



GREENING THE CONCRETE JUNGLE

The importance of urban trees and woods

We need more native trees and woods in urban areas because:

- It could save £ millions in healthcare costs. Around £110 billion is spent each year in the UK on healthcare, equal to 8.5 per cent of all income. It has been estimated that if every household in England had good access to quality green space it could save around £2.1 billion annually in health care costs.
- The UK also has one of the world's highest rates of childhood asthma, with about 15 per cent of children affected and a higher prevalence in urban areas. Researchers found asthma rates among children aged four and five fell by a quarter for every additional 343 trees per square kilometre.
- 80 per cent of people live in urban areas, but fewer than 10 per cent have access to local woodland within 500m of their home .
- Surface water flooding is a significant risk in urban areas. Trees and woodland can reduce the risk of surface water flooding, which threatens up to 3.8 million homes in the UK. The costs of flooding are thought to be around £2.5 billion annually and could rise to £4 billion by 2035.
- Trees in urban areas support a wealth of wildlife, from the common species to more specialist ones, many of which are in decline and for which urban areas are now their only stronghold.
- Improving green infrastructure and the urban environment helps promote inward investment by creating a more attractive environment for businesses and their staff.

Introduction

More than 80 per cent of us live in urban areas, and many more work or spend a substantial part of our lives in and around towns and cities. They

are important for us socially and culturally, they are the places where we live and work, raise families, socialise and relax, from which we draw identity and pride. The quality of urban areas is of great importance.

Good architecture and design are clearly essential, but of equal importance is the quality of the green space. Public parks and gardens, the landscaping around buildings, street trees and highway verges, the wilder corners along river banks and canals, on railway sidings and industrial sites, and our own gardens.

Trees are often the dominant features of green space; their stature and beauty make them the defining elements of urban spaces. They cast shade in the heat of summer, provide shelter from the rain and wind, help to keep the air clean and breathable, support wildlife, and add value to the culture and economy of our towns and cities.



Urban trees, woods and health

Trees and woods are vital to health and wellbeing. There is a strong relationship between the quality of urban green space and people's health and wellbeing^{1, 2, 3}.

^{1, 2, 3} Sadler, J.P., Bates, A.J. & Hale, J. (in press) Bringing cities alive: the importance of urban greenspaces for people and biodiversity. Urban Ecology (ed K. J. Gaston). CUP

Maas, J., Verheij, R.A., Groenewegen, P.P., de Vries, S. & Spreeuwenberg, P. (2006) Greenspace, urbanity and health: how strong is the relation? Journal of Epidemiological Community Health, 60, 587-592.

Maas, J., Verheij, R. A., Spreeuwenberg, P. & Groenewegen, P. P. (2008). Physical activity as a possible mechanism behind the relationship between greenspace and health: a multilevel analysis. BMC Public Health, 8, 206.



Photo City of London

Increasing tree cover mitigates some of the effects of a warming climate, reduces the impacts of poor air quality, and increases the opportunities for people to adopt a healthy lifestyle.

Urban heat island effect

Increasing tree cover in urban areas can help mitigate the 'urban heat island effect'. This occurs as the buildings, concrete and other hard surfaces such as roads act as giant storage heaters, absorbing heat during the day and releasing it at night. The resultant effects can be dramatic; on some days there is a difference of as much as 10°C between central London and its surrounding suburbs⁴. Projections for our changing climate suggest this problem will get markedly worse.

Higher temperatures increase ground level ozone exacerbating the symptoms of chronic respiratory conditions. In addition prolonged high temperature can bring on cardiovascular or respiratory failure or dehydration, particularly amongst the elderly, very young or chronically ill⁵. In the 2003 summer heat wave over 2,000 people died in Britain alone and more than 35,000 died across Europe as a result of the heat.

Green space, and trees in particular, provide both direct shade and reduce the temperature through the cooling effect of evaporation from the soil and plant leaves. One mature tree transpires up to 450 litres of moisture a day – equivalent to five room-sized air conditioners left on for 19 hours⁶.

⁴ BBC web site, Urban Heat Islands. Available at: http://www.bbc.co.uk/weather/features/understanding/urban_heat_islands.shtml [accessed 9th June 2010]

⁵ Shaoni Bhattacharya (2003) European heatwave caused 35,000 deaths, *New Scientist online*, 10th October 2003, Available at: <http://www.newscientist.com/article/dn4259-european-heatwave-caused-35000-deaths.html> [accessed 9th June 2010]

⁶ Nicholas-Lord, D. (2003) *Green cities and why we need them*, New Economics Foundation, London, p.13. Available at: <http://www.urbanwildlife.org.uk/assets/userfiles/000074.pdf> [accessed 9th June 2010]



Photo Stephen McLaren

Research at the University of Manchester using computer modelling has shown how increasing urban green space can mitigate urban heat island effect. Without any increase in green space, by 2050 the temperature in Manchester is projected to rise by 3°C. However if the amount of green space increases by just 10 per cent this could potentially eliminate the effects of climate change on increasing surface temperatures. However, reducing tree cover by the same percentage could lead to an increase of 8.2°C under some scenarios⁷.

Reducing air temperature is only part of the picture. Radiant heat – direct sunlight – is often more important in terms of people's comfort, and carries a health risk when it results in sunburn. Children's skin is more sensitive to UV damage and the amount of sun exposure during childhood is thought to increase the risk of developing skin cancer in adult life. Shading is particularly important in school grounds and where children play. Providing direct shade using trees in playgrounds reduces the risks from UV radiation⁸.

⁷ Handley, J and Carter, J (2006) *Adaptation strategies for climate change in the urban environment*, Draft final report to the National Steering Group, Centre for urban and regional ecology, University of Manchester. Available at: http://www.sed.manchester.ac.uk/research/cure/downloads/asccue_final_report_national_steering_group.pdf [accessed 9th June 2010]

⁸ Heisler, G.M., Grant, R.H., 2000. Ultraviolet Radiation, Human Health, and the Urban Forest. *U.S. Department of Agriculture*, Newtown Square, PA, General Technical Report pp. 35.

Air quality

Trees and woodland improve air quality⁹ by adsorbing pollutants such as sulphur dioxide and ozone, intercepting harmful particulates from smoke, and dust and of course release oxygen through photosynthesis. This helps to alleviate the problems caused by chronic respiratory disease.

Each year, 24,000 people in the UK die prematurely from air pollution¹⁰. Research by the British Lung Foundation suggests that one in every seven people in the UK is affected by lung disease, almost 8 million people¹¹. The UK also has one of the world's highest rates of childhood asthma, with about 15 per cent of children affected and a higher prevalence in lower socio economic groups in urban areas¹². Columbia University researchers found asthma rates among children aged four and five fell by a quarter for every additional 343 trees per square kilometre¹³.

Trees will have a proportionately greater effect in urban areas, where they are close to sources of pollution and nearer to people who might be affected. Street trees in particular, close to sources of pollution, can intercept particles from traffic and other emissions¹⁴. It is important to remember that despite the significant benefits of trees on air quality, some people do suffer allergies to tree pollen, particularly in the early spring¹⁵.

⁹ Nowak, D., Crane, D. & Stevens, J. (2006) Air pollution removal by urban trees and shrubs in the United States, *Urban Forestry Urban Greening*, 4, pp. 115-23.

¹⁰ HM Government (1998). *UK Environmental Accounts*. HMSO, London

¹¹ British Lung Foundation. Facts about respiratory disease. Available at: <http://www.lunguk.org/media-and-campaigning/media-centre/lung-stats-and-facts/factsaboutrespiratorydisease.htm> [accessed 9th June 2010]

¹² Townshend, J., Hails, S. & McKean, M. (2007) Diagnosis of asthma in children, *British Medical Journal*, 28, 335(7612), pp. 198-202.

¹³ Lovasi, G., Quinn, J., Neckerman, K., Perzanowski, M. & Rundle, A. (2008) Children living in areas with more street trees have lower prevalence of asthma. *Journal of Epidemiology & Community Health*, 62(7), pp. 647-649.

¹⁴ Impens, R.A. & Delcarte, E. (1979) Survey of urban trees in Brussels, Belgium. *Journal of Arboriculture*, 5, 169-176.

¹⁵ Allergy clinic. Available at: <http://www.allergyclinic.co.uk/pollens.htm> [accessed 9th June 2010]

CASE STUDY – Greenstreets, Manchester

Around two thirds of the trees in urban areas are in private and less accessible public grounds – gardens, school grounds, allotments and churchyards. Maintaining and increasing this contribution is vital and provides opportunities for people to take action to increase tree cover.

Green Streets is a joint Red Rose Forest and Community Forests North West project in partnership with Manchester City Council, Salford City Council, Trafford Council, the Forestry Commission, North West Development Agency and Untied Utilities.

Green Streets uses tree planting and greening projects to improve the quality of life for urban communities, fostering a sense of ownership and empowering them to change their neighbourhoods for the better.

Green Streets works at the heart of the community to promote tree planting as a means of tackling a range of issues. The Green Streets Team has been working with local communities in Manchester and Trafford since 2001 and in Salford since 2003. Since then the project has been introduced to Merseyside and Teesside.



Red Rose Forest

Green space and healthy lifestyles

Proximity of green space to people's homes increases the likelihood of the residents choosing walking over other forms of transport^{16,17,18}. With nearly a quarter of both men and women in the UK classed as obese, the Government is looking at the role of trees, woods and other green space in encouraging physical activity.

^{16,17,18} Humpel, Nancy, Neville Owen and Eva Leslie (2002). Environmental factors associates with adults' participation in physical activity. *American Journal of Preventive Medicine*. 22, 188-199.

Giles-Corti, Billie, Melissa H. Broomhall, Matthew Knuiam, Catherine Collins, Kate Douglas, Kevin Ng, Andrea Lange, and Robert J. Donovan (2005). Increasing walking: how important is distance to, attractiveness, and size of public open space. *American Journal of Preventative Medicine* 28 (2S2), 169-176.

Giles-Corti, B. and Donovan, R. J. (2002). The relative influence of individual, social and physical environment determinants of physical activity, *Soc. Sci. Med.*, 54 (12), 1793-1812.

Over a third of people are on incapacity benefits because of mental health problems or muscular or skeletal disorders – both of which can respond to tailored physical activity programmes. If just one per cent of people on incapacity benefit could be helped back into the workplace through active lifestyles, it would save the country £67 million a year¹⁹.

The Campaign for Greener Healthcare and the initiative to establish an NHS Forest²⁰ illustrate a growing consensus amongst health professionals of the importance of trees to people's health and wellbeing. With plans to plant a tree for every one of the 1.3 million NHS employees, the campaign endorses the role of trees in air quality, improved health outcomes and reducing negative environmental impact.

With 80 per cent of people living in urban areas, but fewer than 10 per cent having access to local woodland within 500m of their home²¹, it is vital that the Government sets targets for new woodland that will meet the need near where people live.

¹⁹ Department of Health press release, 13th August 2009, downloaded at: http://www.dh.gov.uk/en/News/Recentstories/DH_104254

²⁰ The Campaign for Greener Healthcare, downloaded at: <http://www.greenerhealthcare.org/nhs-forest>

²¹ The Woodland Trust (2004) *Space for People*. Available at: <http://www.treeforall.org.uk/AboutTreeForAll/WhyTreeForAll/Science/spa-ceforpeople.htm> [accessed 9th June 2010]

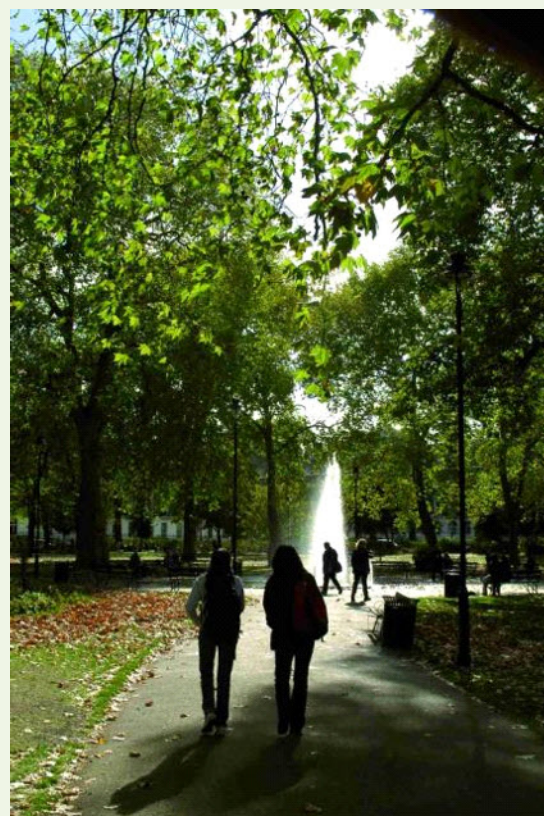


Photo Joe Miles

Mental health

There is evidence that trees not only provide physical benefits but can also be important to mental health.

Trees and woods can have a restorative and therapeutic effect on the mind²². Studies have looked at the beneficial effects of natural surroundings on children with Attention Deficit Hyperactivity Disorder²³. Trees have been found to enhance mood, improve self esteem and lower blood pressure. The quality of natural features and trees in the city helps reduce mental fatigue and stress²⁴, and has important benefits for child development²⁵.

Research in the Netherlands and Japan indicated that people were more likely to walk or cycle to work if the streets were lined with trees and feel better and live longer as a result²⁶.

It is hoped that in coming years there will be an increasing emphasis towards long-term disease prevention through adopting healthy lifestyles. Around £110 billion is spent each year in the UK on healthcare, equal to 8.5 per cent of all income. It has been estimated that if every household in England had good access to quality green space it could save around £2.1

²² Hartig, T., Evans G.W., Jamner L.D., Davis D.S., and Gärling T. (2003). Tracking restoration in natural and urban field settings. *Journal of Environmental Psychology* 23, 109-123.

²³ Taylor, AF et al (2001) 'Coping with ADD, The Surprising Connection to Green Play Setting', *Environment and Behaviour*, Vol. 33, January 2001, pp 54-77

²⁴ 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

²⁵ Kaplan, R. and Kaplan, S. (1989). *The Experience of Nature: A Psychological Perspective*. Cambridge University Press, Cambridge

²⁶ Van den Berg, A.E., Koole S.L., and van der Wulp N.Y. (2003). Environmental preferences and restoration: (how) are they related? *Journal of Environmental Psychology* 23, 135-146

²⁷ Natural England (2009) *Our Natural Health Service – the role of the natural environment in healthy lives*. Page 8. Available at: http://www.naturalengland.org.uk/Images/nhsmanifesto_tcm6-12022.pdf [accessed 18th May 2010]

Photo Ivor Samuels



Trees and flooding

An increase in hard surfaces in urban areas, unable to absorb rainfall, often means drains are overwhelmed and water quickly collects on the surface rushing down streets and over paving. Following the 2007 flooding, paving over of gardens was identified as having a major impact on drainage of surface water in urban areas.

Around two-thirds of the 2007 flooding was a result of surface water, with 3.8 million homes in England susceptible^{28, 29}. The insurance cost of the 2007 floods was thought to have been around £3 billion³⁰, but the Environment Agency expects the regular annual cost of damage to property alone to be in excess of £1 billion. When the cost of further disruption, damage to infrastructure and loss of business is added this increases to £2.5 billion and could rise to £4 billion by 2035³¹.

Interception of rainfall by trees in urban areas can be critical in reducing the pressure on the drainage system³² and lowering the risk of surface water flooding. Slowing the flow increases the possibility of infiltration and the ability of drains to take away excess water. Scientific modelling in Greater Manchester suggests that increasing or decreasing the amount of tree cover affects surface water run-off - increasing tree cover in urban areas by 10 per cent reduces surface water run-off by almost 6 per cent^{33, 34}.

^{28, 29} Environment Agency (2009) *Flooding in England – a national assessment of flood risk*, downloaded 29th July 2009. Available at: <http://publications.environment-agency.gov.uk/pdf/GEHO0609BQDS-E-E.pdf> [accessed 9th June 2010]

The Pitt Review - Final Report, Cabinet Office. Available at: http://archive.cabinetoffice.gov.uk/pittreview/thepittreview/final_report.htm [accessed 9th June 2010]

³⁰ Newratings, 24th June 2007, UK floods likely to cost £3bn in insurance. Available at: http://www.newratings.com/en/main/company_headline.m?id=1577047 [accessed 9th June 2010]

³¹ Environment Agency, 'New reports highlight GBP20Bn investment over 25 years is needed to protect England from flooding' downloaded 29th July 2009 at: <http://www.environment-agency.gov.uk/news/108705.aspx> [accessed 9th June 2010]

³² Gill, S (2009) 'The Essential role of trees – adapting cities to climate change by managing high temperatures and reducing pressure on drainage systems', in proceeding *Trees and Urban Climate Adaptation: a social agenda for liveable cities*, 19th November 2009

The financial benefits of tree cover in water management have been quantified for towns in California³⁵. This suggests that broadleaved trees in urban areas in the UK are already playing an important role in moderating run off and reducing expenditure on other forms of water management, in addition to the other benefits trees bring.

Many places have seen a decline in numbers of older trees with large spreading crowns, replaced with smaller, more manageable alternatives. These smaller crowned trees have less capacity to intercept rain. A report for Government during 2008, 'Trees in Towns II' challenged this trend highlighting the "undeniable" importance of mature and ancient trees³⁶.

Recent years have also seen a decline in the numbers of trees planted in urban areas which, combined with a loss of trees planted during the Victorian era, should send a warning signal about the future for urban tree cover³⁷. Around two thirds of the trees in urban areas are in private or less accessible public grounds – such as gardens, school grounds, allotments and churchyards. Maintaining and increasing tree cover is vital.

Evidence from 'Trees in Towns II'³⁸ shows a lack of sufficient investment and planning from some local authorities in maintaining and expanding the tree cover. The report highlights the need for specialist staff and a clear tree strategy in order to take full advantage of the many benefits trees can bring to people living in urban areas.

³⁵ Xiao, Q and McPherson, E.G. (2002) 'Rainfall interception by Santa Monica's municipal urban forest, *Urban Ecosystems*, 6, pp 291-302

³⁶ Trees in Towns II, a report for Department of Communities and Local Government. Available at: <http://www.communities.gov.uk/publications/planningandbuilding/treesintownsii> [accessed 9th June 2010]

³⁷ Britt, C. and Johnston, M. (2008) *Trees in Towns II - A new survey of urban trees in England and their condition and management*, a report for the Department for Communities and Local Government. Available at: <http://www.communities.gov.uk/documents/planningandbuilding/pdf/treesintownsii.pdf> [accessed 9th June 2010]

³⁸ Britt, C. and Johnston, M. (2008) *Trees in Towns II*, DCLG, downloaded at: <http://www.communities.gov.uk/documents/planningandbuilding/pdf/treesintownsii.pdf> [accessed 9th June 2010]

Biodiversity

The world is losing biodiversity at an accelerating rate, due largely to a combination of habitat loss and climate change. Aside from any intrinsic value, biodiversity is important for helping to maintain the stability of natural systems and in the supply of a range of 'ecosystem services'. These include flood attenuation, pollination of crop plants, soil conservation and climate regulation. Native woods and trees in urban areas, including gardens can be vital to a wide range of wildlife, providing food, shelter and places to breed.

As well as remnant pockets of woodland and more natural space, urban areas have parks, private gardens and planted shrubberies which can support a large number of invertebrate and bird species, especially in the suburbs. These include uncommon species, including for example juniper fauna which has adapted to garden junipers³⁹.

An important characteristic of urban areas is their mosaic of habitats. Industrial sites such as demolition sites, disused railway lands or unused industrial land can be rich in species. Later stages of succession through to woodland contain many uncommon invertebrates with flies, bees and wasps, including some parasitic species and sawflies.

Trees in urban areas support a wealth of wildlife, from the common, such as robins, blackbirds and tits, to bats and bees, many of which are in decline. Native tree species are particularly important in supporting wildlife – native willows for instance may support over 450 species, many of which are insects that provide food for birds⁴⁰.

The Convention on Biological Diversity is an international agreement to which the UK is signatory. The UK Biodiversity Action Plan is the government's response to the convention, and finds local expression in local biodiversity action plans (LBAPs).

The LBAPs include measures to maintain and increase managed urban green space as part of protecting and improving biodiversity. These include opportunities to enhance biodiversity in all major developments through provision of green space, and working with local communities to identify and develop new and existing managed green space.

³⁹ UK Biodiversity Action Plan. Habitat Statement – Urban. Available at: <http://www.ukbap.org.uk/ukplans.aspx?ID=754> [accessed 10th June 2010]

⁴⁰ Trees for Cities. Trees and urban biodiversity. Available at: <http://www.treesforcities.org/page.php?id=490> [accessed 10th June 2010]

The planning system should protect and maintain existing areas of conservation interest, but should also provide opportunities for developing wildlife and its habitats. Tree planting and woodland creation, including by individuals, local communities and schools, can help to create new habitat to meet targets under the LBAPs.

Photo WTP/L/Steve Waters



Photo City of London



Photo Sue James & LB



Photo Capita Lovejoy/Trees & Design Action Group

Civic amenity and economic benefits

The beauty of towns and cities arises from a mix of good architecture and design, and the landscape of public spaces. There is strong evidence that improving green infrastructure and the urban environment helps promote inward investment by creating a more attractive environment for businesses and their staff⁴¹.

Trees are a vital element in providing structure and texture to green infrastructure, and yet this has been eroded in many places. Maintaining what we have, ensuring future generations of trees to replace those that are being lost, and imaginative creation of more places rich in trees is central to making towns and cities places people want to live in, visit and do business in.

Trees are multi-purpose tools for urban adaptation and design. Any measures which undermine current levels of tree cover are likely to be damaging to adaptation, whereas well planned and well maintained urban tree cover can greatly increase the adaptive capacity and resilience of the city.

⁴¹ *The economic benefits of Green Infrastructure: Developing key tests for evaluating the benefits of Green Infrastructure Natural Economy Northwest*, Commissioned from ECOTEC by The Mersey Forest on behalf of Natural Economy Northwest

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