

Chapter 8

Relationships with Other Fields of Knowledge



Abstract The eighth chapter addresses the contributions of urban morphology to fundamental dimensions of our collective life in cities, in particular the social, economic, and environmental dimensions. Bearing in mind the practical achievement of this purpose, five specific issues from these three generic dimensions are selected: public health, social justice, heritage tourism, climate change, and energy. The chapter discusses how to strengthen the channels of communication between each of these issues and the field of urban morphology.

Keywords Climate change · Energy · Heritage tourism · Social justice · Public health

One major challenge for urban morphology, in the next years, is to be able to identify its most important and morphologically specific contributions to contemporary cities and societies. It is urgent to strengthen the morphological dimension of debate and practice on cities. As such, urban morphology should pay less attention to criticizing, modifying, and transforming the wealth of its already sophisticated concepts, methods, and techniques, and pay more attention to potentiate the conditions for the application of its contributions in our daily lives. This process will necessarily involve some simplification, but it does not have to mean a loss in the fundamental contents of the discipline.

There is a need for developing key cross-disciplinary links between urban morphology and the different bodies of knowledge studying cities, promoting effective integrated research. Despite the potential advantages of transferring morphological knowledge to these different disciplines, its occurrence is quite limited. In urban morphology, and more generally in the social sciences and humanities, the ability to identify and build cross-disciplinary links, and the awareness of relevant work in other disciplines, are not very common (Whitehand 2010). The fundamental, and realistic, challenge is to find a balance between two distinct poles: integration and specialization. The identification and construction of specific links should involve the participation of academics, practitioners, and citizens. The development of each linkage presupposes the capacity of researchers to gather and synthesize broad perspectives, knowledge, and skills. Because most researchers, even in urban morphology, are trained in traditional disciplines, they must learn to appreciate differing perspectives

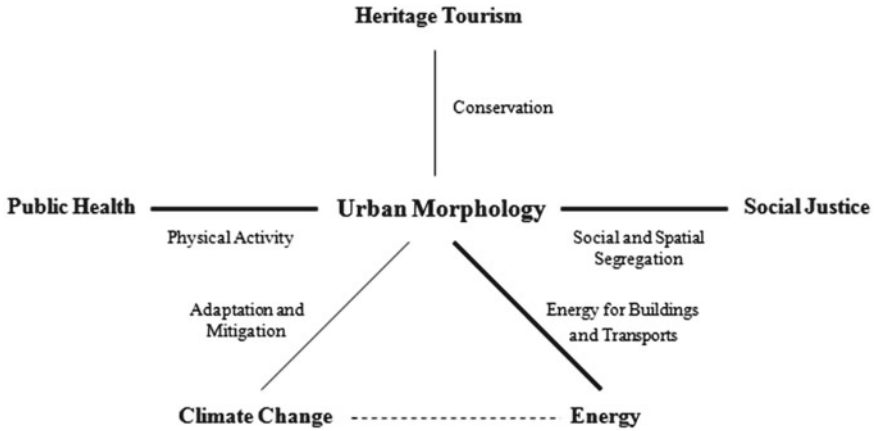


Fig. 8.1 Contributions of urban morphology to our collective life in cities

and methodologies. A breakthrough would be the provision of a sound morphological dimension to other fields. This could, for many research projects, provide the desired added value and, ultimately, enable further advances in our shared knowledge about cities.

The next three sections explore the potential contribution of urban morphology to five specific issues: public health, social justice, heritage tourism, climate change and, somehow interrelated with the former, energy. These are five selected examples (others could have been chosen) of specific issues of daily life where urban morphology could offer a sound contribution. Figure 8.1 offers a synthesis of these linkages—while the thick lines represent the most consistent linkages, the thin lines represent the most embryonic relations.

8.1 Urban Morphology and Society

The first section of this chapter focuses on two crucial issues in our societies where urban morphology can offer a sound contribution, public health, and social justice. Some of the key words in these processes of integration of different areas of knowledge are physical activity and walkability, in the first case, and social and spatial segregation, in the second case.

8.1.1 Public Health

Physical inactivity is a global pandemic, responsible for more than 5 million deaths per year through its effects on multiple non-communicable diseases (Sallis et al.

2016). Several studies in public health suggest that significant benefits can be achieved through the accumulation of moderate physical activity, like walking and bicycling, in regular short bouts (Karmeniemi et al. 2018). The health benefits of daily, moderate physical activity have the potential to be more effective than more structured, vigorous forms of exercise, like jogging or aerobics, because of increased levels of adherence to these activities. Indeed, research indicates that people may be more willing and able to adopt moderate physical activities and, once such activities are begun, to maintain them overtime, as compared with forms of vigorous physical activity. An increasing body of research argues that there is an effective influence of urban form on this type of physical activity and, as such, on public health. Investigation also shows the reverse—how urban form can discourage physical activity. Low levels of physical activity threaten our health, both directly and indirectly. A sedentary lifestyle is a well-established risk factor for cardiovascular disease, stroke, and all-cause mortality. In addition, the lack of physical activity is also a risk factor for being overweight and obese (Frumkin 2002).

One of the most consistent lines of research in this issue, over the last two decades, has been developed by Lawrence Frank and his colleagues, first in the Georgia Institute of Technology, then in the University of British Columbia, and finally in the University of California San Diego. Frank and Engelke (2001) distinguish between two types of barriers to physical activity: personal barriers, which are subjective considerations restricting an individual's motivation or ability to exercise; and environmental barriers, which are real-world conditions that place restrictions on physical activity. It is important to acknowledge that the latter may have disproportionate impacts on different subgroups, most especially on vulnerable groups, like elderly persons or children.

So, how do different elements of urban form impact walkability and cycling? Well-connected street networks and small street blocks (two interrelated aspects) offer more intersections and, as such: more direct movement between activities, the reduction of the distance between trip origins and destinations, the provision of alternative pathways of movement, and the limitation of vehicular travel speed through the closer spacing of intersections (Sallis et al. 2016). The characteristics of the specific parts of a street are also very important for promoting walkability and cycling. Streets with ample sidewalks, bike lanes, and crosswalks on which pedestrians and cyclists can travel will be perceived as safer—the perception of safety is also influenced by faster or slower automobile travel along the street—and have a positive impact on these soft modes of transport (Moudon et al. 1997; Frank and Engelke 2001). The number of parks is also an important attribute to consider (Sallis et al. 2016).

Not only streets are important, but also buildings. The density of buildings is a key characteristic (Sallis et al. 2016). Their age is another fundamental aspect. In general, the average distance one needs to travel for recreational purposes seems to decrease with the age of buildings and neighborhoods, implying that persons who live in older neighborhoods have better access to recreational facilities (Handy 1996). Another important characteristic seems to be the position of buildings within plots. While buildings oriented toward and situated next to streets have a favourable impact on

walkability, buildings considerably set back from streets and often oriented toward parking lots seem to discourage walkability (Moudon et al. 1997). Finally, research also made evident that people living in mixed use neighbourhoods are more likely to be active enough to achieve health benefits (Frank et al. 2005). Modest changes in the walkability of an urban landscape can be translated into important, health-enhancing population-level increases of activity.

8.1.2 Social Justice

There is a robust body of research on the social justice's dimension of the city. David Harvey and Susan Fainstein are two notable examples within this line of research. The work of the latter, around the concept of the just city, has a clear focus on the physical form of cities. An even more explicit link between social justice and urban form has been developed by Laura Vaughan, at the University College London, under the topic of social segregation. Over the last two decades, after her MSc and Ph.D. theses, Vaughan has been showing a consistent correspondence between social and spatial segregation, distinguishing, in the city, the existence of poor, spatially segregated areas and streets and more prosperous, spatially integrated areas and streets.

Research into poverty areas suggests that despite the many attempts to improve housing quality over the twentieth century, these interventions have failed to substantially alter the geography of poverty (Orford et al. 2002). Lupton (2003) states that physical characteristics, through their impact on population mix, lead neighbourhoods to acquire other characteristics, such as services and facilities, reputation, social order, and patterns of social interaction, as people and place interact. While disadvantaged individuals in an isolated area will form one set of social relations (exacerbating the disadvantages of these poor individuals), disadvantaged individuals in a well-connected area may form another set of social relations. Poverty can, for instance, lead to unequal access to jobs and thus to high rates of unemployment in a particular area. In addition to these findings Vaughan suggests that i) the persistence of poverty areas over time can be explained by a number of aspects including the combination of some spatial factors; and ii) when these areas are located close to economically active, well integrated streets, such spatial patterning can serve as a necessary mechanism for the social integration of minorities and it is frequently part of a natural process of acculturation and integration in the urban environment (Vaughan 2007).

The analysis of poverty areas usually reveals a sound presence of immigrants. It is the location and the spatial segregation of each of these areas which make them more likely to be settled by poorer immigrants. The process of formation of immigrant quarters is a critical stage in the integration of immigrants into society. Research into cases of supposed 'ghettoization' has questioned the simplistic notion of the immigrant residential quarter cutting its inhabitants off from society. In fact,

depending on the location and the way in which the street network is utilized, clustering can enable the intensification of communal activity, socialization, networking, and self-support. Analysis has shown that clustering of immigrants during initial stages of settlement, and sometimes beyond the first generation, is part of a process of acculturation and integration. It also shows that for immigrants, the existence of settlements in locations enabling economic activity is a necessary step in the process. Frequently, entrepreneurship in ethnically concentrated neighbourhoods not only results in processes of mixed-embeddedness and economic integration but strengthens social networks and reciprocity (Vaughan and Penn 2006; Vaughan 2007; Vaughan and Arbaci 2011). On the contrary, long term minority clustering can have a negative effect, impeding social mobility, limiting access to work, enabling criminal behaviour, or hampering school achievement.

Another fundamental line of research on the linkage between urban form and social justice has been developed by Emily Talen since the late 1990s, mostly at the University of Illinois, the Arizona State University, and the University of Chicago. Talen started exploring this link by focusing on social equity and spatial accessibility to public facilities, like schools, parks, or playgrounds, using the then emerging GIS for measurement (Talen and Anselin 1998). Throughout the 2000s, her emphasis has changed to diversity and to some key social characteristics, like income, age, family structure, and ethnicity. Underlying this emphasis was the idea that the most successful communities are often those that are the most diverse (Talen 2012). A third focus in this systematic line of research has been the neighbourhood as a spatial unit that people relate to a localized, place-based, delimited urban area that has relevance, meaning, and some level of personal influence (Talen 2018).

8.2 Urban Morphology and Economy

This section addresses the relationship between urban form and economy, with an emphasis on heritage tourism. Most research on the relationship between urban form and economy adopts a macro scale of analysis. A good example is a recent report, published by UN-Habitat within the framework of the United Nations Human Settlements Programme, offering a literature review on the economics of urban form (UN-Habitat 2015). The report addresses two major characteristics of urban form at the macro scale, density and centrality (comparing extreme situations of high and low density and mono- and poly-centricity) and relate both to size (measured by population). In relation to density and centrality, the report sustains that high-density forms, including both monocentric and polycentric, offer the best balance of low transport and infrastructure costs, low environmental impact, and high income-generation abilities. Furthermore, the economic costs of moving towards lower densities include increased transportation costs, increased greenhouse gas emissions per capita (a theme of the next section), and rising obesity rates, in conjunction with decreasing productivity. On the contrary, costs associated with high-density levels include congestion and high land prices. Ultimately, more economic benefits than

costs seem to be present in high-density areas. In relation to city size, the report argues that this characteristic is interdependent with both density and centrality. Increases in city size seem to correlate with higher wages, higher proportions of educated citizens, and higher productivity. These result from economies of agglomeration, which are reliant upon increased proximity and scale afforded by larger cities. The report argues that there is no optimal city size, but efficiency in city size is dependent upon local features and constraints (a view supported by Batty 2008). In a similar way, Gordon and Richardson (who, in the 1990s, have authored an influential paper on the debate between compact and sprawl) argue that urban form matters to economic growth, explaining the logic behind how entrepreneurs and others can be spatially prepared to succeed (Gordon and Richardson 2012).

8.2.1 Heritage Tourism

At the end of the Second World War, tourism began to flourish and spread to all corners of the world, due to high levels of affluence, advances in transports and telecommunications technology, and enhanced international relations. Since then, tourism has become one of the most powerful economic forces in the world. It affects every nation and community, directly or indirectly, and influences decision making, even at national and supranational levels. Due to the global significance of tourism, communities throughout the world have welcomed it as an instrument for economic development. As part of this trend, tourism has become compartmentalised into different types, somehow recognising that it is not a homogeneous or undifferentiated phenomenon. One of the most significant types is heritage tourism. Visitors to historic places and their spending in the areas of lodging, food, admission fees and shopping, contribute billions of dollars every year to the global economy and employ millions of people directly and indirectly (Timothy and Boyd 2006).

Heritage tourism entails visits to historical sites, including built environments and urban areas, ancient monuments and dwellings, rural and agricultural landscapes, locations where historic events occurred and places where interesting and significant cultures stand out. The range of resources that function as attractions in heritage tourism is extensive and the types and dimensions are manifold. Most research addresses the ‘supply’ side, focusing largely on interpretation, conservation (on a wide and non-orthodox sense, being one of the keywords for designing a link between heritage tourism and urban morphology), and other elements of resource management, as well as the support services that exist for visitors at historical locations. While research on ‘demand’ has a less developed expression, it has shown that visitors to heritage sites are better educated, bigger spenders, travel in groups, and have average or high incomes (Timothy and Boyd 2006).

Urban conservation is an idea of modern times, developed after the French Revolution. Over the nineteenth and twentieth centuries, with variations in different geographical contexts, historic monuments were the focus of conservation. While promoting the preservation of these special buildings, this conservation approach

allowed, and in some cases supported, the destruction of significant parts of urban landscapes based, for instance, on health, security, and aesthetic considerations. In parallel to this dominant approach, new perspectives on conservation emphasizing the role of the urban landscape started to emerge in the early twentieth century. In the 1960s and 1970s, there were important advances, including the preparation of the Venice Charter, the creation of the International Council on Monuments and Sites/ICOMOS (and the subsequent realization of the ‘Convention concerning the protection of world cultural and natural heritage’ and establishment of the ‘World Heritage List’) and the making of the first planning documents centred on conservation—notably, the Bologna plan coordinated by Cervellati (presented in Chap. 3). Present debate on urban conservation includes the tension between narrow architectural perspectives (including facadism and pastiche) and a comprehensive understanding of heritage (Bold et al. 2017; Roders and Bandarin 2019), the synergies and tensions with planning, and the contradiction between places that were areas of production in the past and are centres of consumption in the present, to name some of the most important.

While, for urban morphologists, it is widely accepted that cities must change, one of the key problems is how to cope with change while retaining older areas and structures in which past generations have invested so heavily. Within the science of urban form, one of the most consistent lines of investigation on the conservation of urban areas has been developed, for more than two decades, by Peter Larkham, first at the University of Birmingham and then at the Birmingham City University. In the book ‘Conservation and the city’, Larkham (1996) tries to understand how is change initiated and implemented, what effects has it on conserved areas, and how might it be better managed in the future. In doing so he addresses some of the fundamental questions of conservation: (i) what is to be preserved? (and who identifies the preservation-worthy buildings and areas, and whether this identification meets with the approval of the population living, working and recreating in these areas); (ii) to what extent do those influencing development and those affected by it have consistent views about the area in which development is proposed?; (iii) how is conservation/preservation to be carried out: are the buildings and areas identified in any way removed from the natural life-cycle of construction, use, obsolescence, decay and demolition?; and, finally, (iv) what is the nature and scale of changes proposed and carried out to the physical urban fabric? One important aspect of Larkham’s research is the focus on those involved directly and indirectly with change, under the topic of ‘agents of change’ (this topic was addressed in the third chapter).

Conciliating heritage tourism and urban form conservation, through key inputs of urban morphology, is a challenging task. Close to Nasser (2003) we highlight the need to protect heritage as a natural resource that if overexploited will be degraded, the acceptance of change and development to ensure continuity, and the need to consider equitable access to heritage resources by the local community and visitors. Finally, it should be said, as Fig. 8.1 shows, that until now the input from urban morphology in heritage tourism was not as consistent as in the previous cases of public health and social justice.

8.3 Urban Morphology and Environment

This section, on the contribution of urban morphology to fundamental environmental challenges, focuses on two interrelated issues, climate change, and energy. The debate on the former, somehow, frames the discussion on the later.

8.3.1 *Climate Change*

The science of climate change is well established. The delivery of the 2007 Nobel Peace Prize to the International Panel on Climate Change (IPCC) marked the end of debate on whether climate change is human induced and real. Attention has then moved to what we have to do about climate change. At the Paris Climate Conference (officially known as the 21st Conference of the Parties, COP21), in the end of 2015, an agreement between 196 parties was reached. The agreement provides a pathway, and a mechanism, to limit temperature rise to below 2 degrees (maybe even 1.5). COP21 also sent a signal to markets that it is time to invest in the low emission economy.

Predicted weather-related events like sea level rise, increased storm events, and extreme heat waves imply an urgent need for new approaches to settlement design to enable human and non-human species to adapt to these increased risks. Adaptation and mitigation are emerging as some of the most pressing issues nations and cities face. While mitigation works to reduce current and future greenhouse gas emissions, including emissions that are generated through built environment and transports sectors, adaptation seeks to adjust the built and social environment to minimize the negative outcomes of now-unavoidable climate change. Whilst adaptation and mitigation can be seen as methods to achieve the intermediate objective of reducing vulnerability and the risks associated with climate change, resilient communities are the overarching goal (Hamin and Gurran 2009).

Blanco et al. (2011) argue that the way the main elements of urban form and infrastructure systems are organized can contribute to the emission of greenhouse gases and amplify climate change impacts. The structure, orientation, and condition of buildings and streets can increase the need for cooling and heating buildings, which are associated with the level of energy use (this will be expanded in the next subsection) and can account for a significant proportion of greenhouse gas emissions in a city. The extent of streetscape and the impervious surface of structures can intensify flooding and are direct determinants of the urban heat island effect (Yin et al. 2018).

8.3.2 Energy

Energy plays a fundamental role in today's world. The way urban areas are built has a great influence on the present and future demand for energy. The influence on transport demand is mainly expressed in trip generation and on built structures, in terms of end uses like heating, cooling, and lighting.

While urban morphology focuses on the physical stocks of cities and the processes and agents shaping them, sometimes ignoring the issue of urban flows, research on energy sometimes adopts sectoral visions of the problem, and has not been able to deal effectively with the spatial dimension of cities embracing all scales. Most literature on energy has been addressing one of two scales of analysis. At the city scale, research has been exploring the dichotomy between compact and diffuse patterns of urban development, the variations of density, and the land-use patterns, connecting these aspects with transports—including systems management and construction of infrastructures. At the building scale, recent research tends to cluster around three main lines of investigation: the establishment of different frameworks for classifying built forms (from an urban energy perspective); the design of innovative methods for estimating the energy consumption of buildings; and finally, the analysis of the potential of buildings for improvement. Despite the remarkable advances at both scales of analysis, there is a gap between the two communities of researchers.

In the last years, some studies started to address an intermediate scale of analysis (between the city, taken as a whole, and the building, seen as a self-defined entity) that has been previously ignored, possibly due to the complexity of environmental processes and lack of data. Osmond (2010) proposes the urban structural unit, a descriptive and explanatory framework that considers both the stocks and flows (energy, information, and materials) of the city. Ratti et al. (2005) use digital elevation models and the lighting and thermal simulation tool to analyse the effects of urban texture on building energy consumption. Ratti and his colleagues consider the following parameters: built volume and built surface, passive and non-passive zones, façade orientation, urban horizon angle, and obstruction of sky view. Following a similar line of research, Salat (2009) uses several environmental metrics—such as building shape and passive volume—to explore energy consumption in different parts of the city. Both papers include applications in large European cities. Shi et al (2021) address the efficiency of district cooling systems in high-density cities, considering the effects of the street layout, building density (floor area), and land uses, and assessing it according to five cost indicators. An additional step is taken by Silva et al (2017) considering not only heating and cooling in buildings (the focus of previous studies), but also travel. The methodology applies GIS to provide the analysis with a spatially explicit character, and neural networks to model energy demand based on a set of relevant urban form indicators.

The development of new approaches, theories, concepts, and methods should offer greater understanding of the interrelationships between urban form and the level of energy being used to maintain contemporary urban systems—considering both the quantity and quality of energy sources. It should also inform debate on current

urban development strategies, promoting the sustainable use of resources, land, and energy as key ingredients for long-term prosperity. Among the different issues of contemporary debate on cities, energy is certainly one of the most important. Rising energy prices, the urgent need to reduce emissions and mitigate climatic change (the theme of the last subsection), and the large investments that will be needed to make installations and infrastructures fit for the future, make urban energy a key challenge for the next years.

Exercises

A. Testing Your Knowledge

8.1 How does urban form relate to public health?

- i. Urban form can influence vigorous physical activity, and this can have significant health benefits, avoiding cardiovascular disease and stroke.
- ii. Urban form can influence moderate physical activity, and this can have significant health benefits.
- iii. Urban form can influence vigorous physical activity, and this can have significant health benefits.

8.2 What impact can urban form have in the promotion of social justice in cities?

- i. Recovering the architectural styles of the past can remedy many aspects of social injustice promoted by the modernist paradigm.
- ii. The main elements of urban form, and their patterns of combination, can contribute to the social integration of the city's residents and workers.
- iii. Strong planning proposals leading to profound transformations in the city's fabric can reduce the gap between the richer and the poorer residents.

8.3 How can urban morphological knowledge inform the debate between conservation and transformation led by heritage tourism?

- i. Urban morphology can prevent the transformation of historical areas.
- ii. Urban morphology can be a tool against tourism.
- iii. Urban morphology can offer a comprehensive framework to understand, in each situation, what to change and what to conserve.

8.4 How can urban morphology inform adaptation and mitigation strategies?

- i. Urban morphology offers a scientific description and explanation of urban phenomena, enabling the evaluation of different scenarios aiming at adjusting the urban landscape (adaptation) and reducing emissions (mitigation).
- ii. Urban morphology has no significant role in addressing climate change, including both adaptation and mitigation strategies.

- iii. Urban morphology can contribute to reduce current and future greenhouse gas emissions, including emissions that are generated through the built environment and transportation sectors.

8.5 How does urban form influence energy demand in cities?

- i. Industry is the most relevant sector responsible for energy demand. Urban form does not have a significant influence.
- ii. The most relevant influence of urban form is through the street network on transport demand, and it is mainly expressed in trip generation.
- iii. The influence is mainly twofold: of street network on transport demand, mainly expressed in trip generation; and of buildings in terms of end uses such as heating, cooling, and lighting.

Solutions

2.1—ii

2.2—ii

2.3—iii

2.4—i

2.5—iii

B. Interactive Exercises

Exercise 8.1—Urban Form and Health

This exercise addresses the relation between the main characteristics of urban form and the promotion of public health, through moderate physical activity, as framed by Sect. 8.1. The starting point, as in some previous exercises, is the student's house. The student should identify and map an area around his house holding the structural physical conditions (including high density of street intersections, street blocks, plots; coincidence of building and plot frontages) to have a positive impact on walking (as moderate physical activity) and, as such, on public health. This area is likely to have an irregular geometry. The student should then think of, and map, an expansion of this 'friendly walking area' (preferably in its physical continuity), bearing in mind the development of some non-structural changes on urban form—like the promotion of active ground floors, the presence of trees, and the redistribution of street space for pedestrian and cars, to name just a few. The exercise should be prepared as homework and presented in classes. The PowerPoint presentation (5–10 min) should include the two maps (original area and extended area), supported by photographs of both areas, and by the list of extant characteristics and proposed changes on urban form.

Exercise 8.2—Urban Form and Social Justice

This exercise is an exploratory analysis of the relationships between urban form and social justice, as framed by Sect. 8.1. The student should start by identifying

two segregated areas of his city—this identification should be based on his knowledge of the city. The areas should have different geographical locations. Firstly, the student should offer a brief social characterisation of these two areas, based on a few selected social indicators usually available at national statistics—for instance, education, employment, and income. The performance of these areas for each indicator should be then compared to the city average, offering a benchmarking. Secondly, the student should develop a physical characterisation of the two areas, focusing on streets, street blocks, plots, and buildings. The social and physical characterizations should be compared. While the exercise is just an exploratory analysis, it should be able to motivate students to reflect on the relation between spatial and social integration. The exercise should be prepared as homework and presented in classes. The PowerPoint presentation (5–10 min) should include the characterisation of the two areas, supported by text, drawings, and photographs.

Exercise 8.3—Urban Morphology and Heritage Tourism

This last exercise addresses the relation between urban morphology and heritage tourism, focusing on the conservation of urban form. The student should concentrate on the historical centre of his city, as this is usually the area under the greatest pressure of heritage tourism. The exercise is in two parts. In the first part, the student should reflect on the heritage tourism's pressure on his city. He should then offer a physical characterisation (streets, street blocks, plots, and buildings) of the historical kernel, identifying the main strengths, weaknesses, opportunities, and threats raised by heritage tourism. In the second part, the student should briefly outline a conservation policy, defining what should be preserved and what can be transformed (as explored in previous exercises), bearing in mind the goal of offering tourists an authentic experience, while at the same time assuring the needs and aspirations of residents and workers. The exercise should be prepared as homework and presented in classes. The PowerPoint presentation (5–10 min) should include the characterisation of the historical area and the main aspects of the conservation policy. The PowerPoint presentation can be supported by text, drawings, and photographs.

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