UK MAB Urban Forum

Urban greenspace and mental health

(Prepared for the UK MAB Urban Forum by Ian Douglas, May 2004)

> "Denying the relevance of nature to our deepest emotional needs is still the rule in mainstream therapy, as in the culture generally. It is apt to remain so until psychologists expand our paradigm of the self to include the natural habitat—as was always the case in indigenous cultures, whose methods of healing troubled souls included the trees and rivers, the sun and stars" (Theodore Roszak, 1996).

For urban people, the separation from nature is greater than in other forms of human settlement, but need not necessarily be so. Natural vegetation fulfils many ecosystem and human well-being functions in urban areas. One of the more important is alleged to be improvement in mental health, through recovery from, or alleviation of, mental illness and stress and through helping to raise a feeling of well-being among people using natural areas. Since 2000, urban greenspace, both quasi-natural and fully managed, has had a high profile in the planning, health and sustainable development agendas. *Planning Policy Guidance 17* (Office of the Deputy Prime Minister (ODPM), 2002) specifically mentions "promoting health and well-being" among the multiple functions of urban open spaces. The National Audit Office's Report on *Enhancing Urban Green Space* (Comptroller and Auditor General, 2006) points out that "access to green spaces improves people's quality of life, reducing stress, encouraging relaxation, and providing a sense of freedom". The Royal Commission on Environmental Pollution's Report on *The Urban Environment* (2007) states that there is "convincing evidence of the positive benefits to be gained from both active and passive involvement with natural areas in towns and cities".This paper examines the scientific evidence for such assumptions and asks whether the mental health benefits of urban greenspaces contribute to the arguments for their incorporation into planning for the creation or restoration of urban areas.

Relating environment to mental health is not made easy by a lack of clarity in the definitions of the concepts of mental health and of environment. Environment in the context of greenspaces may be taken as the biophysical surroundings of individuals, families and communities. These surroundings affect the human psyche through their direct sensory impacts. Equally our surroundings may influence our thoughts and feelings by the way they inhibit or filter our experience of other things (buildings, for example, detach us from the external environment). In addition, our biophysical surroundings mediate or affect, inhibit or encourage our social and personal relationships. Mental health may be taken in its broadest sense of mental well-being or "peace of mind".

The commonly cited beliefs

Much of what is written about the importance of urban greenspace is related to people's biological needs as mammals for room for various activities. Direct relationships between these needs and health are unclear.

> **"**For a balanced urban habitat we must provide brood cover for small children; safe territory for youthful exploration; flocking, trysting and roosting habitat for young adults; and finally stable and well defined territories for older cohorts. The vacant lot in his block is of far more value to a five-year-old than is the park located three or four blocks away. Likewise, the elderly need readily accessible, comfortable, and quiet parks. With man, as with wildlife, scale and distribution of green areas are important" (Stearns, 1972, p.275).

The expansion of suburbs of semi-detached houses between 1920 and 1940 in Britain was seen as increasing the scope for improvements in physical health. "In contrast to the dirt and overcrowding of inner urban areas, suburban living offered space, low densities, gardens and access to the countryside. The emigrant from the city could rejoice in raising his family in clean and humane conditions" (Ineichen, 1993, p. 16). But such benign biophysical surroundings do not always bring good mental health. The Oxhey estate near Watford, built soon after 1950 to house people from inner London, had a rate of mental illness higher than the national average, despite having a good layout, greenspace within the estate and good access to Oxhey Woods (Martin et al., 1957). Possibly this is an early example of the "suburban neurosis" that has been widely reported from Britain's New Towns (Ineichen, 1993).

Many emphasise that the psychological differences between different urban environments and between urban and rural life depend upon people's attitudes and life styles and cannot be related simply to the biophysical environment (Howarth, 1976). Many modern secondary schoolchildren express fears about natural areas or wildlands to which they may be taken as part of school or recreation centre activities (Wohlwill, 1983). Such negative perceptions are often linked to preferences for manicured path settings, urban environments and indoor social recreation activities (Bixler and Floyd, 1997). Neverthless, much of the literature refers to greenspace as offering a relief from stress. Modern urban living may involve both sensory deprivation and information overload. People can suffer from both. An excess of either one can be harmful. An adequate living environment balances sensory inputs and provides a mix that is both congenial and consistent with people's culturally conditioned needs (Hall, 1968). Areas of natural environment in towns and cities are theoretically seen as providing the setting for recovery and recuperation from the stress and strains of the built urban environment (Kaplan, 1984). Four themes emerge from the literature of the benefits of nature in the city (Knopf, 1987; Parry-Jones, 1990):

- Nature restores
- Nature facilitates competence building
- Nature carries symbols that affirm the culture or self
- Nature offers a pleasing diversion.

These general statements about the benefits of urban greenspace have been adopted by many UK local and regional authorities. Their comments emphasise biophysical environmental benefits. Good quality greenspaces encourage people to walk, run, cycle and play. Greenspaces improve air quality and reduce noise, while trees and shrubbery help to filter out dust and pollutants. If paths and cycle networks are integrated to facilitate commuting, they can reduce transport needs and provide safe and healthy routes to school for children that avoid hazardous road crossings.

Stockport M.B.C. stresses health and well-being aspects as well:

- Relaxation, contemplation and passive recreation is essential to stress management in today's busy world—recent evidence has brought to light the extraordinary role that good quality greenspace plays in relieving stress and promoting physical and mental health not only of individuals but the well being of the community—quality greenspace is often absent from problem neighbourhoods.
- Greenspace issues can unite the whole community and can be the focus of community development and local regeneration fostering a sense of community pride.

Stockport M.B.C. has put these ideas into action. A pioneering development, based in Stockport, funded by the local authority, the Countryside Agency and the Health Authority, promotes and improves access to greenspace in urban areas for people with physical and mental needs. The Council creates and signs accessible paths through attractive greenspace close to areas of deprivation and ill-health. GP's and community nurses refer patients to the project for exercise and well-being. Local volunteers and community groups also work with the project, to create and maintain the pathways and to complete a borough-wide network of routes.

Elsewhere in the UK (Henwood, 2002) projects have been set up to increase the health benefits of activities in the outdoor environment through organised schemes to promote walking (eg the Thames Valley and Sonning Common Heath Walk schemes) and using conservation work to increase levels of physical activity – an approach known as 'green gyms' (Bird, 1999). A wider range of other schemes aim to promote health and wellbeing, but not necessarily or exclusively by promoting physical activity. In these schemes people are encouraged to enjoy the psychological benefits that can be afforded by 'green spaces', or communities enabled to thrive through projects that take a holistic rather than a medical approach to people and health by promoting participation in art and learning in ways that often focus on the value of local environmental amenities, spaces and landscapes (e.g. Rigler and Campbell, 1996).

Campaigning organisations, such as Greenroofs, use similar arguments about the mental health and well-being values of urban greenspace:

> "Many psychological studies have proven that the overall quality of life can be enhanced by the addition of natural green spaces. Distinct therapeutic links exist between moods, health, recuperation time and nature. It has been suggested that mental health and emotional stability are positively influenced by green spaces and with interaction of other elements of nature. Green spaces reflect the changing seasons and provide a psychological link with the countryside. Green roofs could certainly be part of a comprehensive therapeutic environment, especially when contrasted to viewing the more common ugly roof spaces from a hospital window" (http://www.greenroofs.com/psychological_advantages.htm).

A commentary on the London Greenspace plan argues that:

> "Access to green spaces also provides mental health benefits. Green spaces offer relaxation for stressed urban dwellers. Studies in the USA have shown that within

> three minutes of being in green space stress levels return to normal whereas recovery time in a built-up area is 25 minutes. One in five people will suffer from mental illness, including depression during the course of their lives. Regular moderate exercise is as effective as medication in alleviating mild to moderate depression. These benefits of green space represent significant savings for the health care budget which can be achieved by people having easy access to green spaces. There are particular benefits from green spaces for minority groups which have poorer than average health and limited access to the countryside".

Recreational parks and green areas provide opportunities for healthy physical activity and the relief of stress. Furthermore, the passive benefits to physical and mental health of an urban landscape with trees have been documented in industrialized countries (Ulrich, 1984); enjoyment of green areas may help people to relax or may give them fresh energy. Such findings broadly confirm the conclusions of others concerning contact with nature, reduction of stress and escape from dense urbanity (Ulrich, 1979; Greenbie, 1981; Nicholson-Lord, 1987; Kaplan and Kaplan, 1989; Bussey, 1996).

The grounds for these beliefs

The actual evidence for mental health benefits from urban greenspace may be less clear than these assertions imply. Undoubtedly, trees fulfil certain psychological, social and cultural needs of urban people. They play an important social role in easing tensions and improving psychological health. One study has demonstrated that hospital patients placed in rooms with windows facing trees heal faster and require shorter hospital stays (Ulrich, 1984). When appropriately selected and placed, trees are effective in screening out undesirable views and ensuring privacy, while permitting free visual access to the rest of the landscape.

Parks provide easily accessible recreational opportunities for people and offer opportunities for healthy physical activity. In one study (Hull and Harvey, 1989) people visiting parks expected to experience more please the more trees and the less undergrowth there were. The subjects' preference for parks increased linearly with increasing pleasure and arousal. The arousal-inducing characteristics were counter to the calming influence of parks expected by the researchers. The exhilaration and arousal often came from paths through thickets of undergrowth which may have induced an element of fear into some visitors. This study and others suggest that while feelings of calm and relaxation are major components of people's emotional reactions to nature, more animated responses such as being emotionally moved and uplifted are also important (Rohde and Kendle, 1994). Enjoyment of green areas may help people to relax or may give them fresh energy (Ulrich, 1990).

Mental health specialists have noted that the nineteenth century mental asylums often had farms. In the late twentieth century, the extensive grounds around asylums became gardens in which inmates continued to work. An almost universally accepted criticism of the closure of asylums and de-institutionalisation of mental illness is about the loss of these gardens, which implies a universal assumption that gardens are therapeutic to the mind. More recent evidence of this therapeutic value of gardening, comes from Brown and Jameton's observation (2000) that recreational gardening is a way to relax and release stress and Patterson and Chang's evidence (1999) of a link between physical activity such as gardening and reduced anxiety and depression.

Gardens represent attempts at models for the environment as paradise. Should we question this basic idea of their therapeutic quality, we would have great difficulty explaining a large proportion of the world's poetry. Evidence continues to demonstrate the therapeutic value of gardening for many different social groups, whether the inmates of institutions, the elderly or the young (Milligan et al., 2003). Gardens and gardening imply social values of greenspaces and thus demonstrate the significance of the garden city suburban design concept that permeated twentieth century planning.

The Scientific Evidence

Broadly, the scientific evidence is of four kinds: i) the outcomes of experiments in which subjects have been tested in contrasting situations; ii) the findings of studies that used photographs and videos of natural environments to test people's reactions; iii) the results of attitudinal surveys, both quantitative and qualitative, in which people are asked about their preferences and experiences; and iv) the use of national or regional health data sets. The therapeutic value of natural environments has only been tested in a few controlled experiments which have indicated that such surroundings aid recovery from surgery (Ulrich, 1984); enhance the ability to focus attention (Hartig et al., 1991); and improve emotional states (Ulrich, 1979; Hartig et al., 1996, 2003; Wells 2000; Evans et al., 2000). To these experiments may be added studies that used photographs and videos of natural environments to test people's reactions (Ulrich, 1990; Ulrich et al., 1991). More numerous are the attitudinal surveys that demonstrate that people develop particular attitudes to greenspaces, wild landscapes and natural vegetation (such as Bixler et al., 1994; Bixler and Floyd, 1997; Bulbeck, 1999; Milligan et al., 2003; Schroeder, 1982; Schroeder and Anderson, 1984; Westover, 1986). National or regional data sets are able to distinguish contrasts due more to location of residence and occupation rather than individual behaviour.

Controlled experiments. The controlled experiments include work that showed that views of natural scenes from hospital windows aided patients' recovery from gall bladder surgery (Ulrich, 1984) and that prisoners with views of nature reported sick less often (Moore, 1982); and suffered fewer stress-related physical symptoms (West 1985). These experiments suggest that mere visibility of nature may have powerful preventative and curative effects on people's health (Rohde and Kendle, 1994). Hartig et al. (1991) found that subjects' completion of a proof-reading exercise was improved following contact with nature through a hike in a wilderness area or a walk through a park close to the city. Such findings were considered to support the Kaplans' view (1984, 1995) of the restorative benefits of nature.

Hartig and co-workers (2003) have gone further by conducting experiments in urban and natural situations in two phases: indoor and outdoor. In the natural environment, the two phases were sitting in a room with tree views, and then walking in a nature reserve. In the urban environment, the two phases were sitting in a room without views, and then walking in an urban area. This careful experiment using students around 21 years old in attractive but not spectacular natural vegetation and in the City of Orange, California, revealed that in the initial 10 minutes of the environmental treatment, subject's diastolic blood pressure (DBP) declined among those seated in a room where trees could be seen through the windows, but increased in those in a room without views. After walking for 20 minutes, the difference in DBP of subjects in the

natural and urban areas was significant. Self–reported overall happiness was also greater in the natural environment at this stage. However, after the walk had been completed, the differences in DBP between urban and natural walk subjects had disappeared. Emotional differences, however, remained. This Hartig et al. (2003) found converging evidence from different types of measures that natural settings contribute to positive outcomes. Nevertheless, they caution that the magnitude of the effects is not solely produced by the influence of natural vegetation and attractive landscapes. The negative effects of the windowless room and the urban settings also contribute to the differences.

In terms of the practical implications of their work, Hartig et al. (2003) conclude that regular access to restorative, natural environments can halt or slow processes that negatively affect mental and physical health in the short- and long-term, and that, for urban people in particular, easy pedestrian and visual access to natural settings can produce preventive benefits. Public health strategies that incorporate use of areas of natural vegetation in urban areas may have particular value in an era of rapid urban growth, rising health care costs, and deteriorating environmental quality.

Nancy Wells has examined the impact of transforming a barren asphalt space into a green garden within a nursing home environment and has studied the relationship between childhood exposure to nature and adult environmental attitudes (Evans et al., 2000; Wells 2000). A house surrounded by nature helps to boost a child's attention capabilities. When children's cognitive functioning was compared before and after they moved from poor- to better-quality housing that had more green spaces around, profound differences emerged in their attention capacities, even when the effects of the improved housing were taken into account. The children studied who had the greatest gains in terms of "greenness" between their old and new homes also showed the greatest improvements in functioning. The results suggest that the natural environment may play a far more significant role in the well-being of children within a housing environment than has previously been recognised (Wells, 2000). A similar beneficial relationship was found in rural areas (Wells and Evans, 2003).

Tests using slides and videos. Experiments by Ulrich and co-workers suggest that visual exposure to nature through slides or videos may improve subjects' moods. Three studies have shown a connection between trees and lower levels of violence (Mooney and Nicell, 1992; Rice and Remy, 1994, 1998). However, these studies involved prison inmates and Alzheimer's disease patients living in nursing homes. What about people who are not living in institutional settings? The role of urban greenspaces in promoting social interaction and well-being among the elderly is generally regarded as highly positive (Kweon et al., 1998). For older adults, social integration and the strength of social ties are profoundly important predictors of well-being and longevity. Biophysical environments probably can be designed to promote older adults social integration with their neighbours. Kweon and colleagues (1998) examined this possibility by testing the relationships between varying amounts of exposure to green outdoor communal areas and the strength of ties among neighbours.

Thus exposure to natural scenes reduces stress. However, this is unlikely to be the same for all people, all of the time. Bixler and Floyd (1997) used slides in classrooms in rural, suburban and urban schools in Texas to discover the reactions of 450 middle school students to examine reactions to insects, woodland environments, handling soil

and pond water, encounters with snakes or severe storms, and similar outdoor experiences. Students reporting negative perceptions of wildland environments had lower preferences for such environments and activities with them and to some degree also had higher preferences for indoor environments and activities. Counter to popular assumptions about urban attitudes to the natural world, mostly rural and suburban students had these negative attitudes.

Attitudinal surveys. Partly because of important American findings and recommendations on the value of physical activity as part of healthy living (Pate et al., 1995; U.S. Department of Health and Human services, 1996), many countries have adopted new physical activity guidelines that indicate the value of moderate-intensity activity, such as brisk walking, to achieve health improvements. Often it is suggested that the surroundings in which the walking occurs add mental health benefits to the physical health gains (Ball et al., 2001). Theoretical social studies emphasise the importance of interactions between individual psychological, social and biophysical environmental variables (Sallis and Hovell, 1990; Sallis and Owen, 1997). In questionnaire surveys in the East Midlands of England, getting away from stress was associated with relaxation and nature- seeing it, being in natural places and learning about it, suggesting a role for natural greenspaces in stress reduction (Bell et al., 2004).

However, there can be associations between getting exercise and becoming de-stressed, as well as just being in a natural area. Telephone interviews with over 3000 Australian adults revealed positive associations of environmental aesthetics (a composite score based on Likert scale responses to questions about the friendliness of the neighbourhood, the attractiveness of the local area and the pleasantness of walking near home) with walking for exercise in the two weeks prior to the interview. Those reporting low environmental aesthetics were about 40% less likely to walk for exercise than those returning high scores (Ball et al., 2001). As a whole, this survey supported the case for environment-focused public policies and interventions to influence physical activity. Areas of natural vegetation and wildlife habitat in urban areas could form a key part of the local facilities, parks, cycle paths and pleasant areas that may encourage more adults, including those with poorer mental health, to take exercise.

However, there is much to suggest that natural, or wild, areas are unattractive and induce negative reactions on the part of many people. Direct behavioural evidence of such negative reactions is limited because the use of wildlands for recreation is an activity chosen by individuals and thus those who dislike them avoid them. Behavioural surveys conducted among adult visitors in urban natural areas thus sample an already self-selected group likely to have positive attitudes to wildlife. Students attending compulsory field classes represent a broader range of attitudes. Bixler et al. (1994) collected examples of negative reactions by urban students on field trips observed by park naturalists and teachers of environmental science. Some of the attitudes found were generalised fears of the woods; of wildlife; and of insects and spiders; disgust reactions to the dirtiness of the environment; and discomfort from extreme weather conditions.

Vulnerability in natural greenspaces was a greater concern among women than men responding to a questionnaire about natural areas in the East Midlands of England

(Bell et al., 2004). The concern was reinforced by statements made in focus groups in the same study and reflects findings of other research (Burgess, 1995b, Ward Thompson et al., 2004).

Several surveys and focus group discussions led by Burgess and Harrison have demonstrated diverse attitudes to urban greenspaces in various communities, especially in Greater London (Burgess, 1995a, b; Burgess et al., 1988). Members of ethnic minorities in the East Midlands form a smaller proportion of visitors to greenspaces than their proportion of the population as a whole (Bell et al., 2004) In East Midlands focus group discussions, people from ethnic minorities spoke of being uncomfortable in natural areas, of finding them alien to the urban settings with which they are unfamiliar, and of not having enough information about green areas (Bell et al., 2004). The extent and nature use of parks and peri-urban countryside for recreation to relieve stress are likely to differ widely among individuals and social groups. Probably most groups gain many well-being and emotional benefits from contact with nature in urban areas.

As reported by Kweon et al. (1998), the benefits of contact with natural landscapes seem particularly significant among the elderly. In focus group exercises and interviews with people over 65 in Carlisle, Milligan et al. (2003) found natural areas to be intimately linked to older people's social interactions in ways that can be central to relieving the stresses of everyday life. For many the aesthetics of a pleasing and tranquil landscape formed an important element of the therapeutic qualities of social encounters outdoors. Overall, the natural landscape was seen to contribute positively, in both active and passive ways, to the mental well-being of the interviewees.

Sullivan and Kuo (1996) found less violence in urban public housing where there were trees. The role of natural areas in helping to reduce anger, as confirmed by Hartig et al.'s experiments (2003) deserves special attention particularly as anger in urban settings often leads to violence which can affect many people other than the angry individual (see Kuo and Sullivan, 2001). Residents from buildings with trees report using more constructive, less violent ways of dealing with conflict in their homes. They report using reasoning more often in conflicts with their children, and they report significantly less use of severe violence. Also, in conflicts with their partners, they report less use of physical violence than do residents living in buildings without trees.

An important caveat is added by interviews in New York which examined the association between both the internal living environment and the external built environment and depression that showed that while most previous work had concentrated on the external environment, the influence of the conditions inside dwelling might be more important (Galea et al., 2005). This find parallels in other work on health and the urban environment, such as investigations of the link between air pollution and lung disease which suggest that conditions inside the home may in many cases be much more important than conditions in the street and in urban open spaces. In examining the evidence, care is needed to see whether all the factors contributing to mental health are considered.

Synthesising ideas and findings on the physiological and psychological benefits of urban forests and nature, Schroeder and Lewis (1991) developed Kaplan and Kaplan's

concept (1989) of fatigue directed attention (the result of constant externally generated demands for attention characteristic of the urban environment) and proposed several reasons why nature – "the green pause that refreshes" – might act to restore spent or flagging mental capacities. These include positive memories associated with nature; the way trees can off shelter; and deep-seated, culturally ingrained emotional or spiritual connections with nature. They also recognised negative impacts derived from feelings of fear induced by dense tree cover and feelings of annoyance due to the untidiness of nature. Perhaps there is a threshold for many people when positive influences of nature give way to fear and negative impulses. This threshold varies with people's perceptions and may alter as environmental conditions change, for example being positive on the beach when the sea is calm but negative when storm waves a crashing down on the sand and noisily shifting the mineral grains about the shore. In urban natural areas, reactions may cross thresholds, as implied by some of the work reported here, when well-spaced trees give way to totally shaded, dense thickets and undergrowth which may hide unexpected terrors.

National or regional data sets. A study using data from the Health and Lifestyle Survey, a population based community survey of England, Wales and Scotland in which psychiatric morbidity was assessed using the General Health Questionnaire found an association was found between urban residence and the prevalence of psychiatric morbidity (odds ratio 1.54, 95% CI 1.32-1.80) which persisted after adjustment for various confounding factors (odds ratio 1.34, 95% CI 1.13-1.58) (Lewis and Booth, 1994).

Implications of the scientific evidence

The scientific work reported here provides clear evidence that among many sectors of society there are positive benefits for mental health and well-being to be gained from both active and passive involvement with natural areas in towns and cities. Regular access to restorative, natural environments can halt or slow processes that negatively affect mental and physical health. Walking in natural areas provides opportunities for social interaction that are particularly beneficial for the elderly. Exposure to natural scenes reduces stress. Trees play an important social role in easing tensions and improving psychological health. People feel better living around trees. Houses surrounded by nature help to raise children's attention capabilities. Thus living in areas with trees helps to reduce anger and violence and improve the ability to concentrate and work effectively.

The scientific evidence broadly confirms the comments of others concerning contact with nature, reduction of stress and escape from dense urbanity (Ulrich, 1979; Greenbie, 1981; Nicholson-Lord, 1987; Kaplan and Kaplan, 1989; Bussey, 1996, Grahn, 1994, 1996). However, it also implies that for many the greatest value of urban woodlands and natural vegetation is as an escape or refuge away from urban life and probably human (urban) activity (Greenbie, 1981; Nicholson-Lord, 1987). To provide this refuge, areas of urban natural vegetation have to be accessible and allow the user to feel secure (Burgess, 1995a and Burgess, 1995b) and confident in their use (Coles and Bussey, 2000)

Nonetheless, the number of studies is limited and almost entirely confined to the USA, Europe and Australia. They sometimes embrace subjects of varying ethnic background and educational attainment, but are often restricted to certain age groups, such as students or elderly people. There may be some bias in the type of research questions due to the efforts in government-funded research on such topics as urban forestry and the health benefits of physical recreation.

Notwithstanding these limitations, in countries like the United Kingdom, there are likely to be considerable mental health gains from contact with nature in urban areas. Put together with the physical health, biodiversity, local climate modification, air pollution and greenhouse gas mitigation values of nature in urban areas, these gains warrant the inclusion of a variety of greenspaces in all urban design, from formal city squares to patches of natural vegetation and wildlife habitat. All such greenspaces will have multi-purpose benefits, particularly when integrated with protection of steep slopes, urban drainage design and floodplain management. However it is important to note the negative perceptions some people have of some areas of natural vegetation. Unlit footpaths through natural woodland are not suitable for commuter routes to railway or bus stations. Thus planning for natural landscapes in urban areas must involve public participation and close consultation with residents and local communities. There are no single, simple, off-the-shelf solutions that urban designers can incorporate unquestioningly. Both people and nature are complex. What works in one situation may not work in another either for cultural and social reasons, or for ecological, biogeochemical or climatic reasons. However, an abundance of existing good practice is available to help urban designers, planners and managers increase the use of natural areas and to work with those concerned with public health and mental well-being to create healthier cities with urban landscapes that offer positive incentives to take physical exercise in pleasant surroundings.

Conclusions

There is good scientific evidence that contact with nature in urban areas can improve mental health and can help in the restoration on psychological well-being. The evidence is strong enough to make the case for the inclusion of areas of natural vegetation in both urban planning, particularly for the expansion of existing towns and the creation of new urban settlements, as planned in the Thames Gateway area of the United Kingdom. Such areas need to be strategically located to give accessibility to both the young and older people likely to use them and to provide for different types of enjoyment, from dog-walking and jogging to bird-watching and environmental education. Public participation in the planning and management of such areas, especially through interaction and consultation with local communities, will enhance their value and will help to reduce vandalism and other forms of misuse.

New work to evaluate urban greenspace benefits is underway (e.g. De Ridder et al., 2004). It may help to clarify some of the complex, multi-faceted relationships between urban people's mental being and their relationships with urban nature. Nevertheless, the present experimental, survey and quantitative scientific evidence is based on relatively few studies from a narrow range of countries. It indicates that there are cultural and social contrasts in attitudes to, and perceptions of, natural vegetation in urban areas. However, it is insufficient to indicate whether the observed contrasts apply more widely than in the specific socio-economic situations in which

the surveys were conducted. For example, would old people in Miami, Florida respond in the same way as old people in Carlisle, England did? Thus a good case could be made for international comparative studies, or even comparisons between countries and regions within the United Kingdom, to examine how different social groups in similar sized urban areas in around ten different regions or countries enjoy, use and react to urban nature.

References

Ball, K., Bauman, A., Leslie, E. and Owen, N. 2001 Perceived environmental aesthetics and convenience and company are associated with walking for exercise among Australian adults. Preventive Medicine, 33, 434-440.

Bell, S., Morris, N., Findlay, C., Travlou, P., Montarzino, A., Gooch, D., Gregory, G. and Ward Thompson, C. 2004 Nature for people: the importance of green spaces to East Midlands communities. English Nature Research Reports, 567, English Nature, Peterborough.

Bird,W. (1999). The health benefits of forests close to people. Community Forestry, 50 (5).

Bixler, R.D. and Floyd, M.F. 1997 Nature is scary, disgusting and uncomfortable. Environment and Behaviour, 29, 443-456.

Bixler, R.D., Carlisle, C.L., Hammitt, W.E. and Floyd, M.F. 1994 Observed fears and discomforts among urban students on school field trips to wildland areas. Journal of Environmental Education, 26, 24-35.

Brown, K.H. and Jameton, A.L. 2000 Public health implications of urban agriculture. Journal of Public Health Policy, 21, 20-39.

Bulbeck, C. 1999 The 'nature dispositions' of visitors to animal encounter sites in Australia and New Zealand. Journal of Sociology, 35 (2) 129-151.

Burgess, J., 1995a. The ambiguity of woodland landscapes. In: Coles, R.W., Bussey, S.C., Heslegrave, W. (Eds.), Community Forestry in an Urban Context. Urban and Community Forestry Research Group, University of Central England, Birmingham, UK, pp. 39–43.

Burgess, J., 1995b. Growing in Confidence: CCP 457. Countryside Commission, Cheltenham, UK.

Burgess, J., Harrison, C.M. and Limb, M. 1988. People, parks and the urban green: a study of popular meanings and values for open spaces in the city. Urban Studies, 25: 455-473.

Bussey, S.C., 1996. Public use, perceptions and preferences for urban woodlands in Redditch. Ph.D. Thesis. University of Central England, Birmingham, UK.

Coles, R.W. and Bussey, S.C. 2000 Urban forest landscapes in the UK — progressing the social agenda. Landscape and Urban Planning, 52, 181-188

Comptroller and Auditor General, 2006 Enhancing Urban Green Space. The Stationery Office, London.

De Ridder, K., Adamec, V., Banuelos, A., Bruse, M., Burger, M., Damsgaard, O., Dufek, J., Hirsch, J., Lefebre, F., Perez-Lacorzana, J.M., Thierry, A., and Weber, C. 2004 *An integrated methodology to assess the benefits of urban green space*. Science of the Total Environment, 2004 Dec 1;334-335:489-497.

Evans, G.W., Wells, N.M., Chan, H.E. and Saltzman, H. 2000 Housing quality and mental health. Journal of Consulting and Clinical Psychology, 68(3), 526-530.

Galea, S., Ahern, J., Rudenstine, S., Wallace, Z., and Vlahov, D. 2005 Urban built environment and depression: a multilevel analysis. Journal of Epidemiology and Community Health, 59, 822–827.

Grahn, P. 1994. Green structures - The importance for health of nature areas and parks. European Regional Planning, No 56, pp 89-112

Grahn, P. 1996. Wild nature makes children healthy. Journal of Swedish Building Research, No 4 pp 16-18.

Greenbie, B.B., 1981. Spaces — Dimensions of the Human Landscape. Yale University Press, New Haven, CT.

Hall, E.T. 1968 Human needs and inhuman cities. In The fitness of man's environment, Smithsonian Annual, No.2, Smithsonian Institution, Washington D.C 163-172.

Hartig, T., Mang, M. and Evans, G. 1991 Restorative effects of natural environment experiences. Environment and Behavior 23 (1), 3-26.

Hartig T., Böök, A., Garvill, J., Olson, T. and Garling, T. 1996 Environmental influences on psychological restoration. Scandinavian Journal of Psychology, 37, 378393.

Hartig T., Evans, G.W,, Jamner, L.D., David, D.S. and Garling, T. 2003 Tracking restoration in natural and urban field settings. Journal of Environmental Psychology, 23, 109-123.

Henwood, K. 2002 Issues in health development: Environment and Health: Is there a role for environmental and countryside agencies in promoting benefits to health? Health Development Agency, London

Howarth, C.I. 1976 The psychology of urban life. In Harrison, G.A. and Gibson, J.B. (eds) Man in urban environments. Oxford University Press, Oxford, 286-303.

Hull, R.B. and Harvey, A. 1989 Exploring the emotions people experience in suburban parks. Environment and Behaviour, 21, 323-345.

Ineichen, B. 1993 Homes and Health: how housing and health interact. Spon, London.

Kaplan, R. 1984 The impact of urban nature: a theoretical analysis. Urban Ecology, 8, 189-197.

Kaplan, R., Kaplan, S., 1989. The Experience of Nature: The Psychological Perspective. Cambridge University Press, Cambridge.

Kaplan S. (1995) The restorative benefits of nature: Toward an integrative framework. Journal of Environmental Psychology, 15, 169-182.

Knopf, R.C. 1987 Human behaviour, cognition, and affect in the natural environment. In Stokols, D. and Altman, I. (eds) Handbook of Environmental Psychology. Wiley, New York, 783-825.

Kuo, F.E. and Sullivan, W.C. 2001 Aggression and violence in the inner city: impacts of environment via mental fatigue. Environment and Behavior, 33, 543-571.

Kweon, B.S., Sullivan, W.C. and Wiley, A.R. 1998 Green common spaces and the social integration of inner-city older adults. Environment and Behavior, 30, 832-858.

Lewis G. and Booth M. 1994 Are cities bad for your mental health? Psychological Medicine, 24(4), 913-915.

Martin E.M. et al., 1957 Incidence of neurosis in a new housing estate. British Journal of Preventive and Social Medicine, 11, 196-202.

Milligan, C., Gatrell, A. and Bingley, A. 2003 'Cultivating health': therapeutic landscapes and older people in northern England. Social Science & Medicine, (in press).

Mooney, P. and Nicell, P.L. The importance of exterior environment for Alzheimer residents: effective care and risk management. Gestion des soins de santé, 5 (2), 23-29.

Moore, E.O., 1982. A prison environment's effect on health care service demands. Journal of Environmental Systems, 11(1): 17-34.

Nicholson-Lord, D., 1987. The Greening of the Cities. Routledge & Kegan Paul, London.

Office of the Deputy Prime Minister (ODPM), 2002 Planning Policy Guidance 17: Planning for open space, sport and recreation. The Stationery office, London.

Parry-Jones, W.L. 1990 Natural landscape, psychological well-being and mental health. Landscape Research, 15 (2), 7-11.

Pate, R.R., Pratt, M., Blair, S.N., Haskell, W.L., Macera, C.A. and Bouchard, C. 1995 Physical Activity and Health: a recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. Journal of the American Medical Association, 273, 402-407.

Patterson, I. and Chang, M.L. 1999 Participation in physical activities by older Australians: A review of the social psychological benefits and constraints. Australian Journal on Aging, 18, 179-185.

Rice, J.S. and Remy, L.L. 1998 Impact of horticultural therapy on psychosocial functioning among urban jail inmates. Journal of Offender Rehabilitation, 26 (3/4), 169-191.

Rigler, M. and Campbell, J. (1996). Withymoor Village Surgery: a health hive. Dudley Priority Health NHS Trust, Stoubridge.

Rohde, C.L.E. and Kendle, A.D. 1994 Human Well-being, Natural Landscapes and Wildlife in Urban Areas, English Nature, Peterborough.

Roszak, T. 1996 The nature of sanity (mental health and the outdoors) Psychology Today 29, 22-26.

Royal Commission on Environmental Pollution 2007 The Urban Environment. (Cm 7009) The Stationery Office, London.

Sallis, J.F. and Hovell, M.F. 1990 Determinants of exercise behaviour. In Holloszy, J.O. and Pandolf, K.B. (eds) Exercise and Sport Sciences Reviews, Willaims & Wilkins, Baltimore, 307-300.

Sallis, J.F. and Owen, N., 1997 Ecological models. In Glanz, K, Lewis F.M. and Rimer, B.K. (eds) Health behaviour and health education: theory, research, and practice. 2nd. Ed., Jossey-Bass, San Franscisco, 403-424.

Schroeder, H. 1982 Preferred features of urban parks and forests. Journal of Arboriculture, 8, 317-321.

Schroeder, H. and Anderson, L. 1984 Perception of personal safety in urban recreation sites. Journal of Leisure Research, 16, 178-194.

Schroeder, H. and Lewis, C. 1991 in Robdell, P.D.(ed.) Psychological Benefits and Costs of Urban Forests, Proceedings of the Fifth National Urban Forest Conference, Los Angeles, Nov. 15-19, 1991

Seymour, L. 2003 Nature and psychological well-being. English nature research reports 533. English, Nature, Peterborough.

Stearns, F. 1972 The city as habitat for wildlife and man. In Detwyler, T.R. and Marcus, M.G. (eds) Urbanization and Environment: The physical geography of the city, Duxbury, Belmont, 261-277.

Sullivan, W.C. and Kuo, F.E. 1996 Do trees strengthen urban communities, reduce domestic violence? Technology Bulletin. R8-FR56, US Department of Agriculture, ForestService, Southern Region, Southern Station and Northeastern Area, Atlanta, Georgia.

Ulrich, R.S., 1979. Visual landscapes and psychological well-being. Landscape Research 4 17–23.

Ulrich, R.S. 1984. View through a window may influence recovery from surgery. Science, 224: 420-421

Ulrich, R.S. 1990. The role of trees in well-being and health. In P.D. Rodbell. ed. Proc. Fourth Urban Forestry Conference, St Louis, Missouri, 15-19 October 1990.

Ulrich, R.S. Simons, R.F., Losito, B.D., Fiorito, E., Miles, M.A. and Zelson, M. 1991. Stress recovery during exposure to natural and urban environments. Journal of Environmental Psychology, 11: 201-230.

U.S. Department of Health and Human Services 1996 Physical Activity and Health: a Report of the Surgeon-General. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Atlanta, Georgia.

Ward Thompson, C. Aspinall, P., Bell, S. and Findlay, C. 2004 Local open space and social inclusion: case studies of use and abuse of woodlands in Central Scotland. OPENspace report to the Forestry Commission, Forestry Commission, Edinburgh.

Wells, N.M. 2000 At home with nature: effects of "greenness" on children's cognitive functioning. Environment and Behavior, 32, 775-795.

Wells, N. M. and Evans, G.W. 2003 Nearby Nature: A Buffer of Life Stress Among Rural Children. Environment and Behavior, 35, 311-330

West, M.J., 1985. Landscape views and stress response in the prison environment. Master's dissertation. University of Washington, Seattle, WA. (Unpublished.)

Westover, T.N. 1986 Park use and perceptions: gender differences. Journal 0f Park and recreation Administration, 4, 1-8.

Wohlwill, J.F. 1983 Concept of nature: a psychologist's view. In Altman, J. and Wohlwill, J.F. (eds) Behaviour and the natural Environment: Human Behaviour and Environment: Advances in Theory and Research. Plenum, New York, 5-35.