

Biodiversity & human health: what role for nature in healthy urban planning?

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Abstract

It is well known that nature is good for human health and well-being. However, there is little understanding or articulation of this link among built environment professionals. The purpose of the paper is to explore the literature for evidence of the health benefits of urban nature and biodiversity. The key question is whether there is an added health value to urban biodiversity policies. If there is, then what can planners and other built environment professionals learn about the role of nature in healthy urban planning?

The paper has three parts: the first discusses health and its determinants before examining policy on health and biodiversity in the urban setting. The second part of the paper looks at the literature on nature and health. Attention is given here to the ecological services provided by nature as well as the benefits that derive from human interaction with nature. The final section of the paper sets out some initial thoughts about the implications of the paper's findings for urban planners and built environment professionals.

The paper demonstrates that there are clear, documented, links between human health and nature, particularly in the urban setting. Together the results suggest that planners and built environment professionals could have a profound impact on community well-being by promoting urban nature and urban biodiversity in all new development.

Introduction

'Man did not weave the web of life; he is merely a strand in it.

Whatever he does to the web, he does to himself.'

Attributed to Chief Seattle, 1854

That nature is important for human well-being is evident in many ways. From the mounting body of scientific evidence on the harm that we may be doing to human health through undermining global biospheric processes to simple observations such as the tendency for city dwellers to seek out leafy and green places to live. Our contemporary cities, however, are not blessed with good quality habitats for wildlife, and urban nature is struggling. A recent report on urban environments in England and Wales revealed that there is intense pressure on wildlife in urban areas as a result of pollution, development and insensitive design (Environment Agency, 2002). Local plant extinctions increase with population density, suggesting that urbanism is as much a threat to biodiversity as intensive agriculture (Thompson & Jones, 1999). The result is a tendency for the quality of wildlife to reduce with proximity to city centres through habitat loss, fragmentation and disturbance (Environment Agency, 2002). Given that more than 80% of people in the European Union live in urban areas (Expert Group on the Urban Environment, 1996) and an increasing proportion of the world's population are urban dwellers, then the significance of the issue of the urban nature and health link is all too apparent.

Despite growing interest in the relationship between nature and well-being, there is little understanding or articulation of this link among built environment professionals. The purpose of this paper is thus to explore the literature for evidence of the health benefits of urban nature and biodiversity. The focus is on interactions in the urban environment at a day-to-day level and at a local scale. The key question is whether there is an added health value to urban biodiversity policies. If there is, then what can planners and other built environment professionals learn about the role of nature in healthy urban planning?

The paper has three parts. The first begins by discussing health and its determinants, before considering something of the policy context relevant to both health and

biodiversity in the urban setting. The second part of the paper examines the literature on nature and health. Attention is given here to the ecological services provided by nature, as well as the benefits that derive from human 'experiences' of nature in both active and passive settings. The final section of the paper draws conclusions from the first two sections, and sets out some initial thoughts about the implications for urban planners and built environment professionals.

The health-nature link

Before beginning to unravel the literature for evidence about the link between urban nature and human health, it is important to understand the concepts at the centre of this paper. The term health has a range of meanings and associated methods of measurement. Most familiar of these perhaps is the medical and healthcare view of health as the absence of disease. Medical indicators thus measure health through factors such as infant mortality, life expectancy and the incidence of diseases such as coronary heart disease and cancer. Defining health in this way has commonly been referred to as a negative definition.

However, over the past decade or so there has been a shift in the meaning and ownership of the term 'health'. The trend is towards broadening the definition and taking a more holistic definition such as that set out by the original Charter of the World Health Organisation in 1946. This stated that '*Health is not only the absence of disease but a state of physical, mental and social well-being*' (WHO, 1946). The Agenda 21 agreement set out at the Rio Earth Summit in 1992 restated this broad view of human health and made clear that the delivery of health is not solely the responsibility of health authorities. Municipal (local) government also has a role to play as '*...health ultimately depends on the ability to manage successfully the interaction between the physical, spiritual, biological and economic/social environment.*' [Agenda 21:Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992, Chapter 6: Protecting and Promoting Human Health Para 6.3] (UNEP, 1992)

The influence of the urban environment on human health implied in the above text, has been confirmed by the work of Whitehead & Dahlgren (1991) among others. In their work on health inequality, these authors developed a holistic model of the main

determinants of health (see also Barton’s paper in this issue). This captures a complex multilayered system where the final health of an individual is determined by four strata of influence with the environment as the outer level.

In the late 1990s the model of health determinants was advanced with further research into details of the social factors (see for example: Marmot & Wilkinson, 1999). The World Health Organisation has taken this forward through its healthy cities campaign (WHO, 1998) and the publication ‘Healthy Urban Planning’ (Barton & Tsourou, 2000). Taken as a whole these developments started to articulate the role of planning and urban management in health improvement and to bring to light a gap in our knowledge of the link between nature and health.



Ecosystem model of a neighbourhood

Figure 1: Source: Barton, Grant & Guise (2003)

The ecosystem model of a neighbourhood illustrated in figure 1, can be used to indicate the interrelationship between people’s health and the urban realm. Here it is possible to see that community and healthy activities can be supported or frustrated by the form of the built environment, as can the relationships between people and natural resources. Together these models, and the other work discussed above, demonstrate that health is not only the preserve of the health sector. Stott (2000) estimates that 80% of our health is determined by policies and activities outside the health sector.

In 2003, the National Health Service in the UK reviewed the effects that natural environments can have on health (Henwood, 2003). The report, coming from a discipline at the forefront of evidence based policy, analyses the evidence demonstrating a link between health and the natural environment. However, its most important contribution may lie in comments about the desire for precise measurement in the field. It calls for more qualitative interpretation of the meanings and implications of findings. Henwood writes '*...changes to more intangible aspects of well-being (e.g. sense of comfort, rootedness, restored mental vigour) and to the fabric of communities that are health sustaining or enhancing are important issues for consideration*' (Henwood, 2003, p13).

Nature and Health: the policy context

Policy on health and biodiversity provides further clues as to the nature of the link between these two phenomena, and the current priorities of built environment practitioners and policy makers.

As one might expect, the view of human health as a socially and environmentally influenced phenomenon is reflected in health policy at various levels. Both the UK government and the European Commission have incorporated this approach into health policy (see for example: DoH 1999, CIEH 2003 and CEC 2003). The UK government's health White Paper, 'Saving Lives: Our Healthier Nation' for example, states that: '*the social, economic and environmental factors tending towards poor health are potent*' (DoH, 1999). However the White Paper straddles the negative or holistic definition of health divide. This paper broke away from a narrow medical and health service delivery model in that it accepted a wider responsibility for health. However in places, the text struggles though to break out of a negative definition of health, (health as the absence of disease), with little mention of well-being or fulfilment. Interestingly however, the four main causes of preventable premature death targeted in the white paper - cancer, coronary heart disease and stroke, accidents and suicide - all have strong environmental elements.

While government policies generally recognise the role of the environment in determining human health, they have little to say about the specific role of nature or biodiversity in this equation. Also as it has been noted, health policy tends to concentrate on removing or reducing the negative influences on health, and says nothing about

harnessing positive factors. The European Commission's communication on environment and health is a good example of this. Despite its title, it concentrates solely on health threats caused by environmental factors such as air pollution and noise, and makes links to the laws and regulations that govern these nuisances. Surprisingly the communication says nothing about the positive role that the environment in general, and nature in particular can play in human health. Thus while health policy is beginning to recognise the importance of nature to health, there is almost no emphasis - in policy at least - on nature as a way of improving health and well-being.

In contrast to the health sector, policy and good practice guidance on nature and biodiversity is fairly good at making claims for positive links between health and well-being. Almost all UK documents on this topic include one or two general statements about the value of nature and biodiversity for health or well-being. Thus, the UK biodiversity strategy (DEFRA, 2002), planning policy guidance on nature conservation (ODPM, 2004) and the English forestry strategy (Forestry Commission, 1999) all contain positive statements about the role of nature and biodiversity in human well-being. The following is typical of these documents:

'Biodiversity is vital for quality of life; from the simple pleasure of birdsong to life-saving cancer drugs from yew trees. It is a life-support system which provides for all our needs whether practical or spiritual' (ALGE and the South West Biodiversity Partnership, 2000:1).

Despite the links that are made between health and quality of life, it is apparent that policy and guidance on nature conservation relies on the intrinsic value of biodiversity to make the case for its protection and promotion. The benefits of nature – whether in relation to aesthetics, economics, investment or well-being - are only mentioned in very general terms and do not underpin arguments for delivering more and better habitats. The result is a focus on protecting existing habitats rather than a strong argument for enriching degraded environments, or creating new habitats. If nature is good for us, then surely more nature is better?

A recent report by CABI Space on the value of open space has begun the process of making explicit, and providing evidence for, the many benefits that open space provides to the humans that live and work around them. The report observes: *'...there is increasing evidence that 'nature' in the urban environment is good for both physical and*

mental health. Natural views promote a drop in blood pressure and are shown to reduce feelings of stress.' (CABE Space, 2004:7). The report stops short of making policy or practice recommendations, but concentrates on collecting and presenting the evidence for the benefits of open space – including the benefits of urban nature and biodiversity.

So to conclude, policy and good practice guidance in health and nature conservation do make explicit, albeit in a general sense, the links between health and nature. However, neither sector traces the principle through into policy or practice.

Nature and Health: the research literature

In contrast to the relatively limited field of policy documents on nature and health, there is a large body of research literature covering this topic. This literature spans a number of subject areas including: landscape design; medicine; education and development; urban design; town planning; psychology; and, environmental health. In gathering material for this study, we concentrated on literature that provides evidence for the health benefits of urban nature and biodiversity. The objective was to look for clues about the impacts and health benefits of implementing policy on urban greening and habitat creation.

The evidence we discovered falls into three distinct groups, and the following discussion is structured accordingly. The first part of the discussion examines the ecological services provided by nature to urban dwellers. These services derive from the presence and functioning of plants and other organisms, and includes the cooling effect of trees on the urban climate for example. The second part of the discussion concentrates on the benefits that derive from experiential human interaction with nature. This is a broad field that takes in a number of key theories including E. O. Wilson's biophilia (Wilson, 1984) and Kaplan's restorative environments (Kaplan, 1992) as well as a range of related studies. Experiential interaction of humans with nature can usefully be divided into two groups: those dealing with active contact such as gardening or activity in a natural setting; and those dealing with more passive interaction with nature such as the view from an office window.

Environmental Services

It is well known that the process of photosynthesis in plants involves the uptake of carbon dioxide and the release of oxygen into the atmosphere. This is particularly significant in the context of climate change, and there is much discussion about the role of trees and plants in global atmospheric processes. Photosynthesis, and its associated plant metabolism and physiology, is also important at the local level, and a number of authors have noted the role of urban vegetation, particularly trees, in improving air quality.

There are a number of dimensions to the air hygiene functions provided by urban trees and plants. The first is in maintaining balance between atmospheric gases. Nicholson-Lord (2003) claims that many cities have as little as 10-12% oxygen in the atmosphere compared with a more normal 20-21%. The causes of this deoxygenation include both pollution and the absence of vegetation (Nicholson-Lord, 2003). As urban trees have a role to play in increasing or maintaining levels of oxygen and reducing CO₂ (Woolley, 2003), it is clear that a programme of urban greening will have positive impacts on local air quality. As oxygen is important in cellular health as well as respiratory and brain function, the link with human health and well-being is clear. Increasing the amount of nature in cities – particularly in those areas most denuded of greenery – should be a priority for health policy as well as environmental policy.

In addition to their role as oxygenators, trees and plants of all kinds act as bioaccumulators extracting both particulates and chemicals from the atmosphere. Woolley (2003) and others (see for example: CABE Space, 2004; Bolund & Hunhammar, 1999) mention the ability of trees to trap particulates and absorb sulphur e.g. a mature Douglas Fir is able to absorb 19.5kg of atmospheric sulphur per annum. Studies show that both parkland trees and street trees are able to remove up to 85% of dust from the air in summer and 40% in winter (Woolley, 2003). Such dramatic impacts are particularly significant in the context of rising rates of asthma and respiratory illness both of which are exacerbated by pollution and particulates. Although urban air quality is much improved since the early 20th century, air pollution brought forward between 12000 and 24000 deaths each year in Great Britain during the mid 1990s (Environment Agency, 2002). Increasing urban tree cover could thus play a part in tackling urban air quality and reducing the health burden of respiratory illness in modern society.

Urban trees and open spaces also have a role to play in the movement and circulation of air in cities. Differences in air temperature between green open spaces and the neighbouring built environment result in a park breeze as air flows from the cooler parts into the surrounding streets (CABE Space, 2004). The cooling effect of vegetation is not simply confined to urban parks, but is also linked to the amount of vegetation in a neighbourhood. Studies have shown where 50% of an area is covered by gardens, parks and street trees, temperatures are reduced by 7°C when compared to areas with only 15% vegetative cover (CABE Space, 2004). Even individual trees have an impact, with localised cooling as a result of transpiration (Woolley, 2003) and shade. Sitting in the shade is equivalent to wearing a sun protection factor of between six and ten (Nicholson-Lord, 2003).

The issue of temperature and cooling may not seem particularly important in relation to human health and well-being, but it can be a matter of life and death. In the summer of 2003, the extreme heat of the European summer is estimated to have caused around 35,000 deaths (Hillman, 2004). Many of those affected by the heat were living in European cities – and cities, generally, are 5-9°C warmer than the countryside that surrounds them thanks to the urban heat island effect (Nicholson-Lord, 2003).

The evidence mentioned above shows that the presence of nature in towns and cities has the potential to make a considerable difference to urban air quality, air movement and local temperature. There is little here that considers the role of biodiversity in delivering these benefits, or even considers the role of particular tree species. However, the studies do show that the capacity of trees to reduce particulates and pollutants is related to the total leaf area of the tree (Bolund & Hunhammar, 1999). This means that conifers are best at trapping dust and particulates, although they tend to be sensitive to other forms of air pollution. Deciduous trees on the other hand are better at absorbing gases, although the autumnal fall of their leaves means that their ability to absorb pollutants and to generate oxygen through photosynthesis varies between seasons.

There is some evidence about the role of biodiversity in human health and well-being. Walters (2004) describes the way in which the disruption of habitats around New Jersey is contributing to a rise in the incidence of Lyme disease. As the forest habitat is fragmented and disturbed the diversity of mammal species declines, increasing the

probability that newly hatched ticks will bite mice or chipmunks. These two species transmit Lyme disease to more than 90% of the ticks that feed on them, in contrast to an infection rate of only 10% from other forest mammals (e.g. possums, raccoons etc). The problem is that as the habitat is disturbed, the diversity of species in the forest declines and the density of mice and chipmunks in the area increases. When this happens, then the incidence of Lyme disease in humans also rises. Walters develops the concept of ecodemics – disease outbreaks facilitated by human degradation of ecosystems. This has strong resonance with the statement attributed to Chief Seattle at the head of this paper. If nature does provide ecological services that are inseparable from a healthy human habitat, then we will start to see deteriorating health as the biosphere loses its diversity. This is often viewed as a global problem with little action to be taken at the local level, but the brief review of ecological services afforded above, indicated that these services are also important to health in an urban setting.

Experiential Interaction

Aside from the ecological services that nature provides, humans also derive benefit from their active and passive interaction with plants and animals. We all know that nature is good for us. Why else do we hanker after country retreats, spend time and money camping, walking, gardening or watching TV programmes about nature, wildlife and gardening?

The underlying theory for the human affinity for nature is known as biophilia, E.O. Wilson's evolutionary explanation for man's affinity with the environment (Pretty et al, 2003; Frumkin, 2001). Wilson defined biophilia as 'the connections that human beings subconsciously seek with the rest of life', and argued that they are determined by a biological need, developed through evolutionary processes because we have coexisted in the closest relationship with the natural world for so many millennia. In the context of well-being, elements of this concept have been usefully extended by the work on 'restorative environments' and 'nearby nature' by Kaplan & Kaplan (1989) and others in a programme of empirical research going back some 25 years.

Empirical studies examining the experiential interaction of humans with nature can be divided into two groups: those dealing with activity in a natural environment such as gardening and walking; and those dealing with more passive interaction such as the

view from an office window. The distinction between these two is sometimes a little fuzzy, but they are explored in turn below.

Active Experiential Services

Studies of the active interaction of humans in or with nature cover a number of distinct fields with various levels of human activity and different intensity of interaction with the natural environment. A broad schema for representing these differences can be found in Figure 2. It needs to be borne in mind that even while focussing on active interaction of humans in or with nature, the benefits of passive experience will also be taking place.

		Human activity level		
		Low	Medium	High sometimes even aerobic
Interaction with nature	Low intensity	Walking	Hill walking, outdoor sports e.g golf	Trim trails, outdoor sports e.g. football
	High intensity	Birdwatching	Gardening	'Green gyms', Conservation volunteering e.g. hedge laying, reed cutting, woodland thinning

Figure 2. Different levels of human activity and interaction with nature in various outdoor pursuits

Many sports are played outdoors and the recreation itself holds health benefits. However the focus of this paper is to examine the effect of nature on health. One of most well-established areas for promotion of health benefits of activity in natural settings relates to the rewards of gardening and horticulture. Aldridge & Sempik (2002) among others have examined this in detail, reviewing the evidence for the benefits of social and therapeutic horticulture. Such work shows the considerable benefit that particular groups – psychiatric patients, prison inmates, students with learning difficulties – derive from

working with plants. Studies in this field tend to concentrate on the mental health benefits of therapeutic horticulture, and show that participants benefit from enhanced self-esteem and self-confidence, recovery from depression and reduced aggression (Aldridge & Sempik, 2002). The benefits are such that gardening and horticultural projects are used therapeutically in a number of settings including prisons and hospitals.

Recently, following the lead set by Government health policy linking the role of personal choices with diseases related to sedentary lifestyles, the role of outdoor exercise is receiving more attention with several synoptic literature reviews. Pretty et al. (2003) review the complementary role of nature with exercise and diet in promoting well-being. In a report for the Royal Society for the Protection of Birds, Bird (2004) surveys policy and empirical work whilst reviewing whether green space and biodiversity can increase levels of physical activity. Although his work is the only study attempting to explicitly address biodiversity, the links he finds between biodiversity and activity are in the main indirect especially in the urban setting. Interest in the health and outdoor activity area is also leading to practical projects which in time will yield further data. The Forestry Commission and Department of Health are backing the implementation and evaluation of a woodland and health project in the West Midlands (Interface NRM Ltd, 2004) and the British Trust for Conservation Volunteers are supporting a growing 'Green Gym' movement. A 'Green Gym' aims to give people the health benefits of exercise whilst taking part in conservation activities such as tree planting, creating or restoring nature areas, hedge laying or constructing dry stone walls. It has been recognised that through the contact with nature and the outdoor setting, the benefits go far wider than just those afforded by physical exertion and exercise (Humphreys, 2003).

In the US, a strand of work has shown the benefits of wilderness experiences on individuals. Living in or visiting wilderness landscapes can have a profound effect, and a number of studies have shown the benefit of such experiences to specific study groups such as reports that psychiatric patients, emotionally disturbed children and adolescents, bereaved persons, rape and incest survivors, and patients with cancer, end stage renal disease, post-traumatic stress syndrome, addiction disorders and other ailments (as reviewed in Henwood, 2003). These studies report the positive (mainly mental health) benefits of wilderness experience where people enter a landscape rather than just view it. Benefits all seem to relate to a holistic concept of health such as reporting renewed sense of vigour and energy, self-awareness, feelings of awe and comfort at connection

with nature, improved sense of coping and ability to assert personal control (Henwood, 2003).

Henwood goes on to say that the number and variety of accounts of people benefiting in different ways from contact with nature suggest that such experiences can bolster mental health. These benefits span both illness recovery and the more general project of promoting public health (Frumkin, 2001).

Contact with nature has been shown elsewhere to have physiological as well as psychological benefits. For example, studies show pet owners have lower levels of minor ailments than non pet-owners (Frumkin, 2001) and quickly reduce their blood pressure and heart rate following contact with their pets. A very different study in Japan showed that retired people who walked everyday in tree-lined and leafy surroundings lived longer than people who walked in less green surroundings (Takano, Nakamura & Watanabe, 2002). Such studies demonstrate that nature – whether in the form of pets or green surroundings – have a very direct effect on human health.

The final strand of evidence for the health benefits of active interaction with nature has only recently emerged. This concerns the benefits of green spaces as a setting for exercise and activity. In the UK there is tremendous concern about rising rates of obesity and falling activity rates and Nicholson-Lord (2003) tells us that lack of exercise costs the national health service 2-3% of its budget. In response to such concerns two key initiatives have emerged in recent years: Health Walks and Green Gyms. Health Walks can be 'prescribed' by doctors, with patients attending organised and accompanied walks in the local area. The Green Gym is a similar idea with participants engaging in practical conservation tasks (as mentioned earlier). In both cases evaluations have shown that participants in these initiatives were more likely to continue with exercise than those on more traditional gym based regimes. Initial findings from Health Walks and Green Gym schemes suggest that drop-out rates are low, and that participants value meeting new people and being outside in addition to the exercise element of such programmes (Forestry Commission, 2004). Study of these initiatives is at an early stage, and as yet there has been no clinical evaluation of the health benefits afforded to participants. However, anecdotal and research evidence suggests that there are distinct if not easily quantifiable benefits for people who have access to parks, woodlands and forests (Forestry Commission, 2004).

Although this literature documents numerous examples of health benefits from activities undertaken in natural settings, there is little direct assessment of the role that biodiversity plays in mediating these benefits. Settings range from the biodiversity richness of wilderness parks to those not reliant on biodiversity at all, e.g. contact with pets or street trees. It is clear that both contact just with nature and contact with biodiverse nature both have a health effect, though a model for the relationship between the two has yet to be established.

Passive Experiential Services

There is evidence to suggest that health services can be derived through passive, which includes unconscious, experience of nature. Passive interactions with nature can be classified as:

- i) nature as setting; such as walking in a park rather than along a treeless street;
- ii) visual contacts with nature; such as a view of trees or plants from a window;
- iii) implied visual contacts with nature; such as landscape painting;
- iv) other sensory contacts with nature; such smell and sound, bird song and leaves rustling in the wind.

Prominent in the field of exploring passive interactions with nature are Kaplan & Kaplan and particularly useful is their concept of nearby nature (Kaplan & Kaplan, 1989). Nearby nature is a concept based on the passive experience of nature in day-to-day living, both indoors and out-of-doors. It encompasses vegetation from a vase of cut flowers on a table to a plant in a window box or a street tree or neighbourhood park. The relationship to the human subject may be direct or indirect such as a view through a window.

Following extensive research based on an analysis of reactions to slides and photographs, the Kaplans have concluded that 'nature' is a critical component of how people experience the environment (Kaplan, 1992). In particular, what is essential to perception is the presence of vegetation and the context created by it. The focus is on plants in general, not specific plants. In this sense at first the relationships seems to be independent of biodiversity. However they found that the degree to which the setting is 'natural' is important in determining the degree of psychological response. In their work (see also Kaplan, 1991), the term 'natural' is explored mainly in its visual and physical dimensions, being akin to a sense of naturalness in the arrangement of the various elements in the landscape both botanical and geo-physical. In very broad terms this can

sometimes have a positive correlation with biological diversity in that a monoculture or simple setting is on the whole less likely to be as biodiverse as an arrangement with more complexity. The Kaplans view the lack of provision of access to nature as a basic misunderstanding of the human condition, '*Nature is not merely an amenity, luxury, frill or decoration. The availability of nearby nature meets an essential for human need*' (Kaplan, 1992:132).

Ulrich & Parson (1992) provide a survey of the mechanisms for health related benefits. They identify in the literature three main areas of thought in relation to these mechanisms: psychological and physiological effects; evolutionary theories; and learning theories. All these mechanisms promote health through reducing stress. A stress reaction is the process of responding physiologically, physiologically and behaviourally to a situation that is taxing or threatens well-being (Evans & Cohen, 1987).

Several empirical studies have been undertaken under semi-controlled conditions. Findings indicate a role for vegetation in stress reduction. For example, Hartig, Mang & Evans (1987) found that out of listening to music, a walk in an urban setting and a walk in nature, the latter was more conducive to recovery after a stressful task. Ulrich (1981) found that alpha wave brain activity (associated with relaxation) was higher when subjects viewed slides of urban scenes including nature as opposed to those without any natural elements. Heerwagen (1990) found that patients in a dentist waiting room felt calmer and had a lower heart rate when looking at pictures of natural scenes as opposed to a blank wall.

Further evidence of the positive effects of passive interactions with nature exists in studies of enhanced educational performance, improved medical recovery (Ulrich, 1984), improved concentration and self-discipline in girls (Taylor, Kuo & Sullivan, 2002) and reduced crime and fear of crime. Nature may just be a backdrop to city life – a view through a window, an incidental context when commuting, a visual stimulus in a waiting room. Typical of a new wave of empirical field studies in this area is Hartig et al. (2003). As part of the study on 112 young adults, it was shown that sitting in a room with a tree view promoted a drop in blood pressure and reduced feelings of stress. However it is important to note that in all studies reviewed to date, the authors have not found *prima facie* evidence for a direct link between biodiversity and the described effects. Exotic vegetation, species poor vegetation and even merely videos or images of nature, in

some circumstances, seem to be enough to reduce stress. The only link to biodiversity may be through some evidence, discussed above, that links complexity and 'naturalness' to preferred settings. It is worth stating however, that none of the studies examined included biodiversity *per se* as parameter to be tested.

Conclusions: nature and healthy urban planning

This paper began with two questions: is there added health value to urban biodiversity policies; and, what can planners and others learn about the role of nature in healthy urban planning? In response to these questions the paper has drawn together a variety of evidence about the health benefits of urban nature. Together this evidence has shown that the presence of nature has profound psychological and physiological benefits for humans – affecting healing, heart rate, concentration, levels of stress, blood pressure and mental well-being.

Thus an inherent conclusion is that there is very good evidence to show that urban greening would have a beneficial impact on human health and well-being. As urban biodiversity is an extension of policies on urban nature and green space, then these conclusions also hold true for policies on biodiversity. However, it is unclear whether biodiversity brings greater health dividends than straightforward 'nature'. There has been little work on this dimension of the health-nature relationship at the urban scale. However, at larger scales including the global scale links are better understood. Walters (2004) work on ecodemics shows that habitat disruption can be related to ill-health for humans such as the incidence of Lyme disease in New Jersey.

Given that there is good evidence for the health benefits of nature in urban area, there is no reason not to pursue biodiversity at the same time as nature in the urban setting. Human interventions in the environment have reduced biodiversity. Now, increasing biodiversity is a national target and every area has, or is preparing, a local biodiversity action plan, although planners and other built environment professionals have much to learn about the role of nature in providing healthy urban settings. The evidence set out above shows that nature has a key role in human health – not only through direct effects on healing, heart rate and so on - but also as a result of its ability to temper other factors affecting health such as air quality and extreme temperature. Current policy approaches

to urban biodiversity, open space, air quality and health fail to recognise or promote the positive role of nature in well-being and in delivering outcomes in terms of Government health policy. Given the health benefits of urban nature, local authorities could make good use of their powers under the local government act, which permits authorities in England & Wales *'to do anything they consider likely to promote or improve economic, social or environmental well-being of their area...'* (DETR, 2001, p. 4). It is not hard to imagine how tree planting programmes, changes to planning policy and joint ventures with local wildlife and conservation groups could begin to effect a change in the urban landscape. All new developments would have tree-lined streets; planning policy would prevent the loss of gardens to off-street parking; and agencies would work together to create new habitats and enriched environments in all urban regeneration and new development. Following this line of thought, health benefits would become central to these activities and would be built in to projects from the start. This contrasts starkly with current practice where there is a limp idea that 'greening' is 'a good thing', and where these type of interventions are bolted-on to the initial programme.

Despite the convincing reasons for prioritising biodiversity in all urban planting schemes, there are numerous barriers. These include a mix of institutional and commercial trends in the landscape industry and landscape architecture profession. A current initiative *'Flora locale'* funded partly by DEFRA and English Nature aims to promote good practice in the use and sourcing of native flora for all projects that have wildlife in mind. Another barrier is the yawning gap between biodiversity policy and implementation in urban areas. There is highly developed evidence based biodiversity policy in the UK. However, outside designated areas, the will and expertise to promote and deliver increased biodiversity are limited. For new developments planning officers are relied on to appraise landscape proposals. In terms of management, implementation is often left to the contract sector or an emasculated parks department where biodiversity is either of no concern or simply a luxury that cannot be afforded.

Whatever the barriers, there are tremendous benefits to be gained from greening our urban places. The proposed move to a new spatial planning system offers a glimmer of hope. There will be a wider range of spatial sectoral policies to be legitimately included in and co-oriented by the planning process. Those responsible for implementing local biodiversity area action plans should use the 'front loading' of the new planning system to make sure that biodiversity interests, which after all has no economic or social

disbenefit, are correctly addressed in new planning frameworks. All development must seek to raise the 'background level' of biodiversity and capacity for wildlife to live in our towns and cities. Promoters of all new developments should be required to demonstrate how their proposals will play their part. We must insist on healthier streets, neighbourhoods and retail areas which are created to brim with biodiversity. If one of the goals of the planning system is sustainability (ODPM, 2005) then nature has a sectoral role to play alongside, retail, housing and transport in the planning and development of the built environment.

'Our personal health, and the health of our economy and human society, depends on the continuous supply of various ecological services that would be extremely costly or impossible to replace.'

Convention on biological diversity, 2002, p4

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