by community planning in terms of recognizing ecosystem services to secure the territory

2. *The City of Ancona's Urban Agenda*, approved in 2015, is a programme designed around urban interventions that are coherent with the guiding principles of the existing local plan. The general objectives of the Urban Agenda are actions localized in parts of the city:
   - Redistributing uses in the city centre
   - Regenerating the historical periphery: the Archi, Piano San Lazzaro, Pinocchio, Torrette, and Collemarino quarters and the station
   - Urban regeneration of Vallemiano
   - Renovation of Baraccola
   - Integration of new residential neighbourhoods
   - Enhancement of the villages
   - Regeneration of the coastline

Each of the general objectives led to the identification of specific urban-planning objectives. The specific objectives are output (results) that can be realized concretely through planning activities. Some of the main areas are reported in Fig. 23.22 and Table 23.1, with the general objectives to be pursued through urban planning as well as more specific objectives.

3. Beyond these two main documents, another strategic document was also considered, *the National Plan of the City*, according to Art.12 del D.L.n 83 del 22.06.12 "Misure urgenti per la crescita del Paese" (Urgent measures for the growth of the country) (Development Decree), which establishes a project to regenerate the seaside. Interventions related to the creation of public structures are part of a complex, unitary project to regenerate the seaside between the port and the historical city. It also extends to the entire waterfront system and is localized in

Fig. 23.22 City of Ancona. GO 1: redistribution of uses in the city centre—historical centre (*orange line*) and Spina dei Tre Corsi and Corso Amendola (*green line*)

some urban containers of great value, which act as transitions between the port system and the historical centre. The following interventions are highlighted:

- Regeneration of the seaside promenade: requalification of the pedestrian path along the sea that connects the railway station to part of the historical port at the Arch of Trajan (the northern monumental pole). This promenade represents the linear element of use integrated within an organized, diffuse system of transverse connections, both with the fabric of the historical city and with the system of access to the monuments and mechanized lifts under construction and/or those planned in the proposal.
- Completion of the recovery of the Mole Vanvitelliana as a "cultural island".
- Completion of the multifunctional Traiano parking complex, aimed at regenerating a degraded area situated at the end of the natural cliff system. This is an important landscape element in the historical iconography of the city that connects the Capodimonte neighbourhood to the Archi quarter. The existing, functioning part of the complex is composed of a multi-storey parking structure. The project foresees the completion of these spaces and the mechanized public lift system, earmarking the covered spaces created for activities complementary to parking and city services. Completion of the systems to reach the cliff and the ridge of the Capodimonte quarter is also expected.
- Regeneration of the social housing units and services in the Borgo Pio area: renovation of a partially built area within the Archi quarter by creating a

Table 23.1 General and specific objectives (OG1)

General objectives	Specific objectives
OG 1 Redistribution of uses in the city centre: – Historical centre – Spina dei Tre Corsi (Corso Amendola)	*SO* 1.1
	Favour the insertion of commercial and artisan activities related to service, innovation, and neighbourhood revitalization: food and wine, bookstore cafés, studios for handcrafts and local production, etc.
	SO 1.2
	Favour the insertion in the city centre of commercial activities (medium sales structures)
	SO 1.3
	Favour the use and transformation of buildings in the city centre to enhance tourism/accommodation
	SO 1.4
	Develop currently underused commercial spaces (Mercato delle Erbe, etc.) to promote the use of historical and religious areas (Ex Convento di San Francesco, etc.)
	SO 1.5
	Maintain tertiary public functions (Palazzo Provincia, etc.)
	SO 1.6
	Assess the attainment of appropriate levels of public standards compatible with the fabric in the city centre (green areas, parking, education, services)
	SO 1.7
	Promote the development of the system of pedestrian routes in the Guasco San Pietro quarter and connections with the Cardeto Park
	SO 1.8
	Promote the development of existing archaeological sites

building complex of about 35 housing units destined for social residences and including a number of services and social structures.

– Regeneration of the Vanvitelli seaside area. This is one of the areas where urban degradation has been the strongest, affecting the area of the historical port starting in the mid-1800s and passing through wartime destruction and post-war reconstruction. The proposal tries to respond to the need to reorganize the last tract of the margin between the port and the city where different systems meet and interact: productive and commercial systems related to the port and the Fincantieri area, the landscape of the spur of the Guasco hill, the cliff and urban parks on the ridge, and, finally, the historical centre with its monuments and archaeological areas to develop. The programme foresees an integrated set of direct interventions to recover the connective fabric, reorganize the urbanizing networks, develop and systematize the archaeological areas that have come to light with excavations and post-war demolitions, and reconvert and/or reconstruct the stretch of building along the Vanvitelli seaside, with interventions for energy and structural efficiency. Finally, the reconnection of the area with the slopes of the higher Guasco hill via mechanized lifts is expected (Fig. 23.23).

Fig. 23.23 City of Ancona. Project "Fronte Mare delle Eccellenze" to regenerate the seaside of Ancona

Identification of the Partitions of the Ideal Adriatic City

To define the territorial analyses of urban fabrics, the project made use of geographic information systems (GIS) that allowed overlay mapping to be done. This type of operation is fundamental in constructing analyses that simultaneously assess vector and georeferenced raster cartographic data (regional technical maps, orthophoto maps) and different types of alphanumeric data (surface area, altimetry, inclination, exposition, soil permeability, etc.). In this framework, the use of the Urban Atlas is very important. This tool was developed and provided by the European Environment Agency to outline an overall framework of land use and land coverage relating to all urban settlements in the European Union with populations above 100,000 inhabitants. The tool, which is significantly more detailed than the CORINE Land Cover (initial data resolution is 100 times greater), allows the city to be read and defined through its different forms and functions.

Once the basis of analysis was determined, as described above, the urban settlement was repartitioned using a geographical grid of 500×500 m^2. This way of discretizing the urban fabric allows it to be read precisely, but also synthetically, since each tile or partition of the ideal urban area holds a quantity of data that can be easily investigated. By selecting different tiles in the same city or even in different cities at different times, one can make a comparative analysis among the different urban types and morphologies.

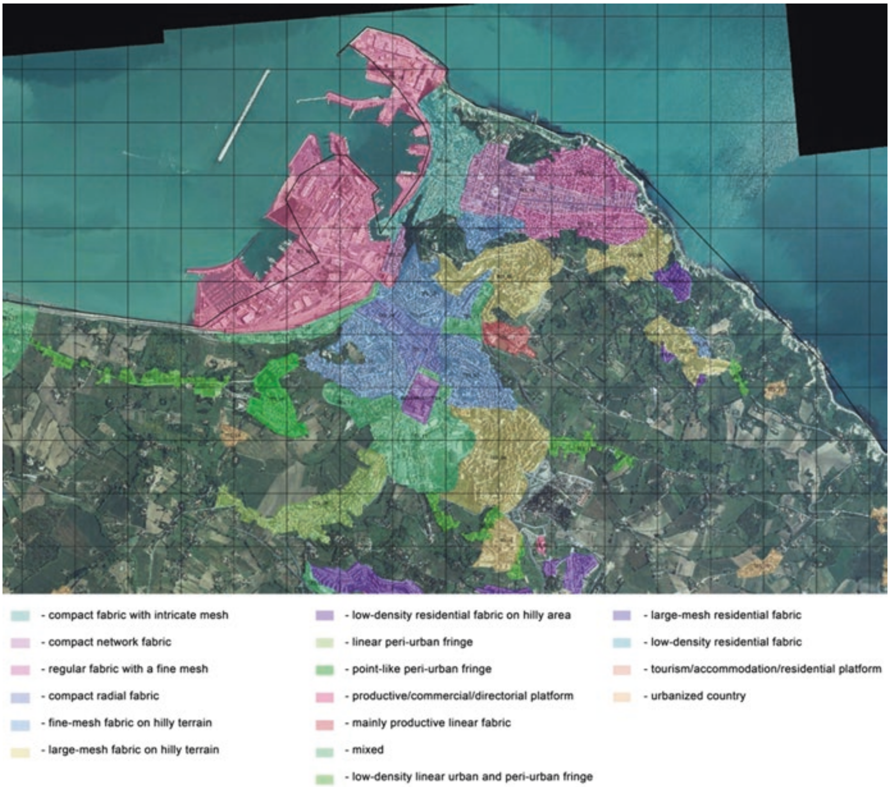

Fig. 23.24 Partitions identified in the city of Ancona and recognition of settlement fabrics

In addition, in a subsequent phase of the project, the use of the partition allows simulations to be made by applying the selected indicators to one or more partitions.

The decision to use a partition to study the Adriatic city starts from the need to discretize and standardize an inhomogeneous datum (or set of data) that distinguishes the urban environment according to its nature. This approach therefore allows analysis and simulations to proceed easily, working within a defined set of "objects" that can be easily investigated, analysed, and compared with others, becoming a part of other partitions in the same or another city (Fig. 23.24).

In order to verify the means of investigating urban fabrics with the support of the GIS Urban Atlas, another case study was studied outside of the geographical area of the Adriatic city. The city of Reims[1], for which some examples are attached, was studied to verify the replicability of the research in contexts with different structural conditions (Fig. 23.24, 23.25 and 23.26).

[1] Interpretation of the urban fabrics in Reims was made by Lucilla Di Prospero with the support of a post-university scholarship.

Fig. 23.25 Map of the classification of the different urban fabrics

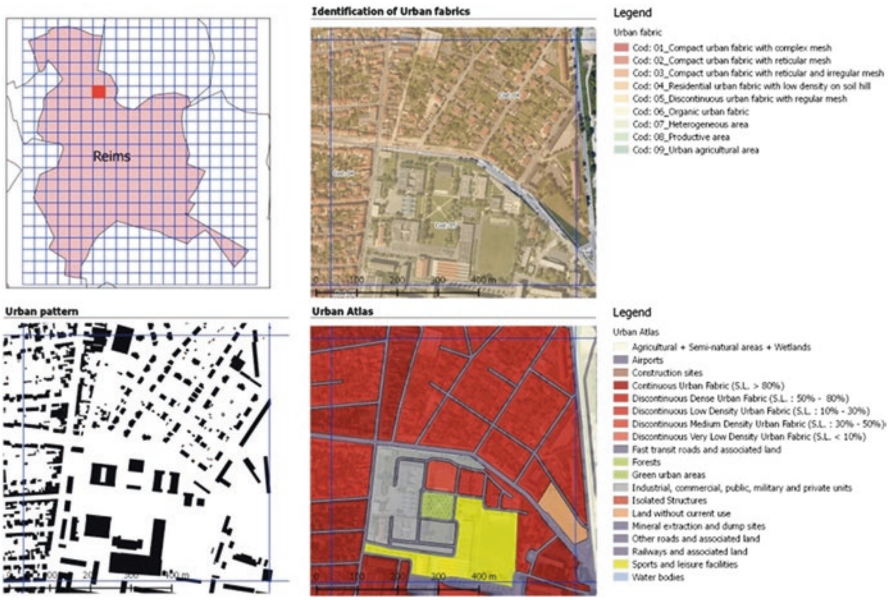

Fig. 23.26 Reims classification of urban fabrics (partition n. 17,763)

Identification of the Set of Restricted Indicators for the City of Ancona

Based on the provisions of the planning and design tools taken as a reference for the city of Ancona, a further selection of indicators was made within the entire long list identified in Part 2 of this book. With reference to the four macro-areas of indicators identified in “Selection of Indicators of Urban Sustainability and Quality of Life of City Inhabitants”, the indicators were further grouped into families of indicators strictly in relation to the themes and problems emerging from the local context and current plans/designs: land security; urban comfort; physical and mental health; urban form and identity; quality of spaces and public services; combatting waste, degradation, and reuse; urban metabolism; and reinforcement of ecosystem services, usability, and accessibility. A short list of indicators was produced from among formalizable and non-formalizable indicators.

Within this restricted list of indicators, those applied to assess the current state and trend scenarios of the different partitions that characterize the city of Ancona were selected. This choice was made with the support of experts in the case of some of the formalizable indicators and with the support of local communities for the rest of the indicators (see Annex D).

Annex D

Short List of Indicators

1 Distinctive and pleasant 2 Efficient and nice 3 Clean and healthy	Land security	Urban comfort, physical and mental health	Urban form and identity	Quality of spaces and public services	Combatting waste	Urban degradation and reuse	Urban metabolism and reinforcement of ecosystem services	Usability and accessibility
Indicators	**1.1.1.** Permeability	**1.1.1.** Permeability	**1.1.3.** Tree-lined boulevards **1.1.7** Presence of areas for landscape/environmental use **1.1.8.** Presence of areas with natural or landscape interest **1.1.9.** Presence of environmental islands	**1.1. 2.** Presence of trees in public space divided by built surface area **1.1.11.**Presence of plant species that can influence the living quality of the area	**2.1.2.** Living density	**1.2.4.** Presence of elements that detract from the visual relationship with the context (obstructions, perception from the site)	**1.1.1.** Permeability	**1.1.4.** Citizen accessibility to green spaces
	1.1.16; **3.1.1** Territorial Biopotential (BTC)	**1.1.2.** Presence of trees in public space divided by built surface area **1.1.11.**Presence of plant species that can influence the living quality of the area	**1.1. 10.** Presence of ecological areas (green permeable agricultural areas)	**1.1.2.** Presence of trees in public space divided by built surface area	**1.3.11.** Unused spaces (residence or service)	**1.3.7.** State of housing conservation—degree of global maintenance of buildings and the historical/cultural heritage	**1.1.5.** Proximity to green urban corridors	**1.1.7.** Presence of areas for landscape/ environmental use
	2.1.2 Living density	**1.1.5.** Proximity to green urban corridors	**1.1.12.** Fragmentation **1.1.15**.; **3.1.8.** RIE—Index of building impact reduction	**1.1.6.** Morphological structures with landscape importance that can influence the quality of spaces	**2.1.3.** Average building height	**1.3.8.** Overall colour impact, identification of façade colour with local tradition, and overall building harmony (materials, paving, openings, proportions)	**1.1.10.** Presence of ecological areas (green permeable agricultural areas)	**1.2.2.** Presence in panoramic views
	2.3.1. Presence of decommissioned or very degraded areas	**1.1.7.** Presence of areas for landscape/environmental use	**1.1.13.** Isolation of urban green areas	**1.1.7.** Presence of areas for landscape/environmental use	**2.2.1.** Ratio of surface area to volume	**1.3.11.** Unused spaces (residence or service)	**1.1.12.** Fragmentation **1.1.15.**; **3.1.8.** RIE—Index of building impact reduction	**1.2.3.** Presence of elements that impact the visual quality of the study area (perception of the site)

	1.1.15.; **3.1.8.** RIE—Index of building impact reduction	**1.1.10.** Presence of ecological areas (green permeable agricultural areas)	**1.2.1.** Presence of areas of landscape/ environmental use	**1.1.8.** Presence of areas with natural or landscape interest	**2.2.2.** South-facing vertical surfaces	**1.4.4.** Quality of community areas in public housing	**1.1.13.** Isolation of urban green areas	**1.2.4.** Presence of elements that detract from the visual relationship with the context (obstructions, perception from the site)
	2.4.1. Population density	**1.1.11.**Presence of plant species that can influence the living quality of the area	**1.2.2**. Presence in panoramic views	**1.1.9.** Presence of environmental islands	**2.2.3.** Southeast- and southwest-facing vertical surfaces	**2.1.8.** Percentage of conservation of existing buildings	**1.1.14.** Connectivity	**1.2.5.** Perceptibility of the site from streets
		1.1.12. Fragmentation	**1.2.3.** Presence of elements that impact the visual quality of the study area (perception of the site)	**1.1.11.**Presence of plant species that can influence the living quality of the area	**2.2.4.** Ratio of passive to non-passive zones	**2.3.1.** Presence of decommissioned or very degraded areas	**2.2.6.** Green areas on the ground	
	1.1.12. Fragmentation	**1.2.3.** Presence of elements that impact the visual quality of the study area (perception of the site)	**1.2.4.** Presence of elements that detract from the visual relationship with the context (obstructions, perception from the site)	**1.1.12.** Fragmentation	**2.2.5.** Sky-view factor (SVF)	**2.3.2.** Unused volumes (residence or service)	**1.1.16**; **3.1.1** Territorial Biopotential (BTC)	**1.4.1.** Presence of spaces for meeting and socialization
	3.2.10. Coastal erosion	**1.3.1.** Building density	**1.2.5.** Perceptibility of the site from streets	**1.1.13.** Isolation of urban green areas	**2.2.6.** Green areas on the ground	**2.1.8.** Percentage of conservation of existing buildings		**1.4.2.** Presence of open public places used by the population
	3.3.1. Presence of at-risk activities	**2.1.1.** Ratio of land coverage		**1.2.1.** Presence of areas of landscape/environmental use	**2.2.7.** Percentage of shade per hour generated in open spaces on the summer and winter solstices			**1.4.3.** Presence and use of buildings of social interest

(continued)

	3.3.2. Presence of areas at risk of flooding	**2.1.3.** Average building height	**1.3.1.** Building density	**1.2.2.** Presence in panoramic views	**2.2.8.** Percentage of permanently shaded open spaces on the summer and winter solstices	**2.4.2.** Employment and unemployment rates		**1.4.4.** Quality of community areas in public housing
	3.2.2. Deficient sections of the sewer system	**2.1.6.** Corrected compactness		**1.2.3.** Presence of elements that impact the visual quality of the study area (perception of the site)	**1.1.16.** Territorial Biopotential (BTC)	**2.4.3.** Average family income	**3.2.7.** Air quality	**1.3.1.** Building density
	Seismic Risk	**1.3.8.** Overall colour impact, identification of façade colour with local tradition, and overall building harmony (materials, paving, openings, proportions)	**2.1.2.** Living density	**1.2.4.** Presence of elements that detract from the visual relationship with the context (obstructions, perception from the site)		**2.4.4.** Poverty threshold	**3.2.8.** Quality of drinking water	**2.1.2.** Living density
	Landslide risk	**2.2.1.** Ratio of surface area to volume	**2.1.1.** Ratio of land coverage	**1.2.5.** Perceptibility of the site from streets	**2.2.9.** Degree of winter radiation and level of natural lighting in the buildings	**2.4.5.** Income inequality		**2.5.1.** Accessibility to street-level public transport stops
	2.1.1. Ratio of land coverage	**2.3.2.** South-facing vertical surfaces	**2.1.3.** Average building height		**2.2.10.** Possibility of effective natural ventilation as a function of the building distribution (e.g., absence of obstructions).	**2.5.4.** Provision of neighbourhood services		**2.5.2.** Accessibility to the network of biking paths
		2.3.3. Southeast- and southwest-facing vertical surfaces	**2.1.6.** Corrected compactness	**1.3.9.** Architectural quality (street furniture, presence of artistic installations) and degree of maintenance of public spaces in relation to open spaces	**2.2.11.** Average distance between buildings	**2.5.5.** Diversity of functions		**2.5.3.** Accessibility to green spaces

		2.3.5. Sky-view factor (SVF)	**2.1.4.** Degree of privacy (living and associated spaces)	**1.4.1.** Presence of spaces for meeting and socialization	**2.2.12.** Adaptation of the building type and architectural character to the local climate	**2.5.11.** Effectiveness and quality of public transport		**2.5.4.** Provision of neighbourhood services
		2.3.6. Green areas on the ground	**1.3.2**; **2.1.5**. Settlement mix	**1.4.2.** Presence of open public places used by the population		**2.5.16.** Presence and usability of public functions		**2.5.5.** Diversity of functions
		2.3.7. Percentage of shade per hour generated in open spaces on the summer and winter solstices	**1.3.3.** Elements of the historical settlement structure and consistency of the historical/ monumental heritage	**1.4.3.** Presence and use of buildings of social interest	**2.3.1.** Presence of decommissioned or very degraded areas	**2.5.17.** Presence and use of community functions		**2.5.6.** Presence of primary roads in the site
		2.3.8. Percentage of permanently shaded open spaces on the summer and winter solstices	**1.3.4.**Skyline: recognizability and symbolic value	**1.4.4.** Quality of community areas in public housing	**2.3.2.** Unused volumes (residence or service)	**2.5.18.** Presence/ use of basic health services		**2.5.7.** Quality of connections between main roads in the site and flow between neighbourhoods
		1.1.16; **3.1.1** Territorial Biopotential (BTC)	**1.3.5.** Presence of buildings characterized by particularly prestigious architectural solutions (e.g., lesser architecture) or qualifying contemporary architectural elements for the urban context of reference	**2.1.9.** Urban complexity	**2.3.3.** Percentage of conservation of existing buildings	**2.5.22.** Quality and degree of parking area maintenance		**2.5.8.** Accessibility of the site on the urban level
			1.3.6. Presence of structures with architectural characteristics that are inappropriate for the urban context—detracting elements from the language point of view	**1.3.10.** Presence of decommissioned or very degraded areas		**2.6.1.** Quality and degree of walking and cycling path maintenance		**2.5.9.** Density of biking paths (length/surface area or length/ inhabitant)

(continued)

		2.2.9. Degree of winter radiation and level of natural lighting in the buildings	**1.3.7.** State of housing conservation – degree of global maintenance of buildings and the historical/cultural heritage	**2.5. 20.** Commercial surface area per inhabitant and proximity	**3.2.3.** CO_2 emissions	**2.6.2.** Quality of lighting in open spaces and buildings during the day and at night		**2.5.10.** Linear urban density of public transport
		2.2.10. Possibility of effective natural ventilation as a function of the building distribution (e.g., absence of obstructions).	**1.3.8.** Overall colour impact, identification of façade colour with local tradition, and overall building harmony (materials, paving, openings, proportions)	**2.5.18.** Presence/use of basic health services	**3.2.4.** Energy consumption	**2.6.3.** Architectural quality (street furniture, presence of art installations) and degree of public open-space maintenance		**2.5.11.** Effectiveness and quality of public transport
		2.2.11. Average distance between buildings	**1.3.6.** Presence of structures with architectural characteristics that are inappropriate for the urban context—detracting elements from the language point of view	**2.5.19.** Presence/use of social buildings	**3.2.5.** Water consumption	**2.6.4.** Quality and degree of parking maintenance		**2.5.12.** Percentage of residents with walking access to areas of collective interest within 300 m (5 min) of green areas. Maximum walking distance to collective spaces and/or services
			1.3.9. Architectural quality (street furniture, presence of artistic installations) and degree of maintenance of public spaces in relation to open spaces	**2.5.16.** Presence and usability of public functions	**3.4.1.** Density of urban waste bins per inhabitant	**2.6.5.** Quality of community areas in public housing		**2.5.13.** Availability of pedestrian zones and restricted traffic zones per inhabitant in m^2
		3.2.1. Presence of congested intersections and streets that influence the smells and sounds of the site	**1.4.1.** Presence of spaces for meeting and socialization	**2.5.17.** Presence and use of community functions	**3.2.6.** Waste collection and management	**2.6.6.** Quality and level of maintenance of public-housing buildings		**2.5.14.** Maximum walking distance to school for children

		3.2.3. CO_2 emissions	**1.4.2.** Presence of open public places used by the population	**2.5.1.** Accessibility to street-level public transport stops	**3.4.2.** Percentage of landfilled urban waste	**2.6.7.** Degree of maintenance and quality of public green spaces		**2.5.15.** Degree of accessibility for disabled and elderly people
		3.2.7. Air quality	**2.1.1.** Ratio of land coverage	**2.5.2.** Accessibility to the network of biking paths		**2.6.8.** Degree of maintenance and quality of green spaces in mostly residential and public city blocks.		**2.5.16.** Presence and usability of public functions
		3.2.9. Quality of silence	**2.1.2.** Living density of the study area	**2.5.3.** Accessibility to green spaces		**3.5.1.** Safety of the road network (vehicular traffic)		**2.5.17.** Presence and use of community functions
		3.3.3. Light pollution	**3.1.3.** Average building height	**2.5.4.** Provision of neighbourhood services		**3.5.2.** Safety of the road network (pedestrian and bike paths)		**2.5.18.** Presence/ use of basic health services
		3.5.3. Quality and degree of maintenance of pedestrian and bike paths	**2.1.6.** Corrected compactness	**2.5.5.** Diversity of functions		**3.5.4.** Quality of lighting in open spaces and buildings (both daytime and night-time)		**2.5.19.** Presence/ use of social buildings
		3.5.4. Quality of lighting in open spaces and buildings (both daytime and night-time)	**2.1.7.** Diversity of building type	**2.5.6.** Presence of primary roads in the site		**3.2.1.** Presence of congested intersections and streets that influence the smells and sounds of the site		**2.5.20.** Commercial surface area per inhabitant and proximity
			2.1.8. Percentage of conservation of existing buildings	**2.5.7.** Quality of connections between main roads in the site and flow between neighbourhoods		**3.2.2.** Deficient sections of the sewer system		**2.5.21.** Commercial façades present in the city fabric

(continued)

			2.1.9. Urban complexity	**2.5.8.** Accessibility of the site on the urban level		**3.3.3.** CO2 emissions		**2.5.22.** Quality and degree of parking area maintenance
			2.5.6. Presence of primary roads in the site	**2.5.9.** Density of biking paths (length/surface area or length/inhabitant)				**2.5.23.** Presence of areas for unexpected, unregulated stops
			2.5.21. Commercial façades present in the city fabric	**2.5.10.** Linear urban density of public transport		**3.2.7.** Air quality		**2.5.24.** Assessment of parking presence in busy areas
				2.5.11. Effectiveness and quality of public transport		**3.2.8.** Quality of drinking water		**2.5.25.** Public kerbside parking spaces per inhabitant
				2.5.12. Percentage of residents with walking access to areas of collective interest within 300 m (5 min) of green areas. Maximum walking distance to collective spaces and/or services		**3.2.9.** Quality of silence		**2.5.26.** Private parking spaces per inhabitant
				2.5.13. Availability of pedestrian zones and restricted traffic zones per inhabitant in m^2		**3.2.10.** Coastal erosion		**2.6.1.** Quality and degree of walking and cycling path maintenance
				2.5.14. Maximum walking distance to school for children		**3.3.1.** Presence of at-risk activities		**2.6.2.** Quality of lighting in open spaces and buildings during the day and at night

				2.5.15. Degree of accessibility for disabled and elderly people		**3.3.2.** Presence of areas at risk of flooding		**2.6.3.** Architectural quality (street furniture, presence of art installations) and degree of public open-space maintenance
				2.5.21. Commercial façades present in the city fabric		**3.3.3.** Light pollution		**2.6.4.** Quality and degree of parking maintenance
				2.5.22. Quality and degree of parking area maintenance		**3.2.9.** Quality of silence		**2.6.5.** Quality of community areas in public housing
				2.5.23. Presence of areas for unexpected, unregulated stops				**2.6.6.** Quality and level of maintenance of public-housing buildings
				2.5.24. Assessment of parking presence in busy areas				**2.6.7.** Degree of maintenance and quality of public green spaces
				2.5.25. Public kerbside parking spaces per inhabitant				**3.2.1.** Presence of congested intersections and streets that influence the smells and sounds of the site
				2.5.26. Private parking spaces per inhabitant				**3.2.3.** CO2 emissions
				2.6.1. Quality and degree of walking and cycling path maintenance				**3.2.7.** Air quality

(continued)

				2.6.2. Quality of lighting in open spaces and buildings during the day and at night				**6.5.2.** Safety of the road network (pedestrian and bike paths)
				2.6.3. Architectural quality (street furniture, presence of art installations) and degree of public open-space maintenance				**6.5.4.** Quality of lighting in open spaces and buildings (both daytime and night-time)
				2.6.4. Quality and degree of parking maintenance				
				2.6.5. Quality of community areas in public housing				
				2.6.6. Quality and level of maintenance of public-housing buildings				
				2.6.7. Degree of maintenance and quality of public green spaces				
				2.6.8. Degree of maintenance and quality of green spaces in mostly residential and public city blocks.				
				3.2.1. Presence of congested intersections and streets that influence the smells and sounds of the site				
				3.4.1. Density of urban waste bins per inhabitant				
				3.5.1. Safety of the road network (vehicular traffic)				
				3.5.2. Safety of the road network (pedestrian and bike paths)				
				3.5.4. Quality of lighting in open spaces and buildings (both daytime and night-time)				

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Chapter 24
Application of the Tool and Criteria for Activating the Forum

Roberta Cocci Grifoni, Rosalba D'Onofrio, and Massimo Sargolini

As illustrated in Part III, the decision-support system (DSS) is composed of two parts:

– An evaluation system relying on a mathematical algorithm that simultaneously and contextually assesses different indicators (composed of multiple variables) that can be formally defined and represented. For brevity, we refer to this first part of the output as "Tool".
– An interpretation and assessment system that relies on the active participation of local communities and "interested populations" (European Landscape Convention/ELC 2000) and uses indicators that cannot be formalized in a mathematical algorithm. For brevity, we refer to this second part of the output as "Forum".

The Tool was applied to two case studies: Ancona and Pineto, with different analyses. In the first case, particular attention was placed on the interpretation and assessment of the "partitions" into which the city is decomposed for its morphological/typological interpretation. In the second case, instead, experimentation was made with the Forum, examining the other formalizable indicators within the short list, which were also selected based on the Forum activities. When the objectives cannot be parameterized via mathematical functions (they are not formalizable), it is necessary to use another approach based on a range of possibilities—indicators that can be translated in qualitative levels (i.e. comfortable/uncomfortable, valid/invalid, etc.)—in order to connect/correlate these levels with the values of formalizable parameters through neural network algorithms. Both case studies present environmental and bioclimatic characteristics typical of the Adriatic city.

R.C. Grifoni • R. D'Onofrio (✉) • M. Sargolini
School of Architecture and Design, University of Camerino, Ascoli Piceno, Italy
e-mail: roberta.coccigrifoni@unicam.it; rosalba.donofrio@unicam.it; massimo.sargolini@unicam.it

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The objective is to identify a range of possible balances among the parameters, which could orient a wide range of different possible scenarios. Among the possible scenarios, we have hypothesized one that represents the current state (Scenario "0") and one that can be deduced from urban planning forecasting of the city (Scenario "1"). The different possible scenarios will be evaluated based on the choice of all the geometrical dimensions characteristic of an urban area (e.g. the compacity of the built area, urban density, etc.) as well as characteristics related to the land (soil permeability and impermeability, presence of greenery, etc.), which can vary with changes in the different designs that will pervade the Forum.

Identification of the "Pivot Partition" in the City of Ancona

The city of Ancona was classified with reference to the different "partitions" that characterize the ideal Adriatic city resulting from the integration of three interpretational keys: morphology, density, and building height. This interpretation was applied to the city of Ancona based on a 500 × 500 m mesh that allowed one or more settlement fabrics to be identified in each partition. This means of classification was described in Chap. 23.

Among the partitions identified, the experimentation was made in the historical centre of the city of Ancona (Fig. 24.1). The chosen partition was denominated "pivot partition" (Fig. 24.2). This partition was classified based on (1) the type of fabric; (2) the density (ratio between built space and open space), with reference to the GIS Urban Atlas; and (3) the building height (see the Regional Technical Map).

With regard to the type of fabric, this is a "compact network fabric" (Fig. 24.3). The street layout presents a network that defines the shape of the lots on which the buildings are situated, following the street layout. The mesh characterizing this

Fig. 24.1 View of the historical centre of Ancona

Fig. 24.2 Pivot partition

Fig. 24.3 Type of fabric in the partition: compact network fabric

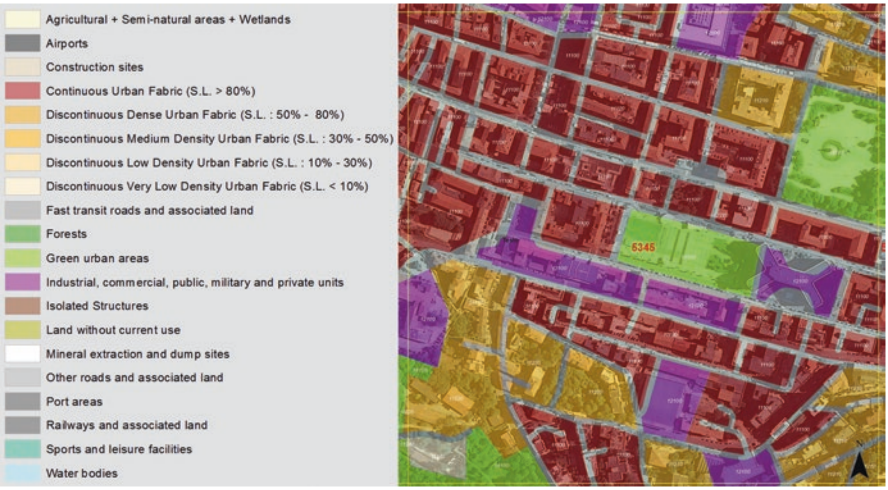

Fig. 24.4 Uses and heights in the pivot partition

category is composed of various sized buildings with courtyards that have an average height of four or five storeys. The ratio of coverage is high. The buildings occupy only part of the block, leaving space for green areas.

The partition lies in the old city, which is generally occupied by medium-scale buildings with internal courtyards. The average building height is about 4–5 storeys. Most of the buildings are rather old, though a few modern buildings are being built. The buildings are used mainly for residences, with shops present on the ground floor. The area also contains numerous public offices and buildings of historical/architectural interest (Figs. 24.4 and 24.5).

The height-to-width ratio of the urban canyons affects shading patterns and solar radiation, creating both positive and negative effects on the microclimate. Ancona's climate can be categorized as Mediterranean: mild, with summers that are usually warm and humid. Temperatures can sometimes reach 35 or 40 °C, especially if the wind is blowing from the south or west. Despite the statistical rarity of a heat wave, temperature records have been set repeatedly in recent years. Five years of meteorological data were examined and evaluated using the representative day technique to obtain a representative meteorological scenario for the summer and winter. The representative day is determined by actual data of the day in the period considered, where the sum of the mean-square differences among the monitored quantities averaged within each hour and the same quantities for all other days at the same hour is minimized.

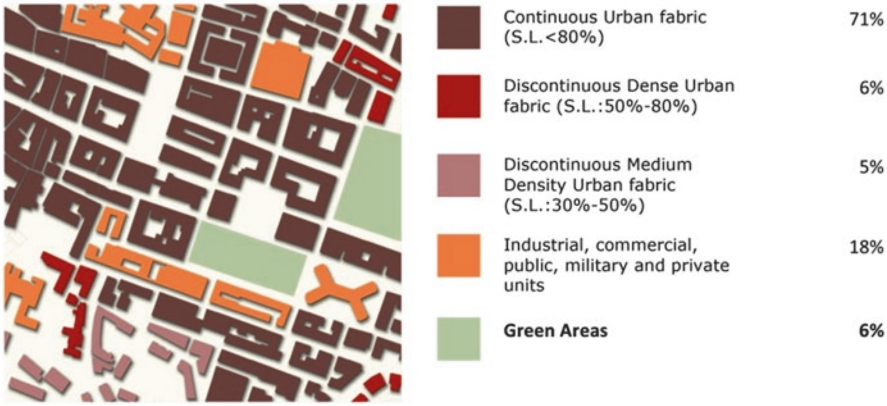

Fig. 24.5 Densities in the pivot partition

Application of the QLandQLife Tool to the Current State (Scenario 0) and Trend Scenario (Scenario 1) of the Pivot Partition

Construction of the Scenarios

The Tool uses indicators that assess the environmental performance of the partition pivot city. The mathematical algorithm within the Tool relates the different indicators (by pairs) in order to identify a range of possible balances among them, which could orient a wide range of possible scenarios. For the initial experimentation, the use of formalizable indicators was limited to the following:

- Compacity, which describes the amount of exposed building envelope per unit volume
- Permeability, which indicates how the land lets water pass through
- Energy consumption, which describes (1) the ratio of the buildings' energy loss to the solar energy gain and (2) the energy loss on a larger, city-wide scale, between the built area and the sky

The indicators listed above regard the "environmental performance" of the city, which influences the quality of the urban landscape and the quality of life of city inhabitants. For the permeability, the RIE (reduction of building impact) was used. This is an index of environmental quality that serves to certify the quality of the building intervention compared to the permeability of green areas and the soil (Fig. 24.6). It is defined by the ratio of pervious to impervious surfaces. One other indicator was also considered: the predicted percentage dissatisfied (PPD). This is an index that represents a quantitative measure of the thermal comfort of a group of people at a particular thermal environmental index.

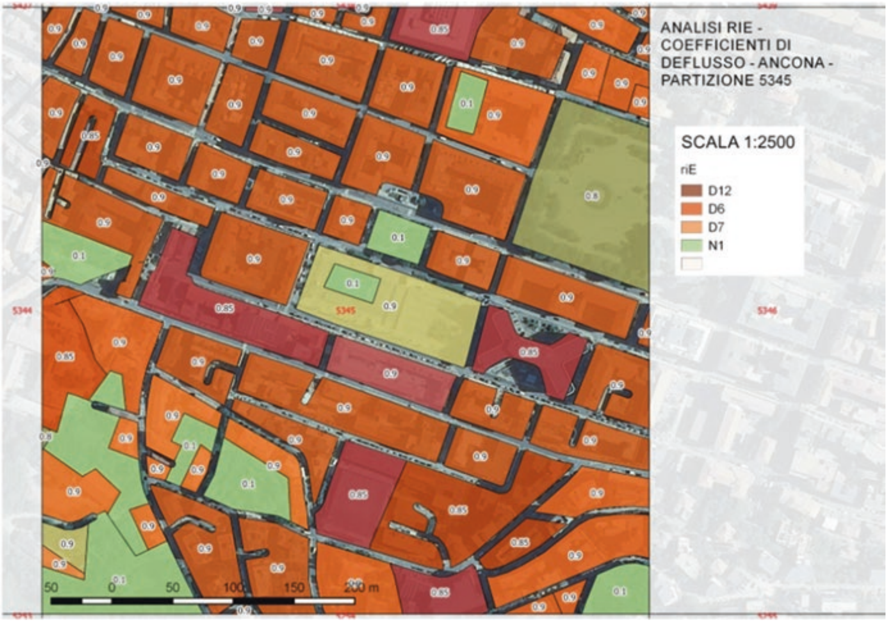

Fig. 24.6 RIE analysis: analysis-outflow coefficient-Ancona-partition 5345—Scenario "0"

Scenario 0 regards the current state of the pivot partition. In contrast, Scenario "1" (Fig. 24.7) was created with reference to the general and specific objectives of the Urban Agenda (Box 24.1) and planning included under the strategic metropolitan projects and in reference to Ancona's local plan (*Documento Programmatico del Piano Regolatore Generale*, PRG) (Box 24.2). These plans and programmes establish the following interventions:

– The restoration and redistribution of use of some public buildings and their energy renovation.
– The renewal of some open public spaces (12,500 m^2) by creating pedestrian areas, renewing the urban décor, planting trees, installing permeable pavement, and updating public lighting for energy savings along 3600 m of roads.
– Installation of photovoltaic panels on 8% of the rooftop area.
– Planting trees along 2640 m of streets.
– The creation of green roofs on 7% of the rooftop area. The introduction of green roofs would increase the amount of permeable surface, thereby increasing the albedo and helping to regulate water.

Figure 24.8 shows the types of pavement and covering proposed for Scenario 1 in order to improve the RIE index (Fig. 24.9).

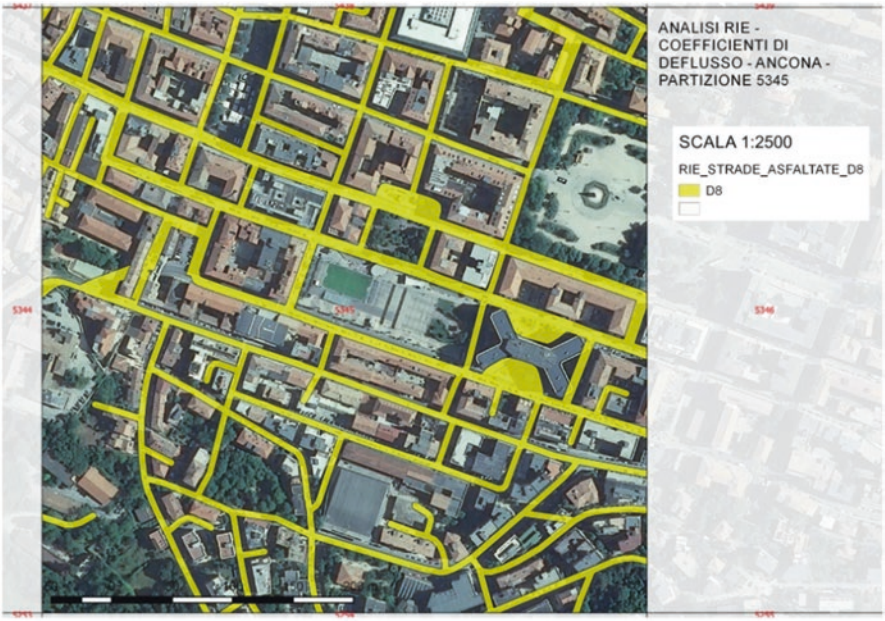

Fig. 24.7 RIE analysis: asphalted streets-Ancona-partition 5345—Scenario "0"

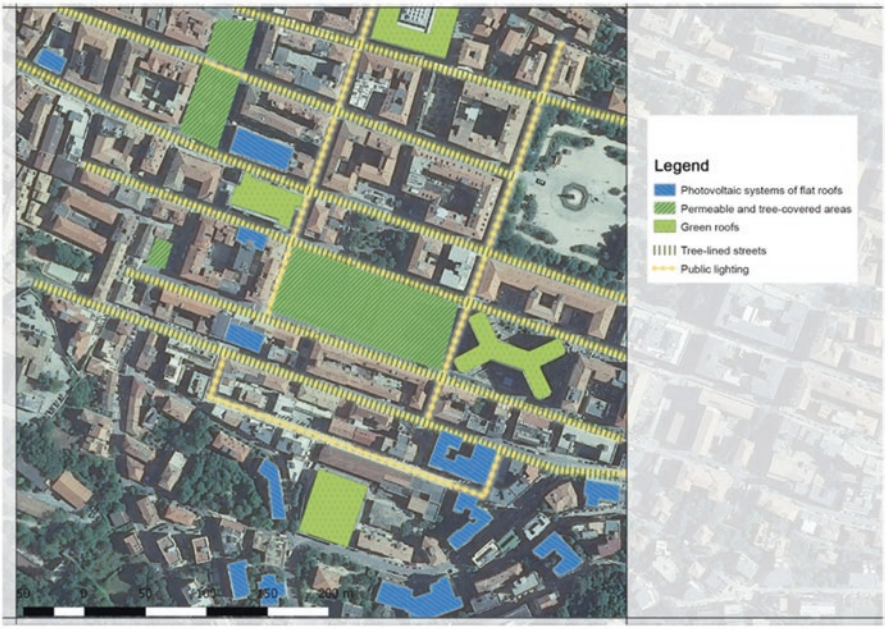

Fig. 24.8 Scenario "1"

Fig. 24.9 RIE analysis, Scenario “1”

Box 24.1 Urban Agenda

General objectives

These regard the redistribution of use in the city centre, in particular:

– Historical centre (Figs. 24.10 and 24.11)
– Spina dei Tre Corsi (Corso Amendola)

Specific objectives

These regard actions aimed at:

– Favouring the insertion of commercial and artisan activities related to service, innovation, and neighbourhood revitalization: food and wine, bookstore cafés, studios for handcrafts and local production, etc.
– Favouring the insertion in the city centre of commercial activities (medium sales structures).
– Favouring the use and transformation of buildings in the city centre to enhance tourism/accommodation.
– Develop currently underused commercial spaces (Mercato delle Erbe, etc.) to promote the use of historical and religious areas (Ex Convento di San Francesco, etc.).
– Maintain tertiary public functions (Palazzo Provincia, etc.).

- Assess the attainment of appropriate levels of public standards compatible with the fabric in the city centre (green areas, parking, education, services).
- Promote the development of the system of pedestrian routes in the Guasco San Pietro quarter and connections with the Cardeto Park.
- Promote the development of existing archaeological sites.

Fig. 24.10 Ancona: Lungomare Vanvitelli

Fig. 24.11 Ancona: Historical Centre, Corso Giuseppe Mazzini

Box 24.2 Local Plan (PRG)

The plan focuses on actions to favour:

- The renovation and enhancement of the chain of streets and squares from Piazza della Repubblica to Piazza IV Novembre as a continuous system of open spaces, subject to an international design competition.
- Redesigning Piazza della Repubblica, enhancing the entirety of the space and the integration of the buildings, eliminating the isolation of the Chiesa del Sacramento.
- The spatial renewal and functional revitalization of Corso Garibaldi.
- Redesigning Piazza Cavour (Fig. 24.12) as a vital space for connection, rather than separation, between the Spina dei Tre Corsi and Viale della Vittoria.
- Renovating Piazza IV Novembre, the pine grove, and pool area as the urban terminus of Viale della Vittoria.
- Regenerating the transverse streets to access the parks on the hills and to revitalize the functional building fabric.
- The creation of a continuous system of hilltop paths from the Passetto to the Cathedral and to the historical port, eliminating the gaps that currently exist near the military areas (Fig. 24.13).
- The creation of some transverse connections with the beaches at the foot of the cliff, recovering the existing historical paths.
- The construction of underground parking at the Cathedral and development of the square in front.
- Developing the archaeological complex composed of the amphitheatre and the areas between the Vie del Guasco, Birarelli, Ferretti, and Pio II (ex Convento di Santa Palazia). A large international design competition will be held in order to create an integrated museum system including the dynamic coexistence of excavations, the development and collective use of open spaces (also for events), and the creation of limited covered spaces for various uses.
- Completing the recovery of the San Paolo Bastion on the Cappuccini hill by restoring the Caserma Stamira (ex Convento dei Cappuccini) for the university and demolishing the old Forensic Police building.
- Completion of interventions to consolidate and secure the cliff.

Fig. 24.12 Ancona: Piazza Cavour

Fig. 24.13 Ancona: view of the city

Application of the Tool

As stated in the previous chapter, the parametric optimization programme ModeFRONTIER was used to minimize the compacity and the PPD. The parameterization allows different hypothetical development scenarios identified for the urban form to be tested for sustainability. As a result, it allows for the selection of those parameters that can best inform decision-making, governance strategies, and policies for change indicated as objectives for each hypothetical development scenario. The results presented here relate to the summer for its interest in combating the urban heat island (UHI) effect. The result is not a single solution but rather a set of solutions that dominate the other possible solutions.

As mentioned above, urban density is the distribution of elements on the ground such as houses, streets, empty plots, vegetation, etc. In addition, the space between buildings (including streets) and the average building height also contribute to the urban density, which affects the local climate and the thermal comfort of the inhabitants. According to Salat and Morterol (2006), the non-dimensional parameter compacity, C, is an interesting descriptor of urban morphology. It describes the amount of exposed building envelope (A_{ext}) per unit volume (V):

$$C = \sum_{\text{buildings}} \frac{A_{\text{ext}}}{V^{2/3}}$$

Compacity is sometimes called the "shape factor" because the higher the value, the less compact the building fabric is. This is advantageous during the summer since by reducing the building envelope exposed to the outside environment, the indoor-outdoor energy exchange during the summer and thus the energy consumed for cooling and ventilation are reduced.

The thermal conditions and the diversity of human responses to them are also important for assessing the quality of the built environment. To determine the thermal comfort of the environment, the predicted mean vote (PMV; Fanger 1970) was adopted. This widely used index predicts the mean value of the subjective ratings of a large group of people on a seven-point thermal-sensation scale (+3 hot, +2 warm, +1 slightly warm, 0 neutral, −1 slightly cool, −2 cool, −3 cold). Related to this, the predicted percentage dissatisfied (PPD) predicts the percentage of a large group of people likely to feel thermally uncomfortable in a given thermal environment. The indications to calculate PMV and PPD are provided in technical standard ISO 7730 (1994).

For the purposes of this research, the compacity and PPD for the urban fabric in an area of Ancona were considered. The result is not a single solution but rather a set of solutions that dominate the other possible solutions. With input data particular to this case study, as described above, a Pareto frontier to minimize both the compacity and the PPD was formed for the summer meteorological scenario after 60,000 runs.

Results and Validation

The results are shown in the bubble chart in Figure 24.14. Each data point is displayed as a bubble on a two-dimensional plot. The chart also has third and fourth (virtual) dimensions represented by bubble size and colour. Bubble radius represents building height, so the larger the bubble, the taller the building; bubble colour represents the temperature, where blue is colder and red is warmer.

A correlation thus exists between compacity and PPD, allowing the best values to be chosen from the non-dominated Pareto frontier that minimizes both quantities (Cocci Grifoni et al. 2016). The results show that compacity can be useful parameter when designing comfortable cities. Its optimization implies different planning/building layouts to improve thermal comfort, such as wide streets and medium-height buildings in places where the wind speed is low.

It goes without saying that lower temperatures are favoured for comfort in the summer, and this is clearly expressed by the simulations (blue bubbles in the figures). Furthermore, it is worth noting that temperature is the most important factor in the model and can be considered the leading parameter. To demonstrate this, a sensitivity study was made by running a series of simulations where the outdoor temperature was fixed but varied among the simulations from 25 to 35 °C (Fig. 24.15).

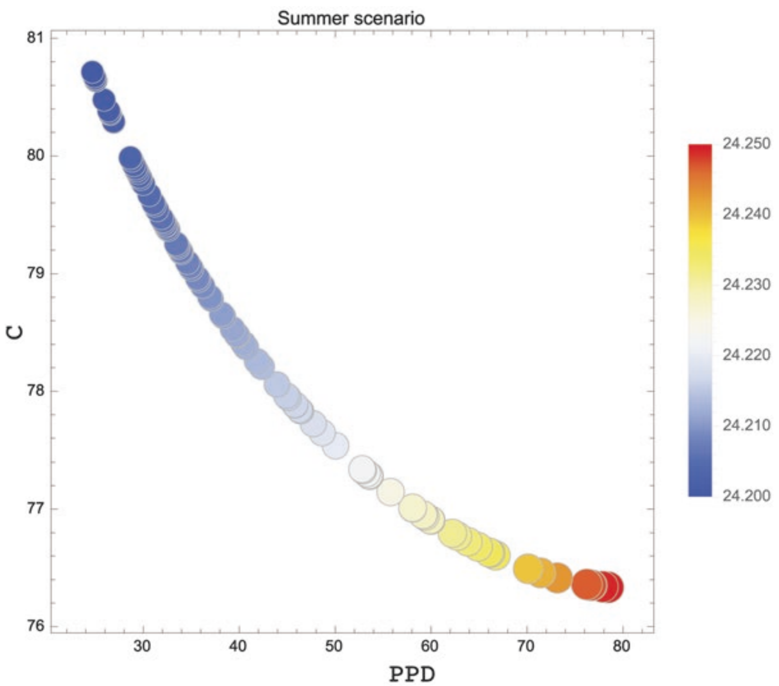

Fig. 24.14 Pareto frontier of solution clusters for the summer scenario. The compacity is on the *y*-axis and PPD is on the *x*-axis

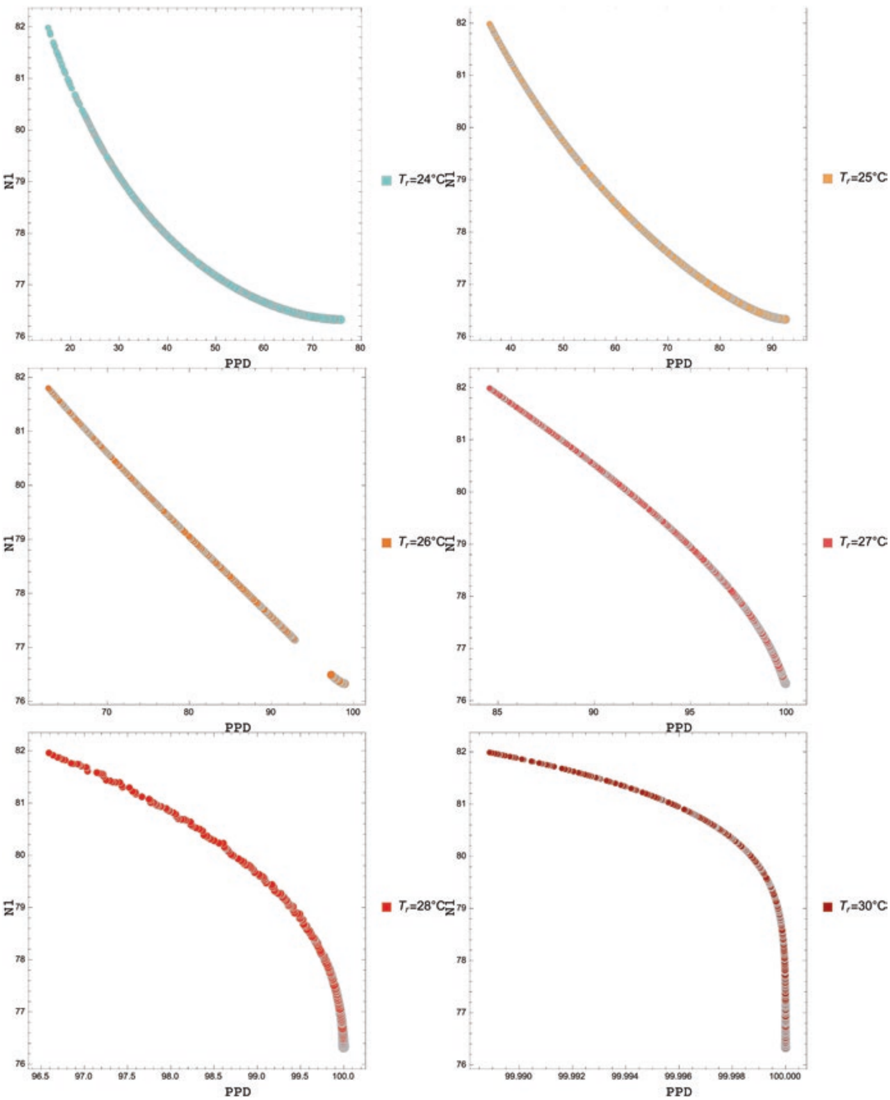

Fig. 24.15 Pareto frontier of solution clusters for the summer scenario. The compacity is on the *y*-axis and PPD is on the *x*-axis for different temperatures

Above 33 °C, there is no Pareto frontier for our model, so solutions do not exist. Furthermore, while a Pareto frontier is possible for temperatures below 33 °C, temperatures above 29 °C do not in reality provide a solution since the scale of the horizontal axis extends over only one value: 100% dissatisfaction. This again reflects the fact that, for more comfort, lower temperatures are preferable in the summer. Therefore, temperature determines not only the number of solutions but also if solutions exist or not.

The temperatures examined are not at all extreme for summers in Ancona but represent typical real values in the representative summer scenario. This analysis shows that the external temperature can be considered the “dominant” variable in planning. On the building scale (measured by compacity), increasing the external temperature leads to an inversion of the Pareto frontier. Thus, for temperatures greater than 33 °C (in the case study presented here), there are no possible solutions.

Outdoor temperatures are increasing due to climate change, and Italy in particular has seen a higher increase in temperature compared to the European average. The analysis thus highlights the importance of reducing the outdoor temperature with physical elements such as green areas and green canopies. In addition, integrating green infrastructure, e.g. tree-lined streets, lawns, and green roofs and walls, into the urban landscape has the potential to cool the urban microclimate by providing shade and evapotranspirative cooling while reducing heat storage.

To assess the effects of green areas in the city, the RIE index and PPD for the urban area of Ancona were then considered. As defined in the previous chapter and as mentioned above, the RIE index indicates the presence of pervious surfaces and serves as a numerical index of environmental quality. It is applied to a building lot to assess soil permeability and the extent of green areas, and it expresses the ratio between the elements that modify the land and the management of storm water. The modification of the land may be positive for improved water collection or negative for smaller water runoff. A higher RIE index corresponds to better land management with regard to the quantity of infiltrated storm water and more benefits for the microclimate and environment. As in the case of compacity and PPD, the result is not a single solution but rather a set of solutions that dominate the other possible solutions. As Fig. 24.16 shows, there is a correlation between RIE and PPD, allowing the best values to be chosen from the non-dominated Pareto frontier that minimizes the PPD and maximizes the RIE index.

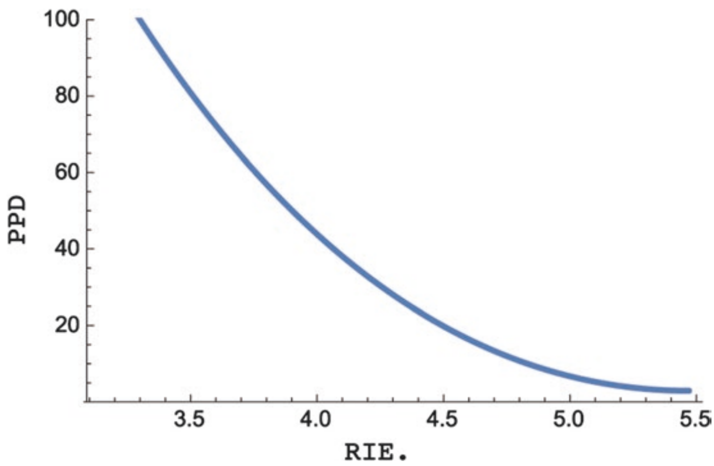

Fig. 24.16 Pareto frontier of solutions for the summer scenario. The PPD parameter is on the *y*-axis and RIE is on the *x*-axis

The analysis indicates a strong correlation between a decrease in the perception of discomfort and the appearance of large green (pervious) areas in the city. Vegetation provides a source of moisture for evapotranspiration, the movement of water back to the atmosphere as water vapour. In fact, the energy used for evapotranspiration is transformed into latent heat, because it is only released when the water vapour molecules condense back into water as they are cooled in the upper atmosphere.

To validate these indications, an interesting area was chosen as an example of "best practices" applied to environmental planning, which concerns itself with the decision-making processes. This is the city of Pineto, as highlighted in the introduction, a town of about 14,000 people in the province of Teramo (the Abruzzo region in Central Italy). For this city, a new PRG is being drafted along with the preliminary planning document (*Documento Programmatico Preliminare*, DPP). The PRG adopts the theory that sustainable planning imposes a cultural revolution that should know how to reinterpret relationships between the different physical and environmental, morphological, historical, and socioeconomic components of Pineto with a transdisciplinary approach aimed overall at ensuring the sustainability of the transformations.

The DPP also foresees the creation of green wedges (an urban park and an agricultural area) at the northern edge and south of the experimentation area and a linear park towards the north along the border with the coastal hills; these will be crossed by a cycling path with connection to central Pineto. Other projected interventions deal with securing the area from the risk of landslides and floods, through the realization/maintenance of artificial drainage canals.

To give an idea about the expected effects of the planning choices contained in the PRG and DPP, simulations were run using a computational fluid dynamics tool (i.e. ENVI-met). ENVI-met (Bruse and Fleer 1998) is an efficient tool that analyses micro-scale thermal interactions in urban environments. It is a user-friendly tool that aims to reproduce major processes in the atmosphere that affect the microclimate on a well-founded physical basis (i.e. the fundamental laws of fluid dynamics and thermodynamics). It is a three-dimensional non-hydrostatic model used to simulate surface-plant-air interactions inside urban environments.

Simulations were run for the daytime, because daylight hours represent the time of the day when outdoor spaces are used regularly. Calculations were performed during the summer period and in two different scenarios: an *ante operam* configuration and a *post operam* configuration (Cocci Grifoni et al. 2011).

Figure 24.17 shows the ENVI-met output (PMV index) for the first simulated scenario (*ante operam* configuration). The colour map shows high values for the PMV at almost every point, representing the rather poor (hot) thermal comfort conditions. For the second simulated scenario (the *post operam* configuration), the colour map (Fig. 24.18) shows lower values for PMV index at more points (viz. the green belt and green corridors in the blue areas), resulting in a better comfort conditions.

The cooling effect of the green belt and green corridors is therefore very important for improving thermal comfort and the quality of life. These results represent

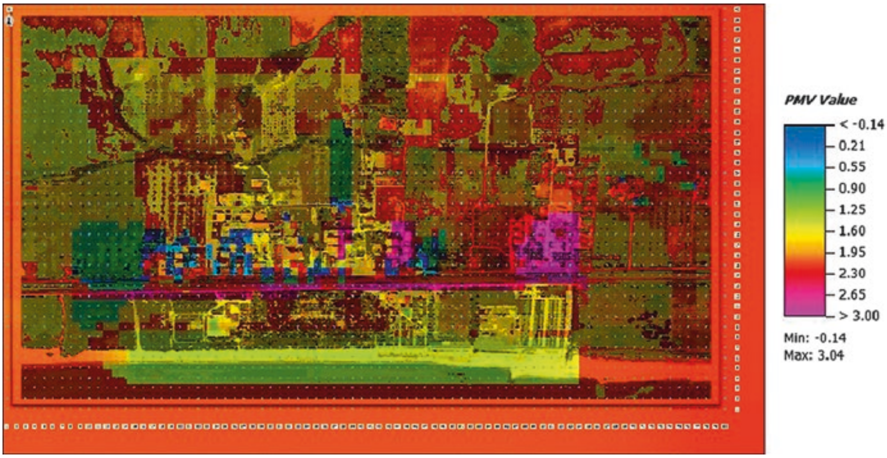

Fig. 24.17 Map of PMV index (ENVI-met simulation) for the *ante operam* scenario

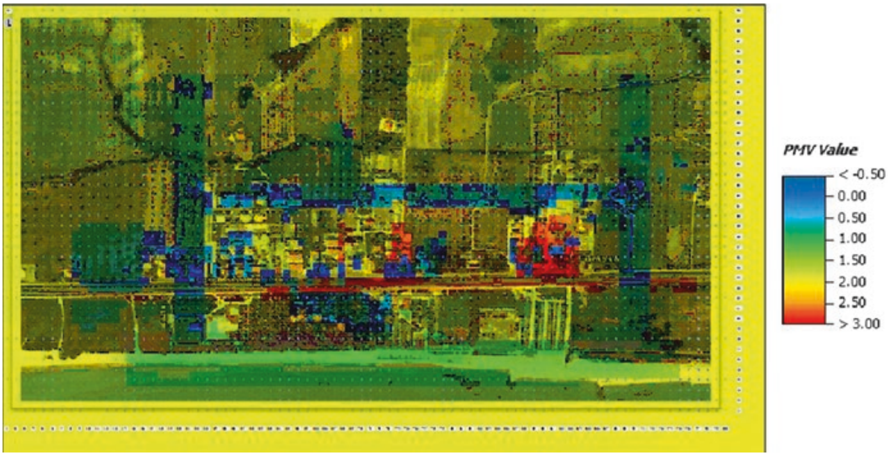

Fig. 24.18 Map of PMV index (ENVI-met simulation) for the *post operam* scenario

benefits for the local government when taking measures to alleviate environmental thermal problems in the city and to achieve more sustainable development at the local level. This initial result, applied to a typical Adriatic city, shows how important it is to mitigate the increase in temperature from a planning point of view. This research highlights a series of possible solutions that would allow energy consumption to be reduced while also improving thermal comfort for users.

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Chapter 25
Interaction with Decision-Makers

Rosalba D'Onofrio and Massimo Sargolini

The changes in the market economy and social context that have been widely described in this volume form the background and reference for innovations introduced as much in participatory processes as in the practice of urban planning. If we place the relationship between environmental sustainability and quality of life of citizens at the focus of urban policies, it is necessary to address questions ranging from the reduction of waste and efficient use of resources to the conservation and hydrogeological balance of the land and from the reorganization of infrastructure and immaterial networks to the formation of an ethic of collective goods. This is to ensure real sustainability in processes of enhancing and using the goods, avoiding irreversible consumption. All of this forces the behaviour, habits, and lifestyles of inhabitants and operators to be redefined, imprinting them with a more conscious, responsible use of the territory, etc.

These are questions that circumscribe a very hot topic in recent European policies, which have not curtailed the promotion of actions aimed at (1) supporting the transition to a low-carbon-based economy; (2) promoting the adaptation to climate change and the prevention and management of risks; (3) preserving and protecting the environment and promoting resource efficiency; and (4) incentivizing sustainable transport and improving network infrastructures. More than €10 million from the European Regional Development Fund will be assigned directly to these strategies, focusing attention especially on urban areas, where a large part of the abovementioned problems are found and where more than half of the world's population is concentrated.

Cities are in fact the urban organism that, in its multiple forms and continuous evolution, constitutes the favoured area for experimentation with the desired change in paradigm. This is because cities are social organizations built functionally for

R. D'Onofrio (✉) • M. Sargolini
School of Architecture and Design, University of Camerino, Ascoli Piceno, Italy
e-mail: rosalba.donofrio@unicam.it; massimo.sargolini@unicam.it

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humans' various needs and therefore the space in which citizens find answers to their demand for well-being and quality of life.

In this sense, the Adriatic city was considered an appropriate area of study to address the theme of quality of life of city inhabitants within cities in a new way, focusing on the key questions mentioned above: the reduction of waste and the efficient use of resources (human capital, land, landscape value, environmental quality, energy); the conservation and hydrogeological balance of the land; the reorganization of infrastructure and immaterial networks; and the formation of an ethic of collective goods.

Our case study was addressed starting from other positive experiences in Europe and in particular the "Smart City Wien" initiative launched in 2011, which created many advances in transport, housing construction, urban development, environmental protection, supply and waste disposal services, as well as social services for the population. In this guiding experience, optimal results were obtained, thanks to a cooperation agreement between Vienna's mayor and the Federal Minister for Transport, Innovation, and Technology. The careful study of a model like this was an important step before entering our study area.

Revisiting Planning Practices

In the case of Vienna, an attempt is being made through the framework strategy to create a smart city by 2050, which means obtaining the best quality of living for all people in the city combined with maximum resource preservation, which is brought about by comprehensive innovations.

The background to this initiative also contains the goals of the European Union to address climate change, end the dependence on fossil fuels, make use of renewable energy resources, and develop sustainable conversion technologies and services. In this sense, the objectives related to sustainability coincide with those tied to increasing the quality of life.

It is clear that to emulate the case of Vienna and, at the same time, activate many of the European policies aimed in the same direction—including the 2014–2020 Cohesion Policy, which is particularly aware of themes of improving the quality of life in cities—the decision-making system must be reorganized, looking for appropriate arguments for governance choices and favouring the participation of local communities. Analogous experiences are being addressed in other European countries. Regarding experiences in Italy, we recall that Law 10 February 2013 "Norme per lo sviluppo degli spazi verdi urbani" (Regulations for the development of urban green spaces) aims to promote the development of urban contexts according to what was established in the Kyoto Protocol. That is, urban areas are developed in accordance with the objectives of sustainable development and respectful of the environment and citizens, who become aware of and understand the therapeutic role of their green heritage.

The important role of open green space in cities to improve the well-being of citizens is well known, and the participation of interested populations in designing these living areas is an unavoidable step in the activation process. It is clear that the decision-maker charged with activating the National Green Plan could not hope to do so without establishing deep connections with tools, laws, and national and international programmes regarding these themes (such as the Convention on Biological Diversity (CBD), the 2011–2020 Strategic Plan for Biodiversity, the Charter of Rome on Natural and Cultural Capital, and the National Strategy for Biodiversity). It is also not possible to do so without implementing appropriate processes to create educational and awareness-raising paths for the population before requesting their proactive participation.

One should keep in mind that the problems inherent in activating the abovementioned objectives include not only the uncertainty of current ecological, social, and economic changes, for which it is difficult to predict the results. There is also the fact that the disciplines that have guaranteed the activation of urban planning processes for territorial and urban reorganization are experiencing an overall crisis and a refusal by public administrations which has led to a substantial resizing of urban planning procedures in city government. As often happens, when a new position is taken with respect to new political needs and requests, it is easy to lose sight of the virtuous operation already implemented and the experiences from which important teachings for innovation can be drawn. Therefore, for a decade already, technical activities in town and regional planning have been limited to determining the feasibility of territorial-management initiatives that were promoted without a general framework of reference and which were based on private business initiatives, marginalizing and losing sight of more general, systematic strategic visions. It follows that the proposal for a new planning paradigm and new visions capable of responding to the current period of profound changes cannot help but lead, at least in part, to a more comprehensive rethinking of the conditions to exercise territorial government and therefore to the decision-making process that accompany the policies.

The Essentialness of Argumentation in the Participatory Process

It is extremely important that actions to protect and enhance the landscape and improve the quality of life in urban areas fall within an overall strategy of local development in which priorities for intervention and the consequent actions, implemented with the community's contribution, are identified. There are different means through which citizen participation is developed in public choices. The three most cited are (1) one in which participation is used as a passkey with respect to predefined choices, which are already executive and inviolable; (2) one in which participation becomes a tool to speak for weak or traditionally excluded social subjects, considering such requests to be uniform and generalizable; and (3) one which instead starts with the assumption that society is pluralist, where participation is an interactive encounter/confrontation among citizens that have different or contrasting ideas, points of view, or interests. The diversity of ideas is viewed as an asset rather than a problem and is used to favour the introduction of development paths and smart, innovative management. Since the last approach was chosen by the QLandQLife research, there is an evident need to ensure clear arguments in support of or against theses and assumptions. In this sense, in the case study of Pineto, where the Forum was implemented along with the discussion of different opinions, the model of urban parameterization was applied to a recently built neighbourhood in Pineto along the Adriatic State Highway (SS-16). The goal was to verify the environmental and morphological compatibility of the design proposals contained in the preliminary planning document (*Documento Programmatico Preliminare*, DPP). This design proposal was built on a series of meetings with citizens and interest holders (Forum-charette) and based on SWOT analysis (strengths, weaknesses, opportunities, threats) to assess the current state and future plans. Based on what emerged from the Forum and SWOT analysis, with particular reference to environmental quality and the safety of inhabitants near a very congested road, a design solution was identified that responded to the desires of the administration and citizens. This was verified by (1) characterizing the weather/climate of the city and its different parts; (2) analysing its density as a function of geometric factors; and (3) assessing the permeability of the land and its use.

The scope of the discussion was not only to assess the possible solutions in terms of reaching the objectives but also the different types of impact that these have for the players involved and the territory of reference. Therefore, for example, a process to build environmental and landscape policies in a given territory requires the definition of a set of actions/reactions/interactions within which different reasoning and interests from the different actors involved can be compared, likely generating conflicts. Even before this, however, there can be conflict in the way to read and interpret the territory, between local knowledge and expert knowledge. Combining these two areas of knowledge ensures that technical problems are not detached from the social context and also that a plurality of participants in the process are actively involved and contribute to making legitimate decisions from different points of view. Operating in this way increases the possibility of eliminating possible conflicts and finding effective solutions to problems, improving the trust of citizens and the credibility of public institutions.

This wide involvement favoured, for example, the same applicability and acceptability of the assessment procedures in the case of sensitive questions. When citizens intervene in choosing the set of indicators used to assess policies and projects, it is even easier to help local administrations to better define the problems and find adequate solutions. Likewise, anchoring the indices within reasoning for the decisions could ease the probable renegotiation and reconsideration of some choices that could intervene in the face of unexpected events.

The Need to Start Again from Strategies

The processes and effects of government are the intentional or unintentional result of not only institutional action of numerous players with public authority (government) but also the interaction among a plurality of actors (public, private, service sector, etc.) involved in a variety of ways that generate governance effects and well-defined physical/spatial results. In the experience of Vienna, it is not by chance that the Memorandum of Understanding the City of Vienna and the Federal Republic of Austria with the aim of supporting the goal of Smart City Wien played a very important role.

The development model determining the transformation of defined portions of the urban territory destined for high-class housing, shopping centres, and exhibition areas that contrast and are separated from areas that are abandoned or of lower prestige has run its course. This very probably runs counter to fewer large projects, which have been substituted with numerous smaller pointlike projects fixed within definite strategies understood as systems of well-calibrated spatial and economic choices.

In the case study of Pineto, this approach was supported by intense Forum activity, which guaranteed:

- A close relationship between the decision-maker, public entities, experts, and beneficiaries/users of the policies and projects proposed and subsequently implemented
- A breeding ground of ideas, from which politics and technical knowledge can extrapolate aspects for strengthening and integration, and those that still need to be incentivized
- The accountability of communities and other various actors. Local development and territorial self-sustainability require active citizenship and a propensity for collaboration on which civic involvement and association are based
- Control of achieving benefits through the involvement of numerous interest holders who have expressed themselves regarding different questions
- The development of a learning mechanism through which the different actors can acquire skills and knowledge in order to interact in a dynamic, creative way

In this sense, the construction of the strategic choice by the decision-maker benefits from an intense, organized, reasoned relationship between the mathematical model and interaction with the population while respecting some basic conditions:

1. The entire process is considered to be an open process, in the sense that the final output is not set as an exclusive objective so much as to make the entire assessment/interpretational process available in its different phases, developed through the Tool and interaction with stakeholders. In this sense, there should always be a trace of the interpretational framework and the progressive variations introduced.
2. The decision-maker is able to intervene in the different phases of the open evaluation process starting with the identification of the indicators, both when interpreting the current state and when critically analysing the current programmes or constructing the evolving strategic proposal. The decision-maker gathers the most appropriate means and makes suggestions based on the formalizable technical

considerations and the impressions of stakeholders, who become the main actors in the Forum.

3. The decision-making process assumes an iterative, circular character, with the possibility of feedback at each step of the interpretational and decision-making stage, including the final decision. In each step of the process, there is always the possibility of reopening the reflection based on the specific request of the decision-maker, leading to the evaluation of data and different interpretations.

These three basic considerations guided the decision-making process within the Adriatic city case studies (Ancona and Pineto). The different stages of assessment that the decision-maker can use to address the final choice consider:

- Scenario 0, based on the data present in the literature, made available by administrations and interpretations of the ideal Adriatic city (see Chap. 23)
- Scenario 1, which is achieved by applying the Tool and the Forum to current planning and programming policies. In our case studies, the references were the AMMA and the Urban Agenda for Ancona and, in the case of Pineto, the DPP preparatory to the drafting of the general urban planning tool
- Scenario 2, which foresees the formulation of new structural hypotheses for the area, considering the real effects on the quality of life based on the evaluation tools implemented and suggestions made through the Forum

In the two case studies investigated, Scenario 2 introduces new products and organizational solutions that characterize so-called smart cities and which regard:

- Public and private transport, integrated logistics, and mobility
- Standards of service provided by public administrations
- Integrated digital management services

The focus is concentrated on:

- Transforming urban areas into centres of innovation and technology
- Ensuring social cohesion and integration
- Reducing ecological footprints and enhancing climate neutrality and exploiting technological solutions to achieve efficient and sustainable urban areas

In this age of globalization, climate change, and cultural diversity, some strategic actions identified are more closely tied to increasing the quality of life in the two cities (Ancona and Pineto). These include:

- Greening the urban landscape, favouring the improvement of the climate in important swaths of the city, eliminating or mitigating heat islands, introducing news forms (urban gardens, urban agriculture), and offering spaces for outdoor living, which are important for citizens' free time.
- Managing urban stormwater in a way that facilitates robust, synergistic, and multifunctional green infrastructures that will address the present and future climate and other changes in dynamic urban areas.

- Reducing the vulnerability of urban areas and citizens to pluvial flooding, which causes serious damage to the urban environment, and involving citizens in monitoring rainfall and flooding, making use of low-cost sensors and web-based technologies.
- Studying and making the most of interactions between urban forms, economic welfare, and energy use by and emissions from households and firms, increasing urban density and city size to reduce average household energy consumption.
- Increasing the quality of public open space (squares, parks, green space) as a community service, using information technology to reflect the needs of different social groups. Public spaces should favour the integration of built and open spatial forms and offer a place for interaction among generations and ethnicities.
- Making public transport more efficient and facilitating its use by citizens through the installation of an open Wi-Fi network. From the bus or the metro, citizens, tourists, and travellers in general can calculate the best route using all means of public transport (bus, metro, tram).
- Introducing the concept of *modal shift* (using all the different system of public and private transport) and presenting effective solutions to ensure that innovation becomes operational, facilitating the participation of all stakeholders in evaluating alternative transport and logistical measures that minimize disruption and nuisance and improve energy efficiency.
- Integrating road transport, cycling and walking, and public transport, creating a broad range of devices, including electronic fare cards, real-time public transport information, and automated vehicle tracking.
- Improving the walkability of cities via three actions: (1) assessing the conditions provided to pedestrians; (2) estimating the costs and benefits of promoting walkability; and (3) developing a navigation system by combining specific criteria with pedestrian preferences. The improvement of walkability is one of the most important dimensions of smart sustainable and inclusive cities.
- Integrating different networks (natural gas, electricity, and heating/cooling are almost always planned and operated separately from each other) and identifying opportunities for synergy among the networks in order to increase the reliability and robustness of energy supply.

In conclusion, the strategic visions that transition urban areas into a more sustainable and resilient future should be conceived as a collaborative process that involves all key stakeholders—from public and private organizations to private individuals—in order to improve the quality of life in the city. This requires a well-devised and structured collaboration between interpretations and assessments from technicians, impressions and suggestions from the population (interacting through the Forum, beginning with the phase to define the indicators used to monitor the state of health and the quality of the city), and the responsibility of the decision-maker. The use of big data, evaluation tools, and new enabling technologies and methods that support these participatory approaches is especially promising in this context.

Part VI
New Research Frontiers

Chapter 26
Urban Agriculture for Urban Regeneration in the Sustainable City

François Mancebo

Dense cities are often perceived as universal models for urban transition to sustainability (Williams et al. 2000). Of course, there is a strong case for considering high urban density as a requisite for sustainability, if only because sustainability usually means making a better use of what is already there—for example, recycling the urban fabric and urban functions without going through phases of degraded neighbourhoods (Whitehead 2003). This is all well and good, but it should be accepted nevertheless that low urban density offers some advantages as far as sustainability is concerned. It reduces the concentration of nuisances and pollution and lowers the density of urban centres that are sometimes on the brink of congestion (Neuman 2015). Besides, climate policies introduce new arguments for low-density urbanizations. Green neighbourhoods planted with trees presenting a high water loss coefficient can lower the local temperature (Boutefeu 2007). In low-density areas, more square metres of roof per household are available than in high-density areas; thus, generalized photovoltaic roofs can be significant. Such facts compel us to cast an eye without prejudice on the very notion of sustainable city, which does not consider from the start that "sustainable" means "dense".

Furthermore, sustainability cannot be addressed within the limits of the urban centres. For example, any city—be it sustainable or not—has to provide water and energy to its inhabitants while reducing pollution and processing all the urban waste (Elliot 2006). Beyond all the well-known technical solutions—smart grids, selective sorting, urban heating, wastewater treatment plants, intelligent buildings, etc.—the energy, the resources, the water, and the food still come from outside the city limits. Sewage plants and garbage dumps are also outside. Even a large number of people working in the city live outside, when they cannot afford to live anymore in the expensive—and sometimes gentrified—densely built city (Burton 2001). Cities

F. Mancebo (✉)
IATEUR International Research Center on Sustainability (IRCS), Rheims University, Rheims, France
e-mail: francois.mancebo@univ-reims.fr

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benefit from what David Pearce calls imported sustainability (Pearce et al. 1989), that is, when an unsustainable place looks sustainable by giving to other places the burden of its sustainability: exporting pollution and polluting activities while siphoning resources. Thus, it is not possible to address urban sustainability issues by considering only urbanized areas and densely built urban centres. It is crucial to design sustainability across areas large enough to include most of the fluxes of the urban metabolism, which means areas encompassing suburban, peri-urban, and dependent rural or natural places (Wheeler 2004).

As a matter of fact, the social, economic, and cultural transformations of the last few decades have produced deep changes in how people live. Today, urban areas have either no boundaries or very fuzzy ones, as shown by Bernardo Secchi with the notion of *Citta Diffusa* (Secchi 2002) or by Thomas Sieverts with the notion of *Zwischenstadt* (Sieverts 1997). Why on earth are we supposed to set up a false dichotomy between urban and rural area, given that lifestyle, facilities, and amenities are not so different? Time has arrived to think different: No, high urban density is not the be all and end all of transition to sustainability. No, it is not possible to address urban sustainability issues by considering only urban centres. The whole rural-urban continuum has to be addressed.

Is there already a new type of urban arrangement, that if generalized would deeply transform the city while contributing to a more sustainable future all through the rural-urban continuum? Yes, there is one, and its name is urban agriculture: a way of counteracting urban sprawl by what could be called "rural sprawl", via the introduction of rural characteristics such as farming within the city.

Different Types of Urban Agriculture, Not All Sustainable

What do we really call urban agriculture? Urban agriculture looks first like an oxymoronic and elusive term (www.fao.org/docrep/003/w1358e/w1358e07.htm). Urban agriculture is not only about food and landscapes, and urban agriculture production can certainly not be sufficient to feed a whole urban area, anyway. What specific services may urban agriculture bring to a city and what nuisances and unexpected consequences may result are important though too often dodged issues.

Basically, urban agriculture is the practice of cultivating, processing, and distributing food in a city (Bailkey and Nasr 2006). This notwithstanding, there are very different types of urban agriculture that don't have much in common except that all are about growing edible plants: intensive vertical farming, micro-farming, kitchen and community gardens, etc.

Let's consider *vertical farming*—cultivating plants or breeding animals within tall greenhouse buildings or vertically inclined surfaces (Hough 1995). Vertical farming takes form in several ways: crops being grown in along the interior floors of mid-rise buildings, 30-foot apparatuses that rotate crops on belts (http://www.verticalfarm.com/), rooftop farming, tree-like skyscrapers, and agritectures (http://

agritecture.com/). The point of this farming laden with eco-technologies is exploiting synergies between the built environment and intensive—if not industrial—agriculture (Caplow 2009), with recirculating hydroponics and aeroponics that significantly reduce the amount of water needed, systems to collect rain and treat wastewater, producing photovoltaic green energy, etc. (Brown 2012).

But let's go back to the source of modern vertical farming. Dickson Despommier started using the term in 1999, first to qualify the cultivation of plants on flat roofs and then inside retrofitted empty mid-rise buildings (Despommier 2010). And, by the way, it was Gilbert Ellis Bailey who first coined the term "vertical farming" in 1915, long before anybody heard about sustainability (Bailey 1915). This is quite different from the brand new smart buildings—tree-like skyscrapers and high-rise agritectures—proposed today as the paragon of urban agriculture. Besides, these projects remain projects: no one was ever built, which says a lot about their feasibility (Vogel 2008). In real life, vertical farmers are far more modest and much closer to Despommier's intuition: three-story building, with solar panels on its roof in the South Korean city of Suwon and three floors underground in the city of Den Bosch in the Netherlands, cultivated without sunlight by a private company—PlantLab.

As beautifully put by Stan Cox and David Van Tassel, modern vertical farming looks like a dreamy idea with a solid financial and political hidden agenda that would ultimately become more industrialized than traditional agriculture (Cox and Van Tassel 2010). Such a type of urban agriculture is all but sustainable.

For example, there are many good reasons why high-rise buildings do not already have trees. Nearly every climate variable is more extreme than at street level. As mentioned by Tim De Chant: "If-and it's a big if-any of these buildings ever get built, odds are they'll be stripped of their foliage quicker than a developer can say 'return on investment'" (De Chant 2013). Besides, how are these trees going to be watered and fertilized? Concerning cattle, what would be the real productivity of such farms, when a single cow needs more than 1.5 ha of grassland in its life. And, well, even vegetable crops grow better on natural soil than indoors or on roofs (Ladner 2011). As a matter of fact, generalizing vertical farms would require significant technological breakthroughs. As pointed out by Saskia Sassen, it is not feasible simply to plop down a new technology in an urban space (Sassen 2011). How the urban fabric may be inclusive of this type of farming?

When trying to determine if urban agriculture may contribute to a sustainable future, the first question to ask is: will this agriculture be at the service of the inhabitants—and not the other way around. Indeed, it is crucial to keep in mind that the "environment", far from being pure transcendence, is embedded in societies (Hajer and Versteeg 2005). Thus, to address urban sustainability, it is crucial to know what a "good environment" is for the people and the communities living there: one in which the enhancement of environmental conditions stricto sensu (water quality, air, biodiversity, prudent use of resources, land and energy, etc.) improves living conditions and facilitates new lifestyles (Mancebo 2013). The success of urban agriculture depends on its local ownership by the people (Greenfield 2013).

Urban Agriculture Is a Common Good

All of the above leads to consider that to design a more sustainable future in the rural-urban continuum, we should rather focus on a more traditional type of urban agriculture made of community gardens, kitchen gardens, crofting and micro-farming, land sharing, low-rise rooftop gardens, or schoolyard greenhouses—which are different things but strongly linked to each other, not least because they develop the potential for people to exercise significant influence over the place where they live (Mougeot 2005). The point is bringing longer-lasting change, in the spirit of Rob Hopkins' *Transition Towns* (Hopkins 2008).

This urban agriculture varies a lot according to the climate, the cultural background, and the economic and social situation of the city. In many urban areas of Central America or India, urban agriculture is essentially a food security issue, related to fight against poverty and malnutrition (Smit et al. 1996). The situation is quite different in European (Fleury and Donadieu 1997) or North American cities (Reyburn 2002). There, urban agriculture is mainly seen as a social innovation that contributes to improving the quality of life, fostering social links among neighbours, and enhancing urban landscapes. For example, many official urban agricultural projects result from "greening" agendas, created under the umbrella of the "Green New Deal" which aims to address global warming and financial crises rather than food issues as mentioned by Tim Jackson (Jackson 2009). In many other cities, the landscaping aspect and recreational dimension are highlighted.

In any event, all these urban agricultures—whatever their forms, their goals, and their means—share significantly common features, which result from the fact that they have been there since time immemorial, from the very beginning of the cities actually (Jacobs 1969). In medieval times, when walls and defensive structures left out most of the farmland, agricultural patches were available inside the city and next to the city walls (Cockrall-King 2012).

Thus, urban agriculture is not such a fresh idea. Moreover, it is certainly not an offspring of sustainable development. It has existed for a long time, in very different places around the world, such as the *chinampas* in Tenochtitlan, the actual Mexico city, since the fifteenth century or sooner (Torres-Lima et al. 1994); the *hortillonnages* in Amiens, a French city north of Paris, for more than twenty centuries (Clauzel 2008); or the interstitial gardens (*agriculture d'interstice*) of Yaoundé, Cameroon's capital, which accompanied the foundation of the city in the nineteenth century (Dauvergne 2011). Indigenous people in South America have long used vertically layered growing techniques within their cities, and the rice terraces of East Asia follow the same principle, as were the hanging gardens of Babylon, thousands of years ago.

But while cities and agriculture have long been inseparable and mutually reinforcing, everything changed during the twentieth century: increased mobility and progressive globalization made pointless the previous need for geographical proximity between the farmers and the urban consumers. Farming was more or less banned from the city, under the combined forces of urbanization and planning regulation (Tornaghi 2014). The new craze for urban agriculture, in the form that we are dealing with in this paper, began 20 years ago. It renewed—but also transformed deeply—the old tradition of nineteenth-century backyard gardens. Beyond allotment gardening, urban agriculture is appearing in front lawns, kitchen gardens, pavement verges, railway embankments, and any interstitial spaces. In many ways, the citizens involved in urban agriculture claim ownership over the city and particularly over the policies and projects developed by the city (Reynolds 2008).

In this sense urban agriculture proposes a radical remaking of the urban, which breaks with the urban-rural dichotomy and paves the way to a reinvention of the urban form. One among the many challenges of urban sustainability is re-establishing the inclusiveness of the urban fabric instead of just popping up parks, green spaces, or smart buildings: the current regional master plan of Paris proposes—as an important means to foster sustainability—a quantitative objective of 10 m^2 of public green area per inhabitant, as though it were sufficient to display "green" to become suddenly sustainable. Shocking but understandable, mayors, representatives, and more generally elected officials adore showcasing actions that are very visible. They are less interested in citizen ownership and holistic approaches, which are more important to make the city sustainable but harder to implement and less profitable as an electoral issue.

All things considered, when trying to make a city sustainable, there may be some good sense in promoting urban agriculture instead of manicured sophisticated green areas (McKay 2011). But, promoting urban agriculture is not enough. The point is rather that this urban agriculture be considered a common good, bringing people together and reshaping the whole urban fabric (Hodkinson 2012). Is it doable, and if so how? Urban agriculture "works better" when no public or private actor explains to the population what the procedure should be and how people should act. To say it otherwise, it looks like it "works better" when the inhabitants transform their living environment outside of any legal framework or official urban project. France's *Trames Vertes et Bleues* (Green and Blue Grids) is a wonderful counterexample. *Trames Vertes et Bleues* is a land management tool for the preservation of biodiversity—especially in urban and peri-urban areas—whose procedure was too formal and technocratic. Nobody asked the local communities and the inhabitants for their views. Thus, in many places, its implementation turned confrontational and resulted finally in inconsistent and incomplete grids (Blanc 2009).

Conclusion

As I discussed in a recent paper, a city does not arise from the sole will and skill of architects, planners, surveyors, and politicians (Mancebo 2015). It has to be nurtured and moulded by its inhabitants. Such a process needs time. Quite differently from the frenetic timeline and knee-jerk reactions to any opposition that elected officials and planners, guided by their own short-term interests (the next election, compliance with construction deadlines etc.), impose on urban policies, it would make sense to establish—or maintain—productive lands at the core of urban design.

All the more since agricultural plots are often temporary—not to say ephemeral—and eventually disappear under the pressure of urban growth, urban densification, and increased property value (Sandstrom 2002). We definitely have a long way to go in including agriculture in urban planning on a permanent basis, but it is worth the effort. For—let there be no mistake about it—urban agriculture has an unexplored potential to foster resilient cities.

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Chapter 27
Healthy Cities and Urban Planning: The QLandQLife Model as Input for Experimentation

Elio Trusiani

Based on input provided by the QLandQLife research, this contribution reflects on the potential of the content and devices contained in Law no. 10/2013, with particular reference to the national urban green plan. The questions asked by the research and its results highlight the importance of working with the open space of the contemporary city to improve environmental comfort and well-being in urban areas. Broadly speaking, these themes seek a renewed relationship between urban planning and health in which urban open/green space is only one of the structural elements addressed to promote better lifestyles and widespread well-being. In this view, the potential of the national urban green plan is seen not just as an additional tool for the sector but as an opportunity to reconsider urban green and open space as a possible incubator of new principles, functions, and activities. Reinterpreting some content and objectives expressed legislatively as matters of design inherent in ordinary planning tools seems indispensable. First of all, this means reconsidering the role of urban green areas as a necessary performance standard capable of overcoming the quantitative standard that arose at the end of the 1960s. This new interpretational key is capable of anchoring the principles of experimentation in the QLandQLife model with an existing and still-developing disciplinary debate regarding urban health and well-being. It favours the role that urban green areas can play in renewing consolidated approaches and paths in the city's governance tools according to a perspective that favours a healthy city and a reciprocal interest in health and urban planning.

E. Trusiani (✉)
School of Architecture and Design, University of Camerino, Ascoli Piceno, Italy
e-mail: elio.trusiani@unicam.it

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City, Health, and Urban Green Areas

Article 1 of the Manifesto *La salute nelle città: bene commune* [Health in Cities: a Common Good][1] states that "every citizen has the right to a healthy life integrated within their urban context". This implies urban policies that focus on citizen health, aiming to improve the quality of the urban environment. Actions include promoting the health of citizens, studying and monitoring the specific determinants of health in the urban context, making the most of the strong points of the city, and drastically reducing risks to health. In this view, an important role is played by policies and strategies to promote urban green areas and public spaces and the system of open spaces in general as containers/incubators of indicators and ecosystem services that can restore biodiversity, ecological continuity, and the quality of common living spaces.

The connection between health and nature, which is understood as green space on a range from the regional and urban scales down to pocket parks, is now acquired fact. Scientific research in recent decades has highlighted how the loss of biodiversity also negatively affects health and well-being and how, in contrast, life in contact with nature has beneficial effects for the physical and mental health of people (D'Onofrio and Trusiani 2015). Many projects around the world are proposing and experimenting with this relationship: from forest therapy and ecotherapy, capable of strongly recasting the central, strategic role of parks and natural protected areas, to public and private urban green areas. The former have the virtue of uniting the social, ethical, and economic consequences of protected areas and parks with positive effects on physical and mental health. The latter reactivate forms of sociability, inclusion, and participation, together with the qualitative redesign of green spaces and cycling and walking. These are, in many cases, associated with healthy lifestyles that promote daily physical activity as preventive medicine for the many illnesses of the twenty-first century (diabetes, obesity, cardiovascular diseases, etc.), as has been reported many times by the World Health Organization.[2]

All of this is naturally related to medium- and long-term policies and strategies implemented by public administrations. The European Healthy Cities Network presents an interesting panorama in which urban green areas become the dominant structure in significant urban regeneration projects. Many recent European experiences are moving in this direction. Cities such as Belfast, Bristol, Rennes, Copenhagen, Malmö, and Odense have for some time adopted policies and strategies where urban green areas act as a vehicle for and incubator of quality, encompassing sectoral objectives in a global scenario and a new way of understanding urban space. In the case of Malmo, for example, a dedicated commission within the public administration developed The City's Spatial Impact on Health report

[1] The manifesto was presented in Rome in July 2016 and was the result of work by a group of experts pertaining to the Health City Think Tank.

[2] WHO and UN-Habitat (2016), Global report on Urban Health: equitable, healthier cities for sustainable development, available at: http://who.int/kobe_centre/measuring/urban-global-report/en/.

(Stad 2014) within which two chapters are dedicated to the relationship between health and urban planning. Urban open/green space acts as an indicator of performance for urban-planning measures aimed at reducing segregation between residential areas and improving trust, safety, and social opportunities. It contributes to deliberately locating schools in good environments and creating a sustainable, mixed, inclusive city with new economic and strategic structures.

Among the most recent experiences, even outside the Healthy Cities Network, it is worth citing the case of Essen, Germany, winner of the European Green Capital Award of 2017. This city abandoned its industrial past and was transformed into a city with extraordinary environmental performance based on 12 heterogeneous indicators, one of which is urban green areas, which play a decidedly important role in pursuing the established objectives. Other indicators include energy production, biodiversity, waste production and management, and measures to adapt to and mitigate climate matters. In recent years, some Italian cities such as Udine, Reggio Emilia, Bologna, and Turin have also finalized projects and actions aimed at promoting these principles. In many cases, the health/urban-planning binomial represents the most advanced research and experimentation. In this sense, particular reference should be made to some initiatives promoted by the United Kingdom, such as Reuniting Health with Planning, the National Planning Policy Framework, and the Healthy Urban-Planning Checklist (D'Onofrio and Trusiani 2017), which offer the possibility of integrated paths for planning and realization. In addition, all of this corresponds to a new model of welfare that affects administrative budgets in the medium and long terms. Of particular interest in these experiences is the role played by green areas and public space in processes of urban regeneration and the quality of life in cities.

In light of this, and based on the QLandQLife experimentation, it is interesting to investigate Law 10/2013 as a possible field of application respect to the Italian experience. Among the various objectives, it evidences the drafting of a national urban green plan, which has still not been applied.

Law n.°10, 2 October 2013: "Norme per lo sviluppo degli spazi Verdi urbani" [Norms for the Development of Urban Green Areas]

Italian national law 10/2013 came into effect on 16 February 2013. It aimed to promote the development of urban contexts according to what was established by the Kyoto Protocol, that is, sustainable development respectful of the environment and citizens and in the full awareness and knowledge of the green heritage.

The main focus of the law is aimed at recognizing the role that trees, in particular, play in controlling emissions, protecting the land, and improving air quality, the microclimate, and the livability of cities. The detailed knowledge and management of the arboreal heritage play an important, almost strategic role for any municipal administration. The law, in its general objectives, establishes that all municipalities with more than 15,000 inhabitants adopt a registry of trees, that a new dedicated tree is planted for each child born or adopted in the city, that the data of the dedicated tree are communicated to the parents of the child, and that city administrators produce a green budget at the end of the mandate that demonstrates the impact of the administration on public green areas (number of trees planted and cut down, consistency and state of the green areas, etc.).

Law 10/2013 seems to fill a legislative gap on the national level. Article 7, which specifies regulations for the protection of monumental trees, rows of trees, and wooded areas of particular landscape, natural, monumental, historical, and cultural prestige, brings the issue to the fore and defines criteria to identify a monumental tree. These then become unique and homogeneous throughout the national territory and are attributed with environmental and cultural value as a symbol of historical or cultural events or traditions or simply identify a place and the people that live there.

Three years on, the annual report (2016) drafted by the committee for the development of urban green areas in the Italian Ministry of the Environment and Protection of the Land and Sea offers an opportunity for reflection. This includes not only on the state of the art but also and especially the law's unexpressed potential when considered as input to experimentation with innovative paths to connect/integrate health and urban planning. From this point of view, the object of the present essay is not the main focus of the law. Rather, it addresses an apparently secondary aspect that is not, in reality, secondary but which could potentially represent an interesting disciplinary innovation to reflect on: the proposal of the national urban green plan.

This plan is a working hypothesis supported by ISPRA, the Italian National Institute for Environmental Protection and Research, which has initiated activities and actions aimed at understanding the needs of local administrations and a broader reflection on the proposed tool. The transverse nature of the theme connects it with tools, laws, and national and international programs such as the Convention on Biological Diversity (CBD), the Strategic Plan for Biodiversity 2011–2020,[3] the Charter of Rome on the Natural and Cultural Capital (December 2014),[4] and the National Biodiversity Strategy adopted by the State-Regional Conference on 7 October 2010,[5] to name a few.

[3] The plan gives biological diversity an important role in supporting the provision of essential ecosystem services for human well-being.

[4] This represents a connective element between the European and national contexts. The Charter of Rome provides support for the protection, conservation, and enhancement of the natural capital. Among the various aspects considered, "creating synergies between the green infrastructure and rural and urban zones" is of particular importance.

[5] The strategy is organized into 15 working areas, including area number 9, "urban areas". Specific mention is made of the need to address planning by integrating plans for green management, promoting the maintenance of green areas, and aiming to regenerate the system of natural areas within territorial government plans to allow the biodiversity to be continuous, even in anthropized areas. The 11 objectives specified include number 7, "integration of green plans in local in urban planning".

According to ISPRA's proposal, the concept of the national green plan should be articulated in the following five steps: (1) state of the art in urban green-area planning and management, (2) directions and tools for designing urban green areas, (3) directions and tools for managing urban green areas, (4) directions and tools for monitoring interventions, and (5) directions for the formation of educational and awareness-raising initiatives.

Recent data on the city environment (Istituto nazionale di statistica (ISTAT) 2016) show a panorama in which only 12 of 110 provincial capitals have approved a green plan, always intended as a voluntary tool integrated within the general urban plan. Since 2011, another 13 cities have adopted a still-unapproved green plan as a tool to support the local plan. Analysis of annual reports shows that existing plans are not all configured in the same way and that their treatment assumes different forms and content. In some cases, it is composed almost exclusively of documentation regarding the current state, while in others it anticipates planning actions and interventions through pilot projects. Likewise, the types of greenery targeted in the plans also vary, from classical areas such as rows of trees, parks, and play areas to more extensive areas in peri-urban and rural areas, such as forests and river watersheds, even extending types to favour biking and walking such as bicycle paths.

In addition, the relationship between the green plan and other general sectoral urban-planning tools, its position in time with respect to the development of other tools, and the binding nature of the indications contained therein is still unclear.

Despite the differences mentioned above, some common points among the plans exist. Plans in Emilia-Romagna, characterized by the integration of urban sustainability policies, consider bike paths as the natural ally of a green vision of the city. These strategic elements connect the city and country and act as greenways to unite the external areas with the city centre and tie together places for living again. More in general, additional common elements include the methodological approach, the content, and the recognition of the importance of viewing the heritage of urban green areas as a diverse, complex set of open spaces that cross the city and interact with different uses and functions of the city itself, from the neighbourhood scale to the territorial scale.

As the ISPRA working group confirms, the experience also highlights a "delay probably due, on the one hand, to the absence of both national regulations regarding matters of public green areas and local green infrastructures and a binding legal basis with respect to the theme of governing the urban green areas. On the other hand, it is due to the 'cultural' difficulty of overcoming the urban-planning idea of green areas as a mere dimensional parameter (m^2/inhabitant)". Aside from this, one could also mention the usefulness or not of an additional sectoral plan for which methods of drafting, activating, and relating with existing local planning should be defined. Rather, it could represent an opportunity to direct research directly towards planning criteria on the local scale. This is especially true for programs of urban regeneration where urban green areas can progressively assume new roles and functions and respond to what is desired in the latest annual report, which revisits the connection with planning tools and with probable innovative paths. "Urban green areas become important elements for environmental quality, representing real 'tiles' in a natural network. Increasingly often, one therefore talks about green infrastructures defined as a network of natural and seminatural areas capable of providing a vast range of ecosystem services. This network of green spaces represents a versatile, multifunctional tool capable of creating social, ecological, and economic benefits" (Ministero dell'Ambiente e della Tutela del Territorio e del Mare 2016).

In this view, experimentation with the QLandQLife model, with all its possible variations, leads to considering legislation as one of the possible fields for experimentation with and innovation in existing urban-planning tools and not as an additional sectoral plan. The point of view has changed to reinterpreting the content of the law and experimenting with it. Precisely by making the most of expertise, always relied on by ISPRA with respect to urban environmental quality monitoring indicators (e.g. density, availability of public green areas, its composition, protected and agricultural areas; Bajo and Guccione 2004; Chiesura and Mirabile 2014), a step ahead in terms of design and experimentation would be desirable.

Research Perspectives

It is clear that local administrations, the main actors in planning and managing green spaces in urban areas, require a plan with a clear definition of objectives and the operational means to make it an effective, efficient reference tool. Beyond the method adopted by ISPRA, interest lies in using the opportunity offered by the law, not so much to develop a national green plan and to sow more uncertainty as to innovate and experiment with new paths for urban planning related to the theme of quality of life and well-being in synergy with determinants of health. In this sense, urban green areas, and the system of open spaces in general, can play an important role. The second step in ISPRA's path seems to offer precisely this opportunity: directions and tools to design urban green areas. This could be the step in which criteria rather than directions are provided to design urban green areas in relation to determinants of health (see WHO), environmental comfort, and urban well-being, as proposed in part by the QLandQLife experimental model. It would mean activating a design path integrating health and urban planning that is inserted directly in the design process of local urban-planning tools rather than formulating directions and general guidelines within which the level of generality is often rather high. The other steps in the ISPRA concept could correspond to the operational phases of monitoring and managing the results obtained, in addition to the indispensable phase of education and awareness raising, which would perhaps require new specific skills related to the theme.

In addition, the recent plan for peripheral areas financed by the Italian government could be a further field of application to experiment with pointlike application of the model. Many of these areas, subject to public financing, grew out of the principles and criteria of rationalist urban planning and, successively, from urban-planning standards. Many times they do not lack standard green space; what they lack is *quality* green space. Why not rethink these areas starting specifically from experimental projects based on scientific criteria related to environmental comfort and well-being in the city and in response to climate change and the social demand of residents? Why not attempt integrated paths that go beyond the classical categories of intervention to include determinants of health, urban green-area performance, and the needs of residents, thereby overcoming the standard quantitative idea as desired by the above-mentioned annual report and the disciplinary debate from premier research institutes such as the Italian National Institute of Urban Planning and the Italian Society of Urban Planners? The field may be extremely fertile and allow for experiences capable of activating fruitful reflection, from the micro-scale of the project for urban regeneration to the macro-scale of the local urban-planning tool.

It therefore seems opportune not only to consider but especially to reinterpret the real possibilities inherent in the idea of the national urban green plan, its effective organization, and relative perspectives for development. This is within a view that favours innovative paths, integration, and forms of experimental design between general urban planning and determinants of health, in order to pursue better lifestyles and the well-being of city inhabitants. Urban green areas can act as a tool to promote a reciprocal interest between urban planning and health. In this view, the QLandQLife research opens the door to possible new design frontiers that unite some themes of the healthy city within a broader vision of refining and experimenting scientifically with local planning tools, between a theoretical/applicative reflection and a critical revision of the concept of *standard* in a need- and performance-based key. In this, particular interest is assumed by experimentation with QLandQLife on the urban scale and its application to the sample area. It is on this scale that a large part of the urban quality of life in existing historical and contemporary cities is addressed under different structural conditions of transforming, adapting, and making the urban fabric resilient. With a revision of the consolidated planning process, it is probably necessary to revisit the consolidated glossary of urban green areas and introduce checklists for new planning indicators/criteria (Fry et al. 2009) and categories (Boeri 2011) that best respond to the transformation underway and the demand for urban health, well-being, and environmental comfort.

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Chapter 28
Urban-Planning Tactics and Strategies in New Decision-Making Processes

Michele Talia

The basis on which the main economic and social p institutions are situated, which until a few years agowe believed to be solid, began to waver dangerously, spreading in the public and scholars an atmosphere of uncertainty and concern that could hinder the seeking rigorous and convincing interpretations and therapies to deal with a particularly negative picture. According to Ulrich Beck (2009), the systemic crisis triggered by the failure of Lehman Brothers Holdings Inc. definitively immersed us in a "global capitalism of uncertainty" such that the climate we are experiencing is characterized by a widespread awareness that unmistakable changes are about to arrive. Their direction, however, is still unknown.

In this clearly problematic state, the disciplines that contribute most to the development of urban-planning practices are suffering even more evidently from a crisis of visibility and legitimateness due to which the role of planning tools is subject to rapid objection and substantial resizing. Over the years of feverish growth that preceded the economic collapse in 2008, local administrators increasingly restricted planners' field of initiative, limiting them to ensuring the feasibility of transformation initiatives that were promoted by private operators (Krugman 2009; Talia 2016). And now that urban dynamics have experienced an almost unprecedented setback, the tasks assigned to planners will be drastically marginalized even more.

A survey of the most important writings dedicated to the current socioeconomic crossroads encountered in many Western countries (Bauman 2007; Harvey 2011; Rifkin 2002) indicates that this planning crisis is situated within a more general decline in the social sciences. Furthermore, this dual setback represents an important reflection on the extraordinary difficulty encountered, especially in Europe, by the welfare system and the system of representative democracy. Therefore, the proposal for a new planning paradigm cannot help but direct, at least in part, a more general reconsideration of the conditions under which, even before the market and

M. Talia (✉)
School of Architecture and Design, University of Camerino, Ascoli Piceno, Italy
e-mail: michele.talia@unicam.it

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society, the governmental functions of the territory are exercised along an analytical path that finds a particularly meaningful intersection in the operation of decision-making processes.

Faced with the intensive research programme illustrated in this volume, the reflection presented below offers a restricted contribution. Its utility resides not so much in the presentation of an original, mature theoretical/critical apparatus but in indicating a promising line of reasoning that aims to investigate the existing connection between new decision-making processes, the ways in which it is possible to favour public participation in territorial government, and, finally, the changes in the market economy and social context. The latter inevitably constitutes the background to and reference for innovations introduced as much in participatory processes as in the practice of urban planning.

In particular, the first part aims to highlight the presence of the common roots of the economic crisis, society, and the settlement formations that have been produced in this first glimpse of the third millennium. The second part instead examines the conditions presiding over the identification of integrated solutions, i.e. those capable of favouring the search for a common way out of this particularly difficult situation. Finally, the third part derives the main consequences for a change in the planning tools that allow their effectiveness to ultimately unfold.

The Origins of the Current Systemic Crisis

Many analyses made between the end of the twentieth century and the first decade of the twenty-first record the integration of real estate in the new networks of global capitalism (Savitch and Kantor 2002). Also in Italy, where the financialization of the construction sector occurred with a clear delay, a change occurred in the way the building product was viewed: from a constituent element of an urban aggregate to a mere financial product. This ensured that in many cases, even recently constructed buildings still on the market were posed as a guarantee of the new interventions. The result was that, more than satisfying housing needs, this notable increase in building in fact fed the speculative bubble destined to burst in 2008.

Due to a real paradox, therefore, a production sector such as construction, which was traditionally included among the less innovative sectors, wound up triggering a systemic crisis. However, the singularity of this event should not be classified among other apparently unexplainable events (like so many “black swans” that now crowd the contemporary scene); rather, it merits further investigation. A certain, progressive convergence of this production sector with the rest of the manufacturing industry regarding business relations and the levels of competitiveness and capitalization should not be automatically renounced, however. In fact, the increasingly close relationships between the financial and construction markets should first be attributed to imposing urban redevelopment in the agendas of the main investors, in the growing centrality of the urban economy in global strategies, and in the convergence seen among large transnational real-estate promoters when dealing with large global metropolitan areas.

The city, beyond representing the epicentre of the subprime mortgage crisis, therefore, represents the emblematic place to counteract the danger of secular stagnation in the world economy, which has been the object of worrying analysis for some time (Castells 2002; Harvey 2011; Becattini 2015; Visco 2015). It is, in fact, the urban organism in its multiple forms and continuous evolution that constitutes the favoured environment for experimentation with the change in paradigm, which, according to these authors, could guarantee the permanence of the current socioeconomic system, even if it is radically reformed. But it is necessary anyway to pay attention to factors that endanger the survival of the capitalist economy. In the first place, there is the concern that after more than 200 years, technological innovation can no longer compensate for the loss of jobs in mature commodities sectors due to the increase in productivity determined by the opening of new markets (Ricolfi 2014, pp. 10-11).

One cannot help but recall that this worrying deterioration of economic "fundamentals" coexists with the observation that the planet is characterized by growing complexity, thereby implying an alarming weakening in decision-makers' capacity to understand and govern the change. This complexity constitutes both the reflection of a progressive increase in disorder expressed by some reference "aggregates" (the climate, the economic cycle, business, the city) and a clear lack of information available on the internal composition and functioning of these systems (Moroni 2013, p. 13; Talia 2017).

The increasing entropy of the system and the inability to develop a suitable theory to explain the current changes (Sapelli 2015, p. 23) ultimately collapse further with the impulse to compress the space occupied by social relationships. This is frequently registered not only in specialized debate but also by those who observe changes in habits. This tendency was already evident in the years during the triumph of liberalism, in which a growing crack was seen between the employed and unemployed and between workers on different levels of professional qualification. However, it now seems likely to be further accentuated due to the combination of the effects of these changes with those produced by the generalized crisis of political and institutional representation which has exploded in recent years (Touraine 2008, p. 77, 86).

By studying the context of reference, we can use this point to more closely analyse the effects that these changes have produced on urban dynamics. However, we should acknowledge that the city, being projected globally and weaving new networks, has lost its better-known tangible characteristics by becoming a dynamic and confused ecosystem that tends to become dematerialized (Castells 2002). As Marco Revelli states, the "spatial revolution of the end of the millennium" has fallen on settlement systems inherited from the preceding industrial age and severs the lines of connection between people and territory. As another important consequence, the links between local communities and the usual forms of representation (Revelli 2014, p. 55) have been severed.

Following these sudden changes, even the extraordinary ability historically manifested by capitalism to reorganize the landscape of production, exchange, and consumption in order to adapt to the technological discontinuities imposed by large economic cycles (which Nikolai Kondratiev called “long waves”) seems to have failed. Where the Internet and cyberspace favour the powerful development of commercial relationships in a virtually frictionless space, the movement of material goods and people still requires material infrastructures; this disassociation between the two communication systems risks exposing a deep gap in space-time configurations (Harvey 2011, p. 193).

In expectation that new, important investments in fixed territorial capital can reduce this gap—which seems rather unlikely due to the limits of balance that characterize public spending at the moment—we can only conclude that (urban) society is now founded on an increasingly precarious basis. In this perspective, the dissolution of the sense of collective belonging and the loss of identity will make the task of building the future more and more difficult.

The Search for a Common Way Out

As we saw in the previous section, the spatial revolution provoked by globalization seems destined to destabilize the life of inhabitants in the regions most directly affected by the integration of international markets. When the concurrent effects of technological innovation are also combined, this upheaval can lead to the denaturing of the space-time equilibrium on which humans have long based their cognitive processes and relationships with other individuals.

According to Marc Augé, this unique situation simultaneously constitutes a menace, an opportunity, and a challenge. On the one hand, the first sees the role of the social sciences being brought up for discussion; in perspective, however, they risk being confined to exercising mere taxonomy and parameterization of the technological changes underway. The second aspect instead highlights how these disciplines can radically renew their own point of view such that the social context in which they operate is examined more rigorously.

As for the challenge that the social sciences should accept, it is appropriate to highlight how they can play an important role in contrasting the push towards homologation that constitutes perhaps the most insidious result of globalization. This is provided, naturally, that they manage to enhance the diversity of contexts and local histories demonstrating that both can still play a very important role in maintaining an expert thought with which “to question what is indisputable and uncontested” (Augé 2012, pp. 79–80).

In wide agreement with the dedication to recast a critical view and new meanings where the collective imagination risks being submerged by common places, there then comes an attempt to address the conflicts that arise when seeking to harmonize apparently irreconcilable elements such as economic and social interests. In order to overcome very rooted viewpoints such as the juxtaposition between “public” and “private”, the social sciences can contribute to recognizing different perspectives, possibly by relying on the hypothesis that the provisions and balances of the city can be modified, overlooking the rules of the market at least in part. In line with this research hypothesis, it is possible to indicate the notions of *shared value* and a *sharing economy*. These can be combined to identify a huge stock of shared values, with which nature and the relationships of the capitalistic system to society and space can be radically modified (Porter and Kramer 2011; Foster and Iaione 2016).

Considering the unique characteristics of this scenario, it is perhaps necessary to mobilize the skills and knowledge of social education scholars, market operators, and planners to develop an integrated viewpoint regarding the type of society that can be constructed around a low-work-intensity economy and on changes that this new paradigm will introduce in what remains of the social state. In doing so, it is useful to recall Foucault's admonition not to think that information obtained from a quick observation of reality is enough to answer our questions. If it is true that the world is not complicit in our knowledge, it follows that we should make a deeper exploration that allows us to push beyond the appearance of things.

An important contribution is offered in this sense by the unprecedented availability of data and widespread, low-cost news, whose free circulation can lead to increasing pluralism and citizen awareness. But in a contradictory sense, this cognitive hangover can also be translated as a reduction in the capacity to understand current phenomena, especially when observers do not use the necessary interpretive tools to reorder, hierarchize, and critically evaluate the huge stock of information available on the Internet (Bauman and Mauro 2015, p. 93).

If one wants to remedy the paradox wherein an increasingly informed public is also unable to develop an individual opinion on the main viewpoints in the political arena, the availability of "intelligent" informative support can play a determining role. In this context, information is supplied along with the availability of frameworks of reference useful for contextualizing data and their evolution over time. It is, in fact, rather probable that the crisis in which we are still immersed and our inability to find a way out also primarily constitute the reflex of a serious cultural deficit. At the same time, one can also claim that the tendency to look for increasingly specialized solutions—effective in resolving small questions but absolutely inadequate for responding to large questions—corresponds to the renunciation of an integrated, holistic vision that, on the contrary, still seems very useful. If we want to counteract this worrying trend, it is necessary to dedicate ourselves to overcoming the old disciplinary borders and to developing that joyful indiscipline that generates new synapses and innovation that seems to flourish right where different cultures meet (Da Empoli 2013, p. 19).

Towards the Redefinition of Planning Tasks

As is easy to imagine, the circumstances for which we are still immersed in a transitional phase that is becoming longer and more complicated than expected lie at the heart of an alarming crisis in democratic government, undermining trust in institutions and the principle of representation itself. An urgent need follows for radically new interpretational models that are capable of understanding the changes underway, starting above all by revisiting decision-making processes and the role assigned to planning tools.

For territorial government, such a rapidly changing framework of reference constitutes a very difficult test but also a stimulating opportunity. Indeed, if settlement changes can be perceived not only as one of the hottest themes in conflict management but also as a potential flywheel of employment and as igniting new enhancement processes, they largely depend on the capacity to consolidate new forms of negotiation and identifying values to promote social rooting by creating solidarity networks.

In order to move beyond a nearly decade-long recession, public policies and territorial planning in particular should overcome a crisis of credibility that risks permanently tarnishing authority. Regarding the discipline of urban planning more directly, this means promoting the development of operational research and the capabilities of local players, transmitting an impulse that, at least in perspective, should replace the emphasis on regulatory reform as a pulling force (Talia 2014, p. 33).

In this perspective, the new profile of the planner seems to favour the development of open strategic visions, which should, at least in part, substitute the rigidly codified planning procedures on which designers' technical skills are traditionally based. In renouncing the predisposition of designs carrying their signatures, urban planners are invited to act as mediators between the subjects and actors of urban transformations. By virtue of this new approach, it is possible that the city be no longer perceived as a carefully and rigidly planned space but rather as a heuristic environment in which new forms of belonging are activated (Ratti 2014, p. 123).

In this respect, the suggestions offered by the research presented in this volume are illuminating. In particular, the decision-support system, which was described in the preceding pages, can serve as a particularly effective tool in support of various urban policies introduced to successfully face the challenges of the digital era. The method proposed attributes decisive value to the extraordinary dialoguing resources offered by new communication technologies, provided that the interaction with different subjects is also informal, open, and collaborative. Collaboration like the one hypothesized should ensure that the participatory exercises implemented guarantee the positive development of decision-making processes, i.e. preventing participants from being divided into winners and losers at the end of the sharing process, which would end up increasing rather than decreasing the level of conflict.

This new approach to territorial government, at least at first glance, seems destined to notably resize the planner's role, to the point that he or she renounces authentic leadership in planning processes. It is clear that this secondary position reflects an awareness that the most important urban changes are often the fruit of collective effort and that contributions from planners and other specialists are, in many cases, important but not decisive. However, it is important to note that this conviction should not coincide with the failure of a specific responsibility to formulate tools capable of offering a long-term vision for the territory of interest.

Furthermore, this reconsideration of the tasks of urban planners coincides with a notable expansion of both the disciplinary bounds and the activation of empowerment processes in local communities. By revisiting the relationship between technique and politics, planning can re-establish contact with the requests of a rapidly changing society. This results not only in recovering legitimacy but also in recognizing the skills necessary to reformulate the idea of *city* in which numerous subjects participate not only in management and codified participatory processes but also "in the interstices of the multiple, chameleon-like urban forms that are taking shape" (Perrone 2016, p. 15).

Upon closer inspection, there are at least two consequences of this push for innovation in the field of public policies that should be mentioned. On the one hand, they deal with participatory procedures that have been seen recently, which are destined to profoundly affect deliberative models and practices. On the other hand, they deal with the progressive confirmation of models of and experiences in participatory city construction, of which social players constitute the probably most important success of this new protagonism.

In everyday experimentation, these new forms of mobilization are particularly adapted to drawing out individual abilities and imitative behaviours oriented at social activism. This is corroborated by spreading the awareness that thanks to this approach it is possible to reach concrete objectives, which would not be possible without the direct initiative of citizens. As some authors have already highlighted (Ciaffi and Mela 2011; Rosa and Weiland 2013; Talen 2015), this type of mobilization has for some time ceased to deal exclusively with social problems and to direct itself towards questions with immediate urban-planning relevance. The consequence is a specific line of urban politics called *do-it-yourself urbanism*. Interventions on small and very small scales are often inspired by this new paradigm. They aim to regenerate and reuse abandoned urban areas and are realized and managed by the citizens themselves by virtue of their temporary character and the modest financial resources required.

The parallel evolution of participatory processes and urban-planning regimes that has matured in recent years has consumed the step towards a new climate of local democratic processes. The former are now aimed at substituting, at least in part, the principle of direct deliberation with delegated deliberation. The latter are increasingly used to achieve satisfactory integration between the super-regulatory and hyper-professionalized models typical of traditional plans and the public's claim to direct ownership in implementing urban transformations.

In fact, it is commonly accepted that, as a decision-making technique, deliberation is preferable to the "indirect" method of sending designated representatives to the institutional sites. This not only guarantees the quality of participation in decision-making but also ensures the effectiveness of the decisions made in the implementation phase (Gbikpi 2005). At the same time, it is also clear that planners are increasingly urged not to dissociate the procedural content of the plan from the more immediate questions of substance. They must also ensure that the "great reforming design" can be substituted or accompanied by urban-planning tactics that can be the voice for community action, for which the territorial government cannot be held responsible (Talia 2017).

The planner's new attitude does not necessarily lead to abandoning a long-term reflection foreseeing the configuration of alternative scenarios on which the discussion of the city's future is based. In the perspective indicated, planners should, in fact, dedicate themselves to establishing "urban tactics" capable of observing and monitoring the successes of exploratory, low-intensity actions. Only later should they address more onerous, long-term interventions, which cannot anyway be renounced, if only to prevent the urban-planning discipline from lacking a voice at a crucial point like the current one, in which the search for a way out of a prolonged phase of stagnation can finally achieve some positive results.

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Chapter 29
Participatory Methods for Identifying Stakeholder Perspectives on Urban Landscape Quality

Matthijs Hisschemöller

This chapter discusses an approach to assist participatory governance for the sustainability of urban landscapes. Its scope and focus are on the first stages of the policy process, which concentrate on the problem characterization and policy objectives (Turnpenny et al. 2015). Hence, the focus of this chapter is on a family of participatory methods that help citizens and other stakeholders, including policy-makers and experts, to articulate and understand the different views on issues concerning urban landscape quality. Section "Articulating Different Perspectives on Urban Landscape Quality" introduces a theoretical framework, which explains why participation is needed for urban sustainability governance. Section "An Example: Repertory Grid Technique" explores the challenges for articulating and understanding different perspectives on urban landscape quality and presents the repertory grid technique as an example of a proper method. Section "Discussion and Conclusions" summarizes this chapter's main argument and discusses the implications thereof for the overall purpose of this book, a decision-support system for quality of life issues in urban landscapes.

Participation in Urban Sustainability Governance

The transition to urban sustainability is closely linked to the quality of urban landscapes. Urban landscapes are constantly changing because of large transformations in the landscape of society. Shifts in the economy lead to the phasing out of traditional industries and, elsewhere, the emergence of new (economic) activities, which

M. Hisschemöller (✉)
Dutch Research Institute for Transitions, Erasmus University Rotterdam, Rotterdam, The Netherlands
e-mail: hisschemoller@drift.eur.nl

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has dramatic impacts on urban landscapes. Changing consumer behaviour leads to the disappearance of traditional downtown shopping centres; the energy transition shows an explosive increase of solar and wind power, creating urban landscapes that have never existed before. The impacts of societal changes on urban landscapes cannot always be anticipated and are hard if not impossible to manage and control. This means that landscape changes are often inevitable, even if they tend to decrease urban landscape quality. Local governments cannot live up to broader societal dynamics including the power and influence of huge financial interests in (re)development and construction. This means that the transition to urban sustainability is not at all a linear process with clear visions and targets: urban sustainability is more of a moving target because of the continuous conflict of interests competing for priority (Loorbach 2010; Loorbach and Shiroyama 2016). From this it follows that transition governance for urban landscape quality must be participatory, if only to consider the merit of conflicting visions and address knowledge and information from a variety of sources, which is basically what Diesing (1962) refers to as political rationality.

Although countries have regulations and protocols for urban landscape planning, decision-making processes are in many cases not transparent. In spite of the lip service paid to public participation, citizens' interests are often considered a hurdle if not adversarial to the "quality visions" promoted by urban planners. This is illustrated by the notion of a division of roles between citizens and decision-makers, where citizens stand for their own interests, while planners and administrators stand for the public interest, which is considered a trade-off between conflicting lobbies. The NIMBY (not in my backyard) concept (O'Hare 1977) refers to the conflict between public interest and the interest of people living in a specific area, who have to take the burden of locally unwanted land uses, so-called LULUs—whereas society as a whole shares the benefits. The framing of citizen participation being driven by self-interest is among the main barriers for solving issues concerning urban landscape quality, causing intractable controversies and deadlock in decision-making.

Among the various claims in favour of participation (e.g. Diesing 1962; Lindblom 1965; Pateman 1979; Held 2006), there is one which specifically underlies the discussion of participatory methods in this chapter: effective participation will lead to more inclusive governance where the knowledge available among the participating stakeholders is taken into account as much as possible. In short, participation can enhance learning (Hisschemöller and Cuppen 2015). Learning relates to both facts and values, because knowledge and information is always presented in the context of a social problem. A social problem, as the concept is widely defined in the policy sciences, relates to a gap between a goal (value) and an observed state of affairs (Dunn 1981). When a participatory process is sufficiently open, there is room for problem structuring, which is basically the articulation, confrontation, and, where possible, integration of conflicting perspectives on a specific issue (Hisschemöller and Hoppe 2001). A perspective is defined as a specific (biased) articulation of facts and values highlighting specific information and neglecting other (Cuppen 2010).

Articulating Different Perspectives on Urban Landscape Quality

Apart from the barriers for an open participatory process cited above "Articulating Different Perspectives on Urban Landscape Quality", the governance of urban landscape quality is complicated by the fact that participants involved to defend their views and interests do not constitute a homogeneous group. Human taste with respect to urban landscape quality differs and changes over time and place. Some people prefer green spaces and choose to live in a suburban neighbourhood. Others, though, like the stir of traffic and dislike the quiet of a more "natural" environment. Even within the discourse of "greening of urban landscape", major directions are possible. Research findings are ambivalent with respect to gender differences in the appreciation of green urban spaces (e.g. Nelson and Loewen 1993; Tyrväinen et al. 2014). Citizen initiatives for community gardens may face opposition by other citizens, claiming that these projects undermine the identity of their neighbourhood. Controversies may arise as regards the public access to green urban landscapes and the kind of activities allowed, in which case local environmental organizations may stand opposite to one another (e.g. walking versus cycling).

From this observation it follows that the method for identifying stakeholder perspectives must avoid making assumptions about which category of stakeholders would fit into which perspective. Qualitative participatory research would start by categorizing stakeholders into "policy", "business", "NGOs", "science", and the like and then choose people for a stakeholder dialogue. In case of a typical urban-planning controversy, where, to use spatial planning jargon, red (built) and green oppose each other, this approach will certainly help to articulate adversarial points of view. However, it fails to identify the subtle differences within each category. Using Q methodology, Cuppen et al. (2010) show that perspectives on sustainable biomass for energy in the Netherlands not only differed between groups like businesses and (environmental) NGOs but also within these groups. A similar observation was made by Vasileiadou et al. (2013), using the repertory grid technique in a study of different perspectives on extreme weather events in the Netherlands.

The search for conflicting perspectives on urban landscape quality must certainly avoid to make assumptions about the specific motives, interests, and knowledge level of participants. This does not imply that citizens, in raising their voices, necessarily have the public good in mind rather than self-interest (but is this always true for administrators?). Yet, participants led by specific interests may also have valuable knowledge to offer. Going further, the specific position participants take, e.g. the area they live in, their profession, and their transport movements, but also their race, gender, age, or physical handicap, may enable them to offer specific knowledge that others cannot. The observation that perspectives by definition articulate both values and factual observations contrasts with the broadly shared notion (which underlies participatory methods such as consensus conference or citizen juries) that participation is especially relevant for articulating (lay) people's values, whereas experts have the specific task of providing decision-makers with the right information

(Cuppen 2010; Hisschemöller and Cuppen 2015). However, it is important that the participatory process is about a specific case that all involved can relate to. A discussion on values only turns into an abstract discourse and artificial consensus, such as that everyone generally favours sustainability.

An Example: Repertory Grid Technique

A well-suited method for articulating different perspectives on urban landscape quality is the repertory grid technique. Repertory grid is a bottom-up interview technique, which avoids steering the interviewee by questioning (Kelly 1955; Fransella et al. 2004). The goal is to articulate the underlying dimensions through which stakeholders evaluate their immediate environment. The interviewer presents elements from the interviewee's (social or physical) environment, three at a time, thereby asking the interviewee: which two elements are similar and how are these different from the third? Elements can be presented in many forms, such as short statements or narratives (Van de Kerkhof et al. 2009), names of key persons or companies in a network (e.g. Sühlsen and Hisschemöller 2014), or pictures (e.g. Dunn et al. 1986). A study related to urban landscape quality would typically ask people to categorize triads of landscape elements. McKinnon (2010) presented pictures in a study on people's willingness to install green roofs in a Dutch city. In a similar vein, Smith (2015) studied the attractiveness of green roofs in Malta. Vasileiadou et al. 2013 used pictures to articulate different perspectives on the impacts of extreme weather events for the Netherlands. In response to the interview question to compare triads of elements, the interviewee articulates a bipolar construct, such as man-made/natural, healthy/unhealthy, good memories/no memories, etc. When the interviewee has articulated about 10–20 constructs, which normally takes about 30–40 min, the interviewee is invited to select the three constructs that he/she considers most relevant for evaluating the desirability of, e.g. urban landscape transformations. Afterwards, the rankings of elements by all interviewees can be statistically analysed using multivariate analysis, such as Homals (De Leeuw and Mair 2009; Meulmann et al. 2010). The result is a point cloud, which visualizes the distance between the elements as perceived by the interviewees. Clusters of elements constitute a perspective, which needs interpretation using the qualitative interview data. It must be noted that this interpretation can be difficult, because the overlaps and distinctions between the different perspectives are always multidimensional.

Methods such as repertory grid and Q sort (see Cuppen et al. 2010) are examples of methods that can assist in articulating perspectives in participatory processes because they help to avoid assumptions with respect to the motives, interests, and knowledge of stakeholders in a participatory process, thereby providing a balanced picture of an often complex social reality. An additional benefit of these methods is that they combine qualitative and quantitative (statistical) analysis. The purpose of the analysis is not to measure how many people share a particular perspective, but rather the range of diversity of views with respect to a specific (urban landscape) issue. In particular, the repertory grid also has the advantage that, between 15–25 interviews, saturation occurs in that no new constructs are mentioned. This implies that the number of perspectives identified is not at all infinite but, in contrast, always limited and the time spent for interviewing is reasonable.

Discussion and Conclusions

This chapter introduced a theoretical framework, which argues for an open participatory process, given the observation that the transition to urban sustainability is a moving target with a dynamic that is hard if not impossible to manage and control. Given the impact of societal changes, the quality of urban landscapes is expected to be subject to social conflict and struggle. Urban sustainability governance will benefit from participation, since effective participation can enhance learning. This implies that the broad range of perspectives on urban landscape quality should be considered in decision-making. From this framework, some requirements were derived for participatory methodology. One key element is that, in articulating and confronting different stakeholder perspectives, the intertwinement between facts and values must be recognized.

One topic that deserves further exploration is the relationship between expert and stakeholder knowledge. Is there a specific role for science in the participation process and what is the status of expert knowledge? More specifically, what is the relevance of scientific indicators for urban landscape quality? How does the input from science relate to different perspectives identified in a specific case study region? The answers to these questions in large part depend on the specific view and expectations one has with respect to science and academic research. In general, the use of scientific knowledge in policy has for some time been justified by the myth that science is a unanimous community able to speak *the* truth to power. This myth rapidly disappeared, when, several decades ago, it became obvious that science and academia are far from homogeneous communities. Science makes operational choices based on values, just like other stakeholders. Values are especially important in sustainability research and are clearly visible in the choice for indicators made in this book. It cannot be anticipated that stakeholders in a specific area would make a similar choice. However, research and calculations for these indicators are probably extremely relevant, if they are carried out in the context of a specific urban area, taking into account the specific problems that concern those living in that area. The relevance of input on sustainability indicators may be increased, if the point of departure is not a choice made by scientists but rather a choice that follows from the different stakeholder perspectives on urban landscape quality identified in the case study area. How this can be done and which difficulties and challenges will be encountered are hard to predict. Building on previous experience with participatory integrated environmental assessment and participatory multicriteria analysis, this can be further researched. More importantly, however, scientists should engage in a dialogue with stakeholders in order to respectfully learn about the relevance of their science.

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Chapter 30
Heritage as an Active Space and Spatial Resource

Mladen Obad Šćitaroci

The reflections contained herein were stimulated by the *quality of the landscape and quality of life (QLandQLife)* project, which applies a transdisciplinary approach to examine the historical, cultural, and environmental components of the western Adriatic region, investigate the quality of the environment, and develop new enhancement models and a model of dynamic integration in order to measure the sustainability of the environment. Two aspects of the project are particularly encouraging and significant for this communication, namely, *distinctive and pleasant* and *efficient and nice*.

On the other side of the Adriatic, we begin with research within the *Heritage Urbanism* (*HERU*)—*Urban and Spatial Models for Revival and Enhancement of Cultural Heritage* project—financially supported by the Croatian Science Foundation (HRZZ-2032) and carried out at the Faculty of Architecture, University of Zagreb. This project has three prominent aspects: *planning and heritage, perceiving heritage*, and *development based on heritage*.

The purpose of this communication is to show the thoughts of the *Heritage Urbanism* project in the context of the *QLandQLife* project and thus the mutual contribution to better understanding and enriching both projects. Both projects have a lot in common, and although they are neither structured identically nor use the same approaches, they are compatible and complement each other. It is therefore useful and encouraging to highlight some of the themes of mutual interest.

Heritage is, without a doubt, an important component in the *quality of the landscape and quality of life*. The revival and new life of heritage increase the *quality of the landscape and quality of life*. Cultural heritage, with its possibilities for spatial and economic development, expands the quality of the landscape and quality of life. Why build something new when the heritage is disappearing or in a very poor state?

M. Obad Šćitaroci (✉)
Department for Urban and Spatial Planning and Landscape Architecture,
University of Zagreb - Faculty of Architecture, Zagreb, Croatia
e-mail: mos@arhitekt.hr; scitaroci@gmail.com

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Heritage as an Important Factor in the Quality of the Landscape and Quality of Life

The wider Adriatic region is a cultural heritage treasury. Long ago, the area was simultaneously inhabited by the Etruscans on the Apennine Peninsula, the Villanovan culture in the Po river valley, the Illyrians on the eastern side of the Adriatic, and the Celts in the interior. The first towns were founded by the Greeks in the fourth-century BC on the Dalmatian islands. From then to now, there was intensive development of towns and life in the Adriatic region during the Middle Ages, the Renaissance and Baroque, and the nineteenth and twentieth centuries. Nowadays we are witnesses to a wealth of heritage of different types and ages, overlapping and coexisting and visible in the field or as archaeological artefacts. This heritage is not just a treasure and an indicator of the area's cultural identity. Today, it is also a big burden on the local community, as it requires large funds for restoration, funds that are never sufficiently or continuously available.

The question arises as to how to turn this diverse, abundant, and valuable heritage on both sides of the Adriatic Sea into an active, living heritage. How can heritage, often perceived as a burden, become a resource and generator of development? (Obad Šćitaroci (ed) 2005, 2006). The following issues form the main themes of the research:

– How can the heritage be enhanced and revived?/enhancement and reuse of heritage
– How can new life into be breathed into the heritage, but also how can we live in the heritage?/new life of heritage—life in heritage
– How can the heritage become an active space and a spatial resource?/heritage as an active space and resource
– How can the sustainability and survival of the heritage be ensured?/sustainability of heritage
– How can the criteria, methods, and models for enhancing and reviving the heritage be developed?/criteria, methods, and models for revival of heritage

The goal is to promote the hypothesis that the heritage should not be viewed as a static object (dead capital) but as an active subject. We are conserving heritage and it is conserved, but inactive conservation leads to its decay and disappearance.

The Heritage Urbanism Approach

Heritage Urbanism is one of the many contemporary views and interpretations of behaviour in towns and landscapes, with an emphasis on one dominant approach.[1] The approach emphasized is the urban-planning approach, i.e. considering, using,

[1] More recently, we are seeing various urbanistic approaches whose nature is obvious from their names: Agrarian Urbanism, Archaeological Urbanism, Blue Urbanism, Contest Urbanism, Digital

and experiencing heritage together with its wider and narrower environment in which the emanation of the heritage is felt.

For many years, "heritage" was equated with its conservation. In the past several decades, under the influence of regionalization, a fragmented view of space (town and landscape, as well as cultural heritage) was dominant and considered a new acceptable view. However, the fragmented view (the acupuncture method) did not produce satisfactory results regarding heritage revival. Therefore, the current matter is to develop an adequate approach or method that would lead to satisfactory results regarding heritage enhancement, the understanding between heritage and people, and the coexistence of the heritage and the community in which it is located (Baum and Christiaanse 2012; Smith 2006). *Heritage Urbanism* is an approach that questions the integral view of heritage together with its accompanying environment. The entire/complex heritage space and the environment are considered, with all the impacts of the environment on the heritage and, vice versa, with the impact of the heritage on its environment.

The starting assumption of *Heritage Urbanism* is that revival of the architectural heritage must be considered and implemented in the spatial, urban, and landscape context and in the broader environment. The context affects the heritage and its revival, and the new use of heritage must be stimulating and developmental for the environment.

Fundamentally, the questions are how to turn a decaying heritage into an active one, how to incorporate it in contemporary life, how to prevent its decay, and how to complement and upgrade it creatively, conserving its heritage feature (Claessens and Van Duin 2004). Such questions have been asked before and adequate revival methods with good results existed, but they were abandoned and forgotten after a while. The *Heritage Urbanism* approach attempts to recall the former effective methods, modernize them, and adapt them to current circumstances (Obad Šćitaroci 2015, 2017).

Starting Points

The *Heritage Urbanism* approach starts from the view that cultural heritage can and must be an active participant in activities aimed at improving the quality of the landscape and quality of life. To achieve this, we propose the following hypotheses:

– The heritage is not just a pretty picture and a nostalgic memory of the past.
– The heritage must not be dead capital and a burden to the local community or an individual.

Urbanism, Ecological Urbanism, Emergent Urbanism, Everyday Urbanism, Futuristic Urbanism, Green Urbanism, Hybrid Urbanism, Intelligent Urbanism, Landscape Urbanism, Lite Urbanism, Mobile Urbanism, Neoliberal Urbanism, New Urbanism, Performative Urbanism, Postmodern Urbanism, Recombinant Urbanism, Sustainable Urbanism, Tactical Urbanism, Traditional Urbanism, etc. We also add *Heritage Urbanism* to this list.

- The heritage must not only be a historic monument (protected object) but also an active factor (creative entity) in contemporary life and the cultural, social, economic, and spatial development of a community.
- The heritage must not be protected from people—it should be enhanced for present and future generations.
- We must give the heritage a chance and show that it is flexible and capable of meeting contemporary needs—new life of heritage.

Goals and Objectives

The goals and expected outcomes lean towards the practical use of theoretical starting points. The goal is to enhance physical planning and bring benefits to the local community by using the heritage, which is copious and capable of providing much more than is currently the case. By using, renovating, and reviving the heritage, we are using "internal reserves" that would otherwise disappear unless we provided the heritage with new life. By doing so, we are reducing the "consumption" of landscape and town space for new construction. It undoubtedly contributes to a better quality of the landscape and quality of life because we are conserving the heritage as part of the cultural landscape and are affirming life in the heritage, giving us a new and better quality of life (Baum and Christiaanse 2012; Smith 2006).

To achieve this in the context of the *Heritage Urbanism* approach, we believe the following is important (Obad Šćitaroci 2015, 2017):

- New interventions in the heritage must be creative and of high quality so that the interventions themselves may become new heritage in the future.
- Cultural heritage should be analysed as an active resource in contemporary life and as an engine to develop the environment in which its emanation is felt.
- Cultural heritage is observed in the spatial context, from landscapes and historic sections of cities/villages to architectural complexes and buildings with their immediate urban and rural environments.
- Connecting protection with urban and physical planning—the idea of sustainable development.
- Connecting active heritage protection with urban and spatial planning is encouraged.
- The heritage is analysed from different points of view: spatial and urban planning, landscape, architecture, culture and history, economics, law, and others.
- It is time to remove the artificially imposed distinction between conservation and innovation, though both must be creative and responsible, devoid of bureaucratic discipline.

Elements of the Heritage Urbanism Method

In the context of the *Heritage Urbanism* approach, which could also be identified as a sort of a method in the contemporary rethinking of heritage—from the cultural landscape to individual buildings—three important indicators stand out: factors, criteria, and models important for the enhancement and revival of the heritage. Three types of factors are examined: factors of identity, factors of influence, and factors of value. Three types of criteria are established: development, enhancement, and new interventions in the heritage. Arising from this are models to enhance and revive the heritage. When such a method is applied, it reduces subjectivity, ad hoc decisions, and various pressures that do not respect heritage as part of the national cultural and historical identity, do not recognize the heritage as a national resource, and do not see the heritage as a driver and main contributing factor in development (Obad Šćitaroci 2015, 2017).

Factors of identity indicate the distinctive features, values, and uniqueness, which identify the heritage and make it what it is. We distinguish between general factors (by heritage type) and special factors (for individual types). The factors are determined by cataloguing selected examples (cataloguing, case studies) and applying the method of comparative analysis. The factors are examined from various points of view, such as space, landscape, urban planning, architecture, environment, culture/history, economics, law, etc.

Factors of influence show how and to what extent the environment influences the heritage (positively and negatively) and, vice versa, what influence the heritage may have on the surrounding environment (nearer and farther). Influences are viewed from different points of view.

Factors of value are important for new interventions in the surrounding space or in the heritage itself (the buildings and structures). Development is carried out using well-known and accepted professional methods. The greater the value factor, the lesser the intensity and scope of new interventions.

The criteria for development are established based on the factors of identity. Among the criteria are general criteria, criteria according to the type of heritage, criteria related to excellence, special (local), and other criteria. Development is viewed from different aspects: conservation, culture/history, architecture, urban planning, space/environment, aesthetics, functions, and others.

The criteria for new interventions in heritage must start from a characterization (factors of identity) and the value of the heritage, complementing the heritage and enriching it with a new contemporary contribution.

Models of enhancement and revival should be targeted towards activation, contributing to the active use of the heritage. We examine/seek models of behaviour by which new interventions would upgrade and enrich instead of destroy and devalue. We look for models of sustainable use with a view to finding a lasting purpose.

Models of Enhancement and Revival of the Heritage

In finding appropriate new/future models of enhancement and revival of the heritage, an important role is played by *historical models* from before the twentieth century (still applicable with appropriate adjustments), *twentieth-century models* (still applicable), and current/*contemporary models* (which produce good results). In all previous models, we examine their timelessness and modernity with a view to applying them in the future. The new model can be a *modernized historical model* adapted to contemporary needs (showing what was used and what was upgraded) or a *completely new model* derived from contemporary needs and contemporary views of heritage while at the same time not questioning the factors of identity and value features of the heritage (Obad Šćitaroci 2005, 2006).

According to the criterion of scope and intensity of intervention in the heritage, we distinguish between (1) *the model of complete revival* (applied when the heritage is not alive or used, applied to the entire area) and (2) *the model of partial revival* (applied when heritage is alive but lives unevenly in its context).

The models of heritage revival and enhancement can be related to specialized areas and specific points of view, giving us a typology focused on thematic models such as the *spatial model* (for use in spatial/regional planning), the *urban-planning model* (for use in the entire city or part of the city), the *architectural model* (for use for individual buildings/objects), the *landscape model* (for use in landscape planning for landscape heritage), the *legal model* (solves legal issues, in particular those related to expropriation and land consolidation), and the *economic model* (considers financial sustainability at the beginning of use and later on).

The models of heritage enhancement and revival may follow functional-organizational viewpoints, in which case we can speak of a *monofunctional* or *polyfunctional* model, *traditional* or *contemporary* model, *environmental* model, *individual* or *networked* model, and so on.

Although it is possible to identify and establish the more frequently used models, new, specific models may result from contemporary needs, heritage particularities, and specifics of the approach. When selecting the model, it is important to choose the one that enables recognized values to be conserved, the heritage to be enhanced, sustainability of use to be preserved, and a new life in the future to be ensured (Obad Šćitaroci 2015, 2017).

Conclusion

In the context of the *Heritage Urbanism* (HERU) project, the *quality of the landscape and quality of life* (QLandQLife) project should encompass the entire Adriatic region with its hinterland and, in this context, encompass the research in progress. Life in the Adriatic region, with visible traces of town construction and changes in the cultural landscape, has continued for 10,000 years. It might be worthwhile to explore the changes and use of space, in other words, to explore what it was that affected the cultural landscape of the Adriatic region, especially in the last two centuries, which have seen great changes. In terms of the natural and cultural landscape, the Adriatic region is different. The western and eastern coasts are not identical, neither in terms of natural features nor in terms of settlements and town construction. The eastern coast is sprinkled with a thousand islands and islets and features the continuity of the Illyrian population (contemporaries of Etruscans) from the ancient Greeks and Romans to the present day. This is why we can speak of a treasure, wealth, and diversity of heritage, which can and must be more actively involved in contemporary life in order to contribute to a better quality of the landscape and of life.

To enhance and revive the heritage so that it may become an active space, we highlight, in conclusion, a few guidelines that could contribute to improving the state of the cultural heritage and significantly contribute to a greater/better quality of the landscape and of life:

- The heritage should be understood as a pearl and a resource, as well as a driver of economic development.
- A strategy to actively use the heritage should be adopted, in order to enable sustainability and durability, but also to bring benefit to the community using the heritage or in which the heritage is located.
- An integral and open approach should be affirmed with a comprehensive view of the heritage, together with its accompanying environment.
- An appropriate heritage management method should be developed and implemented to ensure good results in terms of enhancement and revival.
- Appropriate fiscal and legislative models should be found at the national and regional levels to secure adequate funding of heritage revival and enhancement.
- Heritage revival and enhancement should be based on creativity, respect for authenticity, and creativity in planning, designing, and managing the heritage.
- The heritage needs not be protected from people; it ought to be enhanced so it can be conserved, but in such a way that people can use it, so they can live with and off the heritage.

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Chapter 31
Urbanscape Emanation vs. Types of Landscape

Bojana Bojanić

Urbanscape Emanation

Emanation is the effect that any entity, system, and/or being has on its environment. Emanation is an emission that generates an act of emitting, causing something to flow forth. The universe is an emanation from the perfect and an effort towards perfection.

Urbanscape emanation exposes space impressions, modifies insights, and examines the addition of time and structure to space. The transition from static models to dynamic models is what we want to achieve by creating awareness about urbanscape emanation.

The urban landscape is present as a vital means of achieving a better quality of life.

The concept of emanation is seen as the impact of the unit, system, and/or being on its environment and what allows it to move forward in space or time. The main issues are knowing how and why.

The design mode of a city is the choreography of motion, visual illusions, and soundscape anticipation. The aim is to create a paradigm independent of location, content, scale, time, and technology. It presents a network of key terms and concepts, considering the location, context, and programme and integrating classification, structure, and analysis.

A landscape is a creation; it is nature filtered by feeling. This research promotes discussion on achieving unity of space by respecting the existing space, creating an image of space, and on discovering, through analyses of perception and awareness, how space can change with time, and how landscapes become important for the quality of life.

B. Bojanić (✉)
Department for Urban and Spatial Planning and Landscape Architecture,
University of Zagreb - Faculty of Architecture, Zagreb, Croatia
e-mail: bbojanic@arhitekt.hr

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The objectives of landscape quality therefore play a strategic role and are instrumental in advancing towards a new culture of planning. Landscape-quality objectives are meant to increase public awareness of the landscape. These objectives need to act as a guide for planning an urbanscape.

The realization that we need to plan the urbanscape for a high quality of life entails respecting the integrity of the existing space. We need to create a picture of the space detected through the analysis of how the space changes with time. What was it? What is it? What could it be?

The topical framework is shaped by the elements of space and the limiting natural and cultural elements. These elements encourage interaction: causes and effects over time. Functions play within the dynamics of space, creating types of movement. Structures refer to structural elements: points (something special), lines (corridors), fields, nodes, edges, matrices, sounds, and associations.

The questions we need to address for our planning are why, where, and what? Their purpose or meaning is to inquire about the character of the landscape. We begin our journey with an association, trying to plan a landscape as a place called to mind by something sensed by perceiving some innate quality.

The landscape can be described as ecology, botany, and culture, through its spatial structure, and value, or as an idea of identity.

We present urbanscape emanation as a model of the landscape for a high quality of life as the mixed result of an associative landscape-urbanscape, walkscape, soundscape, and tourist lifescape. We can therefore conclude that contemporary landscape architecture is far more existential and seeks to create only forms that are based on some practical function dedicated to improving the quality of life.

Associative Landscape vs. Urbanscape

> The associative feature of the landscape refers to associations with physical components of the landscape—a connection with intangible elements through experience, perception, and interpretation of the meaning of the landscape. They encompass perception of natural and cultural, material, and non-material components as well as collective and personal experiences of the landscape. (Sopina and Bojanić Obad Šćitaroci 2015)

The landscape gives urban nature a context: urban nature emerging from the landscape in a context where elements of the urban landscape create a unique meaning. Current important sustainability parameters are perceived through critical knowledge and interventions. Interpretation, analysis, clarification, and reading of the meaning of the landscape must fall within a framework that will not compromise the needs of future generations.

> Landscapes do not encompass only what we see, but the way we see. We attribute them with purely non-material/spiritual reasons and consider them a cultural construct that embodies a sense of place and memories, including objective research and subjective experience. Each observer creates his own landscape through his own network of associations deeply rooted in personal experience of the world. Each landscape is unique. It is not only different

> from another in terms of components, but the difference is also in the eye of the observer. Collective experience of the landscape is the result of perception and interpretation of community defined through tradition, while personal experience of the landscape is the result of individual perception and interpretation. (Sopina and Bojanić Obad Šćitaroci 2015)

Perception of the landscape is the recognition of its psychological and aesthetic qualities, and the aim is an awareness of quality that brings happiness to our cities and our lives. The perception of landscape elements and landscape as a whole is a component of the contemporary way of life and the contemporary manner of using the urbanscape.

Perceiving the urbanscape helps to recognize a quality of life that the landscape brings to urban nature, embodying the recognition of associative landscapes identified here by urban elements.

> Landscapes are places of human life—immense and free—as well as their associations. Both everyday and exceptionally beautiful landscapes are a true manifestation of culture. They reflect our identity and contain our personal and collective memory. Cultural features of the landscape, which embraces a wide array of a human activities—material and non-material heritage, collective and personal associations—are an integral part of every landscape. (Sopina and Bojanić Obad Šćitaroci 2015)

Attraction that gives identity is, by association, meaning, and the significance of the intangible heritage, connected to a tangible landscape; the best example of this is an urbanscape. Urbanscape as a whole is a real landscape of people and a component of the contemporary way of life and the contemporary manner of use.

Walkspace: Walkscape vs. Urbanscape

The walkspace as a place of connectivity gives urban nature a context: urban nature emerging from mobility. The urbanscape becomes sustainable through parameters of connectivity and a balance between walkspace (we move through a specific space) and walkscape (we contemplate a space).

> In an exquisite corpse what is important are the lines of connection. (Rogers Stirk Harbour & Partners 2013)

> Space is a hidden feature of movement and movement is a visible aspect of space. (Rudolph von Laban 1966)

> Streets are complex open spaces and this is elaborated through four categories of aspects with numerous attributes and sub-attributes. Furthermore, change is the main, dominant element in every aspect, adding complexity and unpredictability. Throughout history their role and purpose has changed. (Marić et al. 2014)

This ability to change is the main reason that streets are one of the most important elements when creating a new quality of life in the city. They not only provide infrastructure and connection; they are the public places with the most changeable character.

In interpreting the urbanscape, we focus on action and movement in perception, and linking spaces through motion is therefore a planning topic for the urbanscape that aims to be full of quality for life. With connectivity, we must perceive the interconnection of the entire landscape with the urbanscape.

> The strategy of linking spaces through motion would provide new opportunities for a major city development that can be summarized in three points: (1) creating an urban context for the twenty-first century, (2) ecological, sustainable city planning with effective measures for space protection, and (3) linking public city spaces by motion, which would be of great benefit to the connected areas. (Bojanić Obad Šćitaroci and Marić 2012)

Attraction through motion in contemporary life of the urbanscape is a phenomenon in which a public space is in constant transformation, bringing into view all qualities that it possesses.

Soundscape vs. Urbanscape

The soundscape gives urban nature a broader perspective: an urbanscape enriched with new elements of quality and attraction, as new sustainability factors and a new layer of cultural heritage.

The sounds that can be experienced at a specific cultural heritage site are an integral part of its setting and they influence its aesthetic value. They should be planned, protected, and enhanced simultaneously with the individual cultural heritage site and its setting (Australia ICOMOS 2013).

A high-quality soundscape becomes a significant factor in the integral experience of the urban environment, and it enhances the mood and health of the population. The quality of urban life is influenced by its soundscape on two levels: (1) the health of city dwellers and (2) a symbolic-phenomenological level (Oberman et al. 2015, p. 120).

The soundscape can be planned by subtracting or adding new elements. Planning a soundscape installation ensures an attractive, dynamic, and unique experience of the urban open space. A new aural context of the urbanscape, in which elements of the natural and urban landscape actively create a unique sonic environment, brings a new quality to city life. Therefore, it can be viewed as a significant indicator in determining urbanscape sustainability and the quality of life, both on its own/per se and as part of the cultural heritage.

> Discover how psychology, acoustics and urban planning collide in the emerging field of soundscape design. Discover a world where sound, not vision, is the foundation on which we build our cities and find out how it's influencing the urban spaces of the future. (Axelsson 2015)

> For the enhancement of the urban soundscape, it is necessary to develop a holistic approach based on the following principles deduced from this research: inclusion of both qualitative and quantitative soundscape analyses in early design and planning stages; affirmation of the existing valuable soundscape elements; a contextual method of adding new soundscape elements; and achieving congruence between visual and aural experience (Oberman et al. 2014)

Soundscape analysis helps to identify integral urban sustainability indicators and offers the possibility to investigate congruence between aural and visual experience of the urbanscape.

An integrated approach to urbanscape planning and design in the early stages is possible, thanks to soundscape theory and recent advances such as the advent and mass availability of virtual reality technologies. It relies on the interdisciplinary cooperation and common goals of all participants. (Oberman et al. 2015, p. 127).

Soundscape analysis becomes a possible/convenient model for determining quality-of-life parameters. A quality soundscape gives a new level of attractiveness to the urbanscape, whose identity lies in sound.

Tourist Lifescape: Urbanscape

The landscape is the reification (materialization) of identity, and tourism is the quest to understand identity from the landscape. The urbanscape is an example of a cultural landscape where a tourist lifescape overlaps the scenery of everyday life.

In tourism development, the value and attraction of a space are important for maintaining and preserving the natural landscape, cultural beauties, and assets (Samsudin and Maliki 2015, p. 433).

Landscapes always change because they express the dynamic interaction between natural and cultural forces. Moreover, the landscape is not a picture that can be conserved (von Haaren 2002).

In order to survive, tourist destinations must be globally competitive as well as locally recognized. Special features, attractiveness, and spatial recognizability, together with the characteristics of a tourist destination, are the benefits underlying tourist offers and demand. Uncontrolled and unplanned tourism activities lead to the reduction or disappearance of certain specificities, attractiveness, and spatial recognition. This emphasizes the need to implement new methods for affecting the viability and competitiveness of a tourist destination's physical attractiveness (Mrđa and Bojanić Obad Šćitaroci 2014).

Therefore, cultural landscape recognizability, authenticity, and uniqueness (whether based on heritage, nature, or a lifescape) are essential in deciding what potential tourist destination areas are capable of.

Cultural tourism here has the potential to enrich our appreciation of the past and to forge stronger links between the past, present, and future, a growing challenge as the rate of change increases. However, in a postmodern society, cultural tourism should challenge the visitor to experience the place in different ways than before. Paradoxically, the continuity of traditional values in tourism will require it to demonstrate an enhanced ability to change. The more the cultural landscape enables one to anticipate and adapt to changes, the more powerful that touristscape becomes.

Touristic landscapes (Cartier and Lew 2005), or touristscapes, are places that receive a large number of tourists but which, in the end, are spaces where people live and in which there are other functions, tourism being only one of them (Metro-Roland

2011, p. 6). The touristscape is identified as a cultural landscape within its lifescape as a whole, strongly opposing the concept of a tourist bubble (Mrđa and Bojanić Obad Šćitaroci 2016).

It is important to realize that people's perceptions give meaning to a place (Shuib and Hashim 2011). The perception of a tourist lifescape as a tool to experience and live in the beauty of the urbanscape is sometimes blurred with a fear of destruction.

Tourism is too important a resource to be left to tourism professionals. Tourism needs to be part of a community mobilization strategy that can reinvent the role of heritage so that it serves the needs of everyone (McNulty 2014).

Perceiving an urbanscape as the creation of sociocultural and experiential aesthetics in a worthy and globally competitive tourism environment has positive effects on the state of the local community and local recognition and serves as a way to introduce a new quality of life.

To conclude, heritage urbanism is a method of recognizing, preserving, and activating cultural landscapes for the sustainable development of tourism (Mrđa and Bojanić Obad Šćitaroci 2016).

Conclusion

With a high quality of life, the urbanscape must strive to become an associative landscape that is well preserved, planned, and managed and is lively and dynamic, heterogeneous, and unique, with new references and values as a walkscape and soundscape. An urbanscape that is enjoyed and complete can become a real lifescape as a walkspace for residents and tourists.

The aim is to change the dualisms that shape current planning discourse, the primacy of objects over space, fullness over emptiness, gesture and expression over atmosphere, and phenomena. The phenomenon of formlessness does not refer to an amorphous object or indeterminate urban pattern, nor is it the rejection or absence of form. Rather, formlessness is equality that indicates a shift in one's focus of attention and habits of perception, from geometry and objects to the material and immaterial qualities of space, atmosphere, and phenomena as a soundscape, associative landscape, shadows, and reflections instead of objects and things.

An urbanscape is to be found in having no boundaries, so far as in it, or by occasion of it, boundlessness is represented as a possibility to achieve a new quality of life.

Urbanscapes emerged as the assimilation of certain epochs, people, civilizations, cultures, care for, and neglect of its aspects through the whole period of the past and the future.

> The urbanscape, as with culture, is a process and is expressed in multitudinous forms. We can perceive the urbanscape by focusing on the tension between the temporary and the permanent, between the planned and the experiential. Any form an urbanscape is by definition a part of a shared story, a passion, a reflection of everyday life within a culture. This is why awareness of the urbanscape is a living phenomenon (Bojanić Obad Šćitaroci 2015).

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Chapter 32
The Combined Use of Environmental and Experiential Simulations to Design and Evaluate Urban Transformations

Barbara E.A. Piga

This contribution presents a research approach based on experiential and environmental simulations to assess urban design projects and city plans. I argue that the combined use of both methods, in parallel or together with other modes of investigation, can foster the design and evaluation process while reducing the risk of failure, thus supporting the decision-making. The research outcomes presented are based on applied research carried out at the "*Fausto Curti*" *Urban Simulation Laboratory* at the *Polytechnic University of Milan*.

Introduction: A People-Centred Approach

The research approach and findings presented here were developed at the "*Fausto Curti*" *Urban Simulation Laboratory (labsimurb)*[1] at the *Polytechnic University of Milan*, *Department of Architecture and Urban Studies* (*DAStU*). Since its founding by *Fausto Curti* and *Peter Bosselmann* in 2007 (Curti et al. 2007), an interdisciplinary approach for designing and evaluating urban transformation projects has been developed at the research laboratory. In fact, there are two[2] main interconnected fields of investigation: (1) *multisensory & experiential* and (2) *energy & environmental* design and assessment.[3] This contribution illustrates the reasons and the logic of the

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[1] Official labsimurb website: www.labsimurb.polimi.it. Official labsimurb Facebook page: www.facebook.com/labsimurb.

[2] Up to 2010, another research field related to the economic and financial domain was led by *Fausto Curti*.

[3] The multisensory research is coordinated by Barbara E.A. Piga, whereas the energy and environmental research is coordinated by Eugenio Morello.

B.E.A. Piga (✉)
Department of Architecture and Urban Studies, Polytechnic University of Milan, Milan, Italy
e-mail: barbara.piga@polimi.it

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integrated approach, which is grounded on the human/environment relationship. In particular, the first section presents simulations as a decision-support tool, while the second part addresses the ethical issues related to its use in practice.

The relevant anthropic impact on environmental sustainability and citizen life demands a serious ethical consideration on the methods and procedures that affect decision-making. In fact, the possible bias generated by misleading simulations, expecially experiential ones, within the design or evaluation phases are still too high (Sheppard 2001). Moreover, planning regulations have rarely addressed this issue effectively, either in the past or today (Appleyard 1977; Sheppard 2001; Smardon 2016). In fact, even if there are several tools available to support decision-making processes, their informative possibilities are not always exploited efficiently; rather, these are sometimes more deceiving than revealing.

Among the different types of simulation, ranging from cellular automata to procedural and generative modelling, the main tools used by *labsimurb* are based on multisensory experiential simulation, e.g. virtual and augmented reality, together with environmental simulations, e.g. solar accessibility and energy maps. These enable an in vitro investigation of the urban context from different perspectives. In particular, the multisensory dimension allows for a focus on the human/environment relationship, while the environmental approach is mainly aimed at assessing urban and landscape sustainability. While the proper scale of the first approach is the urban design or architecture one, the second can easily address wider scales as well. In fact, experiential simulation[4] (Fig. 32.1) is mainly based on the individual scale in a qualitative

Fig. 32.1 In order to be effective, experiential simulations should represent the place in a realistic way in order to enable a reliable use, e.g. by faithfully reproducing the subjective perception of dimensions and distances of the urban elements (Appleyard 1977; Sheppard 1989; Bosselmann 1998; Piga and Morello 2015). The image is an interactive panorama (photo above and simulation below) produced by *labsimurb* for the *Città Studi Campus Sostenibile* project

[4] Defined by George Mckechnie as an "attempt to provide tangible, concrete replicas or isomorphs of environments—often future environments" (1977, p. 174)

Fig. 32.2 Environmetal simulation often describes the environement in a conceptual way, i.e. far from the realistic experience of people. The image is of the solar cadastre for the State of Geneva (CH), 2010, developed by HEPIA, EPFL, POLIMI (labsimurb)

perspective, with the aim of achieving users' reactions and feedbacks to a simulated urban transformation project. Energy and environmental simulation is instead able to study wider scales, such as the city or the regional one, it is often quantitatively oriented, and commonly uses indicators (Fig. 32.2). Indeed, the former investigates subjective reactions to an environment, which can differ from person to person, while the latter is mainly directed at retrieving objective data for environmental analysis. Of course it is important to underline the strong relationship between the two, especially considering the great impact of conditions of the built environment on personal health and well-being—both in the short and long term period—and the large role that human actions play to define environmental sustainability.

Multisensory Simulation as a Decision-Support Tool

Environmental simulation encompasses two possible meanings: one is focused on environmental and ecological sustainability, while the other is related to the human/environment relationship form a personal and\or social point of view. These disciplinary perspectives are often addressed separately. I believe that this separation is not effective; rather it is necessary to evaluate urban transformations outcomes in a combined way.

In the wide domain of simulations, it is important to produce trustworthy outcomes. To do so, the use of the proper method and the correct procedure to estimate and envision future scenarios is crucial. In environmental sustainability assessment this is obvious and quite common. Counterintuitively, however, in the experiential domain, this issue is too often not considered or, even worse, the potential for biased data is not weighed as an issue, even if several scholars have addressed the importance of the so-called ecological validity, which refers to validity, reliability, and efficiency of simulations as a proper decision-support system for urban or landscape transformations (Appleyard 1977; Sheppard 1989; Bosselmann 1998; Piga and Morello 2015). An appropriate support should in fact guarantee an actual *response equivalence* between the real and simulated environment. Furthermore, its effectiveness can be enhanced by features such as *immersion*, *interactivity*, and *multisensory characteristics* (Piga and Morello 2015) that contribute to the sense of engagement and presence.

The visual dimension of an urban transformation is becoming increasingly easy to represent, even in dynamic ways. Unfortunately, other sensory dimensions, such as touch, smell, and even sound to a certain extent, are still not easy to portray realistically,[5] especially considering that these should reliably depict future scenarios. Hence, nowadays the assessment of the direct personal experience of future urban scenarios through a simulated environment in relation, for instance, to perceived wind and sun exposure, is a difficult task to investigate from the experiential perspective.[6] Even if some research is moving in this direction, i.e. developing the first idea of a *Sensorama* invented in 1956 by Morton Heilig,[7] an user-friendly solution is far from being easily integrated in everyday design and evaluation procedures.

To partially overcome the impossibility of producing multisensory experiential media, simulations can be augmented with environmental data that describe fore-

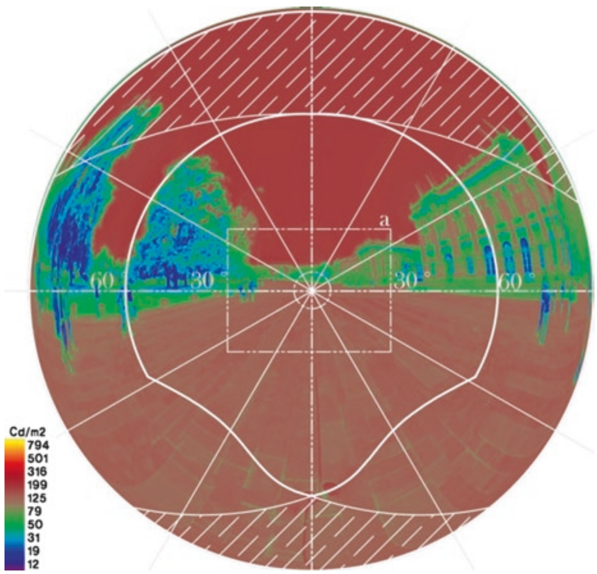

Fig. 32.3 Analysis of light conditions and angle of view on a spherical panorama of piazza Leonardo da Vinci, Milan (Study and image developed by *Mohamed Yacine Saadi*, *LACOMOFA, Department of Architecture, University of Biskra, Algeria,* with *labsimurb, Department of Architecture and Urban Studies, Polytechnic University of Milan, Italy*)

[5] A research aimed at overcoming this limit using an approach based on *perceptual fidelity* is proposed by Vigier, T.; Moreau, G.; Siret, D.; and Lescop, L. (2012). "A new concept of perceptual fidelity to augment virtual urban environments with microclimatic ambiances." In: T. Leduc, G. Moreau, & R. Billen (Eds.). *Usage, Usability, and Utility of 3D City Models*—European COST Action TU0801 (p. 3002). EDP Sciences.

[6] Shadow casting is included in visual simulation in terms of lighting conditions from the visual point of view only.

[7] Krueger, M. W. (1991). Artificial Reality II. Addison-Wesley Publishing Company.

seeable future conditions (Fig. 32.3). In fact, environmental simulations can be used fruitfully to inform inhabitants and decision-makers of the implications of urban transformation projects in two main ways: (1) the direct impact on sustainability, and (2) the indirect comfort conditions generated in the living environment. Of course, experiencing a situation directly—even if in an artificial way through an experiential simulation—or conceiving it through data interpretation does not always lead to the same kind of awareness, especially with the public that is not trained to read analytical data and translate it, i.e. interpret schemes and representations and envision the corresponding experience. Nevertheless, it is crucial to consider the tangible and intangible outcomes induced by plans or design solutions from the personal to the city - or even wider - scale; in other words, it is relevant to evaluate urban transformations in a multi-scalar perspective and in relation to its subjective\societal experience and its measurable environamental impacts.

From the individual perspective, in vitro testing environments based on experiential simulaton can serve as a tool to investigate the *ambiance* of places, i.e. the "physical atmosphere processed through the human senses, culture, and personal experience" (Piga and Morello 2015, p. 8). It can in fact enable a direct validation of the virtues of the design outcomes in terms of livability in different conditions (seasons, crowding, weather, and so on). Despite the traditional modes of investigation used to analyse human comfort with objective measures, merging the experiential and environmental methods may produce comprehensive simulations to assess comfort and well-being. This is rather desirable, since the minimum well-being conditions defined only by quantities (the functional approach) may not satisfy community needs, which depend on individual, social, and ethnic attitudes, going beyond the prevalent activity of a place (Yi-Fu Tuan 1977). All sensory, personal, social, and environmental aspects generate cumulative effects that are important to consider, not only when designing but also along the decision-making process.

The Importance of an Ethical Approach in Simulation and the Analysis of Users' Reactions

It is not surprising that, due to the seriousness and urgency of actions to improve sustainability, laws, guidelines, rules, and procedures in the environmetal perspective are consistent and applied. The same cannot be said, however, for a solid and scientific pre-evaluation of the personal/social impact of urban transformations from an experiential point of view. Nevertheless, this is a crucial issue that should be addressed from the beginning of the design process and should provide support for public/private negotiation and decision-making.[8] The great implication of the anthropic impact on the environment and the relevant inference of design solutions on people's quality of life and well-being require a serious commitment on behalf of designers and public administrations. Of course, this is more than a disciplinary matter, this is an ethical concern.

[8] In other disciplines, such as industrial design or software development, prototyping and beta testing are already viewed as crucial verifications for the final validation of the design solution.

As Stephen R.J. Sheppard (2001, 2005) asserts, there are three main issues related to the ethical problems of simulation: the lack of a proper and diffused code of ethics for visualizations,[9] the need for ethical practice, and the need to scientifically validated procedures. Tools and methods used to support decision-making affect the planning, design, and evaluation process, and thus the urban outcomes; hence, any kind of misleading final representation of data analysis or design proposal implicates uninformed and biased decisions (Appleyard 1977). As mentioned above, experiential simulations can particularly suffer from this issue of unreliability, beyond its apparent realism. In fact, biased simulations are not always easy to detect, and moreover, effective regulations on the subject are almost nonexistent, at least in European countries. Hence, it is crucial not to underestimate their impact on urban transformation judgements at all levels, especially considering the increasing number of realistic simulations accompanying the delivery of technical drawings and their display for the wider public. This responsibility lies not only in the hands of designers and decision-makers but also in the hands of developers and citizens, who, together, should actively contribute to move forwards by asking for transparent, ethical, and ecological decisions through active public participation and involvement.

Even if some researches have addressed the issue of procedures and criteria for producing and presenting reliable simulations (Appleyard 1977; Sheppard 1989; Bosselmann 1998; Piga and Morello 2015), there are few guidelines for assessing design projects relying on personal experience reacting to simulations. In fact, while technical measurements, generally quantitative ones, are required for project approval, e.g. the minimum standards defined by law, very few validations are conducted in terms of scientific pre-evaluation of the human/environment interaction outcomes derived from urban transformations.[10] This assessment is too often solely delegated to the ability of the decision-maker and based on simulations that do not follow a shared protocol to guarantee their efficacy. Moreover, it is unlikely that the design approval considers inhabitants' responses to experiential simulations, and in any case there is not a clear codification of procedures and criteria to judge their feedback, nor is there a reference to the final performance desired in terms of well-being. Beyond simulation reliability, to properly evaluate users' responses, the decision-maker should also benefit from methods and procedures of environmental psychology (Boffi and Rainisio 2017). The same can be said for the ecological perspective seen from the user experience. In fact, even if it is clear that climate design is emerging in recent years, it is not possible to say the same for tools and procedures assessing the environmental comfort of a designed area from a psychological point of view. As Peter Bosselmann (2008) observed, beyond the geometrical aspects, it is possible to measure the implication of a physical transformation from different perspectives, such as the social, political, and economic ones, and it is important to assess their impact in a combined way in order to avoid biases. These aspects should be considered from the design phase to the evaluation phase (Carmona et al. 2010).

[9] This point is even more dramatic if we consider that many simulations are beginning to become multisensory, even in terms of soundscapes and kinesthesia.

[10] This is too often true for post-occupancy evaluation as well, which could instead contribute to generating a virtuous cycle of validated best practices.

Moreover, it is relevant to notice that the way a simulation is presented can also influence user responses. In this sense, it is important to consider how social media are changing the way society interacts and how design projects are displayed. Not all public administrations are equipped and ready to take advantage of this direct, informal communication and interaction form, but since it is an easy way to reach a greater number of citizens in an engaging way, this is hopefully only a matter of time. Of course, this reinforces the need for a critical approach to simulation, also in a deontological perspective. In fact, the possibility of navigating spherical views, photos, or videos has recently been introduced in the main social media platforms. This introduction opens a new mode of visual and sound communication, where the user is free to wander around, even if generally in a predetermined view.[11] This possibility, of course, introduces new frontiers of presentation of design projects on the web; moreover, the next expected step of online visualization is the use of such media with *head-mounted displays*, i.e. tools that enable immersive envisioning and navigation of a virtual environment. These solutions are increasingly less expensive and more user-friendly and thus accessible to everyone, and it is probable that this will lead to the next generation of social media and web data contents fruition. The introduction of these modes raises ethical questions even more strongly, and stresses the need for an urgent and serious study of its potential to foster public involvement in high-quality design and planning solutions. Beyond enjoyment, a critical approach is needed.

Conclusions

I have argued that simulations can serve as valid support for design thinking and evaluation. At the same time, they can provide useful support when communicating urban design projects, both for professionals and lay public. Realiability of simulation is a crucial issue and, if properly produced and presented, it can be an efficient aid in the design process by increasing the transparency of public administrations on the implications of urban decisions; experiential simulation can serve as a tool to share urban projects and collect users' feedback, that can ultimately lead to informed decisions and efficient actions. Thus, simulations can be intended as investigation and validation tools to manage complex ecosystems such as cities, which are composed of tangible and intangible elements with peculiar individual/societal characteristics. The importance of considering multiple perspectives in order to face urgent challenges, such as the environmental or social ones, stresses the urgency of collaboration from different backgrounds to develop an integrated interdisciplinary approach.

In my opinion, this implies the need for a systemic introduction on the topic starting from university courses, and a critical review of the decision-making process towards a more efficient decision-support system to assess design projects before construction, including the evaluation of final users' level of comfort—physical and psychological—in the transformed environments. Of course, to be effective, this approach should make use of the proper tools and should collect personal reactions from representative target groups, e.g. it should consider people belonging to different cultures that may interpret the experience in different ways

[11] This will probably be overcome with embedded 3D navigable models.

(Hall 1992) or people with different types of disabilities that have specific needs for easily navigating the urban space. This approach should thus contribute to build a more inclusive and democratic urban design and planning process.

Nevertheless, simulations alone are not enough to reach these ambitious goals and should rather form part of a wider system in order to effectively support design thinking and decision-making. I strongly believe that a systematic interdisciplinary approach that allows for deeper collaboration among professionals from different disciplines is urgent and necessary for a comprehensive methodology towards well-balanced solutions. Of course, this is not an easy task due to different reasons, not least the linguistic gap among disciplines. It is exemplary, for instance, that the same concept can be labelled in different ways in specific domains or, conversely, the same label can refer to a different concept in some disciplines, for example, *prototype* in psychology and architecture or *architecture* in ICT and planning. Nevertheless, I am convinced that this integrated approach should be encouraged and supported, even if it will require a long time to really become a custom approach and procedure in planning and urban design.

To conclude, it is important to remember that these supports alone cannot guarantee the quality of the final decision, nor do they relieve the decision-maker of the responsibility of evaluation. These can only contribute to the proper understanding and prefiguration of the cumulative outcomes of a design project.

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Chapter 33
Strategies of Landscape Restoration and City Naturalizing

Francesco Domenico Moccia and Gilda Berruti

International attention on climate change has marked a turning point for urban planning and demands a radical change of direction (Moccia 2009). The effort to contain soil consumption and limit urban growth to reduce greenhouse gas emissions is no longer acceptable. It is necessary to adopt an active approach aimed at ecological urban reform that identifies the natural alterations of urban settlements and works to restore the natural balance (Register 2006; Moccia 2011). Assuming such an approach is particularly difficult in urban areas, where urbanization processes frequently modify natural cycles, pollute the environment, and misspend nonrenewable resources or prevent their reproduction. At the basis of this approach lies the definition of ecological restoration according to the Society of Ecological Restoration, as "the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed" (SER 2005). It is an intentional activity designed "to return an ecosystem to its historical trajectory, i.e., to a state that resembles a known prior state or to another state that could be expected to develop naturally within the bounds of the historical trajectory" (*Ibid.*). This is an even more difficult challenge where bonds with the natural environment have been irresponsibly erased. In fact, it is sometimes difficult to identify the natural state to return to, and simultaneously, for the future, it is necessary to deal with the ongoing context when searching for a compatible environmental balance.

Along these lines, contemporary theories aim to support a balanced coexistence of mankind and nature, both in the United States and Europe, from the low-impact development (LID) approach (Coffman 2000; US EPA 2000; Platt et al. 2008) to the sustainable urban drainage systems (SUDS; Butler and Parkinson 1997; Fryd et al. 2010) and green infrastructure (Beatley 2000; Davies et al. 2006; Moccia 2010; US EPA 2013; Coppola 2016), drawing knowledge from different disciplines such as

F.D. Moccia • G. Berruti (✉)
Department of Architecture and Urban Studies, University of Naples Federico II, Naples, Italy
e-mail: fdmoccia@unina.it; gberruti@unina.it

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The Urban Book Series, https://doi.org/10.1007/978-3-319-65581-9_33

landscape ecology and urban ecology.[1] These are ecosystem-based approaches, whose objective is the innovative management of stormwater in order to restore vital cycles and the water cycle in particular.

Recognizing the importance of the water cycle for the life of urban ecosystems entails leaving water disposal methods aside and working hard to bring the hydrographical system of urbanized areas back to the surface, allowing the whole complex of ecosystem services related to environmental mosaics in which water is present to be retrieved (Moccia and Palestino 2013).

This research is concerned with the eastern plain of Naples. Originally a marshland, it was progressively urbanized for industrial purposes during the nineteenth and twentieth centuries and is today degraded after the closure of most of the factories. Here, environmental decline can be interpreted as an opportunity for testing water-centred strategies of landscape restoration and naturalization in urban contexts.

The New Hydrological Paradigm

The pre-industrial city managed and took advantage of natural processes starting from its form. In fact, water was considered a resource, not only as a source of subsistence but also of the vitality of places. Nowadays, such a cooperative relationship with natural processes has lost strength. However, some practices concerned with the water cycle typical of pre-industrial cities that are still alive in empirical knowledge could be resumed and exploited to address current planning strategies. For these reasons, it is necessary to change cities' water-management approaches by adopting sustainable systems for stormwater drainage, based on localized solutions rather than "at the end of the pipe" treatments (Novotny et al. 2010) with a systems approach to the urban watershed.

According to Novotny et al. (2010), from ancient cities to the twentieth-century city, four "paradigms that reflect the evolution and development of urban water resources management" followed each other: basic water supply, engineered water supply and runoff conveyance, fast conveyance with no minimum treatment, and fast conveyance with end-of-pipe treatment. Under the fourth paradigm, or "end-of-pipe control paradigm" (Novotny et al. 2010, 25), from the 1970s to today, "the long distance transfer of water and wastewater dramatically changed the hydrology of the impacted watershed" (*Ibid.*, 26), with consequent problems in our cities related to increasing imperviousness, a dropping groundwater table and subsidence, and urban flooding.

The new paradigm proposed, the paradigm of sustainability, or the fifth paradigm, for "cities of the future" (Novotny and Brown 2007) develops an urban landscape that mimics natural processes. It "is a model of integration of both newer and older urban developments with the landscape, drainage, transportation and habitat infrastructure that will make cities resilient to extreme hydrological events and

[1] For a review of the evolution and application of terminology surrounding urban drainage, see Fletcher et al. (2015).

pollution, while providing an adequate amount of clean water for sustaining healthy human, terrestrial, and aquatic lives; and an optimal balance among recreation, navigation, and other economic uses" (Novotny and Brown 2007, p. xix).

The Planning Process of Landscape Restoration

The recovery of rivers and creeks in urban settings is not a new idea (Kibel 2007; Platt et al. 2008). After the exploitation of natural water for industrial purposes or the covering of urban streams to provide additional space for development purposes, the closure of production activities or the quest for a healthier environment moved people to restore the altered environment to its former condition. In all cases, these proposals were bottom-up movements by concerned citizens looking for better living conditions in their everyday spaces (Register 2006). Landscape architects and urban planners oriented towards smart growth found the driving force to circumvent local governments and address ecological decisions in the neighbourhood. In this way, coalitions of organized citizens, academics, and professionals were involved in local processes that achieved good results and revealed demonstrative projects of how urban environments may regenerate and become more sustainable and resilient. Local action anywhere, whenever it is important and encouraging to move forward along a path of naturalization, is still marginal and less effective if it does not extend its approach and proposal to the whole city and, even more, to the metropolitan form these cities have in the current stage of evolution.

The research presented in this chapter aims to address the issue of landscape restoration on a larger scale. As an object of study and proposal, it adopts not a creek or river tract but a whole urban neighbourhood. To choose such a starting point means considering that any alteration of nature occurred with the urbanization process and how natural cycles and environments changed, including issues such as the increased vulnerability and deprivation of ecosystem services.

The method may be synthesized as an urban narrative in reverse, counter to all urban histories. History is focused on human action and its plans and projects for city enlargement: new streets, squares, parks, buildings, good architecture, and neighbourhood organization without any or much consideration for the settings where the developments occurred. Working in the opposite direction and taking advantage of urban history, the proposed study asks which features described the area before the urbanization process occurred.

To reach this aim, we designed an inquiry process based on the following steps:

1. Definition of a study area
2. Building a geomorphological model of the site
3. Reconstruction the hydrological network as well as the pedology and land vegetation coverage
4. Examination of the historical development narrative
5. Analyses of alterations of the former natural ecosystem
6. Decision of what change can be planned in a timeline
7. Identification of supporters of change and their action plan

The process may be divided in two parts. The first five steps have a main knowledge content and require the collaboration of scientists from many sectors of Earth science, such as geologists, geographers, hydrologists, agronomists, and ecologists. The cooperation of scientists can provide useful input if there is also planning guidance in the knowledge stage when studies should be directed to focus on the problem and have the perspective of change.

The last two steps deal with political action and can be supported by political scientists. In other words, it is necessary to elaborate a strategy, and the steps may expand in a model of strategic planning (Bryson 2011) and involve leadership theories in coalitions of civic associations in public action (Bryson and Crosby 1992). The following paragraphs provide a short description of the planning process.

Defining a Study Area

The main requirement in identifying the study area is that natural and anthropic phenomena can be studied throughout their development as a chain of cause and effect. This is much more important for natural events and functions. Assuming that the water cycle is one of the most important natural geographical functions for living species, the hydrographical basin is the preferred area.

Hydrographical basins are regional administrative partitions in Italy as well as in many other countries. In this case, their perimeters are determined according to both geographical and administrative motives. One of the latest decisions made by the Italian government is to merge many former regional hydrological basin authorities into a few new national hydrological districts. These authorities are an important source of information. Following European Directives, they also carry out studies on flooding and landslides and publish plans for natural hydrological and hydrogeological risk and coastal erosion. Given this tendency to expand authorities for spending review reasons, the real hydrological basin considered must be defined in each planning process on a map of existing river networks and mountains. The basin perimeter can be obtained by uniting all the highest points around the river network.

Building a Geomorphological Model of the Site

The geomorphological model is already needed in the previous step, even if logically the first requirement in research is to know the object of study. What is important in identifying the river network is the superficial flooding of rainwater and its collection in the more depressed soil hollows, confirming what is obvious if not commonly noticed. There is no surprise to find streams in hollows. This truism may help any time superficial water disappears due to alterations resulting from urbanization.

Over the long period of time when cities were built, stormwater flooding on land was considered a nuisance with respect to urban living. Only in Roman and Medieval times were stormwaters directed into urban streets, forums, and squares for cleaning purposes. Later, with the invention of sewage systems, all cleaning processes were hidden from citizens' eyes, and the sewage network became an extended version of the previous natural streams. It is therefore necessary to select from among its many branches only the ones that approximate the natural water flow.

We do not expect the survival of the river system in the channelled network connected to the watershed because mechanical technology was substituted for natural gravitational flow, and along the network, water pumps are employed to climb slopes, circumventing the above-mentioned law of gravity or the leading role of geomorphology.

Reconstructing the Hydrological Network as well as the Pedology and Land Vegetation Coverage

Rivers and their tributaries, including the smaller creeks, are the ties of the water network. Entering a town, the network disappears amid the sewage system. Nevertheless, when it flows through the urban fabric and we see it in the maps and upon closer investigation in the urban environment, it is probable that many alterations were developed. Artificial channels were built for many reasons. Water might be used to increase city defence, filling moats in order to strengthen the city walls, or as transportation infrastructure over which boats move people and freight, or as an irrigation ditch for urban gardens. Water served housing for cleaning and disposing of waste.

In most of these functions, urban water is kept out of the urban landscape. Public spaces, and even open spaces, cannot combine with streams that are hidden in backyards. As a consequence, the river basin is dirty and distressed, a place where the waste of urban life is discharged. For these reasons, reconstruction of the hydrological network is, very often, the discovery of a neglected system of spaces that have great potential to enrich the common network of public places for overlooked urban functions such as walking and cycling in a car-prone street network.

As for reconstruction of the pedology and land vegetation coverage, this addresses soil quality, describing land uses, the ratio of permeable to impermeable areas, and the relative processes of stormwater absorption.

Examining the Historical Development Narrative

Urban history is a well-developed discipline with solid methodology in interpreting old maps. Access to this field of studies means having a firm knowledge of documents since the fifteenth century and more accurate surveys since the eighteenth century. The urban history may help to identify the correct information and benefit a large body of studies where sources have been explored and narratives were told, even if less importance was given to nature and agricultural space.

Nevertheless, the opposite direction of landscape restoration will direct its inquiry to all new findings through the work of removal, instead of addition, of pieces of new urbanization to the land. The historical work will form the understanding of events and decisions to alter nature, whose criticism consists in evaluating the existence of alternatives in solving the same problem in the new sustainable paradigm. The chosen approach is that of operative history (Tafuri 1968), a critical knowledge leading to change.

Analysing Alterations of the Former Natural Ecosystem

In order to reconstruct the original character of the sites, which was interrupted or hidden by further urban expansion, two lines of work are feasible: analysis of cartographers' documents and study of the still-recognizable spatial characteristics of the site. As for the latter, one of the most determining factors for surface stormwater flows is geomorphology. Observing alterations in the environment entails reasoning about their reversibility. A key example is the buried channels that have been replaced by urban streets. The restoration of their natural state is viable only for suitable dimensions and slopes of the street sections as well as under the appropriate environmental conditions.

The most important assessment is the possibility of restoring the former natural situation. In high-density urban areas, creative solutions to move forward compromise overlapping systems of drainage with no sustainable solution added to the existing sewage network.

Deciding Changes and Their Timeline

Stakeholders meet and decide what they want to do immediately, both in the intermediate period and in the long run. A timeline for task completion is necessary. Strategies are developed through action plans that are discussed and shared. Stakeholders identify existing and needed resources, support, and commitments, assigning roles and responsibilities according to individual skills.

Identifying Supporters of Change and Their Action Plan

Involving citizens and local forces from different fields is an important requisite in order to discover critical situations in the area and prepare effective solutions. At the same time, this approach increases the awareness of water's value. Stakeholders who accept a shared problem framework and a set of solutions constitute an "advocacy coalition" (Bryson and Crosby 1992, p. 175) that includes groups to pressure policymakers to adopt a shared proposal. Such an approach provides more satisfactory actions fitting local interests, the possibility of mobilizing both public and private resources, and the combination of foreseen changes with adequate management plans.

The Ecological Regeneration of the Eastern Metropolitan Periphery of Naples

The eastern metropolitan area of Naples is a plain, a natural *impluvium* where stormwater drains from the surrounding heights, where the ancient Sebeto River flowed. Reclamation interventions throughout the centuries have modified the plain, with the objective of controlling hydraulic imbalances (Fig. 33.1).

In our research, the importance of groundwater in the hydrographical system was surprising. In fact, water springing from the ground can be observed in the railway station and the basements of other buildings during intense rainfall in East Naples. Since groundwater emersion has grown just in the last couple of years, the explanation was mainly related to the reduction of agricultural and industrial activities associated with the withdrawal of water from the aquifer. Moreover, 10 years ago, a set of wells feeding the aqueduct was closed because of water pollution. Groundwater depletion, along with the construction of a reclamation channel network, first transformed a former wetland into an agricultural land and then into an industrial area. The question arising from this discovery is the compatibility of wetlands with urban

Fig. 33.1 Reconstruction of the hydrographical system of the eastern plain of Naples

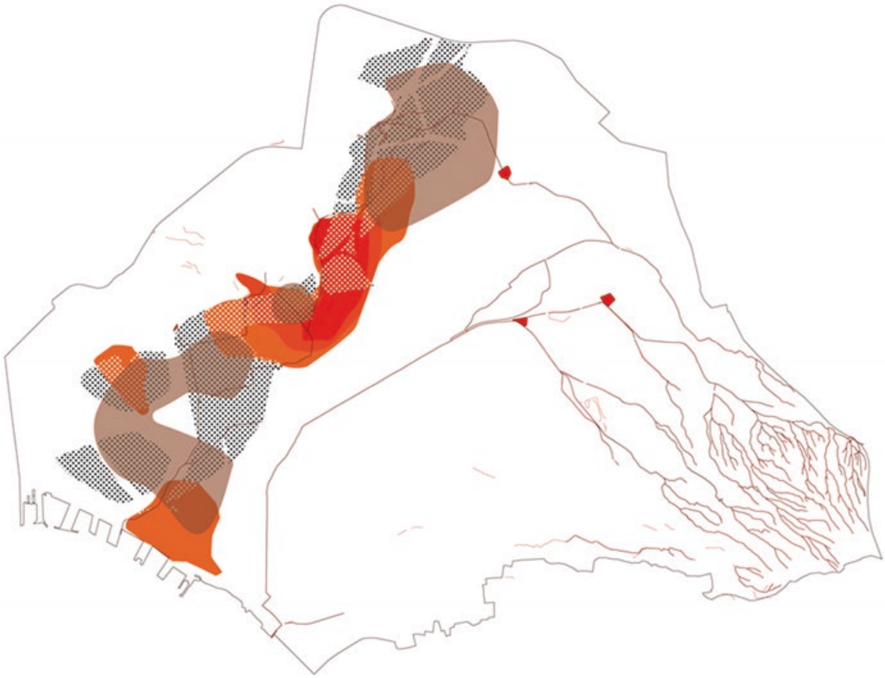

Fig. 33.2 Overlapping historical geological and morphological analyses in the urban region of East Naples

settings, once the reverse process goes further and restores a marsh among the ruins of industrial plants (Fig. 33.2).[2]

The eastern periphery of Naples appears to be a chaotic and degraded urban landscape, where infrastructure is a prominent element, crossing the territory through a disordered network of motorways, railways, and pipelines. An industrial and post-industrial landscape is mixed with unexpected portions of countryside, which are fertile in many cases. Narrow gardens, hidden behind buildings along the main streets and confined by the railway, are still present. Traces of former water channels also persist, but their courses and banks have been altered or covered for development reasons. The same state of abandonment characterizes the ancient mills dotting the area, which echo the image of water as a vital element for the life of former urban settlements (Caputo et al. 2002). Nowadays, such a relationship between places and natural processes could be resumed and adopted as a strategy to recover degraded areas of the metropolitan city, thus enhancing the well-being of citizens and the vitality of the territory.

[2] On wetland design, see France (2003), and with reference to the area of East Naples, see Moccia (2013), di Martino (2013).

Water-Centred Strategies for East Naples' Ecological Regeneration

In order to pursue the well-being of citizens and the vitality of the urban region, not only working to avoid risks but cooperating with the surrounding environment, we identified "four indicators of sustainable stormwater management for a careful water-centred design" (Berruti et al. 2013, p. 163). These are related to the increase of stormwater drainage capacity, the presence of good boundary conditions for the construction of a green infrastructure, the possibility of restoring natural conditions, and the increase of human interaction, thanks to the presence of water. The four indicators perform as a grid of issues applied to the selected cases and may be useful when addressing choices and defining priorities, bearing in mind an integrated idea of stormwater management that can improve the quality and livability of places.

The second step was to adopt the transect strategy to study the territory of East Naples, in its potential "as an analytical method and a planning strategy" (Talen 2002, p. 294), capable of reconciling planners and environmentalists.[3] "A transect is a geographical cross section of a region used to reveal a sequence of environments. For human environments, this cross section can be used to identify a set of habitats that vary by their level and intensity of urban character, a continuum that ranges from rural to urban" (Duany and Talen 2001, p. 1453). In our research, transects represent samples of the different habitats of the East Naples urban region and vary by their intensity of urban character, where urban materials are explored through a morphological survey.

The analysis of morphologies is concerned with two main categories: the residential city and the productive city. However, the changing city, with its areas in transformation and construction sites, is not further investigated since its future is already planned and seems not to be open to improvements. Residential morphologies include historical and recent linear development, independent building development lots, courtyard building blocks, and scattered development lots (Table 33.1). Productive morphologies include high-density small industrial aggregates, small industrial aggregates with open spaces, dismantled factories, and commercial areas.

For each of the morphologies, the relationship with water was investigated in order to highlight its capacity to retain or expel water, also comparing them with some parameters of urban planning know-how.[4] Reading the urban fabric from an effective water-management point of view means defining the selected settlement as introverted if it uses and conveys water within itself or extroverted if water is expelled. In both categories, water is rarely considered a resource and follows the

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[3] According to Talen (2002, p. 308), "the transect can be thought of as an environmentally conceived approach to urban design. Whereas traditional urban design is usually thought of as having nothing to do with t health (Frey 1999), the transect situates urban design within an environmental framework".

[4] The other selected parameters are population density, lot coverage ratio, the presence of permeable or potentially permeable areas, and roof typologies. For a detailed insight, see Berruti et al. (2013, pp. 167–171).

Table 33.1 Urban morphologies and their relationship with water

Urban morphologies	Transects	Relationship with water
(Historical and recent) Linear development		– Extroverted: water is not considered a resource and is thrown out – Population density and lot coverage ratio: high – Presence of permeable areas: low/medium – Roofs: flat and walkable, only rarely pitched
Independent building development lots		– Introvert, follows the fast conveyance system – Population density: medium/high – Lot coverage ratio: medium – Presence of permeable areas: high – Roofs: flat and walkable
Courtyard building blocks		– Introvert – Population density: medium – Lot coverage ratio: medium – Presence of permeable areas: medium/high – Roofs: mainly flat and walkable
Compact grid		– Extroverted: water is something to get rid of – Population density: high – Lot coverage ratio: high – Presence of permeable areas: low – Roofs: flat and walkable
Scattered development		– Introvert – Population density: low – Lot coverage ratio: low – Presence of permeable areas: high – Roofs: flat or pitched

fast conveyance system. In the presence of introverted settlements, the possibility of improving the recycling of stormwaters is naturally achievable, thanks to the morphological characteristics of the sites. Water harvesting and its reuse for irrigation, roof gardens, and the whole inventory of green infrastructure policies can be experimented with in order to improve our cities' adaptability to climate change. This objective is more difficult to achieve in the case of extroverted settlements, where water is considered something to get rid of, which is also due to the reduced available space. In these categories, it is possible to foresee actions only in the permeable or potentially permeable spaces, aiming for a partial disconnection from the sewage infrastructure and introducing stormwater drainage solutions.

As for the design proposals related to each urban morphology, by adopting a transect survey, they were developed following the grid of the four indicators of water-centred design.

In addition to the capacity to realize a decentralized water-management system relying on the ability of the environment to slow, filter, and absorb stormwater, each proposal must address the possibility of improving the existing network of green infrastructure with elements already present in the surrounding areas, the feasibility of restoring a node or a segment of the green infrastructure within the city, and the increase of interaction and exchanges in the urban environment as clues of a vital and healthy place (Table 33.2).

Table 33.2 Urban morphologies and indicators of a careful water-centred design

Design proposals	Increase of stormwater drainage capacity	Presence of good boundary conditions	Restoration of naturality	Increase of human interaction
Courtyard building blocks with public space	Increase of pervious pavements	Abandoned areas at the boundary of the urban settlement (reused as gardens or segments of the green network)	Partial disconnection from the underground infrastructure	Daily or domestic semi-private interactions (use of shared spaces as urban roof gardens)
	Stormwater harvesting and recycle infiltration			
Reconnection of public spaces	Stormwater harvesting and recycle infiltration trenches and pervious pavements	Connection with surrounding public spaces and with Corso Strena		Recreational uses in green spaces and close to the stormwaters collection tanks
		Connection with the compact grid		
Compact grid	Infiltration (rain garden, pervious pavements, infiltration trenches)	Aggregation of spaces at the side of the neighbourhood street (green network)	Partial disconnection from the underground infrastructure	Semi-public daily uses along the street (children's games, parking, etc.)
		Link with Villa Letizia and adjacent spaces		
Channel street bounded by public spaces	Stormwater harvesting and recycling for park irrigation	Connection with the Northern segment of the green network (Via Argine)	Renaturalization of the Pollena channel	Recreational uses (walking along the channels, biking, relaxing in the park and in the outer square)
	Increase of infiltration (increase of green areas in the park, pervious pavements, and infiltration trenches)		Channel restoration	
			Recovery of the riparian vegetation to restore ecosystemic balance	Daily uses related to the nearby public facilities (gardens)

Fig. 33.3 Overlap of the normative sustainable stormwater-management scheme and the urban fabric of East Naples

The selected cases involve a courtyard building morphology, the reconnection of public spaces, a compact grid morphology, and a channel street bounded by public spaces. The disconnection of some roofs and streets from the sewage system, stormwater harvesting and recycling for public or private uses, the reconstruction of a green infrastructure that preserves the ecosystem balance starting from the recovery of abandoned areas, and public open spaces where exchanges and relationships among people are experienced are only some of the design proposals explored. In many instances, water is an element of sociality in public spaces, although in some morphologies its role is more intimate and connected with daily uses (Fig. 33.3).

The case of East Naples' urban region exemplifies a methodology useful in "designing with nature", focusing on territories' genius loci. In fact, the proposed approach is based on territorial resilience, interprets urban fabric's rules and classifies them, and challenges the possibility to return to an apparently lost natural state. Urban transects are used to devise general design solutions to some recurring problems in stormwater management and to foster ecological improvements for natural resources. At the same time, they allow an integrated look at urban ecosystems, in which the issue of stormwater management is not isolated, but addressed with respect to natural and social contexts within the city.

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Chapter 34
Territorial and Urban Recovery Design: In Search of a Contribution to Sustainable Planning

Vincenzo Riso

With the closing of an era of new urbanization and unceasing building growth, architecture will continue to matter, since the built environment still has many problems to address. However, to be operational, sustainable planning needs to be based on a better environmental balance as well as on each territory's distinctiveness. In terms of spatial organization, this should lead to proposals for interventions, which should be both strong with regard to the technical aspects and rooted in the social and cultural context.

For a long time, environmental questions have dealt with the protection of determined areas in order to protect them from the effects of production activities. But climate change has now made it clear that sustainability should be intended as the recovery of a balance between the consumption of natural resources and their possible regeneration. Especially on larger scales of intervention, the main problem today is one of environmental repair. Accordingly, experiences in which the practice of architectural design is considered not only as the art of inventing forms but also as the art of developing and managing transformations are becoming more and more frequent.

For several years, the School of Architecture of Minho University (EAUM) has been involved in teaching and research aimed at developing and implementing design tools to investigate the characteristics of cultural landscapes and their interaction with architectural qualities on different scales and levels of abstraction and in discussing different methods of transformation.

An introductory note about such themes can be made by referring to the words in use today regarding large-scale design, whether in urban or territorial contexts.

The first keyword is "redevelopment", which has been used since the 1980s to refer to a practice oriented towards the replacement of vast old industrial

V. Riso (✉)
University of Minho School of Architecture (EAUM), Landscape, Heritage and Territory Laboratory (Lab2PT), Braga, Portugal
e-mail: vriso@arquitetura.uminho.pt

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(but any case urban) complexes with the physical organization of a brand new environment. The goal is to redevelop them economically, primarily by attracting private investments.

A second keyword, which is currently in full use, is that of “regeneration”, which deals with the improvement rather than the replacement of given urban parts, which may have lost their functional role or identity. When compared with the previous attitude, this one is somehow a recent achievement resulting from acknowledgment of the environmental costs of destroying the energy embodied in existing constructions, as well as the awareness of dissolving the social values inherent to factually established communities. That’s why the historical legacy is upgraded with new technological and social issues. It is also noteworthy that this perspective can be valid regarding both buildings and public areas in urban contexts.

The third keyword is “recovery”, which is connected to the former but is more adequate in describing the specific design strategies developed so as to work in the territory where we are based: the Minho region in Northern Portugal. It can be described briefly as a continuously varying hill topography, which throughout time has been occupied by a number of small settlements closely related to the rich and almost capillary hydrography. In recent decades, this historical model has been used, almost unconsciously, as the basis for the social and economic development experienced in Portugal particularly during the 1980s and 1990s, which resulted in a situation that can roughly be called “diffuse urbanization”. For some years, we have been studying how to resolve the various problems commonly associated which such situations (fragility and the inadequacy of infrastructures, lack of public spaces, etc.). But at a certain point, we recognized that studying parameters of concentration and urban density had limited convenience when considering an operational perspective. On the other hand, we also acknowledged that the peculiarity of the diffuse urbanization in our region consisted in the permanence of strong signs and structures inherited from the historical organization, which have progressively been abandoned but are still alive with the memories and culture of the inhabitants. This does not mean that the alterations seen in recent decades due to economic developments had a small impact; rather, such impacts have been strong, but the previous territorial organization proved—at least—to have a certain inertia.

This acknowledgment was necessarily accompanied by a systematic work of representation. Thus, we experienced how a critical representation of a certain territory could be developed by elaborating a specific interpretation of the existing structures and systems. Some keys ideas were assumed that somehow corresponded to the search of a sort of—even if partial—interpretational narrative.[1]

As an actual example resulting from our work in the Northern Portugal regions of the Ave, Cávado, and Minho valleys, it can be reported that even partial recovery of the old waterline agricultural systems and their related structures has emerged as a real possibility to work on the relationships among the built elements and to reclaim a sense of continuity of the ground. As mentioned above, old water-supply

[1] See also Riso (2012).

structures still exist throughout the territory (whether urban or not), including the adaptation of housing in order to collect and store water, which also gave way to local networks of hydroelectric energy production. The industrialization of the economy and agriculture has obviously led to the complete substitution with larger-scale infrastructures and water supply and energy production systems. The strategy is one of reuse, in all of its various elements and parts. Abandoned infrastructures are technologically upgraded, that is, according to the needs and circumstances we are facing nowadays. This means that, by recalling former structures and practices according to which water and land have always been integrated, the aim is to reopen the association between water and urban areas, an association that again could find its material form in the recovered piece, mechanisms, and constructions, which, although abandoned, still exist on the ground.

The hypothesis to update and reactivate a number of small hydroelectric power stations, for instance, corresponds to decentralizing energy production and at the same time managing the spatial organization of a piece of landscape in the continuity of meanings that it represents. In brief, the time has come to regard the landscapes, buildings, and infrastructures of the recent past as valuable elements if we begin to think about a perspective of compensation to rebalance the urban territory.

This is a simple example, but the same operational logic consisting in reactivating hidden potential can be applied to other structures and/or recognized elements. We are therefore dealing with a research strategy aimed at integrating hydraulic and environmental engineering with land use, without overlooking management of the corresponding impact on the spatial organization. In other words, it is expected that the reinterpretation of hydrographical systems could act as a vector of environmental, economic, social, and cultural recovery.

Finally, should we resume this kind of work in operational positions, we can say that three different concepts govern the whole process from the survey/interpretational phase to the design/operational phase.

The first concept is expressed by the word “gleaning”, whose ancient roots lie in the practice of gathering leftovers after a harvest. In this perspective, it translates as the practice of selecting something that can be found in the place, something that has been used previously but now lacks use and which we imagine could be used again. Such value/usefulness may not be strictly inherent but can also be invented as new.

> Gleaning unfolds through purposeless action, revealing complex relationships that would not become so if oversimplified by a predetermined idea and plan. Why do we glean? To persist in the evidence of an idea which was not. I don’t see when I look but I see if I close my eyes and touch. Gleaning is seeing with our hands. We tend to think that ideas are concepts, but for me ideas are quite concrete: they are matter. An idea becomes an actuality when a thought is transmuted into matter, or conversely, a substance is transmuted into one idea.[2]

[2]A larger discussion on the concept of gleaning can be found in Silva Ferreira (2014) pp. 265–268.

The second concept is *bricolage* as it refers to a construction or creation from a diverse range of available things, made or put together using whatever materials happen to be available (the gleaned ones). The creativity of design resides here in a process requiring the operational dexterity required in the absence of models and formulas.

This concept was proposed in general terms by Claude Lévi-Strauss in his book *The Savage Mind* to define a specific attitude to putting pre-existing things together in new ways, adapting the action to a finite stock of materials and tools. This idea is particularly fitting in orienting an appropriate line of operation in our given territory.[3]

The third concept is "upcycling", which means the reuse of found elements and structures in such a way as to create a product that is as qualitatively valuable as the original, which does not necessarily mean or coincide with the restoration of initial conditions. It implies the awareness of the past as well as the processes of constant transformation that characterize any territory.

Again this word is borrowed from its common use and transported into territorial and urban design practices in the sense that the resulting global operation at territorial level is not exactly meant to return to its historical trajectory. Rather, it is meant to be determined as a new state that could be expected to develop within the logic of its historical trajectory.

In other words, and more explicitly, looking at those proposals for intervention, we could refer to a work of acupuncture. While there is not a definite and continuous plan, this does not mean that we think it unnecessary; we just intend to propose ourselves among the players acting on the ground. To close the circle of logic illustrated herein, we use "recovery" to refer to the three phases as a whole. This term relates to the effort to work with what is found in the place by recognizing the value of the multiplicity of different structures and the provisional nature that is inherent to some of them.

In conclusion, even though our experiences are deeply rooted in the specific nature of our landscape, it would be interesting to apply this operational design model to other places and contexts. Nevertheless, and in a broader sense, this could be intended as a contribution towards an update of urban and territorial design methodologies that could provide opportunities for further research challenges.

Footnote: It is recommended that this text be read with the support of the works (i.e. drawings) available for consultation on the digital platform "On Being With-it",[4] which gathers a good selection of the abovementioned teaching and research in design developed at EAUM in the sector of Urban and Territorial Studies (Fig. 34.1).

[3] See Labastida Juan (2013), pp. 176–181.

[4] The title "On Being With-it" relies on a quote by Peter Shepheard, who used it as title in a 1969 speech, while he was president of the RIBA. It focuses the need for an integrated approach to the questions of the built environment (viz. trying to avoid a separation between architecture and urbanism).

Fig. 34.1 On Being With-it

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Chapter 35
Quality of Governance and Quality of Life

Massimo Sargolini

In the early 1300s, Ambrogio Lorenzetti created two cycles of frescoes about "good and bad governance" in the city hall in Siena's Piazza del Campo (Fig. 35.1). The effects of good governance on the city are used to illustrate the quality of life in a medieval city, show some construction aspects of the housing, and show the historical state of a splendid urban context in which people lived joyfully in a climate of happy social coexistence. This historical period ranged from 1287 to 1348, during which time the learned Governo dei Nove (three representatives for each third of the city chosen for a rotation of a few months) favoured the wide, episodic participation of citizens in government. This allowed for a period of peace and splendour cut short only by the arrival of the black plague, which marked the end of an extraordinary historical period.

The relationship between the quality of governance and the quality of life is often taken for granted, although the appropriate tools do not always exist to enable this relationship to solidify. The entire path of research described up to this point is meant to provide a tool to support decision-makers. This is not the first research in this direction, considering that many existing investigations and lines of study are already oriented at supporting governance choices and a lot of follow-up research to preceding work has been appropriately developed (Keen 1980; Burstein and Holsapple 2008; Sargolini and Gambino 2014). Furthermore, this objective is rather widespread throughout Europe, and some long-consolidated research paths such as ESPON and Horizon 2020 have focused on these aspects. In recent calls, special attention is focused on the development of surveys and territorial interpretation in order to make organized databases and territorial assessments available to European governments. However, this and other research, which do not necessarily concentrate on the production of decision-support systems (DSS) in the spirit of formulating observations, aimed at integrating, perfecting, and reconsidering possible

M. Sargolini (✉)
School of Architecture and Design, University of Camerino, Ascoli Piceno, Italy
e-mail: massimo.sargolini@unicam.it

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Fig. 35.1 Allegory of bad government. In: The Allegory of Good and Bad Government (a series of three fresco panels painted in the Sala Dei Nove by Ambrogio Lorenzetti from around 26 February 1338 to 29 May 1339) (Source: Wikimedia Commons)

research advances over time. In light of this, four areas of reflection emerge that could be the object of further investigation: (1) the time horizon of reference, (2) the utopian space, (3) the strategic thought, and (4) the involvement of "interested parties" (Council of Europe 2000).

Time

The question of time intersects a government's decision-making process in that governance actions produce effects on different time horizons and affect the quality of life in different ways.

Time plays a central role in describing the external world, but it is also, as Borges says, the "substance I am made of", relating to our personal identity. Both Christianity, with its incarnation of Christ occurring at a present instant that cannot be postponed, and the great Greek philosophers and Eastern religions, with their different references to the future (Hadot 2002), exhort us to concentrate on the present, where our lives unfold and where we can appreciate the sense and quality of life. But if relativistic physics teaches us that "past, present, and future all exist in the same way", it is clear that we face the present when talking about well-being and happiness, knowing that we are considering a second, an infinitely small part of an infinitely extensive cosmic vastness (Donato 2013). Three considerations therefore follow with respect to governance:

(a) The present moment is managed in the unavoidable union between three determinations of time: past, present, and future.
(b) The passage and flow of the present and therefore the growth of things are central in addressing the recognition, interpretational, and planning phases, knowing that planned actions tend to positively and negatively condition and reorient dynamics and ongoing transformational processes.
(c) The past is unchangeable and irrecoverable. This means that each of our actions will inevitably be aimed at the future, in the awareness that it is impossible to return to the past.

The reading of time is addressed and implemented in governance choices with these three conditions, which should be intervened on while keeping an eye on the memory of the past, considering the current conditions to start with, and developing visions of the future that are innovative and can relate local actions to global balances. Therefore, we are in a position of having to assess the results of governance actions, knowing that the action could produce different results in the present and the future.

An example may help to better explain the concept. If I introduce (through the demolition of some buildings) an open space in a compact urban fabric (Fig. 35.2), planning to create an urban park for the years to come and planting specific vegetation, I can evaluate:

1. Today: some initial beneficial effects on the quality of life, considering the contribution that an opening of a clearing can provide in terms of ventilation, land permeability, a decrease in the heat island effect, an increase in the field of view for residents, and the realization of a wilderness space for outdoor activities (Fig. 35.3).

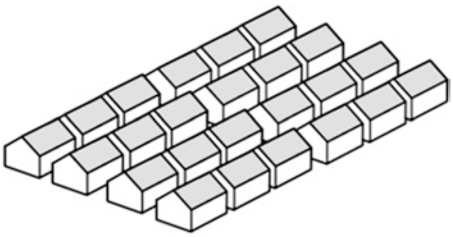

Fig. 35.2 Compact block of buildings

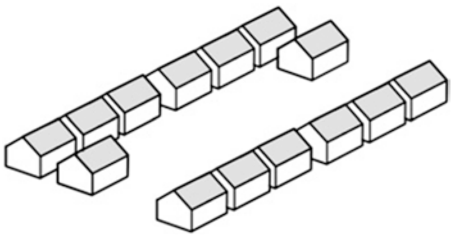

Fig. 35.3 Opening an empty space by demolishing a built area

2. When the vegetation is planted and the first trace appears on the land of the useful organization of the area: further beneficial effects due to the use that citizens can make of the area, even if it is still incomplete. It is already able to satisfy some initial needs such as for walking or bike riding, for trekking, space for outdoor children's games, etc. (Fig. 35.4).
3. When the vegetation has reached the ideal size to create shade and provide particular freshness: benefits will be at the maximum desired level. Beyond improving the quality of activities carried out there already, new ones can be added to benefit users, for example, breaks in shaded areas; the possibility of parking in areas protected from direct solar radiation; the ease of access for pregnant women, elderly people, and children; etc. (Fig. 35.5).

Therefore, while the move from state 2 to state 3 is reached through the planned passage of time, the move from state 0—the initial state—to state 1 and then to state 2 is achieved through a deliberate planning choice in the unpredictable natural evolution of things but only through decision-making processes.

The fact remains that in implementing assessments regarding the quality of life for the same urban space, reference should be made to different time scales: in some

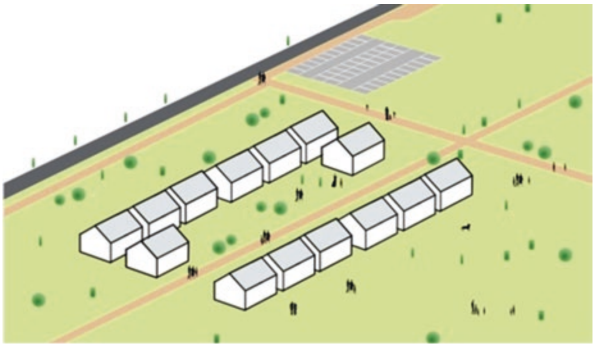

Fig. 35.4 Ground plan of park organization and planted vegetation

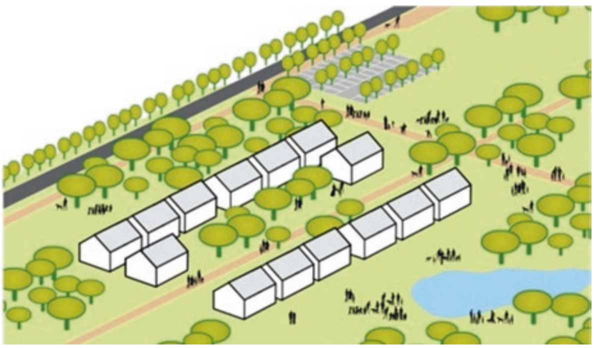

Fig. 35.5 Vegetation has reached a state of maturity

cases, within the natural flow of events, and in others, the unpredictability/programmability of governance and management choices. At any rate, we know and can describe the past of which traces should remain in the present, but our actions are always directed towards the future, even if they deal with the lag of a second with respect to the present.

Utopian Space

The DSS can become tricky during measurement, when it appears that it is possible to address and resolve within a black box the different critical situations that the responsibility of governance involves. However, it is evident that the tool can play only a supporting role in decision-making processes and it cannot be charged with the responsibility of final decisions that concern only the decision-maker, as has been clarified by the different authors that have described the QLandQLife research. This means that, faced with an interpretational activity, there are different possible strategies and no unique answers. Each individual strategy is characterized by an open evaluative matrix of different components on which, due to its wide interpretational range, governance decisions will be based. However, the DSS cannot smother the geniality and creativity of the decision-maker in offering governance guidelines and orientations, and above all, it can neither exhaust nor restrict the space available for the utopia.

The term "utopia" is ambiguous and polysemous, and this semantic problem comes from its use by Thomas More in his celebrated work of 1516 in which the neologism appears for the first time. "Utopia" is composed of *ou*, "non", and *tópos*, "place", but even in More's work, it is not clear if this is *eu-tópos*, the perfect reign of happiness, or *ou-tópos*, an inexistent place due to antonomasia, or both at the same time. However, the different uses of the word refer to both the imaginary and ideal. F. Choay describes More's *Utopia* as a paradigmatic text inaugurating a new literary genre. The text, like an architectural treatise, intervenes in the creation of the urban space, defining global spatial models (Choay 1986), the necessary, integrating supports in a utopian society, extraneous to the effects of duration and change.

Utopians do not accept that reality is as it appears; they aim to design a perfect society projected into an indefinite space-time dimension where happy coexistence can be realized. Time is not a component to worry about. Choay intends to verify if utopian society is an alternative to the system of real society, but not if the space of utopian society is innovative with respect to the urban structure of the real city. It is clear that what is interesting here is not a utopia intended as a dream, evasion, or mental hypothesis but rather a utopia that, spanning time and space through a strategic approach, can become a feasible project regarding ideal societies and ideal manners of living, in which perfection is intended as harmony and allows the concrete happiness of the population to be achieved. The correlation between utopia and urban planning has therefore already been acquired, and utopian thought regarding urban planning has nothing to do with a naïve representation of reality. Often, even, utopias have produced real experimental models (consider Owen, Fourier, or Godin).

Urban planning is posed as a story, a narrative structure that develops a project in two overarching phases. The first phase describes and analyses the bad aspects of the city; the second identifies the remedies and corrective solutions (Secchi 1984; Pavia 1994). In the same way, in the first part of the utopian story, criticism prevails over the current social condition, focusing in particular on urban dysfunctions and aiming to understand the mutual relationship between social form and spatial model. In the second part, the new social model, which is always situated in a spatial structure, is identified. In this sense, it is affirmed how utopian thought of the 1800s has contributed to defining the modern urban planning discipline, also guaranteeing a high level of innovation in constructing space (Reiner 1967; Benevolo 1963).

The DSS can provide arguments for utopia that remain at the helm of a decision-making process in its capacity to go beyond the contingencies of the present and implement a visionary nature. Mechanical consequentiality, the fruit of formally definable processing via algorithms and matrix representations, is available to serve utopia, whose definition can range far from the so-called exact sciences and gather strength and substance from human sciences.

However, the dialogue between utopia and the sounding line of the formally definable assessment and interpretational model risks becoming a "meeting of the deaf", with two major consequences: destroying the creativity and ideal configuration of the utopia and varying proposals for weak urban and territorial layouts that lack an adequate visionary nature. To avoid this, it should immediately include a dialogue among visionaries (artists and poets) and interpreters of the systemic complexity of the city (technicians) and, from the very beginning, planning.

Strategic Thought

Utopo fixed the form of the state and its rules of operation. When the isthmus connecting Abraxas, the conquered territory, to the continent broke, he created the Island of Utopia (More 1516), defining the plan of the city, specifying even the form of the gardens, and leaving only embellishments and touch-ups to the utopians. The city of Utopia was therefore created based only on the creator's intuition and his idea of the city, not looking for sharing with the utopians, even as their happiness was set as a goal.

The strategic approach does not renounce the utopia; it cannot do without a visionary nature, however abandoned the idea of authoritative planning is. It preventatively informs and shares each governance decision with the actors and operators, both public and private. Strategic planning becomes an opportunity to make the choices of economic policies and decisions about territorial layout converge towards the same general goals, ensuring that congruent actions can be implemented with the appropriate operational tools (Mascarucci 2008).

Much has been written about strategic planning, and the related scientific debate has become more focused (Borja and Castells 1997; UN-Habitat 2009; Albrechts et al. 2017). However, the path for possible interaction between strategic thought and the measurable, formally definable conditions that pertain to the intrinsic regions of the territory remains. These include the structural characteristics of the site (from the geological, geomorphological, ecological, socioeconomic, and historical architectural points of view), the relationships with the contextual elements, the assessment of the operational successes of the programmed actions, and the evaluation of how the final quality of the spaces considered directly influences the quality of life.

Assessment, which is at the heart of the strategic approach, goes beyond the rigidity and mechanical implementation of traditional planning. It becomes the basis for discussing "the negotiation, the constant necessary method of the relationships and the resolution of conflicts between institutions, social parties, public powers, and private interest groups that, if not built around common objectives, impede policies from finding concrete activation in the territory from the very beginning" (Urbani 2007).

Spatial planning has a desperate need to question political and economic processes, which are closely interwoven with the city and territorial layout, in the search for new ideas of quality of life, urban sustainability, and social equity (Allmendinger and Haughton 2010; Sager 2013). It must respond to the current social and territorial challenges dictated by the profound ecological, climate, and economic changes underway (Sargolini 2012).

The approach to strategic planning begins with the failure of traditional zoning. The division of land use by zone indicates what can or cannot be done in a given area, and in this sense it regulates land use and the property market, but it does not guarantee the concrete realization of what governance has deemed possible to do in that area. On the contrary, strategic planning aims to fix the objectives of a territorial system and then define the means, tools, and actions to achieve those objectives in a medium- to long-term perspective.

In the specific case study analysed in the QLandQLife research, the problem is posed of using pointlike, planned, coordinated actions to organize the overall objective of increasing the quality of life by intervening in the chaos of peri-urban areas. For local governments, recognizing the need for the green of open spaces is one thing; the design and activation of policies are a different, more complex question. Through the social, economic, technical, and cultural changes of recent decades, societies have faced profound changes related to space. Today, urban areas have uncertain borders. The current urban/metropolitan structures in Europe are not composed only of urban centres and peripheries but of a cloud of urban fringes, a continuous conurbation that presents residual urban spaces (Fig. 35.6). This urban dimension of the diffuse city has been the object of particular focus (Secchi 2002; Grosjean 2010; Sieverts 1997; Dubois-Taine and Chalas 1997; Basilico and Madesani 2005); it implies a profound difference with the historical city and introduces the theme of an urban-rural continuum (Nilsson and Nielssen 2013; Mancebo and Sachs 2015). The urban-rural continuum is, by definition, not balanced, since landscape transformations are produced by (1) social changes (movements in the economy lead to the gradual elimination of traditional industries and the emergence of new economic activities), (2) changes in consumer behaviour (with the disappearance of traditional commercial centres in the city centre), and (3) climate change, an increase in solar and wind energy, and heavy rains that create urban landscapes that have never existed before.

Fig. 35.6 Example of urban-rural continuum in Central Europe

Within the challenge for the sustainability of these areas, it emerges that in spatial planning, red (new constructions) and grey (infrastructures) investments are repaid rather quickly, while green (nature and landscape) and blue (water) investments often require public financing. However, all four are studied contextually. As established by the European Landscape Convention, integrated approaches capable of considering ecological, aesthetic, social, functional, and economic values are necessary to favour a high level of well-being for inhabitants (Sargolini 2005). Increasingly wide agreement has therefore developed about the fact that urban green areas can offer numerous advantages, including benefits for physical and mental health, reducing mortality rates, favouring employment, attracting investments, and increasing local environmental quality and property values (Millennium Ecosystem Assessment 2005). In this sense, there is a wide, global tendency to implement measures in favour of standards linking urban greenery to numbers of inhabitants or families, responding as well to the need to obtain greater resilience in order to avoid problems and catastrophes such as floods and urban heat islands. There are many possible technical responses, but they do not always include the greening of urban space, or, in the case of an urban extension, the balance or integration between red, grey, green, and blue. In defining green spaces, there is also a contrast in the introduction of many small or few large spaces, which range from trees or green walls to landscape parks, community gardens, and urban businesses. However, the relationship between overall strategic vision and the measurement of the effects of each individual action on the quality of life accompanies the decision-making process of the government.

The Involvement of Interested Parties

The urban transition of sustainability therefore resolves critical questions for the government in that the management of urban landscapes calls for requests from the population that are sometimes contradictory. An initial challenge for governance in facilitating the greening of urban landscapes consists in understanding the multidimensional character of social needs and conflicts that emerge and, as a consequence, the various complex, unstable stakeholder configurations. Not everyone considers in the same way the possible objectives posed to increase the quality of life. Differences due to social class, demographics, geographical location, and cultural maturity of the affected population are profiled. Participation therefore plays an important role in the decision-making process, and the QLandQLife research considered in this volume addresses this question in the part dedicated to the Forum. Paths for consultation and negotiation are therefore important in designing the city, in that they highlight the different interpretations made by the interested parties.

Trends in and responses from different populations may be very different, especially with regard to the assessment of outdoor living environments (Hisschemuller 2016): from the need to protect ordinary landscapes as they are, in that they are perceived as safe and healthy, to the push to transform abandoned spaces into green areas, to the spontaneous spread of rural areas in the vicinity and within urban centres. In general, however, the considerations made by current citizens are less categorized than those of the experts. The proposal for current international research "Smart-U-Green"[1] makes clear the random spread of opinion in appreciating urban green spaces (Nelson and Loewen 1993; Tyrväinen et al. 2014). For example, citizens' initiatives for community gardens can face opposition from other citizens who claim that these projects threaten the identity of the neighbourhood. There may also be controversies regarding public access to green urban landscapes and the type of activities allowed, in which case local environmental organizations themselves can be opposed.

In recent decades, opportunities for public participation have been limited in urban-planning experiences for reasons of economic savings as well. One unintended effect is that local knowledge is underrepresented in final decisions. This tendency is amplified by the fact that planners tend to view the participation of interested parties as a question of procedure and process management, often as a passkey to be agreed upon, rather than a necessary conversation (or better yet, controversy) about local problems and solutions. It would instead be interesting to investigate how urban planning can benefit from organized forms of participation in which strength is given to the representation of diversity and conflict rather than looking for similarities and affinities.

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[1] ERA-NET Cofund Smart Urban Futures Research—JPI Urban Europe (2017–2020). The following researchers were involved: DRIFT Erasmus University of Rotterdam (Matthiis Hishmuller. P.I.); School of Architecture and Design, University of Camerino (Massimo Sargolini); IATEUR IRCS, University of Reims (Francoise Mancebo); Department for Urban and Spatial Planning and Landscape Architecture, University of Zagreb; School of Environmental Design and Rural Development, University of Guelph; Faculty of Natural Sciences, Pskov State University; EKAPRAEK; and CIVILSCAPE. The research project is in line with the objectives of the European Landscape Convention in aiming to orient ongoing landscape changes with the help of "interested parties".

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Erratum to: The Combined Use of Environmental and Experiential Simulations to Design and Evaluate Urban Transformations

Barbara E.A. Piga

Erratum to:
Chapter 32 in: R. Cocci Grifoni et al., *Quality of Life in Urban Landscapes*, The Urban Book Series, https://doi.org/10.1007/978-3-319-65581-9_32

An error in the production process unfortunately led to publication of this chapter prematurely, before incorporation of the final corrections. The version supplied here has been corrected and approved by the author [authors].

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Afterword

Quality of Life and Sustainability: The Relationship Between Place and People Beyond Disciplinary Boundaries

Harald Pechlaner

The term quality of life is expanding in meaning and gaining prominence in academic and everyday discussions. Why is this so? It would seem that further disciplines have discovered an affinity for defining what quality of life means and integrating these new meanings into various disciplinary contexts. Quality of life has thus become a target goal in development. From an economic standpoint, competitiveness was—and still is—the primary goal. However, quality of life is gaining prominence and is being integrated into traditional discussions about the key values of economic development to move discussions in the direction of sustainability, thereby significantly impacting the debate about economic growth and development. In the process, this continually emphasizes the objective and subjective nature of the quality of life. Even if the material standard of living, the GDP, economic development, and prosperity have a large positive impact on the quality of life, these factors can also lead to a deterioration of quality of life, for instance, when a region's environment and culture suffer from a style of politics that is too focused on businesses and industry. Dealing with limited natural and environmental resources sustainably and using human resources responsibly are necessary prerequisites to ensure a high quality of life in any location or place. Places are interesting when they have an intrinsic value, a value that stems from their special functions, historical situations, architectures, topographies, and the communities themselves. Only then can a place live its inherent identity, history, and memory.

Places are reservoirs of complex information; they are also the result of developing the skill sets of different actors, who, driven by goals such as quality of life, form networks and make it possible to establish quality of life in the first place because the quality of the networks built also includes such factors as health, education, personal development, time and leisure time, personal financial status, the

Harald Pechlaner
Chair in Tourism, Catholic University of Eichstaett-Ingolstadt.
Head of the Center for Advanced Studies, Institute for Regional Development,
EURAC Research, Eichstätt, Germany
e-mail: harald.pechlaner@eurac.edu

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given social environment, security, and a wide array of opportunities in society. All of these aspects define how subjectively one experiences quality of life.

In the course of social change, environmental awareness changes on different levels, giving sustainability a tangible value whenever and wherever quality of life is defined. In the end, an indelible quality of life can only be guaranteed if growth-oriented economics and sustainable management of the environment, coupled with various societal aspects, are incorporated seriously. The quality of the networking defines the place; at the same time, the place distinguishes itself from other places because of its individual network. Functionally specific definitions are insufficient to delimit places and spaces. Identities and values or standards are what give a region its meaning and what enable it to shine within its own borders and beyond its borders. In short, making a particular place attractive for specific target groups, such as tourists, local inhabitants, and economic powerhouses, means that the place must be meaningful in the first place. Creating meaning results from a standard of networking that does not stop at community boundaries but that, rather, defines regionalism as the quality of life experienced at the crossroads of morphology, topography, sociology, and geography. Region is thus synonymous with those settings and spaces which present people who distinguish themselves through their reachability, services, and special experiences with the quality just mentioned. The degree to which people are readily available can be measured by such factors as physical and social mobility, as well as by the prevailing infrastructure; services, on the other hand, refer to those services that attract people, for instance, catering or location-specific services; and finally, it is the quality of the experience which explains emotions, feelings, and identities and which makes the aesthetics of longing for the sublime possible—beauty is decisive for the quality of a landscape and for urban quality. Herein lies the deeper meaning of quality of life (Fig. 1).

Quality, however, can be developed only in the context of systems of relationships in such spaces. This community-based model presupposes that there is a broad consensus among stakeholders that the seed for quality of life is deeply rooted in the intense debate about what it means to live together. Quality of life means being able to define and develop how to live (together) in a particular space. It is the ability not only to be economically productive, live, shape the landscape, consume goods, and enjoy one's leisure time in the given landscape but also to continually develop the culture of the space. It is the quality of relationships that defines and determines the quality of an entire network.

The commitment to relationships shifts between cooperative, collaborative, and coordinating networks. For example, while cooperative networks are largely based on exchanging information, collaborative networks are more concerned with creating common network services that require a strong interdependence between individual network partners (Mandell and Keast 2008). The quality of relationships in a network thus makes possible and requires a high level of commitment in a collaborative network, which is an excellent basis for establishing quality of life because the partners become increasingly aware of the fact that they are dependent upon one another and each participant in the network relinquishes some of its unique procedures for the good of the whole network.

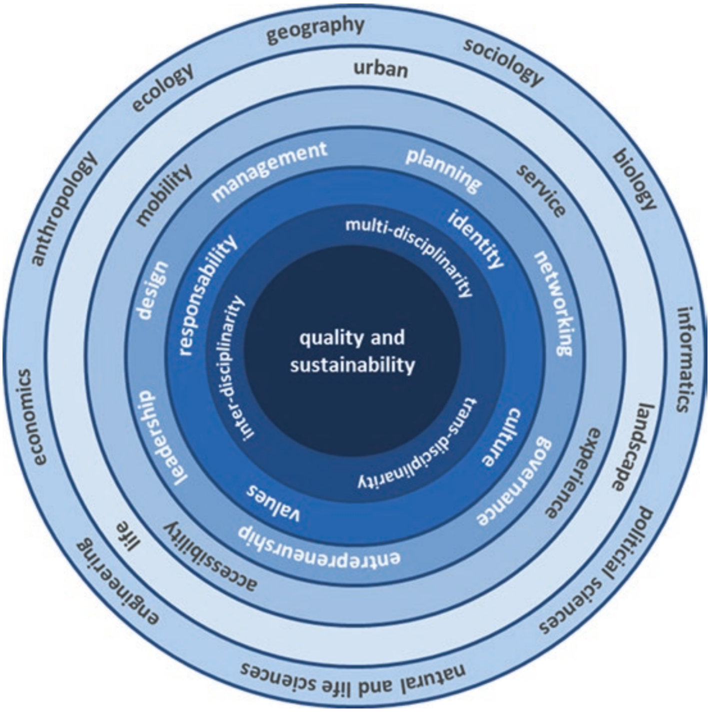

Fig. 1 Beyond the disciplinary boundaries of quality and sustainability (Source: Based on Pechlaner et al. 2017)

In the process, networks can be developed in local, regional, or supraregional (spatial) contexts. The geographical proximity to one another increases the likelihood that there will be face-to-face communication, thereby enabling knowledge transfer and the development of common values. These are values in the sense of standards—for example, a standard of quality—and they constitute a central pillar around which commitment can be fostered that is more deeply rooted than that created by mere geographical proximity. Partners' commitment to one another is determined by topics such as health, education, culture, and security, which are all topics essential for the quality of life people experience in a particular place and which also highlight the similarities and differences between rural and urban spaces. At the same time, the competitiveness of tourist destinations and businesses is also decided along a rural to urban continuum with regard to how mobility, attraction, services, and the general tenor and values of similarities and identities are organized in the space. This stimulates societal, environmental, and economic sustainability (Slocum and Kline 2017), thus supporting the thesis that setting can be an indicator of urban sustainability.

Sustainability includes the entire development of human circumstances. It is not only about using material resources but also about securing and improving social, political, and ideal resources. To a certain extent, this necessarily leads to a sustainable quality of life. It is ultimately about the fact that a truly sustainable quality of life can only be had by doing more than satisfying material needs. Only those who can satisfy people's basic economic needs also have the necessary capacity to free themselves from material thoughts and the ability to tackle the question of the quality of life. It is clear that Western lifestyles in particular ultimately destroy that which they seek to guarantee, namely, happiness, satisfaction, and well-being, by relying too heavily on certain resources. In other words, true quality of life demands that people reflect on their modern lifestyle to compensate for a lack of quality of life by seriously contemplating what sustainability means. Mobility through space and time as a sign of quality of life serves as an example of how places and regions attempt to balance acceleration and deceleration and urban and rural challenges in order to give people living there the feeling that they are experiencing quality of life and that they can determine and appreciate the value of such regions.

Quality of life in urban landscapes: In search of a decision support system. This idea warrants the question of how the goals of achieving a sustainable quality of life (quality of life plus sustainability) can be met. Leadership means more than merely managing because it is not enough to simply make decisions within the existing system. Instead, decisions need to be made within the framework of a given system that is adaptable and subject to transformative processes.

System innovations are key to sustainable change because such innovations require combining technological and social innovations to be able to incorporate social practices and learning processes in a regional context, thus fostering the requisite easing up of resource use to protect ecosystems. The standard of sustainability thus moves within reach because it has been considered and integrated more carefully. Leadership means making transformative learning processes possible in spaces to leave room to develop a comprehensive sustainable quality of life. Urban landscapes are complex landscapes and can apparently be places for system innovations only by means of transformative processes, for instance, as living laboratories of experimentation.

One prerequisite for achieving this goal is to concomitantly create cooperative and/or integrated thinking in conjunction with stakeholders thinking in parallel in regional contexts. Thinking within discipline boundaries constitutes parallel thinking because it means looking for models and solutions from the standpoint of a particular discipline. Disciplines have the advantage of having developed methods for solving problems accepted by their respective community due to intense academic debate. Quality of life, however, cannot readily be placed comfortably within the confines of one particular discipline. Rather, it requires a multifaceted examination and, thus, must be explored by a multitude of disciplines. Such a multidisciplinary approach indeed strives to incorporate further disciplines, coupled with the demand that the models, methods, and solutions of the various disciplines be highlighted—which constitutes parallel thinking, researching, and implementation. At the very least, there needs to be a foundation for interdisciplinary cooperative thinking in research, as well as political processes to inform the debate, to determine new boundaries, and above all, to develop new methods, which will arise out of the close examination by various disciplines. A decision support system for an urban-rural context or an urban landscape must accommodate interdisciplinary thinking.

What is more, it must allow for an integrated transdisciplinary viewpoint. By integrating diverse environments, such as digitalization, mobility, and health, new areas of research will become available and create the basis for regional governance, and these areas of research will be compelled to follow transdisciplinary transformative ways of thinking. In a manner of speaking, these new areas of research will foster horizontal and vertical transdisciplinary thinking and acting in science and in practice, which will be required of private and public actors in the name of a new form of regional governance cloaked in an integrative design.

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