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NATURE IMPACT IN BIODIVERSITY & HUMAN HEALTH POLICIES

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Abstract:

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 nature and biodiversity in all new development.

Key Words: Environment, Nature, Human Being, Policies, Biodiversity.

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.' **-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).

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.

Linkage Health-Nature:

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.

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). he 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.

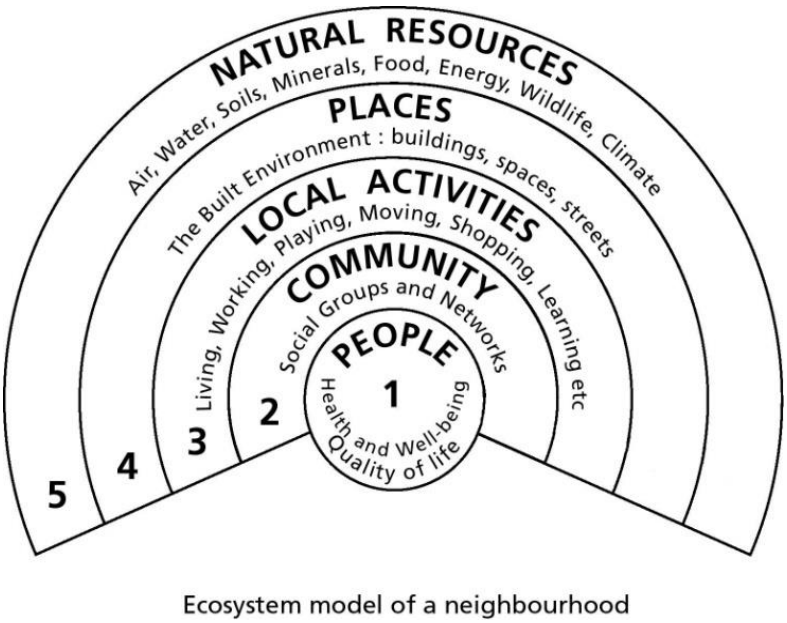

Figure 1: Source: Barton, Grant & Guise (2003)

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.

Nature and Health: Policy

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.

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:

A recent report by CABE 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.

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.

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.

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).

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).

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.

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