

HEALTH & QUALITY OF LIFE IN URBAN AREAS

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WP3



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1 About this report

1.1 Audience

This is the second in a series of Synthesis Reports (SR) produced by URBAN-NEXUS. These Reports are intended mainly for municipalities, policy-makers and businesses engaged in urban issues, but may also be of interest to organisations, institutions and networks involved - or needing to be involved - in decision-making and developing partnerships to tackle problems encountered in urban sustainable development and management. This includes public sector agencies, utilities, the private sector, civil society organisations and community groups.

1.2 Purpose of the report

The SR will help inform debate and discussion as part of an ongoing “structured dialogue” across a network of urban researchers, professionals and actors on developing integrated approaches to the challenges and opportunities of sustainable urban development. The main forum for supporting a rich exchange and learning environment will be a series of “dialogue cafés” held in different European cities during the project duration. These will encourage participants to identify and prioritise common issues and develop partnerships to help promote and deliver innovative, effective and integrated responses to improving urban sustainability.

Each Synthesis Report (SR) of the Urban Nexus project will address a different theme; and this one is highlighting the importance and urgency of integrating health and quality of life in urban areas. Discussions on the outcomes presented in this report will be held at the second URBAN-NEXUS Dialogue Café, to be held on the 17th and 18th October 2012 in Barcelona. The discussions will form a follow-up report at the beginning of 2013, feeding into subsequent thematic synthesis reports on land-use, urban governance, and data and monitoring. This will engender an evolving dialogue and foster integrated approaches to urban sustainability that become intrinsic to decision-making processes and partnership activity.

The SR on Urban Climate Resilience of the URBAN-NEXUS project was presented and discussed in Glasgow, in May 2012, during the first dialogue café, and its outcomes and results can be consulted at www.urban-nexus.eu/.

1.3 Report preparation

Health and quality of life in urban areas was identified as a priority research area by URBAN-NET (EU predecessor research project of URBAN-NEXUS) within a strategic research framework for sustainable urban development. The URBAN-NET study was based on partners’ collective knowledge and evidence pooled from across Europe as part of a comparative assessment of national and regional research programmes.

This report considers research, mainly European, background material from a variety of sources including existing research evidence, case studies from cities and projects results undertaken at EU level. The information was collected from the URBAN-NEXUS consortium, the strategic partners and a wider network of contacts.

This report should serve as basis to inform an evolving dialogue, fostering integrated approaches to urban sustainability that become intrinsic to all decision-making processes and partnership activities related to health and quality of life , and linking it with the other priority research areas being addressed in the URBAN-NEXUS project. The Dialogue Café related to this research area will continue this process and the outputs will be collected in a Follow-up Report.

1.4 Use of terms

For ease of reading, the terms “urban area” and “city” are used interchangeably throughout this report and no specific distinction is drawn between either term with regard to distinct morphologies or administrative boundaries. “Well-being” (the state of feeling healthy and happy) and “welfare” (physical and mental health and happiness, especially of a person) are used as synonyms in this report. Section 3.2 provides a detailed glossary for the main terms used in this report.

1.5 Questions for the dialogue café

In preparation for the URBAN-NEXUS Dialogue Café on ‘Health and Quality of life’, being held 17th and 18th October 2012 in Barcelona, we would like delegates to consider the following main questions (Other more specific questions can be found at the beginning of each chapter);

- Which policies have influence on people’s health in urban areas?
- Are health and environmental aspects included in early stages of policy planning, with the objective to reinforce and strengthen the collaboration at all levels?
- Which social aspects can be linked to urban planning, design and management of urban areas?
- What evidence shows the influence between environmental stressors, such as air quality or noise pollution, and urban morphological aspects?
- To what extent does current urban planning includes health aspects? (E.g. how to integrate health and strategic spatial planning, like transport infrastructure?)
- What are the spatial planning conditions of a determined neighbourhood that could determine a healthy local environment?
- Is people’s quality of life influenced by urban patterns and flows?
- Are there tools to measure positive health effects of biodiversity and the natural environment to promote healthy urban design (“Green cities”)?
- What kind of information is needed to evaluate an efficient management of urban areas including health policy actions?

1.6 Acknowledgments

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2 Key findings

KF1: Local, regional, national and European policies must go hand in hand to achieve the values of the Air Quality and the Ambient Noise Directives. Only an integrated approach will be successful concerning policy, legislation and measures at all levels (local, regional, national and European) and extended beyond air and sound quality to include energy, safety, urban design, public space etc. It is also crucial to include business and industry in this integrated approach.

KF2: Several initiatives and European Directives are focused on tackling noise and air quality problems at source, being the most effective measures for reducing their impact. Technical measures like noise barriers or tunnels, replacement of road surfaces to low noise road surfaces, promoting public transport, promoting walking and cycling to calm the streets, introducing parking fees of local regulations, re-routing existing traffic, etc. can be very effective measures to meet specific local problems for air quality and noise. However, it should be taken into account that as those measures are not addressing the problem at source, the overall emissions rate remain the same.

KF3 There is empirical evidence for different beneficial effects of natural environments and green spaces on health and well-being. Green Infrastructure contributes to biodiversity as it helps to maintain the integrity of related habitat systems, and is central to improving psychological and physical aspects of human health. Special attention must be paid when cities grow in size as access to green areas can be affected, diminishing people opportunities to experience nature, with a corresponding decrease in people's quality of life.

KF4: Physical activity is strongly linked to health. Walking, running or doing sport is associated with a number of positive health outcomes. Therefore, the design of public space in order to facilitate physical activity might be a key feature in healthy urban policies to support this. Considering the consumption of fossil fuel global reserves and likely increases in fuel costs driven by low carbon ambitions, it is likely that urban populations will be more dependent on walking, cycling, and public transportation in the future so that street networks and public open spaces will become increasingly important.

KF5: Inequalities in health outcomes should be recognised at the urban scale but the state and European level policies are decisive to build social cohesion. Socioeconomic and demographic inequalities in risk exposure are present in all countries but with large differences between them. Lower income households cannot afford homes in high price areas, and usually live in areas of dense housing with less green areas and good quality public space, higher noise and air pollution levels and far away from attractive urban areas. Policies on disadvantaged areas are expected to reduce social inequalities in health. Urban renewal or gentrification often results in negative consequences for the most deprived populations.

KF6: There are a large number of scientific researches on Health and quality of life, and all of them conclude that it is necessary to adopt a coordinated integrated approach. The majority of the research on urban health and quality of life assert that an integrated approach is required to develop corrective measures to address stressors. However, many of the adopted measures are restricted to isolated specific topics focusing on sectorial issues like noise, air pollution, mobility, etc... Integrated and multidisciplinary initiatives tackling urban management policies, mobility policies and social policies (including people's perception concerning different environmental stressors) will be much more effective to improve the existing situation in urban areas in Europe.

KF7: Urban structure and land use affects quality of life. The physical space where we live indirectly affects our quality of life. The type of housing, neighbourhood and, to a lesser extent, city and metropolitan areas are crucial aspects of well-being amongst citizens. There is a growing recognition that compact cities with mixed land use provide better air quality compared to dispersed cities with lower densities and segregated land use or networked cities equipped with intensive transport infrastructure.

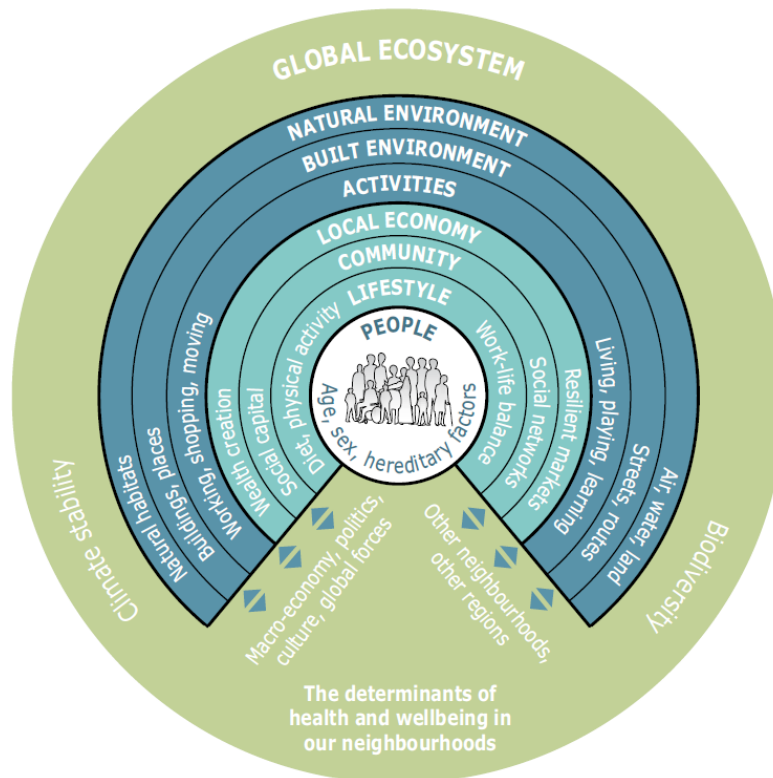
3 An overview of health and quality of life

3.1 The challenge of urban health and quality of life

Quality of life is an emerging issue, as it has been observed that people’s perception, aspirations and behaviour influence to a great extent many socio-economic dynamics and even certain developments in the urban context.

Citizens’ well-being is the focus of quality of life, and health is a primary component of the well-being. As shown in Figure 1, people and their social and cultural factors are the final receivers of decisions taken at macro-economic level and people’s way of life are mainly influenced by political decisions and global forces, as well as social factors and social networks. The figure helps to understand the relationships between health and urban planning, one of the ultimate objectives of this Synthesis Report

Figure 1. The determinants of health and well-being in our neighbourhoods (Source: Human ecology model of a settlement, Barton and Grant, 2006)



As has been highlighted in the Europe 2020 strategy¹, success overcoming the current economic crisis can only be achieved with sustainable, smart and integrative development. Therefore economic success is not the only objective, nor can economic success be achieved without integrating distribution of resources, sustainability, health, human rights and education. New measurements of well-being beyond GDP are needed that consider alternative approaches to measuring progress. These include valuing the services provided by ecosystems which are essential to human well-being, and those that recognise the importance of breaking the link between environmental damage and economic growth to

¹ http://ec.europa.eu/europe2020/index_en.htm

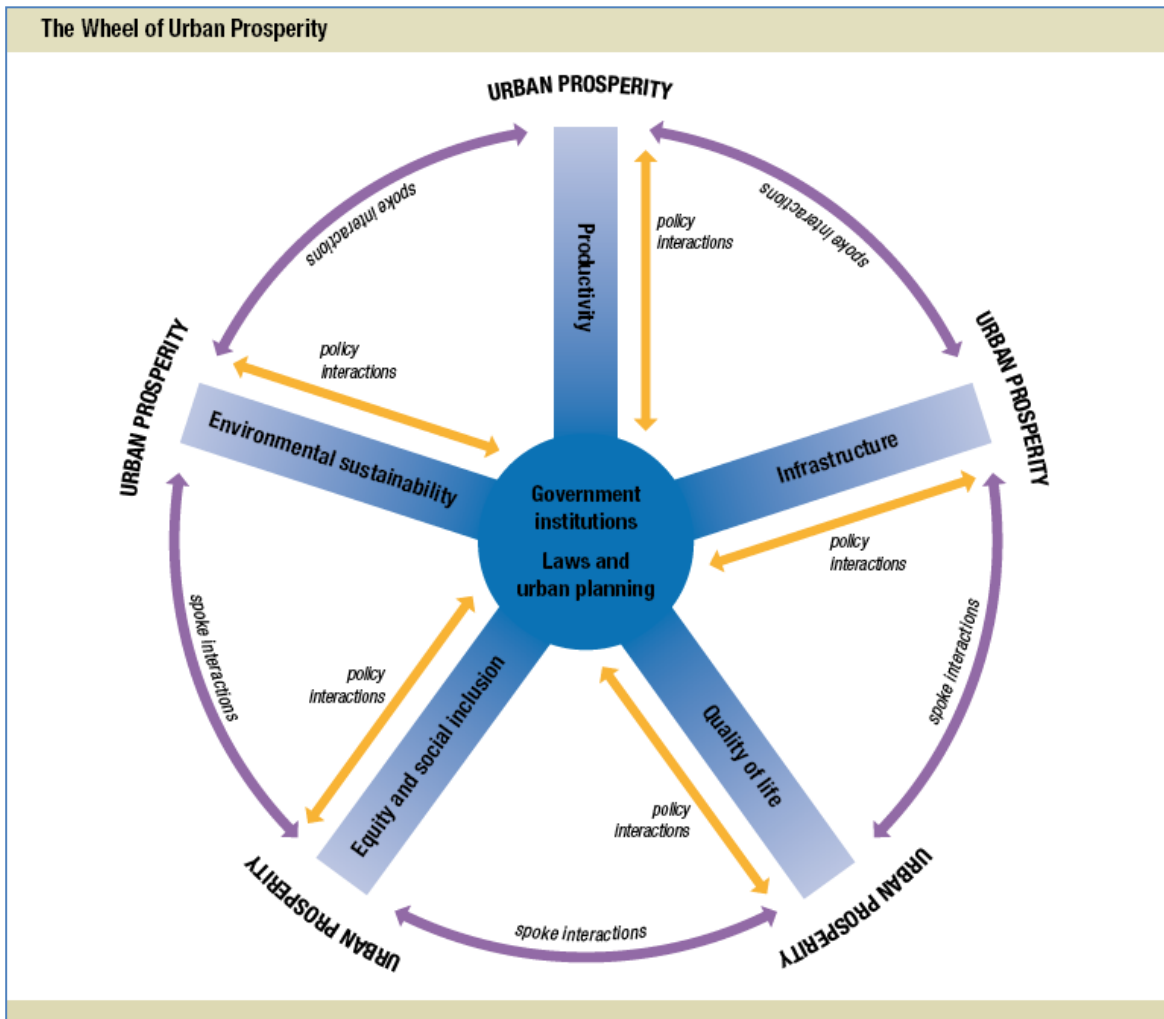
achieve continued prosperity without destroying the natural systems that sustain society development placing an equal measure on material progress, social inclusion, cultural life and living in harmony with nature (“Happiness and Well-being: Defining a New Economic Paradigm”, 2nd of April 2012, New York, meeting of the government of Bhutan at the UN headquarters).

The emergence of this new paradigm can be exemplified with the EU funded ERA-ENVHEALTH project (started in 2008) which aims to achieve “coordination of national environment and health research programs”. This project has been established to help increase the relevance and efficiency of Environment & Health in Europe. As it is stated in the EU Environment and Health Strategy (2004), and seconded by the ERA-ENVHEALTH network and other relevant stakeholders, around 20% of the burden of disease in industrialized countries can be attributed to environmental factors. Europe’s citizens are concerned about the potential impact of the environment on their health and expect policy makers to act. In a survey carried out in 2002 (Flash Eurobarometer EB123), 89% stated that they were worried about the potential impact of the environment on their health.

“It is important to secure both sustainable development and a sustained quality of life based on political decisions, highlighting the fact that decisions taken to pursuit short-term quality of life could have an impact at the expense of longer-term sustainable development” (EEA, 2009). It is therefore vital to raise public awareness on this aspect and on the conflicts that could arise from achieving individual or collective quality of life benefits. “The challenge for cities is therefore, to find acceptable and smart solutions tackling environment and health problems together; finding a balance between all policies and developments that should take place in an urban area and integrate them into the same future urban planning, with the aim of achieving the maximum public support” (EEA, 2009).

UN-Habitat in the State of the World’s Cities Report 2012/2013, proposes the “prosperity” approach in order to measure present and future progress of cities. This report introduces a new tool - the City Prosperity Index - and a conceptual matrix, the Wheel of Prosperity which suggests areas for policy intervention (see box overleaf).

Box 1. Defining a prosperous city²



Defining a prosperous city	<i>A prosperous cities one that provides</i>
<i>Productivity</i>	<i>Contributes to economic growth and development, generates income, provides decent jobs and equal opportunities for all by implementing effective economic policies and reforms</i>
<i>Infrastructure development</i>	<i>Provides adequate infrastructure-water, sanitation, roads, information and communication technology in order to improve urban living and enhance productivity, mobility and connectivity.</i>
<i>Quality of life</i>	<i>Enhance the use of public spaces in order to increase community cohesion, civic identity, and guarantees the safety and security of lives and property</i>
<i>Equity and social inclusion</i>	<i>Ensures the equitable distribution and redistribution of the benefits of a prosperous city, reduces poverty and the incidence of slums, protects the rights of minority and vulnerable groups, enhances gender equality, and ensures civic participation in the social, political and cultural spheres.</i>
<i>Environmental sustainability</i>	<i>Values the protection of the urban environment and natural assets while ensuring growth, and seeking ways to use energy more efficiently, minimize pressure on surrounding land and natural resources, minimize environmental losses by generating creative solutions to enhance the quality of the environment.</i>

² Source (State of the World’s Cities Report 2012/2013)

3.2 Concept definitions: health, quality of life, urban areas

In this section, key terms are defined as used throughout this document.

Health

The World Health Organization (WHO) defines Health in the following way: “Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.” (World Health Organization 1948).

This definition encloses the fundamental elements intended to be addressed by a focus on health and well-being in the urban environment.

Achieving a healthy and sustainable way of living by ensuring a good quality of life is the main tendency that is being observed in western and European countries, replacing the previous concept on just decreasing mortality indices. Based on that, concepts like the DALYs (Disability-Adjusted Life Year) were adopted in several WHO reports and are becoming increasingly common in the field of public health and health impact assessment. One DALY is equal to one year of healthy life lost, which include years of life lost and years lived with disability: it extends the concept of potential years of life lost due to premature death to include equivalent years of ‘healthy’ life lost by virtue of being in states of poor health or disability.

Quality of life

Quality of life is a term broadly used both by the general public and amongst policy-makers. Everyone agrees on its importance, but a definitive meaning cannot be assigned to it — the term can mean many things to many people.

The term quality of life (QoL) is used to evaluate the general well-being of individuals and societies, focused on separate dimensions of collective well-being, such as income, wealth and employment, the built environment, physical and mental health, education, social disorganization, social belonging, and recreation and leisure (Gregory, D., 2009). Therefore, quality of life measures are based more on social indicators than just material living standards that are related mainly to individual or national aggregate levels of income

Other concepts, such as freedom (cf. human rights) and happiness are frequently related to measures of the quality of life that individuals and societies experience, although much work on happiness shows that – to the extent that it can be measured – does not increase above a certain income threshold: people may be more content and live more comfortable lives with higher incomes, but they do not feel any happier (Layard, 2005).

In the report issued by the EEA in 2009, Ensuring quality of life in European cities and towns, quality of life is mainly defined by people as the availability of having public services, employment, shopping, transport, green open space, culture and sport facilities as well as space to live, apart from income (EEA. 2009). If the question asks which aspects could be improved in the city to achieve a better quality of life, the majority of people would mention problems such as traffic, noise and air pollution, all of them problems that people are facing daily. So, apart from promoting clean air and public health, local and regional authorities have to pursue many other objectives that contribute to the well-being of their citizens, such as economic prosperity, mobility, jobs and the preservation of the economic, social and cultural functions of inner cities. Cities cannot simply shut down all transport activities and industries in order to realise clean air and a better acoustic environment.

Urban areas

Apart from population thresholds, urban areas can be defined according to different criteria (EEA 2009).

- Administrative area: constitutes the territorial expression of the political and technical framework of governance, forming the focus for, and critical to the understanding of, the development and implementation of policies to secure both quality of life and sustainable development.
- Morphological area: constitutes, irrespective of administrative borders, the spatial dimension and form of cities and towns in physical terms, comprising urban fabric with buildings, roads and artificially surfaced area, industrial and commercial units, green urban areas within urban fabric, and in addition port areas, airports, and sport and leisure facilities if included or continuous to other urban land use.
- Functional urban area: constitutes the socio-economic reality of towns and cities expressed in terms of the territorial influence of the town or city across its hinterland, and identified in the relevant structures of the built environment.

3.3 Health & Quality of Life in the context of Urban Nexus

Health and quality of life in urban areas was identified as a priority research area by URBAN-NET (an EU – wide predecessor research project of URBAN-NEXUS) as part of a strategic research framework for European sustainable urban development, developed under that project.

The other two priority research areas proposed to be studied by URBAN-NET have been:

- Climate change and urban resilience
- The use and competition for the land

These three thematic areas are being developed under the URBAN-NEXUS project, as well as the interlinkages between them and their integration into two horizontal thematic areas: urban management and integrated information. To show the links between health and quality of life with the use and competition for land and with the urban climate resilience (including how these two areas also influence citizens well-being, citizens health and citizens' quality of life), two specific subsections have been developed in the current report: section 3.3.1 and 3.3.2 respectively, and both of them are being further developed in the corresponding Synthesis Report.

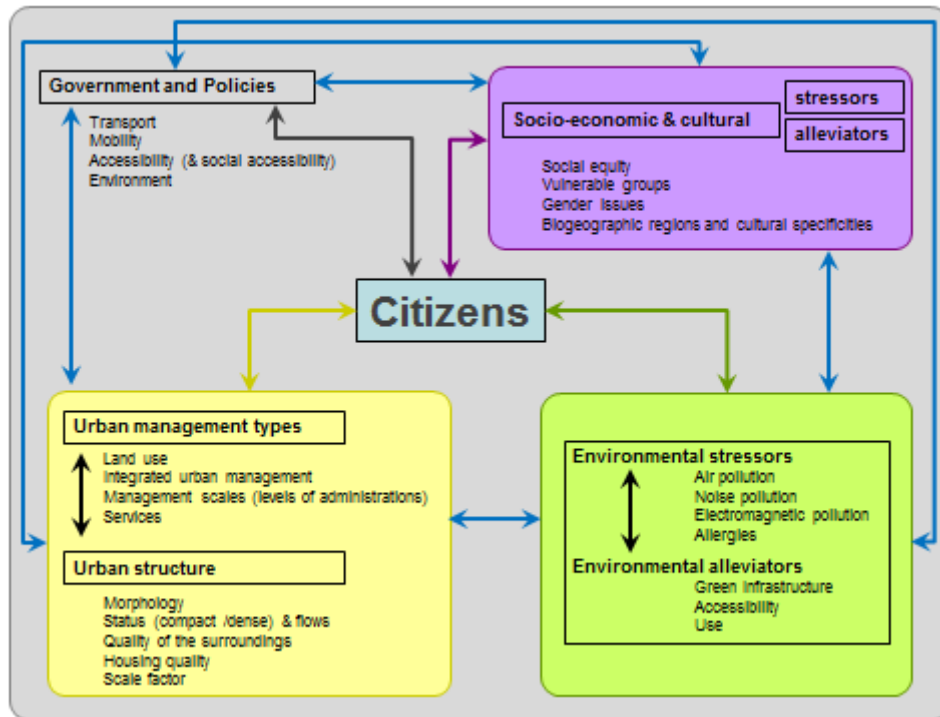
In order to analyse the state of the art on health and quality of life in urban areas, which is the focus of this report, current research, projects and policies already being implemented related to different types of urban structures, urban management practices and policy decisions, have been used as the basis for the discourse being presented. The development of an urban area is clearly determined by those factors, influencing urban patterns and resource / people flows. The resulting environmental quality of the urban environment comes from the effect of all the policies applied that are assessed through indicators such as the quality of the air or the use of green urban areas

To contextualize the research that is presented in URBAN-NEXUS, citizens are the focus of the analysis, as they are the participants impacted by the improvements or deterioration of the quality of the urban environment as a result of policies, structures and patterns that determine their quality of life. Very often citizens have only been approached as either “receivers” or “users” which implies a passive role.

In recent years, Smart Cities³ project has taken special relevance to ensure citizen participation through technologies.

From an urban environment perspective then, a framework has been developed to analyse health and quality of life of urban citizens, as shown in Figure 2.

Figure 2. Overall framework to analyse health and quality of life from an urban environment perspective (based on own elaboration)



Based on this schema, the main challenges that urban areas may face concerning the improvement of health and quality of life of their citizens in the context of the URBAN-NEXUS project, are summarized below:

- Social integration: analysis of the social aspects (such as the existence of socio-economic groups and their distribution, vulnerable groups and specific impacts that can be observed in those groups, etc.) that can be linked to urban planning, design and management.
- Physical components of quality of life: analysis of the relationship between components of quality of life such as air quality, noise pollution or accessibility to services with morphological aspects of the urban areas (land use management, the existence of green urban areas or the quality of the surroundings of urban areas), and how all these aspects are linked with citizens' health. This issue will also be addressed in the next report "Competing for Urban Land".
- Integrated policies: analysis of which urban policies have a real influence on people's health.
- Determine how to include sectorial policies in the development of an integrated health policy.
- Mobility as a fundamental driver of quality of life/way of life: analysis of how mobility policies (including bike lanes, footpaths, sidewalks or car parks) have an influence on urban patterns and flows, and if it can be demonstrated as a result of those policies, a healthier way of living of the citizens of the different urban areas.

³ <http://www.smart-cities.eu/>

- Integrated policies - green infrastructure and health: analysis of the influence on greening urban areas and infrastructure (blue and green urban environments) on people's quality of life, that would also provide a link with the analysis that will come from earlier URBAN-NEXUS work related to climate change and subsequent work related to sustainable land use in urban environments.
- Decision-making models: analysis of which models or decision-making applications would be the best ones to be applied in an integrated urban management plan that should include quality of life and health aspects as one of the criteria to be taken into account in urban development (urban development models as well as planning instruments and policies need to be reconsidered in order to integrate health aspects as fundamental aspects of urban management).

These challenges have been addressed throughout the report as the basis to focus the literature review undertaken to summarize the state of the art in terms of research policy and practice, and to highlight the main achievements obtained by all the projects being analysed. The questions will be also discussed in detail during the upcoming Dialogue Café that will be held in Barcelona in October 2012, and the outcomes of the Dialogue Café will constitute the central part of the Follow-Up Report on Health and Quality of life in urban areas.

Chapter 4 of this report contains the findings concerning the environmental stressors and alleviators, the socio-economic and cultural stressors and alleviators, and the urban structure and urban management types affecting health and quality of life of citizens in urban areas. All the items are highly interlinked, and political and governmental decisions highly influence the characteristics of the urban environment and determine the path to improve or worsen the situation focused on the quality of life.

In all the subsections, the main pieces and sources of evidence for each thematic area have been identified in order to establish the state of the art of each of them. Several case studies as well as current research projects have been analysed in order to exemplify some of the main aspects highlighted in the analysis, which are presented in text boxes in each thematic section. Finally, this synthesis report should serve as basis for the discussion to be held in a Dialogue Café, in order to identify existing gaps for any of the thematic issues and to determine the possible strategic solutions to be applied by long-term partnerships resulting from the URBAN-NEXUS project.

3.3.1 Competing for urban land

Urban land uses and their spatial distribution ultimately have an influence that affects health and quality of life. In a similar way urban sprawl and the way it occurs might affect either in a positive or negative way. For instance, the findings of several studies provide evidence that the shape of a city and the land use distribution determine the location of emission sources and the pattern of urban traffic, affecting urban air quality. It has been concluded by C. Borrego et al. (2006) that compact cities with mixed land use provide better air quality compared to dispersed cities with lower densities and segregated land use or networked cities equipped with intensive transport infrastructures. The European Commission has already advanced a series of actions to promote a strategy for sustainable urban development, and to improve the quality of life of the increasing population of European cities. With regards to this, vegetation could help specifically to improve the quality of the urban environment, not only because of its well-known aesthetic and recreational benefits, but also for its capability to reduce air temperature and to remove air pollutants, that could help to match the air

quality standards with the required reduction of primary and secondary pollutants. (McPherson E.G., et al. 1998).

“Urban expansion is often perceived as a route to a better quality of life as it offers affordable, greener places to live. But related transport infrastructure developments may lead to further deterioration and fragmentation of natural areas and valuable landscapes, thus resulting in a less biodiversity and the deterioration and loss of ecosystem services – flood prevention, water clean-up, climate regulation etc.” (EEA, 2006).

In contrast to the general lowering of urban densities, some cities experience growth in the inner city, that results in areas of high population densities (the so-called compact cities). On the positive side, this type of growth generates the potential to reduce transport demand and overall emissions, but on the negative side there is a risk that more people are exposed to higher levels of air pollution and noise. Some of the main challenges of these compact cities are the combination of different administrative measures and urban design and spatial planning measures that demonstrate reduction of these impacts to some extent. However, unfavorable living conditions in inner city areas associated with excessively high population densities can also contribute to suburbanization and ex-urbanisation and thus reinforce the tendency to urban sprawl. (Pflieger, G.2009)

Moreover, regeneration of deprived areas can lead to a process of gentrification, which is the process of renewal and rebuilding accompanied by the influx of middle-class or affluent people causing the displacement of poorer residents. This socio-spatial polarization, that its geographic reshaping, will continue in the future (FOCI, 2010).

Poorer residents are unable to pay increased rents or house prices and property taxes. Often old industrial buildings are converted to residences and shops. In addition, new businesses, catering to a more affluent base of consumers, move in, further increasing the appeal to more affluent migrants and decreasing the accessibility to the poorer residents (R. Atkinson 2012), (L. Freeman 2012).

Nevertheless, city planners mostly agree that poor people need to be better located in cities to improve their access to social amenities and economic opportunities. This competition for urban land has much to do with social equity (see chapter 4.2.1).

Another problem is the lack of green areas in many highly urbanised regions (EEA 2009). Urban expansion and higher building densities have often led to a growing separation of homes from recreational areas and the reduction of parks and playing fields, limiting the possibilities for outdoor recreation. Also, the deterioration of landscapes and natural areas surrounding the cities due to low density urban expansion reduces the quality of the countryside with adverse impacts on social life, physical activity and mental health.

As stated in an article from J. Corburn (2007), based on several studies undertaken in several USA cities, land use data could be used to estimate environmental health hazards, especially for estimating neighbourhood scale air toxins. Hazardous air pollutants (HAPs: aldehydes, benzene and other volatile organic compounds along with diesel particulate matter) are known to have adverse health effects on urban populations exposed at the micro or neighbourhood scale, exacerbating respiratory disease and in the majority of cases being evaluated, disproportionately concentrated in low-income urban neighbourhoods and communities of immigrants.

Competition for urban land has then, different consequences which should be analysed and taken into account when it comes to urban planning.

3.3.2 Urban climate resilience

A section dedicated to the health effects of climate change is contained in the Synthesis Report related to “Urban Climate Resilience”. Section 5.3 of that document covers issues such as the effects of the increasing temperatures, exposure to extreme heat events, river and coastal flooding, and drought events.

It is known that “climate change will cause deaths during heat waves, increase health problems as a result of additional particle emissions during droughts, exacerbate ozone and air quality related health problems, and intensify the distribution and spread of infectious diseases. Climate change will also affect the basic elements of life and hence, the economy” (EEA, 2009).

The configuration of towns and cities, their land use patterns, infrastructure layout, types of materials used, development planning and management are all factors determining resilience. These components are related to the capacity to deal with impacts such as the heat island effect on human health or maintaining interconnected transport networks in case of floods. Within urban areas, climate change can also aggravate social inequalities and change consumption patterns and lifestyles related to people’s quality of life.

The benefits of vegetation and its setting in the city in relation to air quality and city climate have been widely studied. The urban climate, influenced by shading effects offered by vegetation, altered radiation fluxes and increased evapotranspiration; apply especially to the levels of human thermal comfort . Vegetation is an important factor altering the urban microclimate through the variation of those influencing factors. Provided this situation, it has been demonstrated that that vegetation is a very effective heat mitigator in dense urban environments mostly due to shadowing effects, especially during summer time, when heat stress events usually occur (project developed in the Department of Earth Science , Gothenburg University, by Lindberg, F. (2010)).

Environmental issues such as climate change and air quality require good policy coordination across planning, transport and environmental health sectors to ensure that policies and actions to benefit one area of concern do not adversely affect another; e.g. increased concentrations of air-borne fine particulates and toxic residues is a potential health concern previously overlooked in the promotion of biomass technologies as a means of reducing carbon emissions and mitigating climate change.

Box 2. Urban Reduction of GHG Emissions in China and Europe (URGENCHE)

<http://www.urgence.eu/>

This project develops and applies a methodological framework for the assessment of the overall risks and benefits of alternative greenhouse gas (GHG) emission reduction policies for health and well-being. Project focus on cities ranging in population from 50,000 to 10 million, across various climatological conditions and differences in socio-economic background.

This framework considers GHG emission reductions of energy demand and supply and transport scenarios in urban areas, the effect of these policies, and subsequently the impacts on human health and well-being. The GIS-based approach takes into account the advances made in integrated assessment in a large range of studies in Europe over recent years (many with participation of the project partners). The impact on human health and well-being of GHG policies may be the result of changes in exposure patterns of the urban population to environmental contaminants such as ambient and indoor air pollution as well as changes in housing, urban green spaces, workplaces, transport and lifestyles. Distribution of the impacts across different socioeconomic groups will be addressed. Results will be demonstrated for the year 2030 on a business-as-usual and two GHG emission reduction scenarios with emphasis on transport and buildings.

The ecosystem services provided by urban green spaces are directly linked to the physical aspects of these spaces (de Groot et al., 2002): environmental services that could be taken under consideration would be climate amelioration, carbon storage and sequestration, pollution control, decreases of rainwater runoff and protection against floods, but also aesthetical and recreational services (Ong, 2002). Some of these services will play a key role in the adaptation of urban areas to climate change, which should be tackled at all governmental levels. Moreover, considering that cities tend to hold greater concentrations of population and economic assets, and that there is a trend to increase these concentrations in the future, urban areas present a high vulnerability to current climate variability and future climate change (EEA, 2012a). More extreme weather events such as heat waves, floods and droughts have been manifested in last years and are more visible throughout Europe (EEA, 2009). Heat in cities is emphasized by the urban heat island effect; the action of heat is a major concern under heat waves when especially affects human health stated by an increase of mortality rate. Many studies have been undertaken to analyse the relation between vegetation and temperature, results show that the cooling effect of vegetation is about 0.94°C in parks (Bowler et al., 2012). However, there is a need to standardise data collection and standardise the decision of which summary temperature parameters should be appropriate for monitoring programmes, in order to allow comparability. Further research is needed to investigate the size and distribution of greenspace to determine the optimal cooling effect of green space. Another climate effect that cities can suffer is floods, which can cause public health, material and economic impacts. Another factor to consider is soil sealing that increases the risk of flooding.

Focusing on climate change impacts, there are different adaptation strategies that can be adopted; maybe the most obvious one is the greening urban areas, founded on the enlargement of vegetation cover and density (Bowler et al., 2012) and boosting green infrastructure (EEA, 2012a) by promoting trees in streets, green walls and roofs, gardens and parks, wetlands and water bodies. It is also important to maintain inward and outward flows for fresh air (for cooling) and water (to avoid floods).

It is recommended to avoid or even remove impervious surfaces where possible, as well as to facilitate the 'renaturalisation' of rivers and wetlands, recovering their ecosystem functions. Other measures at the level of urban planning can involve an integration of building design, such as the establishment of a minimum green quota to be included in new urbanisations, which could be based on a minimum extent or a new approach as the proposed by Ong based on the green plot ratio (Ong, 2002). Urban planners must also be aware that while cities grow in population and not in size they become more compact. Consequently, available green space per capita drops. On the other hand, when cities grow in size access to green areas can be affected diminishing people opportunities to experiment nature, and so decreasing people's quality of life (Fuller and Gaston, 2009).

4 Evidence from research and practice influencing people's health

4.1 Environmental stressors and alleviators

Which are the environmental stressors causing damage in people's health and affecting their quality of life? Are there policies aiming to reduce harmful effects of exposure to those stressors? Are European Member States applying the policies with a positive result for European citizens in urban areas? And which have been the most common measures being implemented to alleviate those effects at local and urban level?

Europe is a highly urbanized continent with more than two thirds of the total population living in urban areas. Although emissions from motorized vehicles and large point sources have been reduced through the use of cleaner fuels and technology, urban areas still show increasing signs of environmental stress: loss of open space, traffic congestion, noise and air quality degradation (Fenger et al. 1998, cited in C. Borrego et al. (2006)).

Several initiatives and European Directives are focused on tackling noise and air quality problems at source, being the most effective measures for reducing their impact. In most cities, road transport is clearly the main source of air pollution and noise, so several measures established at vehicles' levels would achieve presumably better results. In the case of air pollution, directives such as the Clean Air for Europe programme (CAFE) programme, the National Emission Ceiling Directive (more details can be found in section 4.1.1.1) and the Integrated pollution prevention and control Directive (IPPC), establish limit values for air quality and determine reductions of emission standards for cars, ships, agricultural farms and industrial emissions as well (EEA, 2009). In the case of noise, improved standards for vehicles, cleaner vehicle technologies and improvements in tyres are some of the most effective measures for noise abatement.

So, although air pollution and noise are recognised as major public concerns, sometimes is difficult to introduce changes in the organisation and structure of urban areas to reduce both pollutants and improve the quality of life for all citizens, combining individual interest with societal interest to achieve a clean air and a quiet environment in urban areas. It is clear that persisting stresses show that solely technological improvements are unlikely to provide the solution as the drivers behind this problem are multiple and therefore, more than one sector should join efforts to improve the situation.

Local, regional, national and European policies must go hand in hand to achieve the values of the Air Quality and the Ambient Noise Directives. Only an integrated approach will be successful concerning policy, legislation and measures at all levels (local, regional, national and European) and extended beyond air and sound quality to include energy, safety, urban design, public space etc. It is also crucial to include business and industry in this integrated approach (EEA, 2009).

4.1.1 Urban place and environmental stressors

Many problems in cities are strongly related to issues concerning urban density and urban containment. Lower residential densities often offer lower noise levels, less air pollution and better

access to (private) green space (EEA, 2009) . On the other hand, low densities also result in greater demands on the transport system, particularly road transport. Hence urban sprawl and transport infrastructure have a reciprocal relationship and a positive feedback loop develops (ESPON, 2004, cited in EEA, 2009) — more building requires more roads, which leads to more building.

Provided this situation, it has been observed that transport volumes have increased substantially throughout Europe over the last decades driven by urban sprawl and a large number of other socio-economic factors (Stead & Marshall, 2001, cited in EEA, 2009), with an increase of health risks and a reduction of the quality of life in cities and in near surroundings.

Box 3. Health Impact Assessment of Transport Initiatives: A guide⁴

This guide has been written to help people doing a health impact assessment of a transport proposal.

- includes a review of evidence on transport and health, positive and negative impacts
- suggests some questions to help apply literature findings to the context of a specific proposal
- outlines how to use the evidence to do a health impact assessment
- provides brief summaries of completed health impact assessments (HIAs) of transport-related topics
- highlights sources of information and data about transport.

Decisions around choosing to travel by car, public transport, bicycle or foot are complex and will often take into account a number of factors.

Table: Perceptions of different modes of transport that may influence choice of transport mode.

	Good	Bad
Car	Convenience Fast Comfort Personal safety Carry loads/equipment More economical for car owners to use car than pay for alternative transport	Pollution Congestion Stress of driving – road rage, guilt about not using public transport Speed cameras Poor road maintenance and signage
Public transport (general)	No worry about parking	Inconvenience – times, location of stations/stops, bus and train routes not well integrated Lack of comfort – vehicles often overcrowded and vandalised, walking to station/bus stop in bad weather is unappealing Personal safety – stations/bus stops are often unmanned
Train	Fast Environmentally friendly	High cost Unreliable in poor weather
Bus	Low cost	Unreliable Lack of timetable information Exact change for fare required Slow Affected by congestion Polluting
Walking/cycling	Healthy/exercise Low cost Predictable Environmentally friendly Weather dependent Not able to carry goods/equipment	Danger Exposed to pollution Weather dependent Not able to carry goods/equipment

Noise and air pollution are mainly caused by road transport in most European cities, and both of them are the major environmental stressors to take under consideration to improve citizens' well-being. Despite all measures and improvements already occurred, both stressors still show higher values above the healthy established limits, leading to various types of diseases and reduction of life expectancy.

⁴ http://www.healthscotland.com/uploads/documents/5039-03686_NHSHIAGuideFinal1.pdf

Those two stressors are not the only ones causing all the health effects that could be observed in people living in urban areas; there are also the electromagnetic pollutants and the effects caused by different allergies in people's health.

Place shaping in cities has a significant role for local government in improving health: people need good places to live in order to enjoy good health and well-being, which are characterised by good services, availability of high-quality housing, access to employment and a sense of safety and community (WHO, 2012).

It is therefore necessary to evaluate the role that urban structure, urban form and green spaces are playing in parallel in alleviating those adverse effects of urbanization on people's health. A methodology to assess the impacts and benefits of green spaces and settlement patterns based on urban sprawl, traffic congestion, noise and air pollution, social stressors, etc. is being proposed and tested in the BUGS ("Benefits of Urban Green Space") project, among others. Its final objective is to formulate recommendations regarding the use of these areas as a design tool for future urban planning strategies to make cities a more attractive place to live concerning traffic flow and emissions, air quality, microclimate, noise, accessibility, economic efficiency and social well-being.

As a conclusion, urban structure and policies being implemented in the urban area have a great influence in limiting noise and air pollution locally. Technical measures like noise barriers or tunnels, promoting public transport, promoting walking and cycling to calm the streets, introducing parking fees of local regulations can be very effective measures to meet specific local problems for air quality and noise, although it should be also taken into account that the overall emissions rate remain the same, as those measures are not addressing the problem at source.

Local governments can demonstrate good practices to citizens to tackle those problems by establishing green public and private areas, the procurement of clean vehicles in the public transport fleet, the creation of environmentally certified buildings and applications, etc. (EEA, 2009).

4.1.1.1 Air pollution

According to WHO assessment of the burden of disease due to air pollution (WHO Air quality guidelines – global update 2005), clean air is considered to be a basic requirement of human health and well-being.

Air pollution is a major environmental risk to health: it is calculated that more than 2 million premature deaths each year can be attributed to the effects of urban outdoor air pollution and indoor air pollution (caused by the burning of solid fuels). Four common air pollutants are being evaluated in WHO's report: particulate matter (PM), ozone (O₃), nitrogen dioxide (NO₂) and sulphur dioxide (SO₂). Guideline values have been established and also interim targets related to outdoor air pollution have been determined, to promote a gradual shift from high to lower concentrations. In

Table 1, a summary of the health effects determined by each air pollutant evaluated as well as the guidelines values that have been proposed by WHO have been summarized.

Table 1. Air pollutants and guideline values established by WHO.

Air pollutant	Guideline values	Health effects summary
Particulate matter (PM)	PM2.5: – 10 µg/m ³ annual mean – 25 µg/m ³ 24-hour mean PM10: – 20 µg/m ³ annual mean – 50 µg/m ³ 24-hour mean	The range of health effects is broad, but is predominantly to the respiratory and cardiovascular systems. All population is affected, but susceptibility to the pollution may vary with health or age.
Ozone (O₃)	100 µg/m ³ 8-hour mean	Epidemiological time-series studies have revealed positive, small, though convincing, associations between daily mortality and ozone levels, which are independent of the effects of particulate matter. Little new information about the health effects of ozone has been obtained from either chamber studies or field studies
Nitrogen dioxide (NO₂)	40 µg/m ³ annual mean 200 µg/m ³ 1-hour mean	Animal and human experimental studies indicate that NO ₂ – at short-term concentrations exceeding 200 µg/m ³ – is a toxic gas with significant health effects. Animal toxicological studies also suggest that long-term exposure to NO ₂ at concentrations above current ambient concentrations has adverse effects.
Sulphur dioxide (SO₂)	20 µg/m ³ 24-hour mean 500 µg/m ³ 10-minute mean	Short term exposures: Controlled studies involving exercising asthmatics indicate that a proportion experience changes in pulmonary function and respiratory symptoms after periods of exposure to SO ₂ as short as 10 minutes. Long term exposures (over 24 hours): Early estimates of day-to-day changes in mortality, morbidity or lung function in relation to 24-hour average concentrations of SO ₂ were necessarily based on epidemiological studies in which people are typically exposed to a mixture of pollutants.

Source: WHO, 2005.

Provided the guidelines values being specified by WHO, the concentrations currently being found in many cities in developed countries concerning ozone (O₃) and particulate matter (PM) have a risk for people’s health: it is possible to derive a quantitative relationship between the pollution levels and specific health outcomes (increased mortality or morbidity). The exceedance of air quality standards seriously increased respiratory and cardiovascular diseases, in particular in young children and the elderly people. There seems to be a strong relationship between the amount of heavy traffic and the health effects (EEA, 2009), affecting more severely disadvantaged people with increased risk of respiratory diseases and other illness.

By achieving the targets and guidelines values specified by WHO, significant reductions in risks for acute and chronic health effects from air pollution can be expected. And a significant reduction of exposure to air pollution can be achieved through lowering the concentrations of several of the most common air pollutants emitted during the combustion of fossil fuels. Such measures will also reduce in parallel greenhouse gases emissions and contribute at the same time to the mitigation of global warming, item broadly developed in the Synthesis Report on Urban Climate Resilience and tackled as well on section 3.3.2 of this report.

Provided this situation and with the main aim of protecting human health, it is necessary to initiate laws and regulations as well as actions that will lead to cleaner air and therefore better health status, such as the NEC Directive (2001/81/EC) on national emission ceilings for certain atmospheric pollutants⁵, where ceiling limits are established for nitrogen oxides (NO_x), non-

⁵ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2001:309:0022:0030:EN:PDF>

methane volatile organic compounds (NMVOC), sulphur dioxide (SO₂) and ammonia (NH₃). All these air pollutants, apart from being harmful for people in relation to their health mainly causing respiratory illnesses, are also harmful for the environment causing soil and water acidification and damage on vegetation.

EEA published a report (EEA, 2012b) evaluating the compliance of the Member States and of the EU on the ceiling limits established by the NEC Directive, and the following key findings has been highlighted:

- Nitrogen oxide (NO_x) limits were exceeded most frequently, with 12 Member States failing to keep emissions below agreed ceilings.
- Road transport contributes approximately 40 % of total NO_x emissions in the EU. Reductions of NO_x from this sector over the last two decades have been lower than originally anticipated, according to the report. This is partly because transport has grown more than expected, and partly because the real-world emissions from diesel vehicles are higher than those estimated when the vehicle emission limit standards were set.
- A lot of progress has been made in reducing sulphur dioxide (SO₂) emissions in recent decades. SO₂ emissions in the EU were more than 40% below the EU's ceiling for this pollutant, and no Member States exceeded their SO₂ ceiling.

Box 4. Preliminary emission data provided by Spain exceed the respective ceilings for three out of four pollutants (NO_x, NMVOC and NH₃), and for two pollutants in Germany (NO_x and NMVOC) and Finland (NO_x and NH₃).



In the case of Spain, and although severe plans have been implemented to improve the quality of the air and reach the ceiling values specified by the Directive, the objective has been achieved concerning the particulate matters but the nitrogen dioxide is still higher than the limits specified.

Traffic is the source that most contribute locally to the high concentration levels of NO₂, but temporary works in the streets also increase the concentrations of several air pollutants, especially in the case of Barcelona and Vallès-Baix Llobregat. Those two municipalities as well as Palma de Mallorca, the metropolitan area of Granada, Madrid, asked for a moratorium to 2015 for the accomplishment of the Directive, as the objective to reduce to 40µg/m³ the NO₂ concentration in 2010 have not been accomplished (in the case of Barcelona, a 20% cut of the existing contamination have been achieved, but not yet the value established in the NEC Directive).

The European Commission has rejected this petition as they consider that, with the measures proposed, those areas will not be able to accomplish with the limits established by the NEC. Therefore, Spain is going to be penalized by the EC for this fact.

This information appears in a Spanish daily newspaper, El País, on the 20th of July, 2012⁶.

So, in order to reduce air pollution, several initiatives and programmes have been developed at local level, focused on the improvement of cars and its related technology, on the utilization of cleaner fuels, on the improvement of transport infrastructure and vehicle fleets, or on the promotion of public transport and active living as well.

Several projects are also focused on the reduction of air pollution, such as the EC TRANSPHORM project⁷ (Transport related Air Pollution and Health impacts – Integrated Methodologies for Assessing Particulate Matter), an EU FP7 funded project providing advanced knowledge on the impact of transport emissions on human health in Europe. This project should bring together internationally leading air quality, health researchers and users (1) to improve the knowledge of transport related airborne particulate matter (PM) and its impact on human health and (2) to develop and implement assessment tools for scales ranging from city to Europe.

Other initiatives are implemented at local level to reduce air pollution such as green roofs. Green roofs imply in parallel a great range of other environmental benefits such as the reduction of the “heat

⁶http://pda.elpais.com/index.php?module=elp_pdapsp&page=elp_pda_noticia&idNoticia=20120720elpnepaut_19.Tes&seccion=aut

⁷<http://www.transphorm.eu/Home/tabid/1912/language/en-GB/Default.aspx>

island” effects, storm water retention, or sound insulation, as well as it creates new spaces in the urban areas that can be used for food production and recreational spaces (concepts further developed in sections 3.3.2 and 4.1.2 respectively).

Finally, it is very important to invest resources in education and public awareness, to create corporate responsibility among all citizens to achieve a decrease of the emissions and reduce the quantity of energy used on individual or household scale to the neighbourhood scale and to the complete city area as well.

4.1.1.2 Noise pollution

The EU Environmental Noise Directive had been established with the aim to define a common approach intended to avoid, prevent or reduce the harmful effects of exposure to environmental noise.

It is crucial to consider that European cities have become increasingly 'noisy', not necessarily because the noisy places have become noisier, but rather because there are fewer quiet places left. People are affected by noise from traffic, leisure activities and the general neighbourhood at all hours of the day and night. (EEA, 2009).

Road traffic, primarily main roads, and also railways and aircraft noise are the main environmental noise sources inside and outside urban areas. Furthermore, noise problems are often worse in areas of high density housing and deprived neighbourhoods, where aspects such as neighbourhood noise are added to the environmental noise.

The Environmental Noise Directive⁸ (END) legislate about the assessment and management of environmental noise, with the aim to define a common approach intended to avoid, prevent or reduce on a prioritized basis the harmful effects, including annoyance, due to exposure to environmental noise. It requires Member States to determine exposures to noise in major urban agglomerations through means of noise mapping, as well as exposure due to major transport network infrastructures; assessing the number of people disturbed during the day and night, informing the public of the results of strategic noise mapping and where necessary, preparing and adopting action plans with a view to preventing and reducing environmental noise. To achieve all those objectives, several administrations should work together and invest the resources to achieve an improvement of the current situation.

All data being provided by the Member States under the END, related to the number of people exposed to damaging noise levels and the action plans being undertaken to improve the current situation, show that noise is a serious problem in Europe and lots of people are exposed to levels higher than the ones recommended by WHO.

Several studies (Stansfeld et al., 2005; van Kempen, 2008; Babisch, 2006; Jarup et al., 2008, cited in EEA, 2009) demonstrated that the exposure to high levels of environmental noise can be associated to various health effects such as sleep disturbance, learning difficulties, loss of memory, inability to concentrate or irreversible damages as heart attacks, hearing impairment and impact on mental health, the last ones associated with chronic exposure to noise

The World Health Organisation issued a report entitled Night Noise Guidelines for Europe (WHO, 2009), where guideline values for community noise in various settings have been established based on the scientific evidence available. These guidelines, neither standards nor legally binding criteria, offer guidance in reducing the health impacts of night noise, establishing the thresholds of night noise

⁸ <http://ec.europa.eu/environment/noise/directive.htm>

exposure at $L_{\text{night, outside}}$ (as defined in the END) of 40dB. As interim target for those countries that cannot achieve the 40dB in the short term, a value of $L_{\text{night, outside}}$ has been established at 55dB, but with the objective to reduce it to the target of 40dB for the final protection of the public, including the most vulnerable groups such as children, the chronically ill and the elderly.

Solutions to tackle noise pollution in urban areas have started to be implemented, as test cases, as a result of studies or projects being financed by the European institutions or as measures being promoted at European institutional level or at Member States level. Nevertheless, noise abatement measures (replacement of road surfaces to low noise road surfaces, re-routing the existing traffic and the implementation of changes in park and ride scheme and the establishment of sound barriers or the optimisation of the transport modal split, amongst the most common measures being proposed and implemented by local authorities) can hardly be implemented alone, which means that integrated and multidisciplinary initiatives tackling urban management policies, mobility policies and social policies (including people's perception concerning noise) will be much more effective to improve the existing situation in urban areas in Europe.

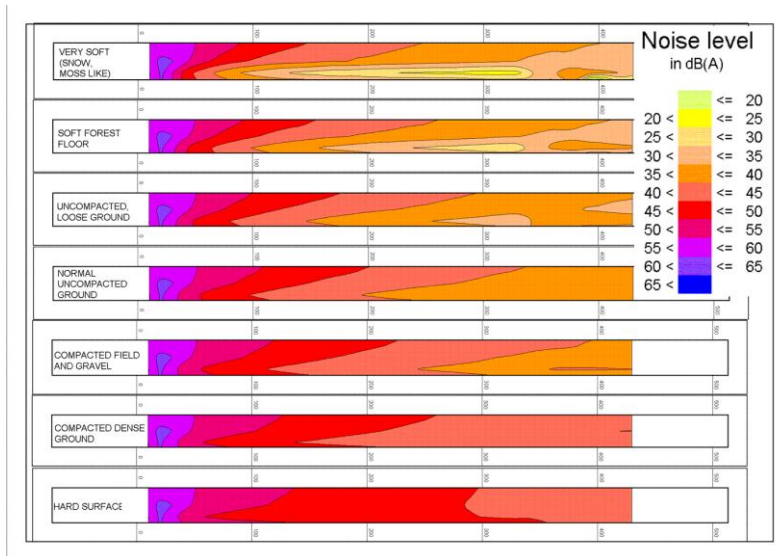
Box 5. Benefits of Urban Green Spaces (BUGS), 5th Framework Programme.⁹

The BUGS project assesses at smaller scales – up to a few hundred metres – the impact of urban vegetation on noise, micro-climate, and air quality.

In general terms, the project evaluates:

- 1) At scales ranging from the street canyon to the urban park (microscale): the impact of trees and other vegetation on air quality and microclimate. Evaluates as well, ways of incorporating natural noise barriers and porous noise-absorbing surfaces into green structures. Air quality is assessed in terms of percentage changes in the exposure of urban citizens to concentrations of (essentially) traffic related pollutants, such as NO_x, O₃, benzene, particulate matter, VOCs, etc. Microclimate changes are assessed quantitatively as changes in temperature, humidity, and radiation loads, amongst other indicators.
- 2) At the scale of the entire city including its rural surroundings (mesoscale): the potential impact of green space and city morphology on urban sprawl, traffic congestion (including emission reductions), and air quality. Traffic congestion is quantified in terms of numbers and fluxes of vehicles and as percentage emission reductions. Air quality and climate are quantified in much the same way as for the microscale at the mesoscale level, although with more emphasis on urban-rural interactions.

Specifically for noise, noise reduction strategies using green elements are being characterised based on the amount of dB decrease they induce. Excessive noise, mainly caused by traffic, is one of the main nuisance factors in the urban environment. In BUGS; noise is dealt with by means of measurements and modelling. Measurements were performed to evaluate the impact of vegetation on noise attenuation. In the figure below it can clearly be seen the attenuation effect of placing different vegetation coverages (from grass to forest) at 80m from the source.



The outcomes concerning the advantages of introducing green elements between the noise source and the receivers are:

- At shorter distances the effect is less pronounced, meaning that vegetation needs a hundred metres or so to yield a significant impact on noise propagation.
- Despite the forest cover being apparently more efficient for noise attenuation, it is allegedly due to the groundcover effect (surface below trees is very porous owing to the presence of leaf litter and low vegetation) rather than to the blocking effect of the trees themselves.
- Apart from obvious effects related to the distance and orientation with respect to the source, effects caused by building type and ground cover are also apparent.

⁹ <https://www.vito.be/bugs/index.htm>

4.1.1.3 Combined effects of noise and air pollution in relation to health

The combination of several environmental stressors may enhance or exacerbate health effects caused separately by an individual factor. The combined health effects of noise and air pollution are considered in this section.

Noise levels are correlated with car, truck, and bus traffic and also with air pollutants. Differences between day time, night time or the day of the week have a direct correlation with noise and air pollutants variations: noise levels are temporally correlated with traffic and combustion pollutants; and those correlations are modified by the time of the day, frequency and meteorological conditions. Therefore, temporal variation in co-exposures to noise and air pollution in studies of the health effects of these urban pollutants should be taken into account.

Several studies have been undertaken to analyse the differences between the exposure to solely one environmental stressor or to more than one environmental stressor. Some of the most noticeable remarks from analysing the combined health effects of both pollutants are highlighted below:

- Aircraft noise was associated with mortality from myocardial infarction, with a dose-response relationship for level and duration of exposure. The association does not appear to be explained by exposure to particulate matter air pollution, education, or socioeconomic status of the municipality. (Huss et al, 2011)
- An association between railway noise and mean blood pressure readings was found, but this association was not affected by the inclusion of NO₂ or PM₁₀ (sensitivity analysis) in the model. The study reveals more severe health effects by transportation noise in vulnerable populations, such as adults with hypertension, diabetes or cardio-vascular diseases. It has also been studied the correlations between traffic noise and NO₂ and between traffic noise and PM₁₀, and it was found that in rural centres, the correlation with PM₁₀ was lower than with NO₂ compared to urban study centres. (Dratva et al, 2011).
- Medium and high frequency noise was more strongly correlated with air pollutants than low frequency noise, and this correlation was stronger at night (to be taken into account that wind speed modifies the associations). Co-exposures between noise and air, however, should be considered in some epidemiologic time series studies. (Ross et al, 2011).

It is also important to assess, apart from traffic variables, the contribution of urban land use to the noise and air pollution correlation. This contribution has been studied in the city of Girona, where a previous investigation of the chronic effects of air pollution and noise on cardio-vascular diseases already took place (REGICOR-AIR). As demonstrated in this study (M. Foraster et al. 2011), the correlations found between NO₂ and noise differed across the urban space, with lower correlations at sites with higher traffic density and in the modern downtown. Traffic density, distance from the location to the side walk and building density nearby explained some of the variability observed, although some other variables not yet measured may have a significant role. The results of the study also suggest that epidemiological studies should include then, a detailed local assessment of both environmental factors.

4.1.1.4 Electromagnetic pollution

Europe's populations have begun to show increasing concern over the potential health risks of electromagnetic fields. "The potentially harmful effects of electromagnetic fields on the environment and human health have not yet been fully elucidated and a number of scientific uncertainties continue to exist in that regard." (Committee on the Environment, Agriculture and Local and Regional Affairs, May 2009). Electromagnetic radiation (EMR) or electromagnetic fields (EMFs) are the terms that broadly describe exposures created by the vast array of wired and wireless technologies. The report 'Bioinitiative: A Rationale for a Biologically-Based Public Exposure Standard for Electromagnetic Fields' (BioInitiative Working Group, August 2007) recommends precautionary limits of exposures where people live, work and go to school. Safety limits for public exposure to EMFs need to be developed on the basis of interaction among not only scientists, but also public health experts, public policy makers and the general public.

According to this report the main reasons for disagreement among experts are:

1. Scientists and public health policy experts use very different definitions of the standard of evidence used to judge the science, so they come to different conclusions about what to do. Scientists do have a role, but it is not exclusive and other opinions matter.
2. We are all talking about essentially the same scientific studies, but use a different way of measuring when "enough is enough" or "proof exists".
3. Some experts keep saying that all studies have to be consistent (turn out the same way every time) before they are comfortable saying an effect exists.
4. Some experts think that it is enough to look only at short-term, acute effects.
5. Other experts say that it is imperative to have studies over longer time (showing the effects of chronic exposures) since that is the kind of world we live in.
6. Some experts say that everyone, including the very young, the elderly, pregnant women, and people with illnesses have to be considered, but others say only the average person matter.
7. There is no unexposed population, making it harder to see increased risk of diseases.
8. There is lack of consensus about a single biological mechanism of action.
9. There is strong evidence of human epidemiological studies reporting risks from ELF and RF exposures, but animal studies don't show a strong toxic effect.
10. Vested interests have a substantial influence on the health debate.

In today's world, everyone is exposed to two types of EMFs: (1) extremely low frequency electromagnetic fields (ELF) from electrical and electronic appliances and power lines and (2) radiofrequency radiation (RF) from wireless devices such as cell phones and cordless phones, cellular antennas and towers, and broadcast transmission towers.

4.1.1.5 Allergies

Today, more than 40% of Europe's citizens suffer from at least one form of allergy. Asthma, allergic rhinitis, and other chronic respiratory diseases are the most common non-communicable diseases in children, and their prevalence and burden have increased in recent decades (Council conclusions on prevention, early diagnosis and treatment of chronic respiratory diseases in children, 2011). According to this report, the biggest risk factors for the development of chronic respiratory diseases are a combination of genetic predisposition with environmental exposure to inhaled substances and particles, such as environmental tobacco smoke, poor indoor air quality and outdoor air pollution.

Allergies are a growing health concern in most industrialized countries during the past decades (UCB Institute of allergy, 1997; Wüthrich, 1989). In particular the prevalence of atopic diseases has to be taken into account, such as bronchial asthma, allergic rhino conjunctivitis (hay fever), and atopic eczema or dermatitis (Ring *et al.*, 2001).

The relationship between the increase in allergic diseases and climate change was addressed in the earlier URBAN-NEXUS Synthesis Report: Urban Climate Resilience. Increasing temperatures related with climate can have direct impacts on human health, particularly respiratory problems (European Environment Agency 2008).

4.1.2 Green infrastructures and utilization of public spaces

Green cities keep the doctor away

4.1.2.1 Green infrastructures for a good urban environment

“Green Infrastructure” is a concept recently introduced to the language of environmental, social and economic disciplines, however its use has rapidly spread within the expert community (James *et al.*, 2009). Accordingly, many definitions have been described since it came out and not a single one has been widely accepted (EEA, 2011). A general understanding accepts Tzoulas' proposal as “all natural, semi-natural and artificial networks of multifunctional ecological systems within, around and between urban areas, at all spatial scales” (Tzoulas *et al.*, 2007) whatever their ownerships, including private or public spaces. However, the concept should also consider the connectivity of ecosystems, as well as their protection and the provision of ecosystem services, not forgetting neither their role in climate change mitigation and adaptation (EC, 2010a).

Figure 3. Green infrastructure inside urban areas



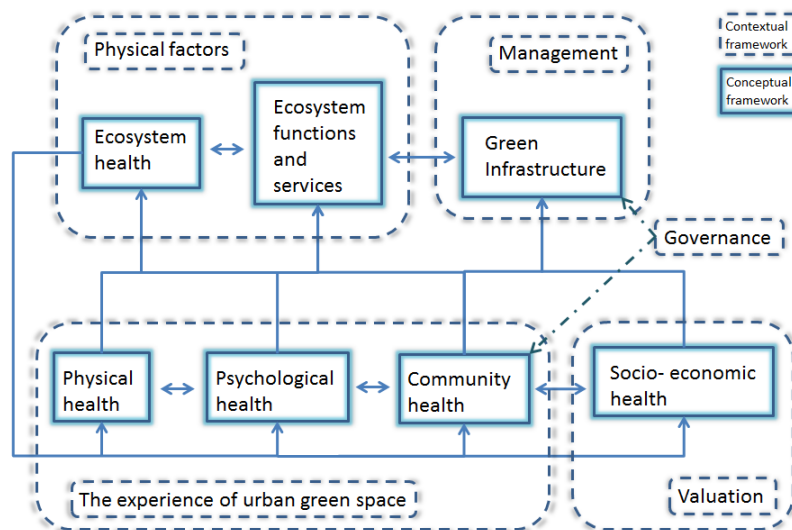
Source: Illustrations of the Green Infrastructure concept at <http://ec.europa.eu/environment/nature/ecosystems/illustrations.htm>, accessed 20/07/2012

Green Infrastructure can be an integral part of urban areas (Figure 3) when properly designed. It can comprise parks, walking paths, green roofs and walls, which can contribute to biodiversity, to tackle climate change and to enhance the well-being of urban residents.

The appearance of the term responds to the need of an improvement of the idea of green space (Tzoulas et al., 2007), as it has to be pointed out that Green Infrastructure implies a certain degree of management (Sandström, 2002). The planning approach sets a background comprising different initiatives in order to achieve a good urban environment, which efficiently brings together the disciplines of urban development, nature conservation and public health promotion.

Urban green areas are important for human health because they are beneficial for psychological and physical health as people in contact with nature is physically more active, contact with nature reduces stress and improves behaviour and attention in children, facilitates social interaction and integration (EEA, 2009). In addition, green spaces improve the quality of the urban environment as air quality is enhanced and heat stress is reduced. In a similar way to the concept of human health, the idea of ecosystem health comprises a variety of ecological, social, economic and political factors. For this reason, the development of interdisciplinary and multidisciplinary approaches fit well as they integrate biological, social and other sciences to achieve a major understanding of the interactions occurring between ecosystems, land use planning and management (Haeuber and Ringold, 1998; Collins et al., 2000; Ehrlich, 2002).

Figure 4. Framework linking Green infrastructure, ecosystem health and public health, based on the integration of conceptual and contextual approaches



Source: Adapted from Tzoulas et al., 2007 and James et al., 2009

This integrative framework is two folded; one part related to ecosystem comprising ecosystem health, ecosystem functions and green infrastructure. The second part corresponds to public health defined by physical health, psychological health, community health and socio-economic health.

The physical factors of green space will determine the ecological quality and ecosystem functions and services provided by green space. Ecosystem health could be analysed from (1) the biophysical parameters perspective (coverage of the green vegetation fraction, temperature, humidity or radiation loads), from (2) the morphological quality (based on street geometry or connectivity of green areas), or from (3) a more anthropogenic point of view (such as traffic congestion, percentage of emission reduction on PM, O3, NOx or on dB in the case of noise).

Nevertheless, it is accepted by the scientific community that there are important gaps in urban green space research (James et al., 2009). There is a need to encourage interdisciplinary and multidisciplinary approaches, to develop joint initiatives across Europe, and a common framework for comparative research.

However, it has been demonstrated that green infrastructures maintain the integrity of habitat systems, contributes to ecosystem health in various ways, and are central to maintaining human health (Tzoulas et al., 2007). From the management point of view, local measures can be implemented, although it is important to involve national and European governments to assist on the different needs and when plans requiring multi-level actions should be developed. A collaborative work involving a variety of disciplines and at different spatial scales is needed to plan, design and manage green spaces, although the management of urban green spaces normally falls on municipal or regional authorities (Niemelä, 1999).

Governance can only be achieved when community participates in the process of planning and making decisions about the green space. This fact will be highly related to community health and political awareness. Governance can comprise decisions in the planning process, in the social use of the space and the accessibility to it. The citizen perception of the green area will be determined by the capacity degree of governance. Accordingly, this perception is related to the experience of the urban green space; however it is more referred to the opportunity to come in contact with nature by each individual. Citizen's opinion is important to know the degree of satisfaction. The European Commission (DG Regional Policy) has been using perception surveys to know people's opinion about a range of urban issues. In the survey undertaken on 2009, questions about people's satisfaction with public parks and gardens and with opportunities for outdoor recreation were introduced (EC, 2010b). The results show that the majority of citizens were satisfied with the available green spaces in their cities pointing out that the better satisfaction scores were for Malmo, Munich, Groningen, Cardiff and Luxemburg.

Valuation of green infrastructure requires a quantitative and qualitative economic valuation of both physical and social ecosystem services provided by green areas. Further research is needed in this issue.

Box 6. PHENOTYPE project¹⁰

Green space has been associated with a range of beneficial health effects in a number of experimental and epidemiological studies. These have mainly been carried out in north-western Europe and North America, but show that the potential positive health impacts of green space around the world could be large. People in expanding cities and new, developing ones, may benefit enormously health wise if sufficient green spaces are included.

However, we do not know exactly which kind of space is most beneficial and what is the underlying mechanism responsible for it. These could be related to physical activities and social contacts, reduction of stress, pollution, etc.

Questions such as the size of the green spaces to obtain an optimal benefit, the comparison of the benefits between small and large spaces, the aspects city planners need to take into consideration or the accessibility, availability of the different facilities or safety aspects are the type of questions that the Phenotype consortium will try to answer by conducting a number of studies in different parts of Europe. The wider geographical coverage is important to understand if, and to what extent, there are differences in availability of green spaces, perception and use in different areas in Europe (e.g. green space in the Netherlands is very different from the same kind of green spaces in Spain).

From the social point of view, special care should be given to aspects related to the use of green space in the development of deprived urban areas and to issues of accessibility of green areas and citizen perception of green structures (K. De Ridder et al., 2004), as well as the involvement of the community in the planning process of the green area.

There is strong evidence that indicates a lot of benefits linked to the use of the green spaces for both physical and mental health and well-being. These include decreases in general health problems, blood pressure, cholesterol and stress levels and improved perceived general health and resilience. Some studies have even quantified the positive effect of green space. For instance, the chance of feeling unhealthy is 1, 5 larger when living in environments with less green space than when living in an environment with a lot of green space (Maas et al., 2006). Likewise, the chance that people visit their general practitioner with complaints related to depression is 33% higher in living environments with little greenspace than in living environments with lots of green space. Equal associations have been found for diabetes and asthma (Maas et al., 2009)

The more often a person visits urban open green spaces, the less often he or she will report stress-related illnesses. The distance to public green spaces seems to be of decisive importance, as is access to a garden, in the form of a private garden or a green yard immediately adjacent to, for instance, an apartment house. People do not usually compensate for lack of green environments in their own residential area with more visits to public parks or urban forests. A garden can restore an elderly person with low psycho-physiological balance to a state of better harmony. Health improvement seems to be especially significant for the most susceptible (Grahn, 2005). There is also evidence that children in day nurseries who have access to a varied outdoor environment with lots of nature elements are healthier, can concentrate better and have better motor function (Grahn, 2006). Finally, it has been demonstrated a link between the lack of green spaces and higher stress levels among people living in "deprived" urban areas (Colding, 2011).

¹⁰ <http://www.phenotype.eu/>

Box 7. Significant reduction in pollution achieved by creating green walls

Scientists at the Universities of Birmingham and Lancaster (UK) argue that by ‘greening up’ our streets a massive 30% reduction in pollution could be achieved, according to research published in the journal Environmental Science and Technology.

Trees, bushes and other greenery growing in the concrete-and-glass ‘urban canyons’ of cities would deliver cleaner air at the roadside where most of us are exposed to the highest pollution levels, and could be implemented street-by-street without the need for large-scale and expensive initiatives.

Plants in cities clean the air by removing nitrogen dioxide and microscopic particulate matter, both of which are harmful to human health. These pollutants cause significant problems in cities in developed and developing countries: UK Government Environmental Audit Committee estimates are that outdoor air pollution causes 35,000-50,000 premature deaths per year in the UK, while the World Health Organization’s outdoor air quality database puts the figure at more than 1 million worldwide.

The researchers have found that, because pollution cannot easily escape street canyons, ‘green walls’ of grass, climbing ivy and other plants have a better opportunity than previously thought to act as an air pollution filter. Instead of reducing pollution by 1 or 2%, reductions of more than ten times this magnitude could be achieved, according to this study.



Article based on some of the outcomes of the **HEREPLUS project**¹¹, which aims to determine the most suitable species and management practices of urban green areas to improve the sink capacity of urban vegetation in order to minimize the air pollutant impact on population, mainly related to ozone (O₃) and particulate matter (PM) pollution levels.

¹¹ <http://www.hereplusproject.eu/>

4.1.2.2 *The use of public spaces, including the green urban areas*

Nevertheless, the use of other public areas and spaces additional to the green areas already described, play an important role in terms of health and quality of life. People benefit from having good services and green areas close to their homes. In the description of child-friendly environments by a Swedish study, children in general mentioned proximity to schools, shops and amenities as often as green spaces. This was not the case for adults, who mentioned green spaces more often than commercial or public services as important environments for children's development (Björklid, 2010).

In town centres and local neighbourhoods, public spaces provide social arenas for all kinds of people – residents, workers, shoppers, visitors, and children at play. Different age groups tend to use public spaces at different times of day and for different reasons. Older people and children in particular appear to be influenced by the presence of other age groups. Older people are frequently absent from public places, especially after dark. In addition to the social function of public spaces, some people use them for privacy or to support a sense of territorial ownership – this particularly applies to groups of young people and marginalised groups. Public spaces retain a democratic and civic function, alongside commercially driven uses. Policy-makers can support this by encouraging diversity and harnessing people's tendency to 'self-regulate' to avoid conflict: over-regulated environments are not conducive to vibrancy and integration (Holland et al, 2007).

Nature's potentially positive effect on well-being may serve as an important resource for population health. There is empirical evidence for different beneficial effects of natural environments on health (Annerstedt, 2011).

Physical activity is associated with a number of positive health outcomes. Therefore, the design of public space in order to facilitate physical activity might be an asset in healthy urban policies. However, it has been stated that is difficult to change people's behaviour towards a healthier lifestyle, such as including more physical activity in their daily lives. Moreover, the benefits of increasing the physical activity and therefore improving people's mental health only arise if the green spaces are of high quality, accessible and safe (WHO, 2012).

One example that gathers all those concepts is the case of urban vegetable gardens that assemble a simultaneous sense of nature and society, rural and urban, labour and leisure, production and consumption (Domene and Saurí, 2007). A healthy ecosystem produces fresh food, leisure and the experience of rural nature. A community sense between users that also practise some exercise, feeling personal fulfilment, which gives them physical and psychological benefits. And finally, there is also a direct profit as the provision of fresh food, added to the social function of the urban vegetable garden, with the final consequence of the improvement of environmental and cultural welfare.

4.2 Socio-economic and cultural stressors and alleviators¹²

Should inequalities in health outcomes be recognised at the urban scale? How are environmental and health impacts distributed throughout Europe? What is the trend in the socio-economic inequalities in health in urban areas in Europe? Why focus on gender in urban health research?

4.2.1 Social equity, inequality, and vulnerable groups

Social health inequality refers to the differences in health opportunities and resources in relation to a person's social class, gender, geographic area and race, which generally lead to a lower health status for under-privileged groups (Marmot, 2007 and Mackenbach et al., 2008). Environmental and health impacts are not equally distributed throughout Europe or within cities.

SUITE (Social and Urban Inclusion Through Housing) project has analysed how to integrate the three pillars of sustainable housing: environmentally sound, economically viable and socially inclusive. The main conclusions have been:

Social:

- Social sustainability of housing depends on a variety of factors, amongst which social mix is one possible tool.
- To be successful, social mix policies should count on at least two conditions: political leadership and funding.
- Applying social mix policies depends on a case-by-case assessment on whether it is necessary and feasible.
- The Social Sustainability Workshop showcased useful tools to implement social mix (e.g. life-cycle approach, planning and land use policies, compulsory purchase, minimum targets of social housing, etc.).
- Robust contracting agreements are needed to create a lasting consensus about regeneration of housing areas to develop a mixture of tenure, accommodation and people.

Economic:

- Despite the impact of the global economic crisis, housing affordability / housing exclusion have been and is still a problem in most cities. Therefore, sustainable solutions are needed, which go beyond contingent factors.
- In relation to housing exclusion: Case management in prevention from eviction; joined-up services and strategies linking housing and communities; emphasis on the social aspects of regeneration.
- Policy on homelessness in Newcastle was considered a good example, as well as the social work carried out with young people.
- Some partners (in particular, those new member states) recognized that, while learning many interesting things during the meeting, they face a severe lack of funding to put anything in place.

¹² It has been decided to analyse stressors and alleviators related to socio-economic and cultural aspects of health and quality of life in an interlinked way, due to the cross-cutting aspects identified in the different policies and projects reviewed.

Environmental:

- Environmental sustainability is holistic, it includes more than energy efficiency, i.e. a wide array of technical, urban and social measures.
- Higher initial investment can 'pay off'; monitoring and evaluation shows positive effects.
- Some countries/cities are already mainstreaming high-grade solutions. There are numerous information platforms.
- To be user-friendly, innovative solutions have to be accepted by residents. Early resident's involvement and easy descriptions are crucial.
- High-level new construction is easier. However, even modest solutions in the old stock have the biggest overall impact (renovation, running costs, residents' information and training).

The general results of the "Environmental health inequalities in Europe" (WHO 2012) state that the unequal distribution of people's exposure to environmental conditions is strongly related to a range of sociodemographic determinants. It is strongly needed to identify population groups that are most exposed or most vulnerable to environmental risks.

The main conclusions indicate that socioeconomic and demographic inequalities in risk exposure are present in all countries. The report reviews inequalities related to housing, injuries, and the environment, identifies gaps in evidence that still need to be filled, and suggests priority action to be taken at both the subregional and the national level, bearing in mind those national variations.

To sum up, these are the main points of the report:

- Environmental health inequalities exist in all subregions and in all countries, and are most often suffered by disadvantaged population groups.
- The magnitude of inequalities and the distribution of inequalities between advantaged and disadvantaged population groups can be very diverse between countries and also depends on the socioeconomic or demographic variable used for stratification.
- To allow reliable identification of the most relevant target groups and to understand better the national inequality patterns and their causal mechanisms, more detailed environmental health inequality reporting and assessment are needed at the national level.
- The evidence base for the assessment of environmental health inequalities needs to be strengthened. This is valid for both data quantity (number of countries with data, number of risk factors reported) and data quality (reliability, opportunities for stratification).

The assessment of housing-, injury- and environment-related inequalities shows that inequalities exist throughout the WHO European Region. However, there are large differences between countries regarding the magnitude of the inequalities and the most affected population groups. Depending on the available data, inequality assessments were undertaken in relation to differences by sex, age, income, relative poverty, household type, social position, employment, occupation, education and difficulty paying bills. All of these sociodemographic determinants are found to be associated with significant inequalities.

- Income and poverty-related inequalities are identified for noise exposure, exposure to second-hand tobacco smoke at home and at work, and housing-related inequality indicators, where they are most clearly expressed. Compared to the other determinants applied, income- and poverty-related determinants display some of the strongest inequalities at subregional and

national levels. Differences in national income levels are also associated with injury-related fatalities, with low/middle income countries reporting higher mortality rates.

- Sex-related inequality is most strongly associated with injury, where male fatality rates are often three times (and beyond) female fatality rates. Sex-related differences also appear in relation to second-hand tobacco smoke exposure, yet play no important role for housing-related risk factors.
- Age-related inequalities are present for injuries (especially falls) but differ in direction, depending on the indicator. Age impacts are less prominent for the other inequality indicators.
- Household type-related inequalities in housing conditions are especially identified for single-parent households, and increase when combined with low income and relative poverty factors.
- Data on inequalities by education, employment/occupation and self-assessed social position are only available for some of the environment-related inequalities, but they show a diverse inequality pattern: high education level is consistently associated with higher reported lack of access to recreational and green areas, while employment/occupation level shows different inequality patterns in exposure to second-hand smoke, with the direction of inequality depending on sex and subregion.

Lower income households cannot afford homes in high price areas, and usually live in areas of dense housing with less green and good quality public space, higher noise and air pollution levels or far away from attractive urban areas. These segregation trends lead to temporary and more permanent unequal developments, loss of social balance and cohesion. The resulting imbalances show themselves socio-economically in the exclusion of specific groups from employment and services like culture and education, and by accumulation of socio-economic and environmental problems in deprived areas. Variability of social health inequalities exists both at European and regional and municipal scale. Recent studies (Barceló et al.) states that there is evidence that geographic variability of social health inequalities continues to exist even after individual risk factors have been taken into account. However, relatively few studies have examined the contribution of exposure to air pollutants to those inequalities. The geographic variability of inequalities in mortality and their associations with socioeconomic and environmental inequalities in small areas of the metropolitan of Barcelona during the period 1994 to 2003 has been studied. Furthermore, Mackenbach, J et al. 2008, found that inequalities in mortality were small in some southern European countries and very large in most countries in the eastern and Baltic regions. These variations among countries appeared to be attributable in part to causes of death related to smoking or alcohol use or amenable to medical intervention.

The ESPON¹³ Future Orientations for Cities (FOCI) Report “The Europe 2020 strategy towards a more inclusive EU economy” proposes active inclusion strategies encompassing: social protection, addressing labour market exclusion and tackling in-work poverty, access to quality services, such as healthcare, childcare, housing. This project, in its final conclusions, states that "One of the main questions concerns the apparent decoupling between social cohesion indicators and economic evolutions. Having reached such a high development level, social cohesion in European cities is no more related to pure economic wealth of the population".

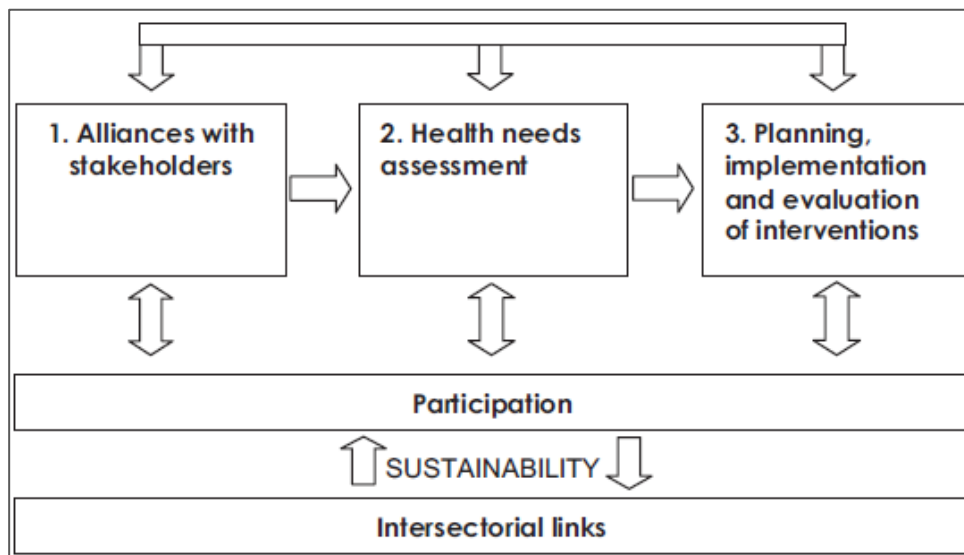
Some projects address inequality at a scale of neighbourhood (see Box 8).

¹³ www.espon.eu

Box 8. Health in the Neighbourhoods is a strategy of the Catalanian Department of Health¹⁴

Department of Health developed in 2005, within the framework of the Catalonia Neighbourhoods Law (Law 2/2004), a project designed to improve underprivileged neighbourhoods. Catalonia is one of Spain’s 17 autonomous communities. Its capital city, Barcelona, is the second largest city in Spain, with 1,616,000 inhabitants. To date (April 2012) Neighbourhoods Law benefited 142 neighbourhoods, 12 of them in Barcelona, developing urban renewal and reinforcement of social and economic networks. Neighbourhoods Law acts on some social determinants of health, as urban renewal, housing, public equipments, accessibility or others; and these policies on disadvantaged areas are expected to reduce social inequalities in health.

Systematic model of community action in the framework of “Health in the Neighbourhoods” in Barcelona:



Conclusions:

- The design and adapted implementation of a community action oriented to reduce health inequalities with the participation of stakeholders has proved feasible.
- The model has followed recommendations from evidence, actions and policies to enhance equity at the urban setting
- The involvement of and consensus with stakeholders and different sectors has promoted feasibility, successful implementation and sustainability of this community intervention.
- The experience presented can be useful to implement community action in other cities.

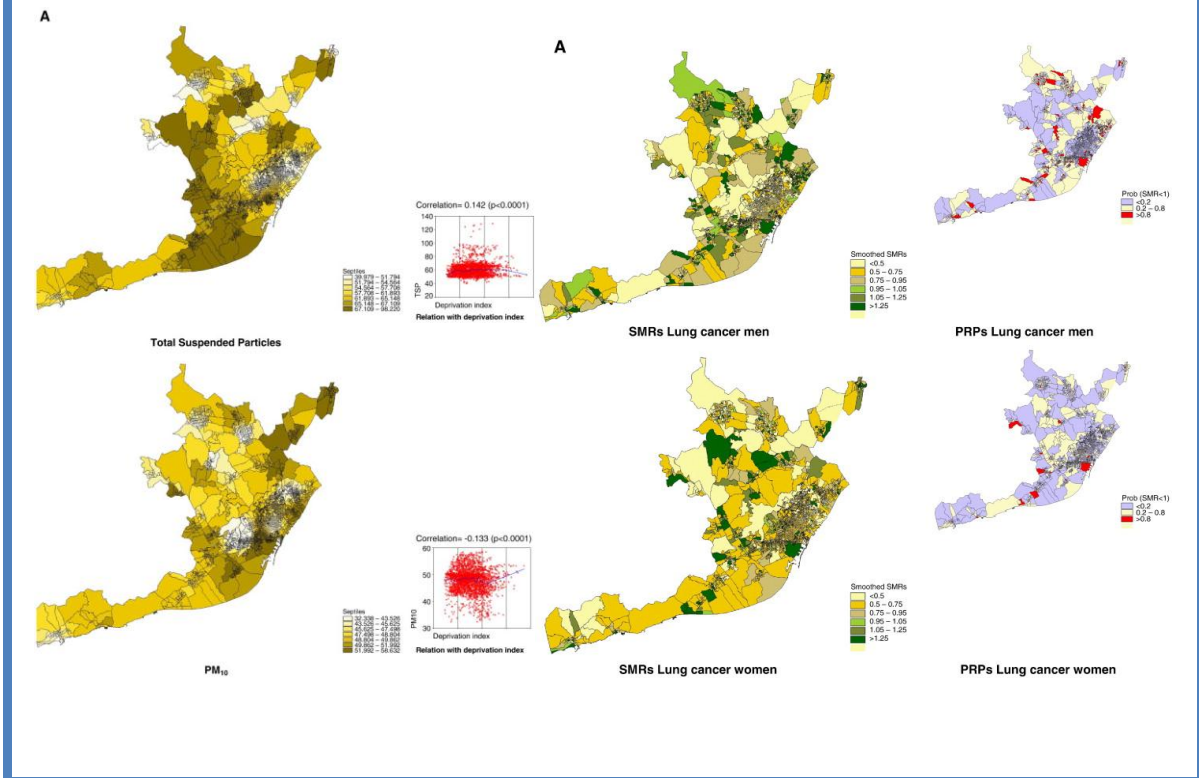
There are also some studies linking air pollution with the health situation in deprived neighbourhoods, and it has been found a direct relationship among both indicators in several countries while in cities that might not follow this trend, the studies revealed that people with higher socioeconomic status are

¹⁴ <http://www.aspb.es/quefem/salut-als-barris.aspx>

exposed to highest pollution concentrations but mortality rates from air-pollution related causes are still highest among those people with lower socio-economic status, which indicates a greater susceptibility to the effects of air pollution among the most deprived people.

Box 9. Spatial variability in mortality inequalities, socioeconomic deprivation, and air pollution in small areas of the Barcelona Metropolitan Region

Statistically significant associations with deprivation were found for the causes of death related to consumption of tobacco and alcohol for men and, besides lung cancer, diet-related causes for women. Statistically significant pollution coefficients were only found in the metropolitan area of Barcelona and in men. A positive interaction between pollutants and the deprivation index was statistically significant for respiratory mortality and PM₁₀, and ischemic disease mortality and NO₂, both for men.



Several projects addressed the problem of the socio-economic inequalities in urban areas. One of them is the INEQ-CITIES Project that aims to identify socio-economic inequalities in mortality and to examine social and health policies developed to tackle such inequalities.

The INEQ-CITIES Project aims to study socio-economic inequalities in mortality in census tracts of 20 European cities at the beginning of the 21st century. A further aim is to identify and compare the social and health policies undertaken in these cities to address inequalities in health, in order to contribute to the improvement of methods to tackle health inequalities in cities.

The specific objectives of the INEQ-CITIES Project are:

- To collect socio-economic and mortality data (5 - 10 years centered around 2005) necessary to construct socio-economic and mortality indicators of the small areas of the European cities involved in INEQ-CITIES.
- To estimate inequalities in socio-economic indicators in the small areas of these cities.

- To estimate inequalities in mortality indicators across the small areas of the cities and to analyse the relationships between mortality and socio-economic indicators at the small area level.
- To estimate inequalities in avoidable mortality indicators across the small areas of the cities and to analyse the relationships between avoidable mortality and socio-economic indicators at the small area level.
- To describe mortality inequalities across small areas taking into account men and women alongside children and working age populations.
- To collect information related to interventions to tackle inequalities in health that are undertaken in the cities included in INEQ-CITIES and to describe the interventions reviewed.
- To collect information on social and health interventions to tackle inequalities in health that use structural funds of the European Union in the cities included in INEQ-CITIES and to describe the interventions reviewed.
- To make recommendations on the information and indicators necessary for monitoring and tackling inequalities in health at the city level and to make recommendations on the policies to tackle inequalities in health to be undertaken at the city and small area level.

Exposure to air toxins may be contributing to adverse health outcomes in urban neighbourhoods where polluting land uses are often adjacent to housing, schools, and highly susceptible residents, such as children with asthma (J. Corburn, 2007).

The key to improve health equity lies in optimizing urban settings for health. Urbanization can be a positive determinant of health in the appropriate circumstances.

Segregation in public space is found to be a far more urgent issue in the context of urban segregation than earlier recognized and urban form has a distinguishable influence on people's everyday lives. The research group on Spatial Analysis and Design (SAD) at the Royal Institute of Technology in Stockholm (KTH), studied various aspects of the urban segregation in Sweden (Lars, 2006-2011) and found that urban design practice is an important tool within anti-segregation initiatives.

4.2.2 Gender issues

Why focus on gender in urban health research? According to what several authors argue, a gender analysis should be a part of the urban health research agenda in order to have a clearer conception of how the urban environment influences and determines the health and well-being of both men and women (UN-HABITAT 2012) (WHO, 2012).

Concerning gender inequalities in health, the WHO "European Health for All" strategy and the Health21 targets, state that gender issues should be considered in conjunction with those of differences in socioeconomic groups. Women live longer than men (on average 5–7 years more in Western Europe and about 7–15 years in eastern countries). Their double burden of work at home and in the workplace, however, takes a heavy toll in terms of morbidity, and they are more likely than men to suffer from depression and anxiety. Gender-specific issues such as maternal deaths are of grave concern in a number of Member States. On the other hand, men are more prone to accidents, for example, and it is the health of working-age men that has deteriorated most in Central and Eastern European and the Newly Independent States (CEE/NIS) in recent years. Rape and wife battering, although grossly under-reported, show alarming proportions in the large majority of countries; in fact, in industrialized

countries domestic assaults have been reported to cause more injury to women than traffic accidents, rape and muggings combined.

Health21 is a European policy framework derived from the “Health for All” strategy for the twenty-first century adopted by the World Health Assembly in 1998.

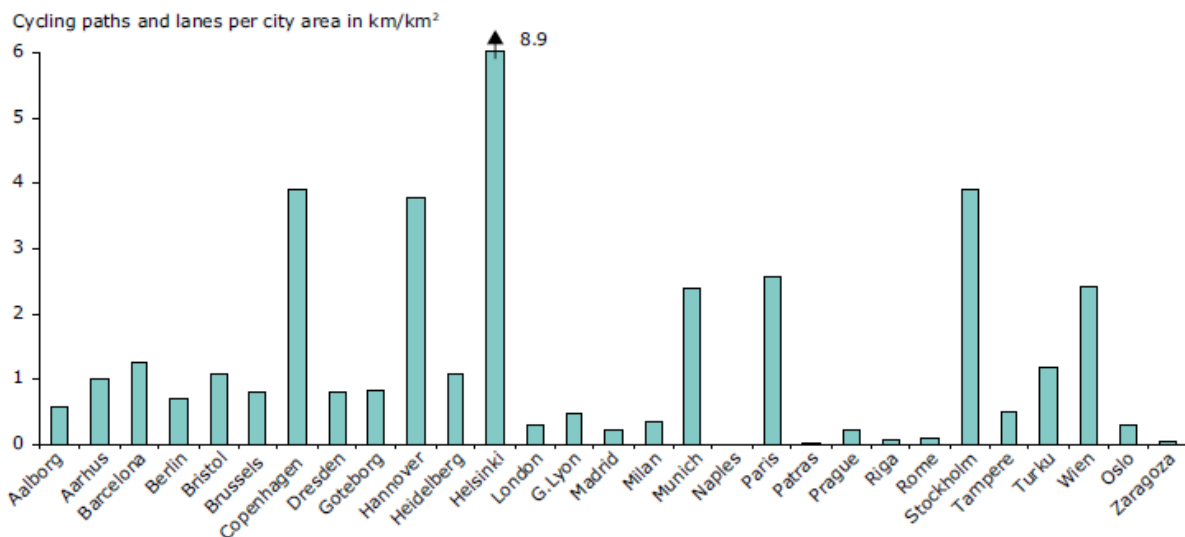
According to Prats (Prats, 1997) the women move in the city differently than men and their use of time is also different. Public space is perceived and experienced differently by the women according to their sexuality, social status, age and origin cultural and ethnic, as well as the idea of having them themselves and the world around them (Corpas and Garcia, 1999; Vazquez 1989).

4.2.3 Biogeographic and cultural specificities

The particular characteristics of the urban areas – cultural, economic, environmental, geographic, historic, political, and social – vary widely, even across cities within countries.

European cities are also remarkably diverse in respect of urban residential densities. Generally, there is a tendency for residential densities to fall towards the north and west of Europe, and the five urban areas with residential densities of at least 10 000 inhabitants/km² are all located in southern or southeastern Europe. There is no tendency, however, for urban sprawl to vary with the density of cities, as irrespective of urban residential density, sprawl is equally evident in the vast majority of the cities examined. (EEA 2006)

Figure 5. Cycling paths and lanes in European cities



Source: Ambiente Italia, 2007.

Figure 5 illustrates major differences throughout Europe leading to big differences in rates of both walking and cycling — the latter ranging from below 1 % of people cycling to work to around 36 % in Copenhagen. The quality of transport infrastructure has a major influence on walking and cycling in cities, but it does not explain all differences. Other factors such as city structure, safety, geography, topography, climate and cultural needs should be considered as well. Different local responses can be explained by different conceptions of quality of life, leading policy-makers to diverging recommendations on what should be done in order to improve quality of life in Europe's cities and regions (EEA 2006). It is widely accepted that physical activity reduces risk for cardiovascular diseases and diabetes and has substantial benefits for many physical conditions (WHO 2004). Without doubt, good quality, accessible and safe walkable neighbourhoods encourage daily physical activity such as

walking and cycling. Consequently, these factors help combat the health impacts of sedentary lifestyles, especially in relation to obesity and cardiovascular disease.

4.3 Urban structure and urban management types

What are the impacts of the urban form on health? How planning and design of the urban environment can reduce health inequities and facilitate better health for all urban residents? What are the impacts of different types of land use on health? How far open spaces and green areas influence health and well-being?

Urban health problems are often too diverse and are difficult to be treated separately. The way in which the urban environment is managed as a whole pays an important role in reducing health problems and, consequently, improving people's welfare and quality of life (EU, URBACT Programme, 2011).

There is strong evidence that multiplicity of factors, interacting between them, are affecting health status in cities and this fact makes the analysis of such problems quite complex, as there is not usually a single cause for a specific health problem.

The objective of this section is precisely to provide some hints on the different management policies being applied in urban areas that have an influence on some of the health aspects dealt throughout the whole report. Models of governance, policies based on a sustainable management of the city area, transport, mobility and accessibility policies, etc. will be among the items that this section will discuss.

4.3.1 Shaping cities for health and quality of life

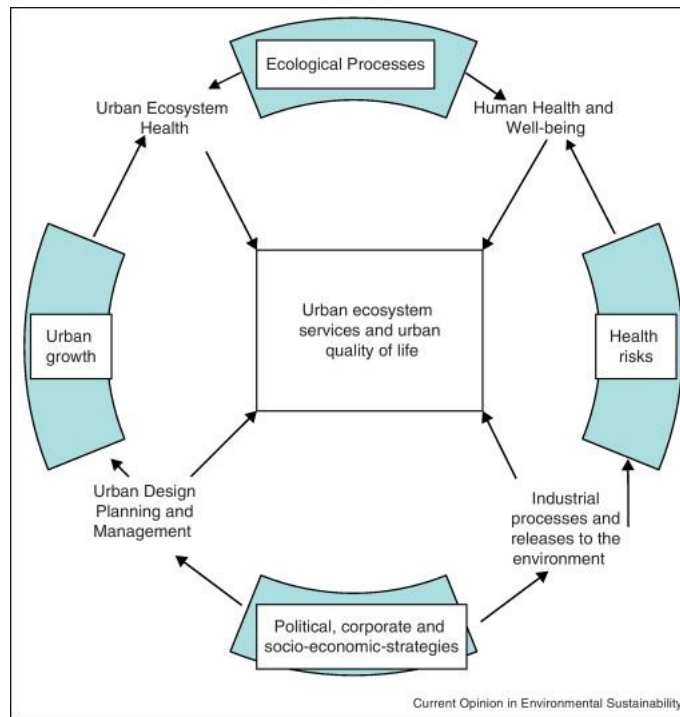
In the 19th century cities were insalubrious in so many ways that they came to be described in terms of the risk of death run by their inhabitants¹⁵. The "sanitarist" approach to the problems related to city spaces is best illustrated by the consolidation of hygienism. This branch of medicine started by detecting risks of illness or death in the city and proceeded to analyse the urban landscape in terms of health risk. The urban landscape, on the whole, is perceived as a high-risk scenario. The quality of the air defined the quality of the urban landscape in terms of public health, and it is not surprising that the hygienists were alarmed at the extreme urban density that characterised European industrial cities in the 19th century. Technical solutions were applied in architecture to improve ventilation and air circulation and, above all, to reduce urban density. The use of technology in urban risk management culminated with the progressive implementation of the sewerage system over the past century. Moreover, in the second half of the 20th century most cities tried to reduce the air pollution caused by burning coal for domestic heating. All these improvements increased life expectancy and lowered infant mortality rates.

There are several factors influencing citizens' well-being and their actual health, starting from the urban structure itself, the type of buildings and neighbourhoods, city services and infrastructures, green areas, etc. This chapter reviews the main facts regarding the relationship between the urban environment form and configuration and health and quality of life.

¹⁵ According to Muñoz, in Generalitat de Catalunya, Departament de Salut (2008).

The complexity of cities determines that urban health outcomes are dependent on many interactions. There is a need for urban planning aimed at improving health and quality of life as it is not enough the assumption that economic growth and demographic change alone will bring good health conditions. The relationship between urban services for population and health varies widely across any city (Douglas, 2012), so firstly it is important to define what are the objectives for achieving improved health outcomes and what targets are to be addressed by management actions. Urban planning for health needs should focus on experimentation through projects, where dialogue between stakeholders is essential, enabling them to assess and critically analyse their working practices and learn how to change their patterns of decision making (Rydin et al., 2012). In this participatory process, the risk factors for health and well-being should be detected considering environmental, economic, technological and social hazards.

Figure 6. Diagram of key factors in the relation between cities and human health and well-being.



Source: Douglas, 2012.

In order to assess and monitor the effectiveness of urban development in terms of health and welfare, there is the need to define several indicators covering a broad comprehensive set of issues that could explain if progress is made in that regard. Those indicators should be based on clear challenges and objectives. The project “Building Healthy Communities” has defined different criteria and indicators to monitor a healthy sustainable urban development (EU, URBACT Programme, 2011), on the basis on the three major topics: Economic Development (see Table 2), Cultural and Social Cohesion (see Table 3) and Environmental Regeneration (see Table 4).

Table 2. Healthy sustainable urban development focusing on economic development.

Issues	Objectives	Indicators
Economic status and wealth	Improve the economic status and decrease the level of poverty	Income per capita Rate of poverty by gender Rate of poverty by ethnic group N. of births by teenage parent Dependency ratio
	Attract more investments from other regions and from abroad	Rate of local investments Rate of international investments Economic activity composition
Employment and working conditions	Maintain high and stable levels of employment	Rate of local unemployment Labour force participation
	Improve working conditions	Level of employees satisfaction
	Increase employability	Level of attainment Rate of professional education compared to availability of jobs
Living conditions	Reduce/Increase/Maintain the cost of living	Cost of living Cost of households per square metre

Source: EU, URBACT Programme, 2011

Table 3. Healthy sustainable urban development focusing on cultural and social cohesion.

Issues	Objectives	Indicators
<i>Demographic issues</i>		
Age	Attract younger people population Improve elderly people living conditions	<i>Aging index Rate of elderly people in need of social and health care Growth rate</i>
Ethnicity	Integrate the migrant population	<i>Density of migrants by country of origin Rate of family integration or reintegration</i>
Family	Improve family living conditions	<i>Rate of single parent families Rate of single teenager parents</i>
Living Conditions issues		
Housing	Improve the conditions of homeless	<i>Rate of homeless people by ethnic group, gender and age Rate of premature death among homeless people during winter or summer extreme weather events</i>
	Increase/maintain social homes	<i>Rate of social homes</i>
	Reduce the proportion of unfit (housing) stock	<i>Rate of homes judged unfit to live in</i>
Leisure time	Increase leisure time opportunities for all	<i>Level of attractiveness of parks, green areas and playgrounds</i>
	Improve access to recreational opportunities	<i>Level of satisfaction of the cultural activities implemented by season in the area</i>
Access to services	Improve health of the population	<i>Healthy Life Expectancy at birth</i>
	Improve accessibility to health services	<i>Proximity of health services Level of satisfaction of the health services in the area Rate of health services accessible to disabled Proximity to pharmacies in the area Self reported health status</i>
	Improve accessibility to social services	<i>Proximity of social services Level of satisfaction of the social services in the area Rate of people using social services by gender, age, ethnic group Rate of social services accessible to disabled Rate of voluntary organisations providing social services Rate of volunteers by age, gender and ethnic group</i>
	Improve accessibility to education and vocational training opportunities	<i>Illiteracy rate Rate of education attainment by age, gender and ethnic group Proximity of schools by grade Proximity of vocational training venues Rate of schools accessible to disabled Rate of vocational training venues accessible to disabled</i>
	Improve/maintain accessibility to private services	<i>Proximity of shops</i>
Safety	Increase the level of safety	<i>Level of crime Rate of reported domestic violence Self reported level of safety by age, gender and ethnic group</i>
Mental health and emotional well-being	Improve mental health, quality of life and emotional well-being	<i>Rate of death by suicide Rate of hospitalisations for intentional self-harm Residents' rating of how happy they are Residents' satisfaction with their own lives in general Residents' rating of experiencing negative stress over the past 12 months</i>

Source: Adapted from EU, URBACT Programme, 2011

Table 4. Healthy sustainable urban development focusing on environmental regeneration.

Issues	Objectives	Indicators
<i>Environmental issues</i>		
Air Quality	Reduce air pollution and improve air quality	<i>Contamination per capita</i>
Indoor Air Quality	Improve Indoor Air Quality	<i>Contamination per capita</i>
Noise	Reduce noise	<i>Contamination per capita</i>
Contaminated land	Reduce/treat/isolate contaminated land	<i>Contamination per capita</i>
Radiation	Reduce/isolate radiated area	<i>Contamination per capita</i>
Waste	Promote recycling	<i>Rate of recycled waste per total kg of waste</i>
	Reduce generation of waste	<i>Rate of waste produced per capita</i>
Greenhouse gas emissions	Reduce greenhouse gas emissions	<i>Greenhouse gas emission per capita</i>
<i>Planning and transportation issues</i>		
Energy usage	Reduce energy usage increasing the usage of energy saving materials for new buildings	<i>Used electricity per household/person</i>
Traffic and congestion	Improve choice in transport; improve access to education, jobs leisure and services; and reduce the need to travel by private cars	<i>Road traffic per day Modal share Number of car owned per 1000 capita Values of investment per different modes (public road / public transport / pedestrian infrastructure / bicycle infrastructure / airports)</i>
Parks, green areas and playgrounds	Increase the number of green areas and playgrounds, improve accessibility to parks, playgrounds and green areas.	<i>Green areas square metres per capita Playground square metres per child under 15</i>

Source: EU, URBACT Programme, 2011

Box 10. Spatial Planning and Health¹⁶

SPAHG is a group of planning and health experts: academics, practitioners and community representatives, seeking to improve public health through the positive use of spatial planning. The group aims to study, promote and disseminate knowledge on the relationship between spatial planning and health, and to promote policies and action based upon evidence.

Spatial planning has a clear and strong influence on healthy choices made by individuals, and can be seen as a force for social justice in positively addressing the issues highlighted below.

Evidence suggests that the following issues impact on physical and mental health:

- The location, density and mix of land uses
- Street layout and connectivity
- Access to public services, employment, local fresh food and other services
- Safety and security
- Open and green space
- Affordable and energy efficient housing
- Air quality and noise
- Extreme weather events and a changing climate
- Community interaction
- Transport

Formulating and implementing planning policies and development proposals based on the evidence of how they affect human health is likely to improve our health. Building health into our urban and our rural environments (or designing out unhealthy factors – we can ‘design in’ health, just as we try to ‘design out’ crime) is a vital step towards delivering longer term improvements in health across the whole of society. This can be as important as investment in medical interventions. Healthcare is a vital service but it often treats the symptoms rather than the causes of health inequalities and poor health. By building health into planning we seek to address some of the causes of poor health.

4.3.2 Sustainable management and good governance

Taking into account that most of Europeans are urban dwellers, cities are of enormous economic, social and environmental importance to Europe. They are centres of innovation and creativity, driving the economy and creating the necessary wealth to raise the living standards of citizens. At the same time, cities are also our main repositories of learning, culture and art. However, cities also present some of the most difficult and pressing economic, environmental and social challenges for society. These include dealing with inner-city decay, pollution, and economic stagnation in more deprived urban areas.

The concept of sustainability applied to urban management is understood as a global approach for all urban policies, in order to ensure a better future for citizens in terms of job opportunities, environment safety, worthy housing and, in short, well-being and quality of life.

¹⁶ <http://www.spahg.org.uk/>

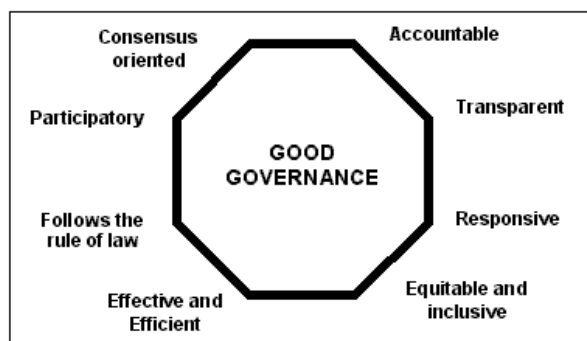
Therefore, in order to achieve healthy cities and happy city inhabitants, an integrated approach must be taken, covering the different aspects that are covered in this report. Some cities have been practicing the so-called “health in all policies” strategy, as there are no specific mandates for the local governments to put health and quality of life at the heart of their strategies. Actually, one of the problems highlighted at the local level is the difficulty encountered in funding initiatives focused on health and well-being improvement. Cities are usually not the appropriate institutional level for health policies and services. Funding health policies at a local level has proven to be difficult. Cities need to cooperate with Managing Authority dealing for Structural Funds (EU, URBACT Programme, 2011).

There are a wide set of aspects which influence urban sustainability. Characteristics such as population density and the extent of sealed areas are comparable for and define urban areas. Such areas differ from the rural environment and generate, for example, the urban heat island effect. However, the actual impact on the urban environment is dependent on specific local characteristics, which differ from city to city. Well-designed buildings and public spaces in a well-planned urban environment can provide attractive, secure, quiet, clean, energy-efficient and durable surroundings, in which prosperous and healthy communities can thrive in the long term. The World Health Organization (WHO) considers urban planning an important determinant of health, and also economic development — as the attractiveness of a city or town is becoming an increasingly important factor in the decision-making process (EEA, 2009).

The role of urban parks and urban green areas goes beyond the environmental sustainability, contributing to the well-being of the city dwellers (see section 4.1.2).

A conjunction of good governance together with sustainable cities produces a variety of social capital components, such as local identity, associationalism, commitment and civic participation, cooperation, trust and collaborative problem-solving (Veenstra and Lomas, 1999). Effective governance receives health needs, facilitates participation in policy implementation, and produces actions improving population health responses. In order to achieve sustainable cities, good governance is needed. Good governance has eight major characteristics (see figure 7): it is participatory, consensus oriented, accountable, transparent, responsive, effective and efficient, equitable and inclusive, and follows the rule of law. It assures that corruption is minimized, the views of minorities are taken into account and that the voices of the most vulnerable in society are heard in decision-making. It is also responsive to the present and future needs of society¹⁷.

Figure 7. Characteristics of good governance.



Source: <http://www.gdrc.org/u-gov/escap-governance.htm>

¹⁷ <http://www.gdrc.org/u-gov/escap-governance.htm>

Whenever good governance is applied on different aspects, it has positive effects on the economic, political, social and environmental spheres, as described in the next table:

Table 5. Main impacts of good governance.

Impacts of Good Governance on...	Economic	Political	Social	Environmental
Delivering Urban Services	Reduces costs of corruption.	Increases public support for difficult choices.	Increases sense of fairness in distribution of benefits.	Reduces negative impacts through waste and misuse of resources.
Attracting Investment, Visitors	Generates more lasting employment.	Increases investor and visitor confidence.	Increases local benefits of investment and tourism.	Ensures compliance with environmental laws and regulations.
Managing Risks, Assuring Safety	Reduces costs of lost production when disasters occur; reduces costs of crime.	Increases public engagement in managing risks and promoting neighbourhood security.	Increases likelihood of all income groups surviving disasters; reduces crime rates.	Reduces environmental impacts of disasters caused by human actions; increases environmental security.
Budgeting, Financing	Increases effective collection of revenues, capacity to borrow at lower rates.	Increases public support for allocating resources to priorities.	Reduces efforts to evade taxes and fees.	Increases support for expenditure on environmental protection.

Source: <http://www.gdrc.org/u-gov/top10-ugov.html>

4.3.3 Sustainable urban mobility and transport

City structure, safety, geographical and cultural needs influence the mobility of cities and therefore the transport policies that could be implemented. As it is known (EEA, 2009), transport related problems are generally greater in cities with a high proportion of individual motorised transport, compared to cities with good public transport and high levels of walking and cycling. The scale of the problems also depends, of course, on the car fleet and city design. Compact cities, where most people live in multi-storey buildings, take up less land per inhabitant than cities where single houses prevail. Nevertheless, residential preferences have typically shifted towards low density housing in greener environments (urban sprawl), and the construction of new infrastructure, in particular motorways but also rail and air networks. Improved opportunities for travel and access have opened up new possibilities for single family houses, second homes and business that stimulates further urbanization of the European territory and, consequently, influencing the shape of urban land and the mobility policies linked to that. This way of development is unsustainable, as it implies the consumption of land as well as an inefficient use of other resources such as public services, transport, water supply, waste collection, sewage, etc.

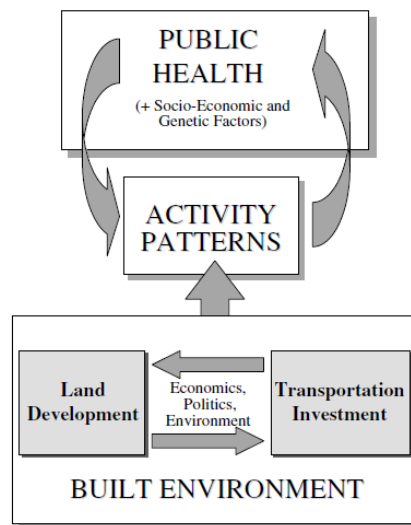
On the other hand, policies promoting good quality, accessible and safe walkable neighbourhoods in existing urban areas encourage daily physical activity such as walking and cycling. Considering the consumption of fossil fuel global reserves, it is likely that urban population will be more dependent on

walking, bicycling, and public transportation in the future; street networks and public open spaces are becoming key issues today just as they were at the end of the nineteenth century, creating compact, sustainable, liveable, equitable, and more competitive cities (Marcus, 2008).

This kind of accessibility and transport policies help combat negative health impacts of sedentary lifestyles, as along with public green open spaces that provide opportunities for exercise, relaxation and social interaction.

Urban planning as such (Figure 8) **Error! No se encuentra el origen de la referencia.**, can promote healthy behaviours and safety in many different ways, applicable both to existing and new areas, including design allowing physical activity in cities; spaces to cultivate healthy and local food; safe, accessible and affordable health services for all citizens, etc.

Figure 8. Linkages between land use, transportation and public health.



For example it has been reported that one of the main factors affecting outdoor activity by children was road traffic (Björklid, 2010). The speed and behaviour of vehicles and cyclists were difficult for them to estimate and understand. Traffic noise and emissions were also a source of disturbance. For parents, traffic caused the greatest concern, but reference was also made to noise pollution, air emissions, inadequate road-safety measures and careless drivers. A safe traffic environment was the factor most appreciated by all parents. Accordingly, the effect of traffic on social interactions and how people perceive their homes and neighbourhoods were described in “Liveable Streets” (Appleyard, 1981) and, more recently, in its second edition¹⁸ it was again stressed the social harm done by traffic after studying how people experience streets with different traffic volumes. These studies highlight the social capital as the major benefit of public spaces, squares, promenades, parks, etc.

Lately, several initiatives have been developed to provide cycling and pedestrian infrastructures in European urban areas, as they are seen both quantitatively and qualitatively important to improve quality of life in Europe’s cities and regions. Some of those initiatives have been proposed in the context of the Local Action Plans (extracted from EU, Urbact Programme, 2011) such as the provision of walking and cycling routes to encourage active travel to school, leisure or work, to promote sport and healthy itineraries at city level and in the nearby surroundings, and arrange healthy path connecting

¹⁸ <http://www.streetfilms.org/visiting-donald-appleyards-liveable-streets>

past and future such as promoting a cultural path between historical and industrial areas, among others.

Box 11. Do the Right Mix Sustainable Urban Mobility¹⁹



- The European Commission's Sustainable Urban Mobility campaign represents a three-year initiative aiming to support sustainable urban mobility campaigners in 31 countries. The central objective of this new campaign is to promote the advantages of combining different modes of transportation. Commission Vice-President Siim Kallas, responsible for transport, said: "We want to encourage people to vary the way they move around the city - so our slogan invites people to "Do the Right Mix". This campaign will give a boost to the local, regional, and national awareness-raising actions that play a crucial role in creating and promoting this 21st century culture of urban mobility. It is vital to promote diversity in our daily mobility choices."

- In addition, the campaign includes initiatives such as an award for European cities based on their sustainable urban mobility plans; and coordinated awareness-raising activities and events in 31 participating countries: EU Member States, EEA Member States (Iceland, Liechtenstein and Norway) and Croatia.

- The European Commission's Sustainable Urban Mobility campaign is linked to the European Mobility Week, which runs from 16 to 22 September every year and culminates in the 'In Town Without My Car!' day. The campaign is managed by the Directorate-General for Mobility and Transport and funded through the Intelligent Energy Europe Programme – the EU's support programme for non-technological actions in the field of energy efficiency and renewable energy sources.

¹⁹ <http://dotherightmix.eu/>

Box 12. Mobility plan of Gracia district. Super urban block of the Vila de Gràcia (Barcelona)²⁰

The concept of superblock is organized in networks involving the different streets in order to achieve a better distribution and use of public spaces. This new organization provides improved accessibility for people and promotes the diversity of uses on the street. The urban quality represents a consolidation of the city as an environmental friendly and environmentally conscious one.

The recovery of the pedestrian space

- Description of the study area with reference to the Mobility Plan of Gracia
- Concept of Superblock

Re-organization of the internal network

- Vehicles
- Bicycle and Public Transport
- Pedestrians
- Parking and loading areas
- Waste containers

Activities and Uses in the Public Space

- Economic activities on the ground floor
- Stratification of the space
- Events throughout the year

Urban Quality Improvement

- Characteristics of the Urban Fabric
- Thermal comfort in the street
- Greenness criteria
- Street trees
- Balconies
- Roofs and walls
- The New Urban Landscapes

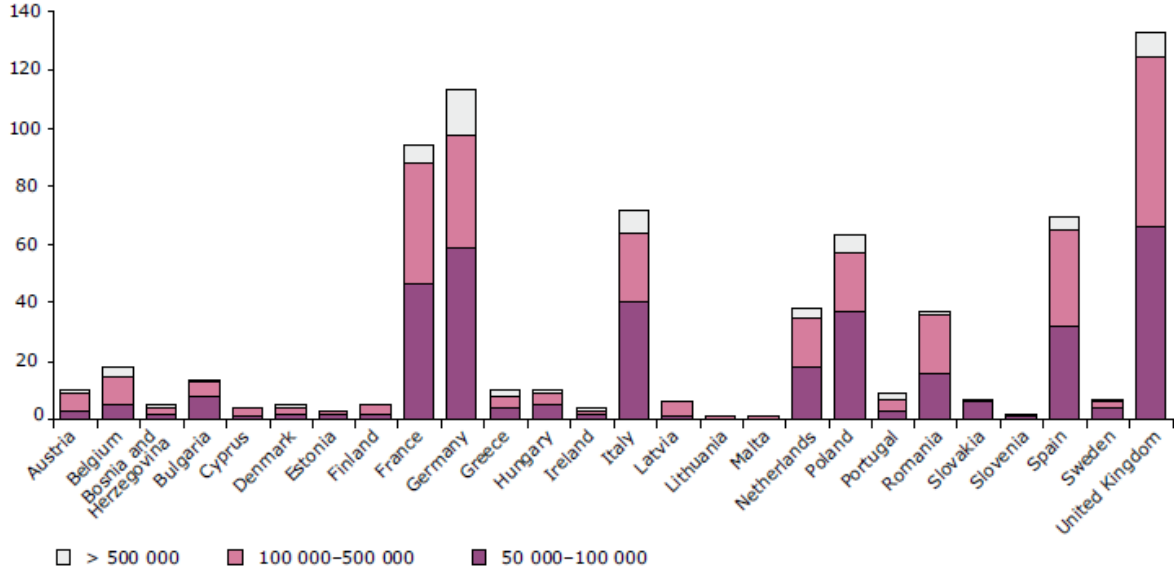


²⁰ <http://bcnecologia.net/en/press/superblocks-gracia-barcelona-bcnecologia>

4.3.4 Urban structure and built environment

More than two thirds of the European population lives in urban areas (EEA, 2009). About 1600 settlements in Europe are considered functional urban areas, with over 50 000 inhabitants (Figure 9), the 75 largest and most important ones are identified as Metropolitan European Growth Areas.

Figure 9. Number of cities greater than 50 000 inhabitants by country



Note: Cities within each country have been differentiated according to the number of inhabitants.
Source: EEA/ETC LUSI Corine Land Cover, 2000.

Urbanisation is evident in many different forms, sometimes in concentrated compact centres but typically in low density developments associated with planned or spontaneous urban sprawl²¹.

From the nineties, several scientific articles highlight the existing link between the urban form in relation not only to a certain degree of urban air quality but more importantly, to achieve a sustainable living and working environments in the future (L.O. Marquez and N.C. Smith, 1999). Cities are the centre of human activity, the primary consumer of resources and the major producer of waste. The integration of different models that study the structure of the cities with models that measure the quality of the environment has become a crucial exercise to plan the type of urban development that is wished to be achieved.

The way city dwellers prefer to live, enabled by the organisation and design of their city, influences the urban environment in many ways apart from the overall consumption patterns (EEA, 2009).

The following list shows the key features of a healthy city (WHO, Healthy cities project):

- A clean, safe, high quality environment (including adequate and affordable housing)
- A stable ecosystem
- A strong, mutually supportive, and non-exploitative community
- Much public participation in and control over the decisions affecting life, health, and well-being
- The provision of basic needs (food, water, shelter, income, safety, work) for all people

²¹ PBL, 2008 and 2009, cited in EEA (2009)

- Access to a wide range of experiences and resources, with the possibility of multiple contacts, interaction, and communication
- A diverse, vital, and innovative economy
- Encouragement of connections with the past, with the varied cultural and biological heritage, and with other groups and individuals
- A city form (design) that is compatible with and enhances the preceding features of behaviour
- An optimum level of appropriate public health and care services accessible to all
- A high health status (both a high positive health status and a low disease status)

The physical space where we live in directly affects our quality of life. The type of housing, neighbourhood and, to less extent, city and metropolitan area are crucial aspects of well-being amongst citizens. For instance, Nordström (2008) has confirmed the importance of physical space to 12 year old children in agreement with environment psychology theory. When children have access to space they behave very differently than when they have little access to space. They relate differently socially and across gender and they move around much more when there is space that they can use, demonstrating that space might have an intrinsic value to children (Nordström, 2008). Moreover, several studies published in the last 5 years, from the USA, Australia, Europe, Canada, and Japan demonstrate strong associations between the built environment, health status, and health behaviours (GCPH, 2007).

We can see also the effects that redeveloping a deprived neighbourhood can have on individual health. Redevelopment in Hovsjö improved well-being such that the proportion of respondents who stated that it was “good” or “very good” to live in Hovsjö more than doubled between 2008 and 2012. Furthermore, the redevelopment seemed to improve individual health (Sundquist, 2012).

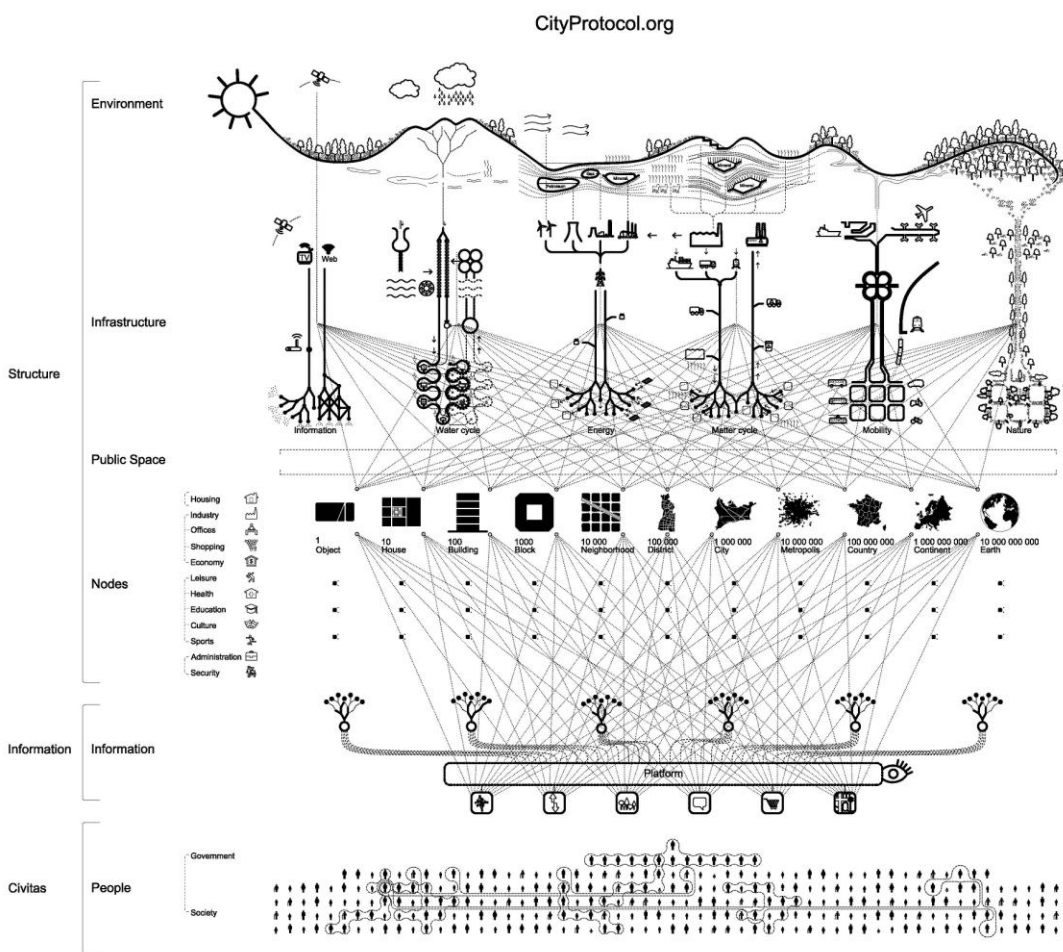
Recently many projects and initiatives have been launched with the aim of building better cities. This is the case of the project that has just started, named “City and protocol”²². This initiative led by the City Council of Barcelona begins with the participation of the following cities: Amsterdam, Barcelona, Boston, Buenos Aires, Busan, Copenhagen, Derby, Dublin, Genoa, Helsinki, Hyderabad, Istanbul, Lima, Livorno, Lion, Maputo, Medellin, Milan, Moscow, Nairobi, Nueva York, Niza, Paris, Quito, Roma, San Francisco, Seoul, Taipei, Turin, Uppsala, Venetia, Vienna, Yokohama.

The cities and 70% of the world's population living in them, have common challenges that need to find a shared language and formulas for flowing ideas, indicators, technological solutions, management models. This is the aim of the City Protocol project. Certainly, it remains to draw exactly what the project means, how to approach and how far to go. City protocol will enable better understanding and cooperation among the different actors (city council, academia, institutions, companies, and society) involved in the development of a more sustainable, efficient, cohesive, innovative and smart city. It will deliver benefits within and between cities, by addressing cities in an integrated systemic way.

²² <http://cityprotocol.org/index.html>

The City Protocol Society proposes a very interesting systemic view of the city (see figure below).

Figure 10. Systemic view of the city



Source: City Protocol society

The City Protocol has five fundamental goals:

1. To facilitate and foster a new science of cities.
2. To establish a cooperation framework among the city council, academia, companies, organizations and people/society.
3. To lead and pave cities’ futures.
4. To understand the common driving forces of urban evolution and find common game-changing solutions.
5. To find innovative economical opportunities and synergies: and deliver value adding products and services.

The project will move worldwide city thinking forward effectively and remain appealing and available to a wide range of cities and smart city communities, and will create a reflection community, a sharing space and opportunities to build complete or partly solutions to allow the emergent new generation solutions for a sustainable city.

5 About urban nexus

URBAN-NEXUS enables knowledge transfer and stimulates dialogue to form long-lasting partnerships amongst researchers, practitioners, policy makers, civil society and SMEs. It promotes integrated approaches to sustainable urban development.

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	<p>UAB – Autonomous University of Barcelona, Catalunya</p>		<p>ICLEI – Sustainability Management and Urban Governance, Europe</p>
 <small>The Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning</small>	<p>FORMAS – Swedish Research Council for Environment and Spatial Planning, Sweden</p>		<p>ADVANCITY French competitiveness cluster on ecotechnologies and sustainable cities, France</p>
 University of the West of England	<p>UWE- University of the West England, UK</p>		<p>SIRS – Information System and Spatial Reference, France</p>
 www.asde-bg.org	<p>ASDE – Agency for Sustainable development and Euro-Integration, Bulgaria</p>		<p>Bauhaus Dessau Foundation, Germany</p>
 REGIONAL ENVIRONMENTAL CENTER	<p>REC – Regional Environmental Centre for Central and Eastern Europe, Hungary</p>		

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