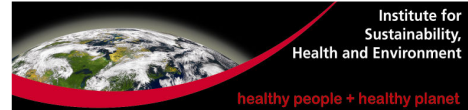


# Building Health

Planning and designing for health and happiness

One-day conference, 22 January 2010

Frenchay Campus, University of the West of England, Bristol



## Masterclass Briefing

### Evidence Review

### Spatial Determinants of Health in Urban Settings

Part 1

# Overview

**WHO Collaborating Centre for Healthy Urban Environments**

**University of the West of England, Bristol**

Text based extracts from:

**Evidence Review on  
the Spatial Determinants of Health in Urban Settings**

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For WHO European Centre for Environment and Health, Bonn  
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## The basis of the material

This document is an overview paper to a series of evidence reviews looking at the determinants of health in the built environment. Evidence was reviewed in terms of reports from 2005 onwards. Significant evidence from before this date was also included. The search for evidence was based in the main on meta-studies, systematic reviews and reviews of reviews. Four components of the urban environment are looked at in separate annexes to this overview (Parts 2a, 2b, 2c and 2d):

- Land use pattern (Part 2a)
- Transport (Part 2b)
- Green space (Part 2c)
- Urban design (Part 2d)

Each component is reviewed in terms of its impact on five health factors.

- physical activity
- social and psychological impacts
- air quality
- noise exposure
- unintentional injury

This part (Part 1) gives an overview of these five health factors.

With special thanks for additional material supplied by the UWE Air Quality Management Resource Centre.

# **Overview:**

## **Urban environments, risks and benefits to health**

*“If everyone on the planet consumed such a quantity of natural resources and energy as an average south west resident, three planets would be needed to support life on Earth” (South West Regional Assembly, 2006, p9).*

It is clear that the south west’s ecological footprint is unsustainable as it stands. This is certainly true for many of the region’s communities where the pressure to plan for further growth has led to the quality of some of our urban and rural environments becoming compromised. Too often, these effects have been compounded by low density sprawl, which as the European Environment Agency (2009a) explains:

*“has increased consumption of energy, resources, transport and land, thereby raising greenhouse gas emissions and air and noise pollution to levels that often exceed the legal or recommended human safety limits.”*

And as part of unsustainable development we also find that aspects of the physical form of our towns have been shown to damage health, leading to *“increases in allergic reactions and lifestyle related diseases, such as cardiovascular disorders caused by obesity, physical inactivity or stress” (EEA, 2009b).*

The way we plan, design and manage the territory of places, spaces, facilities and buildings within our everyday community can have an impact on health, from either a positive and negative perspective (RCEP, 2007).

### **The role of spatial planning**

Spatial planning, as compared to more traditional forms of land-use planning, intends to ensure better coordination between those sectoral policies that can have an impact on physical development. These sectors include employment and the economy, education, transport, health, energy, waste, housing and the green and natural environment.

Each of these sectors can play a major role in shaping an individual’s physical, mental, social and environmental well-being. In fact, these components are all interrelated, thereby placing significant influence over urban health risks which include physical activity levels, social impacts, air pollution, noise and unintentional injury.

### **Physical inactivity**

Physical activity is defined as: ‘Any bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above a basal level’ (CDC, 2008). In terms of urban living this is an all-encompassing term that includes, in terms of increasing degrees of effort:

- every day activity such as walking, carrying and climbing stairs
- health related physical activity such as gardening, cycling, dancing
- children’s active play such as chasing, skipping, hopscotch, Frisbee
- exercise such as swimming, jogging, gym and exercise classes
- sport such as hockey, football and tennis.

For broad population health across age, ability and income groups, the focus should be on everyday incidental activity and not specialist exercise and sport activity. That is the energy expended by people going about their everyday work, shopping and leisure tasks. This would include cycling, as transport can be included as an everyday activity, as can children's incidental play. The degree to which the built environment may support planned recreational activity is also noted where there is relevant evidence. Regular physical activity has multiple health benefits.

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#### **Health Benefits of Regular Physical Activity**

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- Reduces the risk of dying prematurely from cardiovascular diseases e.g. coronary heart disease and stroke
  - Reduces the risk of developing non-insulin dependant diabetes
  - Reduces the risk of developing high blood pressure
  - Reduces hypertension in those already with hypertension
  - Reduces the risk of developing colon cancer
  - Reduces the risk of developing breast cancer
  - Reduces the development of osteoarthritis and osteoporosis
  - Reduces fall-related injuries among older adults
  - Helps maintain a healthy weight and reduces overweight and obesity
  - Helps build and maintain healthy bones, muscles and joints
  - Reduces feelings of depression and anxiety, and promotes physiological and psychological wellbeing
- 

#### **Health benefits of regular physical activity**

Across the south west, as in Europe more generally, levels of moderate-intensity physical activity are generally low and fail to comply with recommendations (WHO, 2004a). Over 40% of adults in the 15 European member countries reported no moderate level of physical activity in the past week. Only 18% participated in a moderate level of physical activity per day, the frequency WHO suggests is required to reduce cardiovascular disease (BHF, 2005). Surveys that include both work-related and leisure time physical activity show that men in the lowest social class, including manual workers, are more physically active than men in higher social classes. However, this difference does not persist in women. Physical activity levels decline with age. In developed countries females tend to be less active than males across all ages (DH, 2004).

A reduced all-cause and cardiovascular mortality has been observed in those who frequently cycle and/or use walking as a mode of active transport (Shephard, 2008). However, more information is needed regarding the weekly level of physical activity required through active commuting, to benefit health. Moreover, there is still a requirement to find better methods of encouraging a sedentary population to use active transport which should include changes to the built environment.

Danish research (reported in KK, 2007) states "Cycling has the same effect on health as other types of exercise and motion. Four hours of cycling per week or approx. 10 km of cycling a day is an adequate level [for recommended activity], which for many people is the equivalent of the daily cycle trip to and from work".

## Social and psychological impacts

Components in the urban environment can have both negative and positive social impacts. Negative social impacts can lead to a host of social, economic and psychological problems at the individual or community level, which then can be detrimental to physical and psychological well-being.

Negative social impacts include what is often termed effects on social pathologies. These result from deviant social behaviours including vandalism, crime, abuse, discriminatory behaviours, isolation and stigmatisation. Whole communities can be affected by these pathologies and the associated fear and stress. There can also be direct social impacts from urban form, such as community severance due to road building or heavy road traffic.

Positive impacts can also occur at both the individual and community level. For the individual the positive impacts are based on mental health, including reduced levels of stress and restorative and recuperative states of mind. They have all been associated with support for mental health and positive states of physiological well-being. This concept is embodied in the salutogenic model of health as proposed by Antonovsky (1987; 1996). At the community level impacts are on social capital (De Silva, 2004) and social inclusion (SEU, 2004), often indicated by communities with more supportive social networks.

## Air quality

Clean air is a basic requirement for health and well-being (WHO, 2005). However, the combination of outdoor, urban air pollution which is mainly from road transport, power stations and other industrial sources, and indoor air pollution caused by the burning of solid fuels, causes more than 2 million premature deaths each year (WHO, 2005).

There is a clear association between long-term exposure to particulate air pollution (PM<sub>2.5</sub> and sulphate and sulphur dioxide) and a reduction in life-expectancy caused by cardiovascular disease (DH, 2006). Coronary heart disease is one of the most common causes of death (BHF, 2008). Outdoor pollution is known to represent 2% of cardio-pulmonary disease mortality (WHO, 2007a).

People with respiratory or cardiovascular disease, in particular coronary heart disease, are most at risk especially if they are elderly. The European Union has established legislation which includes standards and objectives for the major air pollutants (Europa, 2008).

A number of different air-borne particulates are antagonistic to the sensitive lining of the airways and act as irritants, causing breathing difficulties and discomfort. Additionally, for those people with pre-existing respiratory disease(s), for example asthma and other chronic obstructive airways disease, these increase their risk of experiencing a respiratory exacerbation of their current condition.

Approximately 300 million people globally suffer from asthma and around 180,000 deaths per year are attributable to this chronic airway disease (Braman, 2006). It has been suggested that rates are increasing globally by 50% every decade, with the most striking increase being amongst children.

## Noise exposure

Ambient or environmental noise is unwanted or harmful outdoor sound created by human activities. This includes noise created by road, air and rail transportation and industrial activities. Thousands of people in Britain and around the world are dying prematurely from heart disease triggered by long-term exposure to excessive noise, according to research by the World Health Organisation.

Coronary heart disease caused 101,000 deaths in the UK in 2006, and 3,030 could be caused by chronic noise exposure, including to daytime traffic. Chronic exposure to loud traffic noise causes 3% of tinnitus cases, in which people constantly hear a noise in their ears.

Excessive or persistent noise exposure from these sources can have a detrimental effect on health (WHO, 2007b). The main impacts on health are: cardiovascular diseases; sleep disturbance and annoyance, which impacts on mental health; hearing impairment; and tinnitus, which can also affect mental health and disturb sleep and cognitive impairment (WHO, 2007b).

Noisy outdoor environments (commonly traffic noise) can also affect the social inclusion component of social pathology risk factors. For example, intrusive traffic noise can make streets less conducive for social interactions.

Noise can increase the levels of stress hormones such as cortisol, adrenaline and noradrenalin in the body, even during sleep. The longer these hormones stay in circulation around the bloodstream, the more likely they are to cause life-threatening physiological problems. High stress levels can lead to heart failure, strokes, high blood pressure and immune problems.

According to WHO guidelines, the noise threshold for cardiovascular problems is chronic night-time exposure of 50 decibels (dB) or above - the noise of light traffic. For sleep disturbance, the threshold is 42dB; for general annoyance it is 35dB, the sound of a whisper.

## Unintentional injuries

The Manifesto for Safe Communities states that 'all human beings have a right to health and safety' (Spinks et al, 2005). In the UK almost 100 people a day are killed on in road traffic collisions.

For all types of accidents those in lower socio-economic groups are at greater risk of mortality and morbidity from non-intentional injury (Sethi et al, 2008; Peden et al, 2008). Older children are at greater risk of death from an injury compared to younger children, with almost half of all deaths in those aged 15-19 years being caused by an injury (Peden et al, 2008).

In children aged 5-19 years, unintentional injuries are the leading cause of death; the majority of these were as a result of road traffic collisions (Peden et al. 2008). In 2004, 42,000 children and young people aged 0-19 years died from unintentional injuries in the WHO, European region (Sethi et al, 2008).

# ***Orientation:***

## **The urban environment as a system**

The urban environment is a complex and open system. As with any such system, sitting at the interface of an intricate human economic socio-cultural phenomena and the natural environment, it is dynamic, with many sub-systems, and displays emergent properties above and beyond those of its individual components.

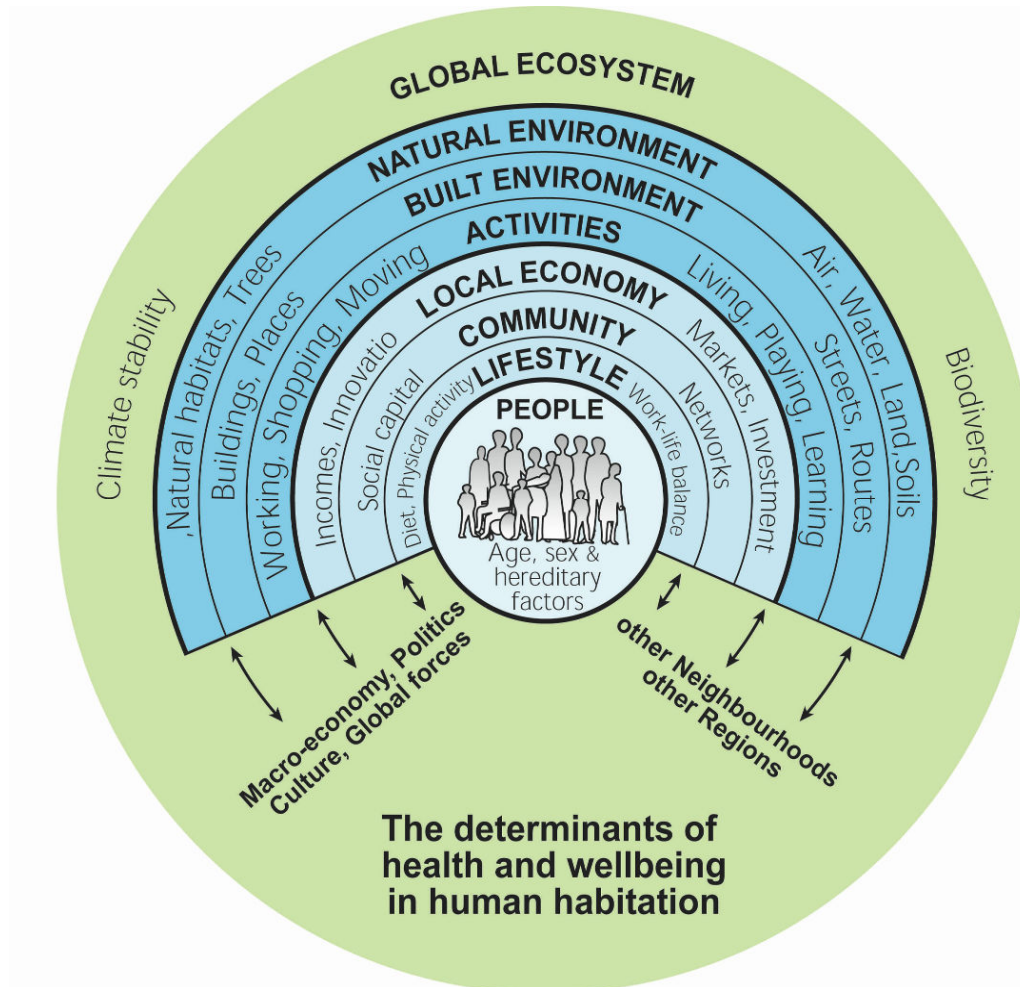
Some of the recent studies reviewed come to this holistic viewpoint of a complex web of interactions (Lavin et al. 2006 p22; RCEP, 2007 p5-7). The evidence presented forms a picture whereby not only do the physical components have an impact but so can people's perceptions. It presents examples where impacts can stimulate the inception of their own reinforcing feedback loops. This can intensify health risk, as in the case with increases in road space begetting cars which then increases pressure for more road space (RCEP, 2007). Alternatively this can reduce health risk, as in the case where a well-designed park attracts people, this in turn attracts others, encouraging them to stay longer and undertake more activity (Lavin et al., 2006).

In its report on the urban environment, the Royal Commission on Environment Pollution observes that many of the urban challenges and problems have been diagnosed repeatedly by specialists over the years with a broadly similar range of solutions being proposed (RCEP, 2007). Solutions that do not acknowledge the systemic nature of action required give rise to tomorrow's problems. There is a need to encourage research based on the use of comprehensive ecological models that incorporate variables beyond basic demographic information (TRB, 2005); a need to use combined variables to better reflect the synergistic combination of a supportive environment, as hypothesised by theoretical ecological models of the environmental determinants of physical activity (Jones et al., 2007).

There have been a number of attempts to develop a systemic concept reflecting the wider determinants of health, from the work of Hancock through the 1980s (Hancock, 1993) in developing a 'mandala of health', to the wider determinants of health model of Whitehead and Dahlgren (1991). In the environmental health field there are also systemic models, such as those arising from the EU-funded project INTARESE and HEIMTSA (Briggs, 2008). This report does not add directly to the environmental health approach for studies of systemic risk in the urban environment. In taking a public health standpoint, it adds obliquely to that developing field, but takes a different path. Building on work of Whitehead and Dahlgren, Barton (Barton, 2005; Barton and Grant, 2006) has developed an ecosystem model of health determinants relating to the built environment (Figure 1).

The *Settlement Health Map* articulates both the ecology of human settlements and the way the human habitat affects people's health and well-being. At the heart of the health map are people. People are the reason for settlements. People's lifestyles, community networks, job opportunities and activities (represented by the inner spheres of the map) are all affected by the urban environment that they inhabit. Those lifestyles, activities and the urban environment all impact on the natural assets of air, earth, water and energy, and the global climate. In turn all of these spheres – the environmental, the social and the economic – affect the health and well-being of people. The health map has become widely accepted as a useful tool to help to understand the interactions between different facets of reality. It provides an holistic model of the relationship

between people, their quality of life, and their local and global environment (Lavin et al., 2007 p6; SDC p6, 2008; Williams and Fisher, 2007 p32).



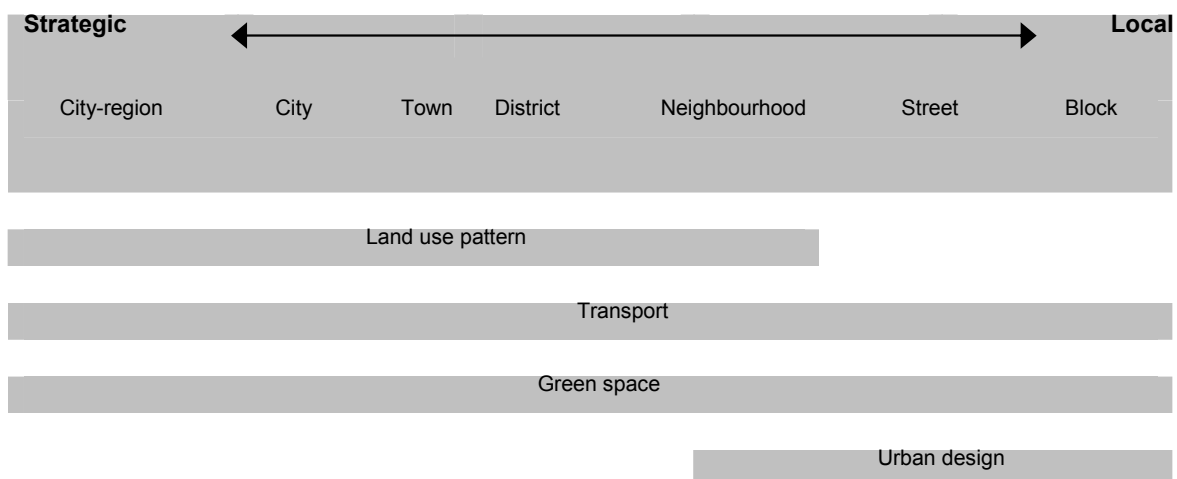
**Figure 1.** The Settlement Health Map

In terms of the health map, the focus of this report is the impact of the urban (or built) environment sphere on the central sphere, the people. The question always arises, what is the relative significance of the physical environment – as opposed to hereditary factors, broad economic, political and cultural influences – on health. The report does not attempt to answer that highly contested question. What it does attempt to do is recognise the interaction of the different facets: for example the impact of the urban environment on social and psychological variables, and thus indirectly on health.

### Key determinants

A valuable way of understanding the impact of urban spatial parameters is to focus on four key parameters of urban form and character. These four capture the majority of the range of urban variety. For each of these, the evidence for health risks and benefits, present in urban settings, can be described as mediated through the actions of spatial planning and urban design. These components of urban planning are:

- land use pattern
- transport
- green space
- urban design



**Figure 2:** Coverage of urban scale by components of the urban environment

The section deliberately deals with these in a sequence designed to foster a better understanding of the interactions between spatial form and urban health. The urban environment is a complex system involving a web of connections (RCEP, 2007). It is the understanding of the importance of scale that can provide vital orientation in terms of gaining a better insight. As a group the four selected components range in scale from the strategic to the local (Figure 2). As the review is concerned with spatial planning, parameters smaller than a block, such as buildings and building materials, which of course have health impacts, are not included. Land use pattern is concerned only with the strategic scale, the scale of the city-region, city and towns, and also with the neighbourhood level. Transport and green space interact with health risk at all scales from the strategic to the street level, including the district and neighbourhood in the middle range. Urban design affects the local environment which has interactions with health risks at the scale of neighbourhood and also at the estate, street and block level.

Potentially these components can have negative and/or positive interactions with the main determinants of air pollution, noise exposure, physical activity levels, social impacts and unintentional injuries.

Strategic planning, or the absence of it, will determine components at the largest scale, that is the form of the built environment across the whole settlement or urbanised region, what we are calling the urban form. Urban form has been split into three strategic components and one local level component. Land use pattern includes the density, disposition and nature of different land uses. These parameters of land use pattern lay the foundations for the movement and activity needs across the settlement and hence strongly influence the transport systems required to meet those needs. Transport includes all movement and infrastructure to support that movement from rail and road to cycling and walking. Strategic green space is the location for major recreational open space. It comprises both landscape features that remain undeveloped due to their natural character or cultural resonance, for example escarpments, woods, watercourses or historic parkland, deer parks and estates, and also comprises habitats, not always publicly accessible, that have evolved taking advantage of larger scale features such as railway, canal or road corridors. Urban design in this report is concerned with the environment at the local level, the arrangement of roads, spaces and buildings, the materials used and the way in which their design interacts to provide settings for urban life.

The degree of community influence on the evolution of these elements varies hugely according to the legislation on land rights and development rights. In some countries the individual land owner can build on their land relatively unhindered by state or municipal policy. In others stronger communal rules can shape the pattern of development to a major degree, subject to the willingness of private or public investors. The most significant determinant of future urban form is the transport infrastructure, normally constructed by national, provincial or local governments. This occurs even where the planning system is weak. It helps structure the decisions of commercial and institutional companies as they seek to maximise locational advantage.

The countries that have been most successful in avoiding the trend to obesogenic and unhealthy environments are those which have an integrated approach to all four of the spatial planning components, so that strategic land use and transport policy, local policy frameworks for green space and settlement form and detailed design are all mutually reinforcing.

Whilst elevating the importance of the role of spatial form in public health, it is also important to avoid the trap of 'physical determinism'. This concept was strongly represented in planning theory and application during the latter half of the twentieth century; as if a set of rules or masterplan for an ideal community can be codified. On the contrary a physical plan for a healthy urban environment, with universal applicability, cannot be developed. What this review of the literature shows is that it is the understanding of the interplay of physical form, cultural traditions and community bonds, economic activity and lifestyle which may result in successful interventions and spatial policies and plans that can support health.

# ***The Challenge***

## **A new public health for the urban environment**

The twin pressures of rising levels of obesity and the increasing threats of climate change, against a background of ever larger, more populous and more sprawling urban settlements, loom large in the urban health agenda. Fuelled partly by this there has been a very high level of interest in and research into how our health is affected by the human settlements in which we increasingly live and work. The emerging evidence points firmly in the direction:

- of legitimizing the validity of holistic approaches,
- of recognising the strength of the shift of focus from illness towards salutogenesis (Antonovsky, 1987; Antonovsky, 1996),
- of moving from an individual-based approach to a population-based approach, and
- of “shifting away from a mechanistic and reductionist focus on single health problems, risk factors and linear causality, towards a more holistic view, concerned to develop supportive contexts within the places that people live their lives” (Kickbusch, 2003).

### **Public health challenges**

Effective planning for public health involves much more than planning for and responding to specific health conditions. It is about healthy human habitat, locally and globally, and supportive social structures (Barton and Grant, 2003). The public health challenge is related to our ability and commitment to create a healthier built urban environment. The idea is expressed in Lavin et al. (2007 p23) as

Neighbourhoods are the localities in which people live and evidence shows they are vitally important for health and well-being. Combating heart disease, respiratory problems and mental illness means ensuring opportunities for healthy exercise, air quality and local social networks, all of which are influenced by the physical nature of localities.

To this should be added the public health challenges arising from inequalities in health. Evidence shows that a disproportionate burden of ill-health associated with the built environment is borne by certain groups within the population. The least well-off people in society suffer poorer health (Marmot, 2004). Several of the reviews cited indicate that poor people are more likely to live in poor quality built environments (including the determinants of noise and air quality) and this contributes to poor health. Lavin et al. (2007) also identify children and the elderly as being particularly vulnerable not only because of a biological vulnerability but also because of the significant numbers of children and elderly who are poor.

## Policy objectives

Policy objectives were set out in the *Healthy Urban Planning* book (Barton and Tsourou, 2000): twelve health objectives for planning and other professionals and decision-makers who determine the shape and design of the urban environment. The chart below elaborates that list and relates it explicitly to the settlement health map. The only significant innovation is to use the inner 'people' sphere 1 to relate to the principle of 'health for all', and therefore to the concerns about health inequalities. The two sphere 1 objectives are fundamental, and cut across all the other objectives.

Spheres of the Health Map	Objectives for Healthy Urban Planning
1. <b>People</b>	<ul style="list-style-type: none"> <li>• providing for the needs of all groups in the population</li> <li>• reducing health inequalities</li> </ul>
2. <b>Lifestyle</b>	<ul style="list-style-type: none"> <li>• promoting active travel</li> <li>• promoting physically active recreation</li> <li>• facilitating healthy food choices</li> </ul>
3. <b>Community</b>	<ul style="list-style-type: none"> <li>• facilitating social networks and social cohesion</li> <li>• supporting a sense of local pride and cultural identity</li> <li>• promoting a safe environment</li> </ul>
4. <b>Economy</b>	<ul style="list-style-type: none"> <li>• promoting accessible job opportunities for all sections of the population</li> <li>• encouraging a resilient and buoyant local economy</li> </ul>
5. <b>Activities</b>	<ul style="list-style-type: none"> <li>• ensuring retail, educational, leisure, cultural and health facilities are accessible to all</li> <li>• providing good quality facilities, responsive to local needs</li> </ul>
6. <b>Built environment</b>	<ul style="list-style-type: none"> <li>• ensuring good quality and supply of housing</li> <li>• promoting a green urban environment supporting mental well-being</li> <li>• planning an aesthetically stimulating environment, with acceptable noise levels</li> </ul>
7. <b>Natural environment</b>	<ul style="list-style-type: none"> <li>• promoting good air quality</li> <li>• ensuring security and quality of water supply and sanitation</li> <li>• ensuring soil conservation and quality</li> <li>• reducing risk of environmental disaster</li> </ul>
8. <b>Global ecosystems</b>	<ul style="list-style-type: none"> <li>• reducing transport-related greenhouse gas emissions</li> <li>• reducing building-related greenhouse gas emissions</li> <li>• promoting substitution of renewable energy for fossil fuel use</li> <li>• adapting of the environment to climate change</li> </ul>

**Table 1:** Healthy Urban Planning objectives

## **Policy and planning responses**

Is it reasonable to expect people to change their lifestyles in an environment that does not support such changes?

Responses with regard to urban planning are needed and the agenda is not just about new build communities, which will always only represent a small fraction of the built environment, nor is it about only including major regeneration schemes. It must also include the continuing modification to the built environment which provides opportunities, over time, to make significant changes to health risk (TRB, 2005). Such action is needed to make the changes that will affect “the multiple pathways within the obesity system in a sustainable way” (Foresight, 2007 p11). Reinforcing this message, with relation to physical activity, the Transportation Board Report (TRB, 2005 p15) recommends that:

Those responsible for modifications or additions to the built environment should facilitate access to, enhance the attractiveness of, and ensure the safety and security of places where people can be physically active.

Similarly the recommendations from the National Institute for Health and Clinical Excellence (NICE, 2008 p6) cover all urban development activity in recommending that action needs to be taken by:

Those responsible for all strategies, policies and plans involving changes to the physical environment. This includes the development, modification and maintenance of towns, urban extensions, major regeneration projects and the transport infrastructure.

## **Making decisions**

Each of the urban components lies across several decision areas which ultimately affect health risk and benefit. These decision areas may sometimes be the responsibility of a particular agency or department, though more often a number of agencies are involved. Without co-ordination this can lead to contradictory decisions, undermining the ability of any one agency to deliver positive health and sustainability outcomes.

For example taking the component ‘local urban environments’: the broad decision theoretically lies with the planning department, but many of the key decisions are likely to be taken by the economic development unit and the transport authority; similarly with transport, the strategic decisions may be taken by the national department of transport, or the national rail authority, rather than the municipal authority. The situation can be very confused – hence the need to establish collaborative working methods that draw together the relevant agencies and ensure a coherent approach.

These recommendations highlight the importance of urban design and spatial planning in facilitating a physically active population active within the urban setting. The important point here is the close joint working required between the medical and planning professions to create such guidance and to support it in implementation.

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