# Chapter 6
# Human Ecology in the Context of Urbanisation

Roderick J. Lawrence

## 6.1 Introduction

Humans have constructed their habitats over several millennia in each region of the world. Human habitats contain built and natural environments that provide sheltered conditions for daily life and infrastructure that maintains the supply of food, energy and water for the resident population (Boyden 1987). All the materials and processes that are necessary for the construction, functioning and maintenance of cities and large urban regions are related in some way to the availability and uses of abiotic and biological resources of ecosystems. Cities are dependent on the quantity and quality of these natural resources and the exportation of waste products in order to sustain their populations (Elmqvist et al. 2013). Energy, fuels, materials and water are transported from elsewhere and transformed into goods and services.

The high concentrations of activities, objects and people in cities and the flows between rural and urban areas mean that urbanisation is a major contributor to national economies and to environmental change at local, regional and global levels (Millennium Ecosystem Assessment 2005). One result of this urban characteristic is that cities are locations of relatively high concentrations of air, soil and water pollution, as well as all kinds of wastes. Consequently, urban populations are exposed to adverse environmental conditions in their habitat that are risks for their health (Hardoy et al. 2001).

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Cities and urban regions of different size provide varying numbers and kinds of community services including education, health care, leisure, tourism and welfare services (Sarkar et al. 2014). However, research confirms that residents do not have equal access to these services owing to geographical and socio-economic differences: Cities can become arenas for social differentiation, segregation and exclusion (Sarkar et al. 2014). They may also facilitate the communication of infectious disease, such as severe acute respiratory syndrome (SARS). They can be localities of social disorders (including criminality and violence), which may contribute to stress and mental illness (UN-Habitat 2010).

The ecological processes and products of cities and urban regions (such as Los Angeles, Kuala Lumpur, Paris and Tokyo) are rarely confined to administrative, geographical or political boundaries commonly associated with them. The reason for this is that cities and urban regions are complex open systems that transgress human-made borders (Dyball and Newell 2015). Hence, policies and projects that encourage land uses for either agriculture or urban development need to extend beyond traditional administrative and political boundaries as well as sector-based divisions of labour (Lawrence 2010). Therefore, coordination between geopolitical authorities within and beyond these boundaries is necessary. This chapter argues that an interdisciplinary and intersector conceptual framework based on the generic principles of human ecology should be applied in order to identify and address the diversity of public health challenges provided by urbanisation. The chapter shows that the advantage of human ecology is that its integrated, systemic framework explicitly accounts for the mutual interaction between the human and non-human components of habitats in a way that either the natural or social science disciplines have not achieved.

### 6.1.1   Rethinking Urbanisation

The drivers of large-scale urban development are difficult to understand (Hobbs et al. 2013). The multiple consequences of urbanisation trends are not well known and measured because they are numerous and operate at different geopolitical levels. There is a growing amount of evidence showing that modern urban and rural development programs and large housing projects have yielded many improvements to living conditions in all regions of the world. However, not all urban agglomerations or residential neighbourhoods benefit equally (UN-Habitat 2010). Some residential neighbourhoods can be characterised by relatively large numbers of migrants who are unemployed, relatively large households with low incomes and a housing stock of many non-renovated high-rise buildings constructed after 1950 (World Bank 2001). Recent events in many African, Asian and Latin American cities highlight a range of contemporary problems related to the exposure of residents to adverse environmental conditions (e.g. summer and winter smog, soil contamination and water pollution), socio-economic inequalities (that can be drivers of deprivation,

delinquency, homelessness and unemployment), and political corruption (that can be a catalyst for social protests, riots and warfare).

There are no simple answers to current challenges stemming from rapid urbanisation, but it should be acknowledged that policy makers have identified and isolated problems too narrowly (Lawrence 2015). Today, there is a growing consensus that uncoordinated approaches need to be replaced by coordinated ones that account for the interrelations between ecological, economic and social dimensions of changing land uses in urban regions and how these impact on ambient living conditions and influence health and well-being. The author of this chapter argues that there is an urgent need to reconsider housing, building, transport and large-scale urban development in a broad environmental, social and political context that explicitly aims to promote public health.

The formulation and implementation of traditional sector-based contributions in housing, building, transport and urban planning should be challenged. Incremental improvements (e.g. the construction of new residential neighbourhoods) are often achieved in tandem with unintended consequences, such as direct negative impacts on environmental conditions (e.g. loss of biodiversity and public green space) and indirect impacts on the health and well-being of citizens (Mueller et al. 2017) (Fig. 6.4). These unforeseen outcomes are partly due to the number and complexity of all those factors that policy decision-makers and professional practitioners need to consider. They are also related to the recurrent lack of coordination between urban development policies, public health and other sectors including energy, housing and transportation (Khreis et al. 2016). Lack of coordination between sectors in order to promote public health has been associated by Lawrence (2010) with conceptual, institutional and social barriers including:

1. The number and the complexity of all those factors that researchers, practitioners and policy decision-makers ought to consider
2. The uncertainties and the unpredictability of the interrelations between many of these factors which are rarely admitted
3. The segmented knowledge of researchers, public administrators and practitioners who may be experts on specific subjects but they do not have an integrated perspective of what they consider
4. The lack of coordination between institutions and actors in different sectors and between people working in different geopolitical institutions
5. The lack of systematic monitoring and feedback within sectors (such as housing or transport) and especially across different local, regional and national levels.
6. The non-account of goals, priorities and values related to the ways policy decision-makers and citizens develop local economies, interpret their livelihoods and value the qualities of their habitat

The author of this chapter has argued for a fundamental rethinking of the relationships between social, economic and health inequalities and other kinds of anthropogenic problems in cities and urban regions (Lawrence 2015). The interrelations between housing markets, transport infrastructure, health systems, community services, environmental policies and land-use planning have been poorly articulated

until now (Mueller et al. 2017). However, it is crucial to acknowledge the important role of cities as localities for the management of numerous resources, as places for accommodating diverse cultures and ways of life, as localities for access to medical services and health care and as significant forums for economic development at the local, national and regional levels (Kresl 2007). Although housing and urban development policies have rarely been a high priority in the manifestos of governments or political parties, there is a growing awareness led by non-governmental organisations, local government associations and research consortiums that health should be an integral component of urban planning. A rethinking of transport infrastructure as a driver of economic and urban development is feasible and necessary (Khreis et al. 2016). For example, the planning of coordinated infrastructure that facilitates cycling, walking and transit to affordable and efficient public transport can reduce exposures to the negative externalities of private car transport infrastructure and reduce sedentary lifestyles, by making active mobility attractive especially when travelling relatively short distances in urban areas.

The next section of this chapter presents the principles of human ecology and distinguishes them from those of general ecology. Then the key principles of human ecology are used to formulate and apply a conceptual framework to analyse the distinctive characteristics of urban ecosystems. This enables us to distinguish cities and large urban regions from other kinds of human habitats. These characteristics can be used by researchers, policy makers and professional practitioners to monitor and evaluate to what degree urbanisation trends impact on the health and well-being of populations in specific neighbourhoods.

## 6.2  Theoretical Concepts and Framework

The term 'ecology', from the ancient Greek words *oikos* and *logos*, denotes 'science of the habitat'. There is a large consensus that this term was first used by Ernst Haeckel (1834–1919), a German zoologist, in 1866 (Lawrence 2001). The word ecology commonly designates a science that studies the multiple interrelationships between organisms and their surroundings. Since the late nineteenth century, the term ecology has been interpreted in numerous ways including general and human ecology.

### 6.2.1  What Is General Ecology?

During the twentieth century, botanists and zoologists use the term 'general ecology' to refer to the interrelations between animals, fungi, plants and their immediate surroundings. The number of contributions about the science of ecology grew from the beginning of the twentieth century (Pickett et al. 2001). Animal and plant ecologists maintain that interactions between organisms and all the components of

ecosystems follow principles that refer to their similarities and their differences. A community of organisms develops from simple to more complex forms through a sequence of developmental stages known as succession. This term refers to the slow progression of changes in communities of animals and plants owing to changes in ecological and climatic conditions. This evolutionary trend means that some species with a longer lifespan become dominant in a particular biotope or ecosystem for a certain time period. This trend may become a climax state: Climax is a dynamic equilibrium state that is determined by the limiting factors of the climate, soil or other ecological conditions (Pickett et al. 2001). Climax refers to the culmination of the evolution of animal and plant communities that correspond to the optimal development of the biomass with respect to specific ecological conditions. By using an analogy, some ecologists imply that human groups and communities are natural phenomena that develop by slow progression and succession processes. This interpretation means that psychological and social characteristics of human individuals and societies are analogous to biological factors, that competition between human beings is an innate biological process and that climax is the outcome. The fundamental principles of human ecology challenge this analogy by accounting for the psychological, social and cultural dimensions of human life (Boyden 1987; Lawrence 2001).

### 6.2.2 What Is Human Ecology?

In contrast to general ecology, human ecology usually refers to the study of the dynamic relationships between humans and the physical, biotic, cultural and social characteristics of their environment and the biosphere. However, this is not the original meaning of this term which was first used by Ellen Swallow Richards (1842–191). In her original contribution, she proposed human ecology in her formulation of euthenics, which she defined as a science for better living (Clarke 1973). From an institutional perspective, human ecology developed in the Department of Sociology at the University of Chicago, in the context of a rapidly urbanising city after the First World War. It was promoted by a coalition of researchers from a number of social science disciplines (including anthropology, demography, geography, psychology and sociology). These researchers shared a concern about the effects of urban living on the daily life and well-being of the residents, especially minority groups of migrants and low-income households.

Today, human ecology generally refers to the study of the reciprocal relations between people, their habitat and the environment beyond their immediate surroundings. A conceptual model of human ecology formulated in Lawrence (2001) is reproduced in Fig. 6.1. This figure is not meant to be a detailed model of people-environment relations that can provide a complete understanding of a complex and vast subject. Instead it represents an integrated model that represents the systemic interrelations between sets of biotic, abiotic and cultural factors that are combined together in any human ecosystem. Hence it does not concentrate only on specific
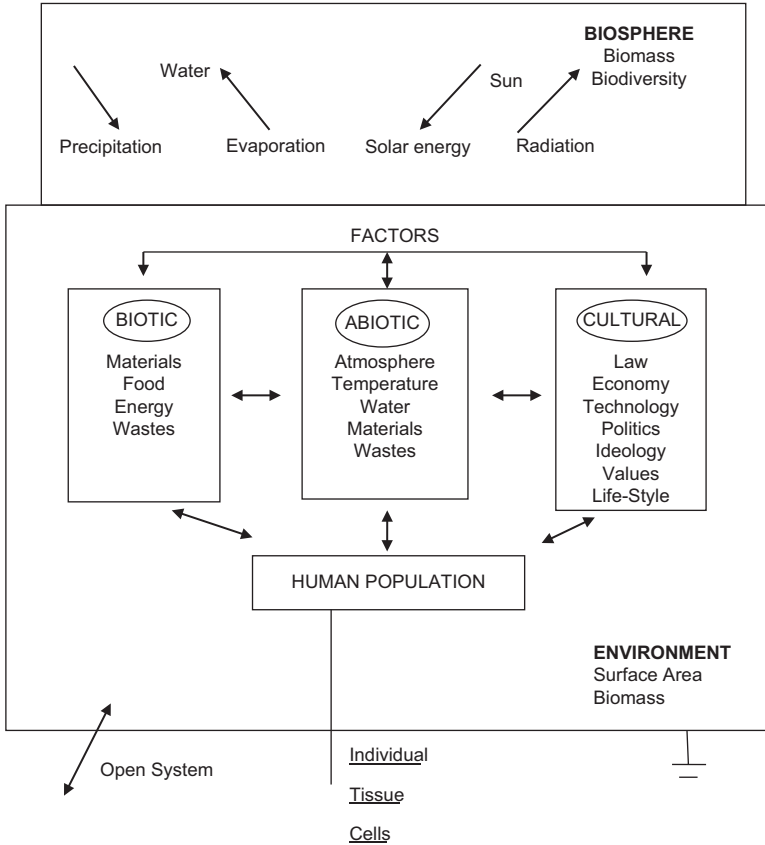
**Fig. 6.1** The holistic and systemic framework of a human ecology perspective showing the interrelations between biotic factors, abiotic factors and cultural, social and individual human factors and artefacts which are delimited by situations, habitats or larger ecosystems (Source: Lawrence 2001)

components because it considers the whole system as the unit of study for people-environment relations. This integrated model can be applied to analyse different geographical areas (neighbourhoods, cities and mega-urban regions). It is a synchronic representation of a human ecosystem that is open and linked to others. The model is meant to be reapplied at different times to explicitly address both short- and long-term perspectives. This temporal perspective can identify change to any of the specific components as well as the interrelations between them.

Human ecology is explicitly interdisciplinary (Lawrence 2001). The material and non-material dimensions of human ecosystems, shown in Fig. 6.1, include genetic patrimony, especially the capacity of the human brain to interpret and transform land and other natural resources into a viable habitat; demographic characteristics such as the size and composition of human populations in mega-urban regions; the social organisation of human groups in urban neighbourhoods (including kinship

relations and household structure); institutions including associations, rules and customs that regulate individual and collective behaviours; the local economy including all consumption and production processes; and, last but not least, the beliefs, knowledge religion and values of local populations (Lawrence 2001).

### 6.2.3  What Is Urban Ecology?

Urban ecology has been interpreted in diverse ways (Douglas et al. 2011; Young 2009). Perhaps the most common interpretation stems from the natural sciences, notably animal and plant biology. In this context, urban ecology refers to the multiple relations between animal and plant populations and the ecological conditions of their habitat, which includes significant human influences in suburban and urban areas (Pickett et al. 2001). Urban development processes can significantly modify natural habitats to the extent that some species migrate and live elsewhere, whereas other foreign species can inhabit the urban ecosystem.

A second set of interpretations of urban ecology stems from the social sciences, notably anthropology, sociology and human geography (Moran 2016). This set of interpretations is anthropocentric and deals specifically with *homo urbanus*. It analyses the mutual interaction between humans living in urban areas and the natural and human-made components of these areas. The geographical distribution of both natural and built components of urban ecosystems, as well as human populations or groups in those ecosystems, has been studied since the 1920s (Dyball and Newell 2015).

A third set of interpretations is technical and functional stemming from engineering and urban planning (Wachsmuth 2012). It considers cities and urban regions as metabolisms with the provision of infrastructure and services to supply all that is necessary to sustain human populations in them: Particular attention is given to the supply of food, energy and water by material flow analysis. Industrial ecology is one application of this kind of interpretation (Young 2009). Another application is the calculation of ecological footprints: Urban areas occupy large surfaces of land, but their ecological footprints (e.g. the quantity of resources needed to sustain them and assimilate all their wastes) exceed these surface areas many times and have significant impacts on hinterlands (Seitzinger et al. 2012). This has become a global phenomenon given that it is estimated that cities and urbanisation processes occupy only about 2–3% of the land surface of the world, whereas they need about 75% of all resources consumed globally (Harrison et al. 2000).

### 6.2.4  What Is Political Ecology?

Political ecology applies a different approach because it has legal and normative foundations enabling environmental problems to be addressed pragmatically by corrective measures (Lawrence 2001). These kinds of problems are meant to be

overcome by legislation, technological efficiency and financial measures to reduce the impacts of human production and consumption stemming from uses of natural resources and the discharge of wastes. This interpretation has been complemented by an ethical one that has addressed property rights (including the rights of nature). Property rights are social arrangements between people that define the rights, entitlements, obligations and duties of persons, companies or an authority (the right holder) in relation to a specific entity (e.g. a component of the natural environment, such as a forest or a lake). Property rights stipulate how the right holder and other parties (non-property holders) are morally and legally required to act (Hann 1998). They create interdependence between people and natural resources as well as issues of distribution and fairness. In general, private claims, rights and responsibilities of environmental resources often fail to meet the collective or public need for environmental protection and intergenerational equity. This means that core principles of sustainable development are not met as Lawrence (2005) noted.

## 6.3 Ecological Public Health

Ecological Public Health posits that human health is dependent on how people live in a complex ecological system (see Chap. 33 by George Morris). Consequently, health is the outcome of the mutual interaction between humans and their immediate environment. Rayner and Lang (2012, p. 93) wrote that a key theme '… is interrelatedness, how people fit into the biosphere, how they use and care for the natural world, how all species interact, and how their interactions have consequences almost always with feedback loops'. One example of the application of this model is the growing concern about the relatedness of climate change, increasing differences in quality of life in human habitats and the health of residents in specific neighbourhoods (Whitmee et al. 2015).

The formulation of an ecological model of public health requires system thinking. Systems comprise components and subcomponents that interact directly or indirectly by two-way processes (Meadows 2009). Urban health should be interpreted as a complex system related to others (e.g. mobility and transport infrastructure) in real-world situations, as shown in Fig. 6.2. This representation shows that any urban health system comprises many proximate and distal components that interact mutually at different levels (Barton and Grant 2006). These complex systems should not be studied using linear interpretations of cause-effect models because such simplification cannot represent extant situations. Systemic models of urban health recognise that any internally or externally generated changes to one of the components of a system will impact on the other components including the initial component that was changed (Dyball and Newell 2015). Therefore, it is too restrictive to assume that improved access to green public space will change human behaviour and then improve health and well-being. It is necessary to consider how an informed public that benefits from improved health and well-being has the capacity to modify their lifestyle and influence uses of public green space. Then it is possible to monitor and evaluate what consequences occur.
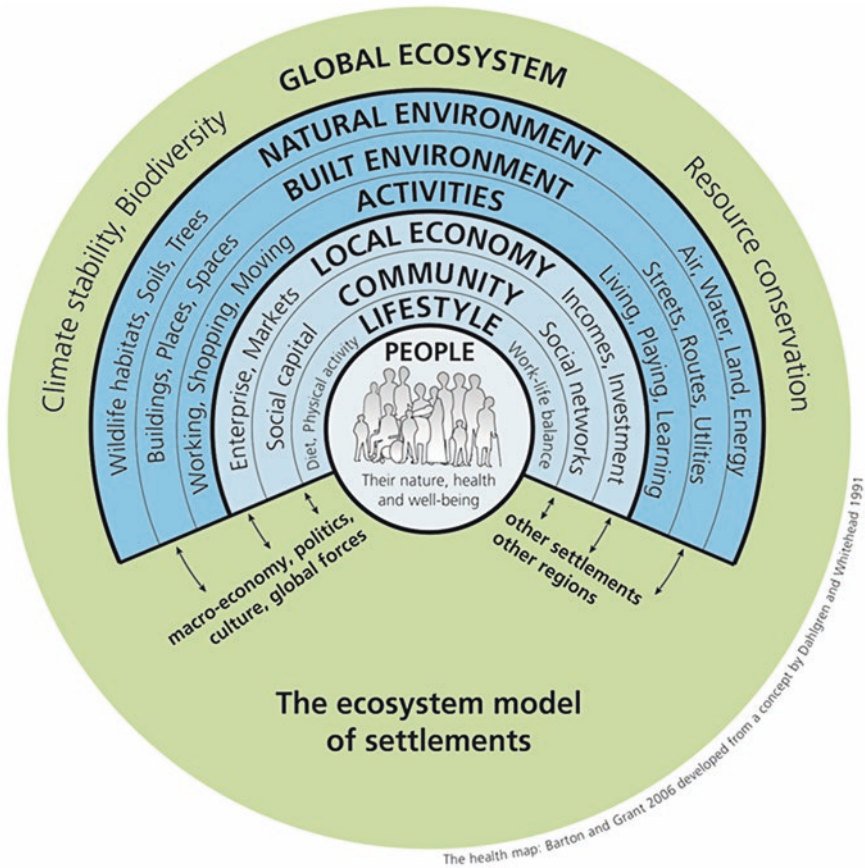
**Fig. 6.2** Barton and Grant (2006) have proposed a health map that represents an ecosystem model of human habitats, their constituents and relationships to human health. This model is provided as a communication tool for public health 'in dialogue' with the built environment disciplines—(e.g. planners, architects, urban designers, landscape architects, transport planners and environmental designers). Developed from a concept by G. Dahlgren and M. Whitehead (1991)

## 6.4 Cities and Urban Development

Despite the global phenomenon of urbanisation, there still is no international consensus about the definition of a city, or an urban agglomeration, or a mega-urban region. Although the definition of a city varies from country to country, the United Nations uses national definitions that are commonly based on population size (Galea and Vlahov 2005). Megacities are often referred to as those with a population that exceeds ten million. Other interpretations are based on the administrative or political authority of urban areas, especially the degree of autonomy in relation to national or regional authorities. Some definitions include the socio-economic status of the

resident population, especially their livelihood (e.g. the proportion of all employed people with nonagricultural occupations).

Between 1960 and 2000, the global human population doubled, and it is projected to increase to 9.7 billion in 2050 and 11.2 billion in 2100. The urban share of the global population increased from 29% in 1950 to 51% in 2011. Therefore, urban ecosystems are the habitat of more than half of the global population, and this share is predicted to increase to about 70% by 2050 (United Nations 2015). Urbanisation during the twentieth century, coupled with demographic growth, migration flows and economic development, has provided both positive and negative outcomes. The negative outcomes have been the source of numerous environmental and social concerns including loss of biodiversity following changes to land use, increasing toxic air pollution (in large cities such as Beijing, Los Angeles, Mexico and Paris), access to safe drinking water and sanitation and the accumulation of liquid and solid wastes (UN-Habitat 2010).

### 6.4.1   What Is Urbanisation?

In order to direct the debate between scientists, practitioners and policy decision-makers, some conceptual clarification is required. First, it is necessary to distinguish between *cities as human-made built environments* (specifically constructed buildings, public spaces and infrastructure that result from numerous decisions about how to accommodate human life) and *cities as urban processes* (including the multiple flows of energy, information, people and material resources that occur between cities and their hinterlands). It is common to adopt only one of these interpretations. The author of this chapter argues that both should be applied in a complementary way to deal with the complexity and diversity of health impacts of urbanisation. When this integrated interpretation is applied, then key principles of human ecology can be used to analyse the ordering of different kinds of natural resources, diverse groups of people and their activities as well as the goals, priorities and actions that are meant to achieve desired outcomes, especially those concerning improved health and well-being.

In essence, the construction of cities is intentional. It always occurs in a human context. Each society defines and is mutually defined by a wide range of cultural, societal and individual human factors that are implicitly or explicitly related to decisions about urbanisation. The layout, construction and intended uses of cities and urban regions involve choosing between a range of options in order to achieve objectives that may or may not give a high priority to health and quality of life. The complexity of cities and urban regions raises some critical questions such as:

1. What parameters are pertinent for a specific building task, such as the construction of a new residential neighbourhood?
2. Whose goals, intentions and values will be taken into consideration?
3. How and when will these goals and intentions be achieved?
4. What will be the monetary and nonmonetary costs and benefits of alternatives?

In order to answer these kinds of questions, it is necessary to recall the generic characteristics of cities and urban regions that have been applied over 9000 years in different regions of the world. This will be done in the next section of this chapter.

## 6.5 Characteristics of Cities and Urban Regions

Generic characteristics can be used to interpret differences between rural and urban areas, but this has been rare, especially in recent published research on large-scale urban development. In order to distinguish cities and urban regions from other kinds of human habitats (notably rural towns and suburban sprawl), it is important to identify their generic characteristics and then consider how they may influence health and well-being.

### 6.5.1 Centralisation or Decentralisation

The first characteristic of cities and urban regions is centralisation. It stems from the fact that the site of a city is chosen by humans. The choice of a specific site and the definition of the administrative and political boundaries of a city distinguish it from all other cities and their hinterlands. Studies in urban history and geography confirm that many factors have been involved in the location of cities (Bairoch 1988). For example, coastal sites for ports—for example, Cape Town, Djakarta, Hong Kong and Mumbai—can be contrasted with sites on inland trade routes such as Florence, New Delhi and Vienna. It is important to note that modern economic rationality has an interpretation of the world and human societies which has rarely accounted for the climatic, geological and biological characteristics of the location of specific cities. This has meant that urban populations in cities including Lisbon, Los Angeles and Tokyo have been confronted with unforeseen natural and human-made disasters including earthquakes, flooding and landslides over several centuries (Mitchell 1999).

During the late twentieth century, the globalisation of the public economy and private financial sectors has been increasingly concentrated in extended mega-urban regions. The era when a limited number of cities—Venice or London, for example—dominated the world economy has been superseded by networks of cities that form new polycentric world markets. This is one illustration of the principle that cities and urban regions are open rather than closed systems (Elmqvist et al. 2013). One outcome of these networks is the proliferation of invasive animal, insect and plant species via commerce and trading. These global trends have adverse impacts on natural ecosystems and their indigenous species, as well as negative impacts on human health (Sandifer et al. 2012).

In a period of accelerating change and globalisation, the growing interrelations between cities and mega-urban regions (irrespective of geographical distance) should be reconsidered in relation to their capacity to participate in and contribute

to local, national and global economies in ways that support the health and well-being of residents (Kresl 2007). It should be recognised that cities and urban regions ought to have the knowledge and political commitment to deal effectively with rapid economic change including financial collapse. Macroeconomic policies and local urban development are interrelated as shown by some cities including Athens and Detroit in recent years. Consequently, the public and private sectors should form coalitions that define and implement policies that build on specific assets and potentials for community services and infrastructure that enable and sustain population health. There is also an urgent need for local and national authorities to enhance the adaptive capacity of cities to respond effectively to both predictable trends and unforeseen changes at the local and regional levels.

### 6.5.2   Verticality or Horizontality

The second characteristic of cities and urban regions is verticality. During the 9000-year history of cities, societies have constructed multi-storey buildings. Bairoch (1988) noted that Jericho included buildings of seven storeys. This characteristic underlies the compact or dense built environment of urban areas in contrast to the dispersed character of rural and suburban development. The height of buildings in cities increased dramatically from the late nineteenth century with the construction of skyscrapers, first in Chicago and then other cities around the world. The relations between high-rise housing conditions and health status are not easy to decipher owing to the vast number of confounding factors (Sarkar et al. 2014).

   In recent decades, published research has identified and measured the relations between the specific characteristics of high-rise housing and health outcomes. Fortunately, there has been a widening of scope of scientific studies: For example, a common assumption in the 1970s that floor level above the ground of residential buildings correlated with adverse effects on mental health has been corrected and qualified by the application of explanatory factors in the field of people-environment studies, such as choice in housing markets, individual preferences, housing tenure and residential mobility. There is empirical evidence that those residents who do not choose where they live, especially households with young children who are allocated housing units in high-rise buildings, may suffer from stressors that impact negatively on their mental health (Hartig and Lawrence 2003).

### 6.5.3   Concentration and Density

Concentration is the third characteristic of cities and urban regions that is directly related to the two preceding ones. Urban ecosystems are dependent on the availability of natural resources and the exportation of waste products in order to sustain their populations. Cities import energy, fuels, materials and water which are
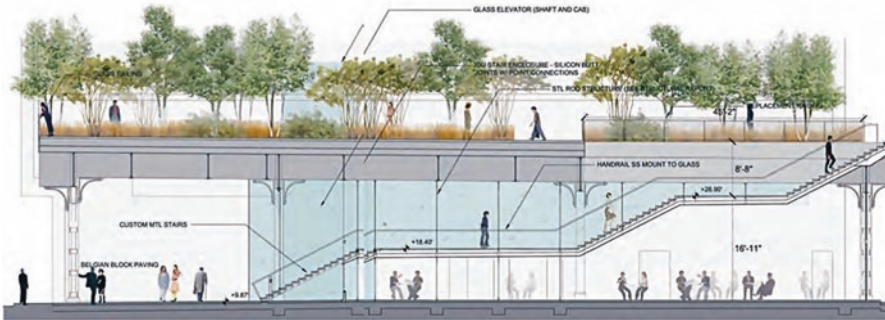
**Fig. 6.3** The Highline in Manhattan, New York, is a well-known example of urban planning and design that has reconsidered promoting active living in conjunction with public green space in this dense city in terms of a people-centred not a vehicle-centred transport and mobility (Sources: New York City Department of design and construction (2010). Active design guidelines: promoting physical activity and health in design; (2010) Fit-city 5: promoting physical activity through design. Implementation of New York City's *Active design guidelines*. Source: www.thehighline. org)

transformed into goods and services. The high concentrations of activities, objects and people in cities, and the flows between rural and urban areas, mean that city authorities must manage the supply of food and water as well as the disposal of solid and liquid wastes that are risks for population health if not well managed (Hardoy et al. 2001). Urban history confirms that cities are localities that favour the rapid spread of infectious diseases, fires, social unrest and warfare (McMichael 2001).

The density of the built environment and the intensity of its activities have an influence on how cities and urban agglomerations can be sustained over time (Jencks and Burgess 2000). Many authors in recent years have argued for high-density, mixed-use urban areas (Fig. 6.3). This kind of urban ecosystem reduces the conversion of agricultural land, while it increases economic benefits related to concentrations of human activities including reduced fuel consumption for transportation, lower levels of ambient air pollution and reduced adverse exposures to noise from road traffic (Khreis et al. 2016). Some authors have claimed that urban concentration also encourages accessibility and promotes social vitality and cultural diversity while reducing social isolation and spatial segregation (Jencks et al. 2004). In contrast, other authors have suggested that there are limits to the degree of urban intensification by the containment and densification of existing or new free-standing cities; for example, when thresholds of overcrowding are surpassed leading to a lack of public open space, fewer recreation facilities and services and the absence of private gardens, then poor health may result from a lack of privacy, air pollution and noise (Jencks et al. 2004).

Too often debate about the limits to urban intensification has neglected health and other social concerns even though the promotion of quality of life has been frequently mentioned. Research shows that the social acceptability of compact urban development is a key determinant of the feasibility of this kind of development.

Social acceptability is defined by the perceptions and values of individuals and social groups. If these perceptions and values are well understood, then indicators of the 'social capacity' for urban intensification can be used in tandem with indicators of 'physical capacity' such as density thresholds (Jencks et al. 2004).

An in-depth understanding of the environmental, economic, social, behavioural, physical and geographical components of specific sites is necessary prior to the formulation of appropriate intensification projects in urban areas. This approach can be applied by local planning authorities in the framework of social and health impact assessment, as shown by recent advances in Barcelona (Mueller et al. 2017) and elsewhere, if they are willing to accept their responsibility to promote and sustain health and quality of life in their jurisdiction (Trop 2017).

### 6.5.4  Diversity: Cultural, Functional and Socio-economic

Diversity is a refining characteristic of cities that can be used effectively to promote ecological, economic and social well-being. Diversity is known to be an important characteristic of natural ecosystems because it enables adaptation to unforeseen (external) conditions and processes that may impact negatively and even threaten survival (Moran 2016). Likewise, lessons from history confirm that those cities with a diverse local economy have been able to cope much better with economic recessions and globalisation. This was not the case for Detroit in the late twentieth century, for example, and the consequences for the health and well-being of residents have been widely reported by mass media. Therefore, diversity—be it economic, ecological or cultural—is an important principle that enables human ecosystems to sustain health by adapting to external events or trends that negatively impact on them.

Social, economic and material diversity are inherent characteristics of cities (Holling 2001). The heterogeneity of urban populations can be considered in terms of age, ethnicity, income and socio-professional status. These kinds of distinctions are often reflected and reinforced by education, housing conditions, employment status, property ownership and material wealth. Data and statistics show that, in specific cities, different neighbourhoods are the locus of ethnic, political, monetary and professional differentiation between 'us and them' and 'here and there'. When these dimensions of human differentiation become acute, they are often reflected and reinforced by spatial segregation and social exclusion in urban agglomerations (UN-Habitat 2010). In recent decades, there have been empirical studies showing that these characteristics of urban neighbourhoods, especially acute socio-economic inequalities and lack of social cohesion, are linked to relatively high incidences of morbidity and mortality (Sarkar et al. 2014).

High levels of diversity and differentiation can be a threat to social cohesion over the long term. Viable communities in cities and urban regions can only be achieved through recognition of two key social principles of sustainable development: The first is intergenerational and intragenerational equity (Lawrence 2005).

However, it has already been noted that the principles of equity are too often omitted from ongoing debate (UN-Habitat 2010). The provision and equitable distribution of public education, vocational training, health care, social services and facilities for recreation can help address some of the root causes of delinquency and crime which can be associated with social differentiation, dependency, segregation and lack of empowerment.

The second principle is quality of life which includes issues of ownership, safety, security, aesthetics and socio-psychological dimensions of urban life. All these dimensions can impact directly or indirectly on health and well-being (Galea and Vlahov 2005). From this perspective, a broad and just interpretation of sustaining urban ecosystems extends beyond conventional contributions by natural scientists to confront a basic ethical dilemma created by some recent residential neighbour-hoods including the so-called gated communities and fortress suburbs in North America (Blakely and Snyder 1997). These kinds of projects are one result of a non-willingness to address social cohesion and inclusiveness by deliberately planning for spatial segregation and social exclusion in urban and suburban areas (Fig. 6.4).



**Fig. 6.4** This attractive public green space with century-old trees in the dense central business district of Sydney, Australia, is used for social contact and leisure by people who do not necessarily live or work nearby (Photo: R.J. Lawrence)

### 6.5.5    Information and Communication

The fifth characteristic is information and communication. Cities have always been centres for the development and exchange of ideas, information and inventions. However, during the twentieth century, some of the traditional functions of cities have been superseded or evolved with the development of information and communication technologies (ICT). The growth of new information and communication technology redefines the function of cities as centres of communication, marketing and information. In addition, the consequences for daily mobility between places of work and residence have still not been fully realised (Castells 1989). However, innovative technologies for the construction of smart cities, intelligent buildings and automated vehicles should be considered in relation to the increasing dependency of urban ecosystems on infrastructure and technologies that have no substitutes. The increasing incidence of disruptions to power supply to cities in developed countries and the hacking of communication and information systems of government agencies and public health services and hospitals in recent years should be recognised as new threats to public health and especially the health of urban populations.

Information and knowledge about urban health challenges requires commitment to systematic monitoring and evaluation of urban policies, programs and projects in relation to population health (Lawrence and Gatzweiler 2017). However, one of the anomalies of the architecture and planning professions is that monitoring and evaluation is not considered to be their responsibility. Today, too few public and private institutions are examining the range of costs and benefits of urban development and precise projects for specific communities, regional and local populations. This shortcoming can be overcome, at least partly, by health and social impact assessments and by funding for systematic monitoring and evaluation of urban ecosystems and population health.

### 6.5.6    Mechanisation and Metabolism

Mechanisation is the sixth characteristic. Cities have been the location of human assets, especially knowledge, technological development and complex physical infrastructures, for about 10,000 years. Cities and urban regions have depended on machinery and infrastructure to import supplies, to treat waste products and to efficiently use their increasingly complex built environments and infrastructure. Contemporary urban regions are heavily dependent on machinery for a wide range of functions and services that guarantee sanitary living conditions. Mechanical and technological characteristics of urban areas that impact directly or indirectly on health include industrial production, transportation, the processing of mass-produced foods and the increasing use of synthetic materials in the built environment. In particular, the incidence of accidents in urban areas is a major challenge for public health (UN-Habitat 2010). For example, injuries caused by motor vehicle

accidents are ranked 10th among leading causes of mortality world-wide and 9th among the leading causes of disability. Today, children and young adults in all regions of the world bear a disproportionate burden of these accidents. This burden is significantly higher in urban areas compared with rural areas; it is also significantly higher in developing countries compared with developed countries (Sarkar et al. 2014).

### 6.5.7  Geopolitical Institutions and Actors

The seventh characteristic is political authority. The city was the *polis* in ancient Greece, meaning it had a specific political status, which is still the case today in some form of local government. Since the 1990s, much attention has been given to urban governance rather than municipal government. Governance can be defined as the sum of the ways by which individuals and institutions (public and private) plan and manage their common affairs. It is a continuing process that involves formal institutions and informal arrangements that are meant to promote mutually beneficial co-operative action. Governance is based on the effective coordination of three main components: market-based strategies for the private sector, hierarchical strategies articulated by the public sector and networking in civil society. The goal of governance in cities and urban regions should be to develop synergies between partners, so there is a better capacity to deal with the most urgent priorities (Fuchs et al. 1999 (first edition 1994)).

One example of urban governance that explicitly promotes health is the Healthy Cities project. This project was founded in 1987 by 11 European cities and the WHO Regional Office for Europe (De Leeuw and Simos 2017). Today this project is active in all regions of the world. The Health for All strategy provides the strategic framework for this project. The Healthy Cities project in the WHO European region includes four main components. First, the designated cities are committed to a comprehensive approach to achieving the goals of the project. Second, national and subnational networks work together in order to facilitate co-operation between partners. Third, multi-city action plans (MCAPs) are planned and implemented by networks of cities collaborating on specific issues of common interest.

The project involves collaboration between sectors to define a "City Health Plan" that identifies the interrelations between living conditions in urban areas and the health of residents (De Leeuw and Simos 2017). Innovative projects show that health can be improved by addressing the physical environment, as well as those social and economic factors that influence health in precise situations (such as the home, the school, the workplace). This broad interpretation means that equity and social inequalities are identified as key factors that need to be addressed in cities. In particular, the plight of vulnerable social groups (including the handicapped, homeless, unemployed, single parents and street children) can be ranked high for interventions. Hence the social and just principles of sustainable development are explicitly addressed.

## 6.6   Synthesis

The formulation and implementation of traditional sector-based approaches in the field of urban policies and programs does not lead to optimal results. Although there may be incremental improvements (in fields such as housing supply, public education, employment or transport infrastructure), these are often achieved in tandem with unintended consequences which may have negative impacts on local environmental conditions, the economy and the health and welfare of urban populations. In part, these outcomes are due to the number and complexity of all those factors that policy decision-makers need to consider (Lawrence and Gatzweiler 2017). They are also due to the recurrent lack of coordination in the field of public health policies and programs, which can be associated with the following factors:

1. The thematic variety and the technical complexity of specific problems related to the environment, the economy, health and well-being. Collectively, actors and institutions from different sectors need to collaborate in order to understand and address the complexity of contemporary urban health challenges.
2. The lack of consensus between specialists. There is no shared conceptual framework, methodological approaches or precise instruments for the study of population health in cities and urban regions. Moreover, there is no consensus about what instruments are most appropriate for defining, applying and monitoring urban policies and programs.
3. The lack of strategic visions and societal goals shared by politicians, professionals and the public about the definition and ordering of priorities. These visions and goals are not solely dependent on scientific knowledge. They are prescribed by human motivations, perceptions and values. Hence both qualitative and quantitative approaches are necessary, and these should be used in a complementary way.

Given the systemic nature of urban health challenges, it is necessary to consider the appropriate means and measures for the redefinition and reorientation of coordinated urban policies that are more ecologically sustainable, more socially equitable and less costly in health, monetary and ecological terms.

## 6.7   Conclusion

This chapter has suggested that an innovative research agenda can be based on the hypothesis that cities and urban regions have the potential to create adaptive responses rather than being considered as the overriding cause of current environmental, economic, health and other social problems. This hypothesis can be studied with respect to three basic ideas. The first is the need to examine urban lifestyles and infrastructures from three complementary perspectives—a comprehensive systemic perspective at the level of urban regions, an individual and household perspective at

the level of residential neighbourhoods and a sociotechnical/institutional perspective encompassing the local, the regional and the global levels. The second idea is the need to apply a temporal framework to address these issues in the past, the present and the future. The third idea involves formulating images of the future by developing scenarios of desirable futures focused on one or more societal goals and then organising a public debate about how these goals could be achieved.

This innovative approach challenges common interpretations of urbanisation borrowed from traditional development agendas that focus narrowly on economic growth and industrialisation. In contrast, integrative principles of human ecology should be applied because they are related directly or indirectly to urban health. In essence, these principles can be used proactively in specific urban neighbourhoods to improve and sustain the health of urban populations. The importance of a radical shift in the way individuals, groups and societies think about these principles in relation to sustaining human health in cities and urban regions is a major challenge in the twenty-first century.

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