



Preparing for climate change; integrating trees into community adaptation strategies

Supplementary Information Note to accompany the BTC 2010 RICS presentation series

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Through the Climate Change Act 2008 (www.opsi.gov.uk), the UK is committed to sweeping sustainability improvements that are going to affect us all. There is a growing public and political awareness of the green relief that trees provide, and their value to our national response to climate change. The task of realising those benefits will fall to land-management professionals overseeing the design of new developments and the upgrading of existing infrastructure. This Information Note reviews what trees can bring to our communities and explores the opportunities to boost this dwindling, but extremely valuable national resource.



The state of the nation's trees

Most of us intuitively know that trees make a real difference to the quality of our lives. All over the world, neighbourhoods with mature trees are the most affluent and the most sought-after; trees make communities look better, feel better and create a focus for civic pride. In contrast, high density development with poor quality greenspace look unattractive, feel uncomfortable and often bring out the worst in human nature. Visualising a familiar street with trees and then imagining it with all the trees gone demonstrates the point; the difference is instant and obvious,

although the precise reasons why are not quite so clear.

Tree benefits are multiple and varied, the most obvious being buffering urban temperature extremes, improving human wellbeing, slowing rainwater runoff, enhancing ecological diversity and ameliorating particulate pollution. However, such 'woolly' characteristics are particularly awkward to reliably quantify and value, which makes it difficult to properly factor them into an urban decision-making process that is value-driven. Accountants and managers understand pound sterling figures very well, but it is much

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trickier to appreciate abstract values such as 'looks nice', 'feels better' and 'human wellbeing'.

Valuing the positive attributes of trees is such a challenge that it is often easier to ignore them. Traditionally, the majority of trees have been given a low priority in the allocation of resources, with other more pressing demands such as social services and grey infrastructure taking the bulk of the funds. This failure to appreciate the potential of trees and the constant budgetary pressure has resulted in a dramatic deterioration of our urban

landscape character. From the Victorian legacy of large suburban properties with similar scale trees, a focus on using space more efficiently has driven design towards smaller plots with fewer and smaller trees. Across the country, urban landscape character is shifting from a heritage of oak, beech and pine, to a future of cherry, thorn and rowan. While the loss of tropical rainforests has been getting all the headlines, urban deforestation has been gaining momentum in the UK, unnoticed in our own backyard!



Failed strategy: Failed sustainability strategies are not new. This 1970s development had real potential for big trees with space to mature, similar to those that can be seen on the skyline. Instead, it delivered a landscape of cherries, thorns and rowans, with no potential to contribute to climate adaptation.

The case for more trees in our streets

Historically, trees were valued in our communities because people instinctively knew that a world with trees was probably better than one without. However, as modern society evolved, this innate wisdom has demonstrably struggled to prevail, manifest now in a debilitated green infrastructure throughout most of our cities. No matter how sensible and how wide the appeal, intuitive aspirations alone have proved insufficient to deliver a sustainable modern society. It seems that

hard evidence has to be the precursor for action and the main modern driver for producing that proof is climate change.

At a political level, the case for climate change is made. Anxieties over how these changes may affect our lives have fuelled a considerable research effort into how we can reduce the adverse impacts on our lifestyle. Detailed information on how trees can help is still patchy, but there is an emerging body of research confirming that they are much more valuable than

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we first thought. Recent simulations from the University of Manchester are revealing that trees have real potential to make our communities more resilient to the impacts of climate change (Gill, et al, *Adapting Cities for Climate Change: The Role of Green Infrastructure*, Built Environment, 2007). Most notably, they can significantly reduce urban temperature extremes and buffer surges in rainwater runoff, creating safer and more comfortable living conditions.

Through the urban heat island effect, a consensus of predictions is that global warming induced temperature rises in excess of 3°C can be expected in our densest urban areas during the next century. Trees, by creating shade and absorbing heat, combined with their verticality and large surface area in contact with the air, are very efficient at reducing temperatures in the extremes of summer. Indeed, one of the most significant indications from the Manchester research was that trees are so effective at temperature buffering that an increase of 10% in urban tree canopy cover and green space may be sufficient to offset all but the most extreme predicted temperature rises. Furthermore, trees, through their size and leaf surface area, are particularly effective at slowing

the rate that water reaches the ground and how much of it flows away. Traditionally, rainwater has been treated as more of a problem than an asset, with the focus on draining it out of cities quickly rather than storing it locally as a resource. However, as hydrologists begin to understand its value and the harm that rapid flow causes, trees and their rooting environment are being recognised as a viable buffering mechanism.

In addition to these benefits, there is accumulating evidence of an even more compelling reason why more trees makes sense; they directly and positively affect the human spirit and condition. Researchers are discovering that trees can measurably improve our psychological and physical wellbeing; people who live near trees are likely to be healthier and happier. The recent Natural England analysis of the NHS *Walking the Way to Health Initiative* (www.whi.org.uk) showed that, for every £1 spent on access to greenspace, there was more than £7 of benefit in terms of averted health costs. This and other similar investigations are confirming that trees offer multiple benefits to our communities, with the potential to deliver significant rates of return on investment.



Rainwater runoff buffering: After a heavy shower, the ground beneath this cedar is still dry; much of the water never reaches the ground, which is why trees are effective at buffering rainwater runoff

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The emerging policy framework

The UK Government has responded to growing concerns about climate change and sustainability through the Climate Change Act 2008. It received cross-party support, which makes it unlikely that future governments will deviate from its core principles. The Act commits us to challenging targets for reducing carbon emissions (a reduction of 80% on the 1990 levels by 2050), with equally tough interim figures (a reduction of 34% achieved by 2020). Although the focus of the Act is on climate mitigation through carbon management, it also addresses climate adaptation, i.e. reducing the impacts on people and their living conditions (clauses 58 and 59).

Furthermore, this recognition of the importance of trees and green infrastructure in adapting to climate change is repeatedly advocated in the latest government consultations on planning for climate change, *Planning for a Low Carbon Future in a Changing Climate* and *Planning for a Natural & Healthy Environment* (www.communities.gov.uk). At the local planning authority (LPA) level, this will be administered through the National Performance Indicator mechanism, with *NI188*

Planning to Adapt to Climate Change providing the detail (www.defra.gov.uk). Its rationale commits LPAs to be "...sufficiently prepared to manage risks to service delivery, the public, local communities, local infrastructure, businesses and the natural environment from a changing climate, and to make the most of new opportunities." Through the administration and planning function of each LPA, all of us will be contributing to the national climate change adaptation response whether we like it or not!

The practicalities of increasing urban canopy cover

If this national effort is to succeed, and it is all our best interests that it does, it will require the active engagement of land-management professionals to appreciate the value of trees and embrace their integration into our existing and emerging urban landscapes. Delivering the ideal of more trees in our streets is an obvious aspiration, but the practicalities are a lot more daunting. Fortunately, innovative managers and responsive private enterprise around the world are developing an increasing array of products and examples of good practice, with exciting potential to assist in this task.



Leadership in climate adaptation: Many US cities are leading the way in preparing their communities for the extremes of global warming.

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Although there is a common perception that the US is inconsistent in the extreme on the broader global warming issues, it has localised pockets of excellence that provide very useful indicators on how the UK might capitalise on work that has already been done. In particular, the mayoral nature of the leadership in US communities has allowed environmental visionaries to influence municipal strategies in favour of a sustainability agenda. The nearest example is New York City that has a pioneering climate change plan, with trees high up the list of priorities. Funds of more than £140m have been allocated over 10 years to plant and maintain one million trees as part of their sustainability strategy (www.milliontreesnyc.org). Furthermore, NYC knows its canopy cover is 24% consisting of 5.2 million trees, it is 74% stocked and is ranked fifth in the US league of greenest cities. In comparison, London clearly has aspirations in this direction as set out in *The draft climate change adaptation strategy for London* (www.london.gov.uk). However, its targets of 10,000 new trees over the next four years and a 5% increase in canopy cover by 2025 confirm we still have some way to go before the US level of ambition is matched!

Another US innovation that has realistic potential for constructive application in the UK is a suite of urban forest management software tools called i-Tree (www.itreetools.org). Its programmes convert the 'ecosystem services' provided by trees into cash equivalents that can then be used to demonstrate value and set priorities for more effective decision-making. Although developed by the US Forest Service, it is now being trialed in the UK, with the latest uptake from Torbay Council participating in a £120,000 pilot scheme.

On a practical level, another product likely to have a big impact on urban greening is the Silva Cell from DeepRoot (www.deeproot.com). The Silva Cell is an emerging product with good potential for improving the success and viability of new trees in the toughest urban environments. It is a steel-reinforced plastic frame that is installed beneath hard surfacing and capable of supporting heavy vehicle loading. The frame voids are filled with soil, which allows roots to grow and trees to flourish where they would have struggled using traditional planting techniques. The cells can be stacked in variable configurations to provide a continuous rooting environment, tailored to the specific requirements of each site. In addition to

providing a rooting medium, it can also absorb rainwater runoff to buffer the surges after storms. This slowed water release mimics the flow from natural areas without surfacing; an additional benefit from an innovative product.



DeepRoot: This Silva Cell installation in the US supports the finished concrete sidewalk on the reinforced cells, which allows tree roots to thrive in good quality soil beneath. The soil also acts as a temporary storage site for surges in rainwater runoff.

An emerging success story from the UK relates to our high failure rate for newly planted trees. It is tough on the streets for new trees and many die before they get to middle age or maturity. Barcham trees (www.barcham.co.uk) identified that small improvements in the way trees are selected, grown in the nursery and planted in the ground have the potential to wipe out planting failures and significantly reduce establishment costs. Traditionally, nursery production has focused on the fastest growing trees in the smallest space to maximise the financial return at the nursery gate. However, the resultant tall, thin

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trees are reliant on intense watering/fertilisation regimes. They do not cope well with harsh street conditions and often die or never flourish. Barchams are researching the production of 'tough trees' that can hit the streets running and cope

with whatever is thrown at them. They are more expensive to produce, but promise significant savings during their life in the streets because they grow better, with lower establishment costs.



'Tough trees': Mike Glover of Barcham Trees (www.barcham.co.uk) explains how research is showing that genetically selected trees grown at wider spacing on low intensity watering regimes are much better at surviving and require much less aftercare, making them much cheaper in the long run.

Conclusions

With the quality of our urban canopy cover in decline, the UK is not in good shape to adapt to the anticipated extremes of climate change or achieve a more sustainable community infrastructure. Central government has recognised these shortcomings, setting in place a world-class legal framework for action, with the potential to reverse this position. Research is confirming that trees deliver an impressive array of essential community services in a very cost-effective manner. The challenge for land managers is to convert this emerging wisdom into results on the ground, i.e. more trees in our streets.

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