Introducing England's urban forests

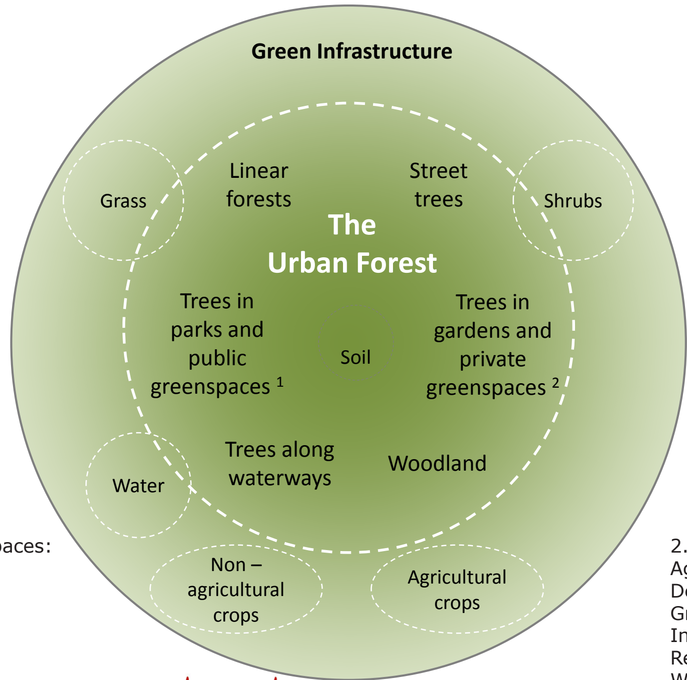
Definition, distribution, composition and benefits

The urban forest comprises all the trees in the urban realm – in public and private spaces, along linear routes and waterways and in amenity areas. It contributes to green infrastructure and the wider urban ecosystem.

Our 'vision' for resilient urban forests challenges those who contribute to and manage the urban forest to 'know the scale and value of their urban forest' (Challenge 1) and 'have a target to increase canopy cover' (Challenge 3). A complete inventory of England's urban tree resource is not currently available. The last comprehensive analysis of the structure of England's urban forests (2008) now requires updating. Producing detailed datasets for individual towns and cities is a basic data requirement for their effective management as resilient forests, for setting baselines from which to develop goals and for monitoring progress.

This document provides valuable information for those concerned with these challenges. It provides a clear definition of the 'urban forest' and details tools and datasets for measuring its distribution and composition. It sets out how urban forests benefit society and summarises knowledge on their structure and extent of distribution across England. It presents ideas on how you can get involved and it encourages all those with an influence in urban tree management to meet these challenges through continued uptake of i-Tree Eco and the complementary methodologies and datasets described herein. This can be achieved through action by public and private organisations, partnerships and citizen science. In so doing, England's urban forests can be expanded and made resilient.

Figure 1. The urban forest and its relationship to green infrastructure (GI). The urban forest comprises all the trees in the urban realm – in public and private spaces, along linear routes and waterways, and in amenity areas. The urban forest contributes to GI and the wider urban ecosystem.



1. Examples of public greenspaces:
Civic and amenity spaces
Green corridors
Outdoor sports facilities
Parks and gardens
Urban orchards

2. Examples of private greenspaces:
Agricultural land
Derelict lands
Green roofs
Institutional grounds
Residential gardens
Water management spaces

Introduction

The Government's Forestry and Woodland Policy Statement (Defra, 2013) recognises the key role of the urban forest in engaging people with trees and woodlands on their doorstep. It notes the importance of valuing our urban trees, using tools such as i-Tree (see below). It highlights the wide range of stakeholders who help to deliver the benefits of trees and woodlands in and around urban areas and recognises that trees are good for people. It states that trees and woodlands can be settings for health, education and recreation and be a focus for community involvement and access.

A 'vision' for resilient urban forests has been set out by the Urban Forestry and Woodlands Advisory Committee's (FWAC) Network (UFWACN, 2016). The Network is now working with other organisations to adopt this Vision as a common way forward. The Vision is organised around eight themes recognising the breadth of positive impact that urban forests contribute to society: 1) Strategic planning and infrastructure; 2) Climate change; 3) Natural environment; 4) Human health and quality of life; 5) Planning and development; 6) Economy and growth; 7) Value and resources; and 8) Risks and resilience. It also raises three challenges to those who contribute to and manage the urban forest.

These challenges are:

1. Do you know the scale and value of your urban forest? Are you harnessing the power of new tools, big data and volunteer commitment to measure the true value of your trees?
2. How well do you support the care of our existing urban forest? Are you engaging with the enthusiasm of local communities and businesses for the protection, improvement and expansion of their urban forest?
3. Do you have a target to increase tree and canopy cover in your town or city? Will you be planting more trees?

'Introducing England's Urban Forests' provides valuable information to those concerned with challenges 1 and 3.

Detailing the distribution of an urban forest, whether it is in private or public ownership, is a basic data requirement for its management. It allows the manager to set a baseline from which to develop goals and for monitoring progress. Here the latest **tools and datasets** for measuring urban forest distribution are discussed together with a review of the canopy extent of some of England's towns and cities.

The structure and composition of England's urban forests is discussed in the final section. By measuring the structure of an urban forest - the tree species present, their size and condition - the benefits that the urban forest delivers to society can be determined, their value calculated and, in some cases, expressed in monetary terms.

What is an urban forest?

There are many definitions of 'urban forest'. To pick just a few, the urban forest:

- 'occupies that part of the urban ecosystem made up of vegetation and related natural resources found in urban, suburban and adjacent lands, regardless of ownership' (Moeller, 1977)

- Is the 'ecosystem of trees and other vegetation in and around communities that may consist of street and garden trees, vegetation within parks and along public rights of way and water systems (American Forests, 2016)

- refers to 'all forest and tree resources in (and close to) urban areas' (Konijnendijk, 2003).

Most definitions include reference to location (city, peri-urban, street, public/private), natural resources (trees, shrubs, grass, soil, water), people (including communities and organisations), activity (such as management and conservation) and benefit (environmental, ecological, sociological, psychological and economic) (Brown, 2007). Some include reference to science, technology or art. Many focus simply on the woodland-forest element, though the majority consider woody vegetation, non-woody structures and general greenspace elements.

Diversity in natural resources is emphasised in the most recent definition of the urban forest: "all trees, shrubs, lawns and pervious soils found in urban areas" (Dobbs et al., 2014).

However, as urban forests provide society with many benefits a useful definition should reflect this functionality and emphasise that the urban forest is part of green infrastructure (GI) and the wider urban ecosystem. Adapting these, our adopted definition of the urban forest is:

'the urban forest comprises all the trees in the urban realm – in public and private spaces, along linear routes and waterways, and in amenity areas. It is part of green infrastructure and the wider urban ecosystem'

Figure 1 presents the urban forest and its relationship to the wider concept of GI. Shrubs, grass and water are important components of GI and in many definitions contribute to the urban forest, and these overlaps are presented in Figure 1.

This definition should not be confused with 'urban forestry', which is defined as "the management of trees for their present and potential contributions to the physiological, sociological and economic well-being of urban society" (Jorgensen, 1970). Urban forestry is inherently concerned with the optimisation of services and benefits provided to people by the urban forest. The term urban forestry was coined in the United States in 1894 and came into broad use in Europe in the 1990s (Miller et al., 2015).

What are the benefits of the urban forest?

Urban forests provide a range of benefits and services, often termed ecosystem services, that help alleviate problems associated with urbanisation. The UK National Ecosystem Assessment (2011) provided a framework to examine these goods and services. Later, the UK National Ecosystem Assessment Follow-on (2014) developed these further, providing four categories:

- *Provisioning* (*including cultural provisioning*) *services* that can be provided by the urban forest include the production of food products (berries and nuts, and fruit from urban orchards) and woodfuel for local heating.

- *Regulating services* provided by the urban forest include the cooling of local climates, interception of rainwater and the regulation of storm water run-off, cleaning air through the trapping of particulate air pollution, and the sequestration of carbon.

- *Cultural services* have been defined as the environmental spaces and cultural practices that give rise to material and non-material human well-being benefits (Church et al., 2014). It is the interaction between place and practice that give rise to these benefits, therefore O'Brien and Morris (2013) proposed six well-being categories to represent cultural services: health, nature/ landscape connections, social development/ connections, education/ learning, economy, and cultural significance. The urban forest provides benefits to society within each of these categories.

- *Supporting services* are intermediate services necessary for the production of the other ecosystem services. As such, they are often presented as over-arching the other three categories. In an urban setting, they include the cycling of nutrients and the provision of habitat for wildlife.

Ecosystems including urban forests also provide *dis*services, with a negative impact for human health and well-being (Dobbs et al., 2014). For example, some tree and plant species are a common cause of pollen allergies, or provide habitat for insects such as the larvae of the Oak Processionary Moth whose hairs are a hazard to human health. Some tree species emit biogenic volatile organic compounds (BVOC) which, on hot sunny days, may react in the atmosphere to form ozone and particulates detrimental to human health. Disservices can also arise through people's use and abuse of the urban forest, such as littering, graffiti or anti-social noise. Sustainable management practices including informed species selection and putting the right tree in the right place can help reduce many disservices.

Ecosystem services and disservices typically associated with the urban forest are presented in Table 1.

Table 1. Ecosystem services associated with the urban forest, arranged according to the categories: regulating, provisioning, cultural, supporting and disservices. Those services and disservices only delivered in small quantities in the urban setting are presented in parenthesises.

Regulating	**Provisioning**	**Cultural**	***Dis*services**
Air purification Carbon storage and sequestration Noise mitigation Storm water regulation Temperature regulation (Disease / pest regulation) (Pollination / seed dispersal) (Soil protection)	Woodfuel (Biological / genetic resources) (Food)	Health Nature/ landscape connections Social development/ connections Education/ learning (Economy) Cultural significance	Decrease in air quality Blocking of light / heat Damage to infrastructure Fruit and leaf fall Fear (stimulation of) Allergies (stimulation of)
Supporting (Intermediate)			
Habitats for species/biodiversity (Soil formation) (Nutrient cycling) (Water cycling) (Oxygen production)			

Understanding England's urban forests: how are they distributed?

A complete inventory of England's urban trees is not currently available, however a range of tools and datasets are available that can be used to present an illustrative national picture through to locally detailed case studies.

Remote sensing including aerial photography, satellite imagery and lidar techniques have been used to map the canopy of trees in the UK, for example the Forestry Commission's National Forest Inventory (NFI) or commercially available products such as Bluesky's National Tree Map (NTM) and ProximiTree. Such datasets currently provide detail on the numbers of trees, their location and approximate canopy dimensions. Information on species identification and canopy volume, however, is not included. There are other limitations that restrict the utility of these datasets. The NFI dataset for example does not include woodland areas less than 0.5 ha. The NTM only includes trees and shrubs over 3 m in height, has reduced accuracy where trees are located close to buildings and data use is contractually restricted. In the future, the scope and accuracy of remotely sensed data is likely to improve, however the need for calibration using ground-truth data is set to continue for many years.

i-Tree Canopy is a web-based tool for the quick and statistically valid estimate of land cover types using aerial images available in Google Maps (for details visit http://www.itreetools.org/canopy/). i-Tree Canopy can be used to estimate tree canopy cover, set canopy goals, monitor canopy change over time and obtain estimate values for the air pollution reduction and atmospheric carbon capture ecosystem services of an urban forest. Canopy uses a statistical point sample methodology to estimate the canopy cover of an area. Points are randomly allocated across the area (typically 500, 1000 for larger cities) and each is classified as tree or non-tree to create the percentage tree cover.

Urban Tree Cover is a partnership web site that displays the results of urban forest canopy assessments from across Europe (www. urbantreecover.org; owned and maintained by Treeconomics). The site provides statistics on potential plantable space, historical tree cover and tree cover canopy goals where available. Table 2 presents percentage canopy cover from a range of studies for seventeen English towns and cities.

Treezilla is the monster map of trees and provides information on individual trees gathered through citizen science (www.treezilla.org). Users map the location of a tree via the web or mobile-app. After entering basic information (tree species and trunk diameter) they obtain valuations for the ecosystem services that the tree provides to society. Currently, there are no means to assess how comprehensive its coverage is, even for small or discretely defined areas. However, even with over 50,000 trees mapped across the UK Treezilla is far from complete.

The most sophisticated surveys of urban trees available are based on a statistical plot-based field sample e.g. the Trees in Towns and i-Tree Eco surveys[1], and include detailed information on the tree (e.g. species, age class, trunk diameter, total height, crown volume, health) as well as land use. Trees in Towns was conducted in 1994 and later updated as Trees in Towns II (Britt and Johnson, 2008). i-Tree Eco surveys have currently been reported for three towns and cities in England (Torbay[2], London[3], Sidmouth[4]) and their canopy cover results are reproduced in Table 2. These have informed the current state of knowledge on the structure of England's urban forests.

[1] i-Tree Eco is one of the tools in the i-Tree suite (www.itreetools.org). It is designed to use a complete or sample plot inventory from a study area along with other local environmental data to:

- Characterise the structure of the tree population
- Quantify some of the environmental functions it performs in relation to air quality improvement, carbon dioxide reduction, and storm water control
- Assess the value of the annual benefits derived from these functions as well as the estimated worth of each tree as it exists in the landscape.

[2] Rogers et al., 2011
[3] Rogers et al., 2015
[4] SA (undated)

Table 2. A comparison of the tree and shrub canopy cover of seventeen English towns and cities

Location	% Canopy cover	Source	Survey year
Birmingham (inc Wolverhampton)	23.0	i-Tree Canopy	2012
Bristol	14.0	Bristol Tree Survey	2009
Cambridge	17.1	ProximiTree	2014
Dudley	20.5	i-Tree Canopy	2015
Eastbourne	15.9	i-Tree Canopy	2011
Exeter	23.0	i-Tree Canopy	2013
London	21.9	LTOA Canopy	2014
G. London#	13.6	i-Tree Eco	2015
Manchester	15.5	Red Rose Forest Survey	2007
Oxford	21.4	i-Tree Canopy	2015
Portsmouth	14.7	i-Tree Canopy	2015
Sidmouth (Sid Vale)	23.0	i-Tree Eco	2014
Southampton	20.4	LiDAR Survey	2013
Telford	12.5	i-Tree Canopy	2012
Torbay	12.0	i-Tree Eco	2011
Walsall	17.3	i-Tree Canopy	2012
Worcester	21.9	i-Tree Canopy	2015

i-Tree Eco study 2015: trees only (no shrub canopy cover)

Table 2 presents a comparison of the canopy cover of seventeen English towns and cities assessed via a range of the methodologies described above. The mean canopy cover is calculated as 18.1%. This is higher than the 8.2% reported in the Trees in Town II aerial photo assessment of tree canopy cover for 147 English towns and cities in 2008, however care needs to be taken when comparing results from different methodologies[5]. Canopy cover ranges from 12% in Torbay to 23% reported for Birmingham (including Wolverhampton), Exeter and Sidmouth.

For each study, the accuracy of the estimate has not been reported. This can lead to a lack of certainty in comparing the canopy cover between towns, especially where different quantification approaches have been employed. Similarly, this omission will make it difficult to state with certainty that canopy cover has changed when these results are compared with future assessments (i.e. the level of statistical confidence cannot be determined).

A study of the canopy cover of each town and city across England is required as a matter of urgency. It can be used to provide a baseline for assessment, to develop goals and to monitor progress; this is especially useful for those towns and cities that have yet to quantify their canopy cover.

[5]This figure is reported as an imprecise estimate of the average canopy cover across the whole sample area due to biases in the Trees in Towns II sampling approach. For example, woodlands were excluded from the survey; therefore where a town contains a high proportion of its canopy in woodland the calculated value will be an under-estimate of the total canopy cover.

The study could also be used to track change in canopy cover across areas that have been previously surveyed. To track change a single approach should, ideally, be employed and the standard error of the estimate reported as an indication of the method's accuracy. The geographic area being assessed should also be reported and kept constant across each survey, wherever possible.

Where canopy cover is found to be low across an urban area a land-use based assessment or a ward-by-ward evaluation could be employed, as undertaken for Cambridge (Wilson et al., 2015) and Wycombe District (Goodenough et al., 2016) respectively.

Case study research in the United States and European cities shows that minority ethnic communities have less access to urban green-space in their vicinity than the general population (Germann-Chiari and Seeland, 2004; Pham, et al., 2012). Mitchell et al. (2015) found that socio-economic inequalities were reduced in neighbourhoods with good access to greenspace and argue for equigenic environments (i.e. places that can reduce health inequalities). Their study included thirty four European countries and explored mental wellbeing and socio-economic status with access to greenspace. There is a need to not only increase canopy cover across towns and cities, but also to ensure that its distribution is fair and equitable to all sectors of society.

Understanding England's urban forests: what are their structure and composition?

The Trees in Towns II survey (2008) still provides the most recent and comprehensive analysis of the **structure** of England's urban forests. By measuring structure, the benefits of the urban forest can be quantified and their value calculated and, in some cases, expressed in monetary terms. Structural information allows assessment of diversity within the urban forest, for example with respect to age class and species composition. Analysis of age class composition can show whether an urban forest comprises the appropriate relative amounts of young, mature and veteran trees. Species composition data is useful for determining susceptibility to pests, diseases and the effects of the extreme weather forecast under a changing climate - such as drought, extreme heat or flooding. This diverse range of assessments highlights the essential role that structural information plays in the management of urban forests and the need for comprehensive and up to date data for each town and city. Urban forest structure information from the Trees in Towns II report is presented below, with comparison to i-Tree Eco studies conducted for English towns and cities where possible.

Findings from the Trees in Towns II report (Britt and Johnston, 2008) indicate that most urban trees are semi-mature (41%), mature (27%) or over-mature (17%). Direct comparison with individual towns and cities is not possible as age class is not a routine assessment within an i-Tree Eco survey. However, the London i-Tree Eco study reported that less than 30% of the trees had a trunk diameter of greater than 30 cm (Rogers et al., 2015). The equivalent data was not presented for the Torbay or Sidmouth i-Tree Eco studies.

Across England, large broadleaved tree species made up approximately 26% of the total number of trees and shrubs in the 2008 Trees in Towns II study, small broadleaved tree species made up 35% of the total and conifers comprised 23% (Britt and Johnson, 2008). Large broadleaved tree species included alders, ash, beech, elms, eucalyptus, horse chestnut, limes, oaks, planes and sycamore. Small broadleaved species included birches, cherries, hawthorn, holly, apples and pears, willows, magnolias and laurels. Approximately 83% of all conifers were cypresses, most of which were Leyland cypress (x *Cuprocyparis leylandii*)[6]. For comparison, the top ten most common tree species reported for urban forests across England are presented in Table 3.

[6] The Trees in Towns II methodology required all stems to be counted; in the case of hedging plants such as Leyland cypress, however, this biased the results leading to values higher than would otherwise be expected.

The Trees in Towns II report estimated that two thirds of all the urban trees and shrubs were on private property or less-accessible public land, such as schools, churchyards and allotments. Almost 20% were located in public open space and 12% were street trees (Britt and Johnson, 2008). In Torbay 71% of the urban forest was reported to be in private ownership (Rogers et al., 2011) a figure similar to that reported in the Trees in Towns II report. In London, it was estimated that 57% of the urban forest is in private ownership, with the remaining 43% in public ownership (Rogers et al., 2015).

[6] The Trees in Towns II methodology required all stems to be counted; in the case of hedging plants such as Leyland cypress, however, this biased the results leading to values higher than would otherwise be expected.

Table 3. Most common tree species reported for urban forests across England, a comparison of the Trees in Towns II report's national average to three i-Tree Eco studies.

Trees in Towns II		Torbay		Sidmouth		London	
		Eco study		Eco study		Eco study#	
Species	%	Species	%	Species	%	Species	%
Leyland cypress*	12	Leyland cypress	14	Larch spp.	20	Sycamore	8
Hawthorn	6	Ash spp.	12	Douglas fir	15	Oak spp.	7
Sycamore	6	Sycamore	10	Ash spp.	11	Silver birch	6
Silver birch	5	Hazel	7	Silver birch	9	Hawthorn	6
Common ash	4	Elm	7	Hazel	6	Ash spp.	5
Privet	4	Hawthorn	5	Beech	6	Apple spp.	4
		Holm Oak	4	Oak spp.	2	Cypress spp.	4
		Beech	4			Ash spp.	3
		Palm spp.	3			Willow spp.	3
		Cherry spp.	3			Plum spp.	3

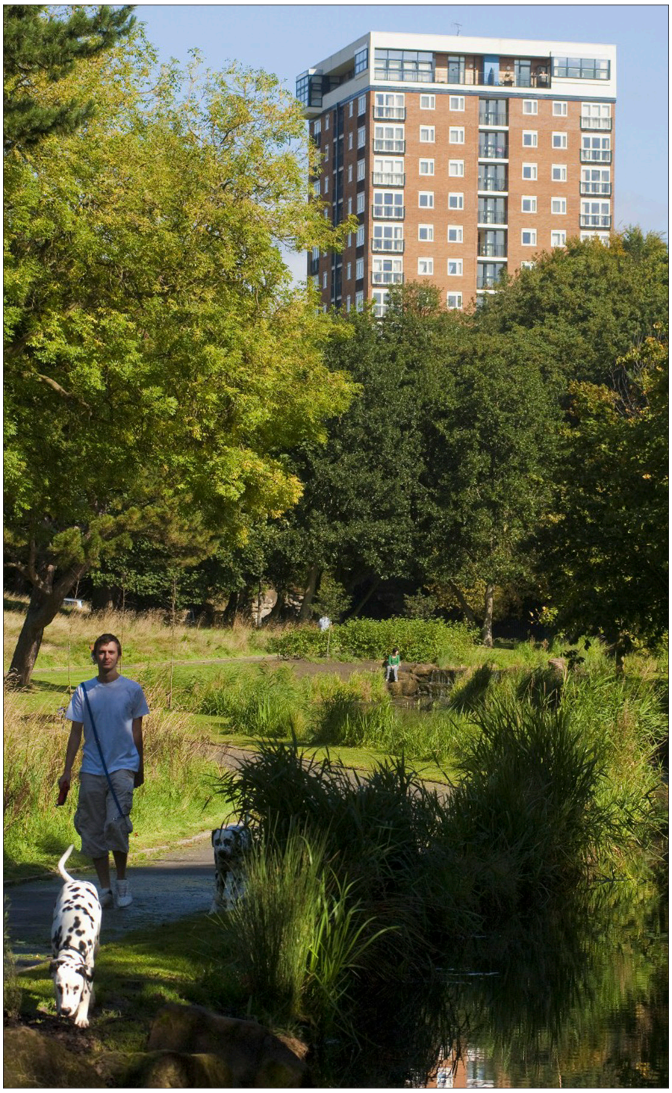
Results presented are for 'Greater London'
* See also footnote 6

What needs to be done next and how can you get involved?

A complete inventory of England's urban tree resource is not currently available. Producing detailed datasets for individual towns and cities across England is a basic data requirement for their effective management as resilient urban forests, for setting baselines from which to develop goals and for monitoring progress. They can also be used to produce a detailed national picture on the distribution of England's urban forests.

There are opportunities for organisations and individuals to get involved. i-Tree Eco surveys have already been conducted by volunteers and in collaboration with their local authority; examples include Sidmouth Arboretum (SA, undated), and the towns of Lewes (2015, unpublished) and Petersfield (field sampling throughout summer 2016). Information on how to plan and run an i-Tree Eco study can be obtained direct from i-Tree (www.itreetools.org), through the social enterprise Treeconomics (www.treeconomics.co.uk) or from Forest Research (www.forestry.gov.uk/fr/itree). Similarly, individuals can partake in citizen science through Treezilla (www.treezilla.org) and in so doing help to generate the 'monster map' of urban trees.

Progress in generating both the national picture and localised datasets has been achieved in recent years, especially through the application of the i-Tree tools and Treezilla. However, there is still a long way to go: both in terms of coverage (the numbers of towns and cities assessed), consistency (between surveying techniques as well as between surveys), and composition (canopy assessments alone do not provide the essential detail of species and age class composition that is critical to developing a long term management strategy). The uptake of i-Tree Eco and the complementary methodologies and datasets described herein will enable England's urban forests to be expanded and made more resilient. This can be achieved through a combination of actions from public and private organisations, partnerships and individuals taking part in citizen science initiatives.



Authorship

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References

1 American Forests. (2016). Web-page: American Forests: Protecting and restoring forests. www.americanforests.org/our-programs/urbanforests/ Accessed: 11th March, 2016.

2 Britt, C. and Johnston, M. (2008). Trees in Towns II: A new survey of urban trees in England and their condition and management. Research for Amenity Trees No. 9. DCLG, London.

3 Brown, I.K. (2007). *Wisconsin Statewide Urban Forest Assessment: Development and Implementation,* Master of Science, University of Wisconsin.

4 Church, A., Fish, R., Haines-Young, R., Mourato, S., Tratalos, J., Stapleton, L., Willis, C., Coates, P., Gibbons, S., Leyshon, C., Potschin, M., Ravenscroft, N., Sanchis-Guarner, R., Winter, M. and Kenter, J. (2014). UK National Ecosystem Assessment Follow-on. Work Package Report 5: Cultural ecosystem services and indicators. UNEP-WCMC, LWEC, UK.

5 Defra. (2013). Government's Forestry and Woodland Policy Statement. Incorporating the Government's Response to the Independent Panel on Forestry's Final Report. Defra, London. 47 pp.

6 Dobbs, C., Kendal, D. and Nitschke, C.R. (2014). Multiple ecosystem services and disservices of the urban forest establishing their connections with landscape structure and sociodemographics. *Ecological Indicators*, 43, 44-55.

7 Germann-Chiari, C. and Seeland, K. (2004). Are urban green spaces optimally distributed to act as places for social and integration? Results of a Geographical Information System (GIS) Approach for Urban Forestry Research. *Forest Policy and Economics*, 6 (1), 3-13.

8 Goodenough, J., Handley, P., Rogers, K. and Simpkin, P. (2016). Canopy Cover Assessment and Recommendations for Wycombe District. A report by Treeconomics and Forest Research to Wycombe District Council. Available from: https://www.wycombe.gov.uk/pages/Planning-and-building-control/New-local-plan/New-local-plan-supporting-evidence.aspx. 41 pp.

9 Jorgensen, E. (1970). *Urban Forestry in Canada*. In Proceedings, 46th International Shade Tree Conference (pp. 43a-51a). International Society of Arboriculture, Urbana, Illinois.

10 Konijnendijk, C.C. (2003). A decade of urban forestry in Europe. *Forest Policy and Economics*, 5 (2), 173-186.

11 Miller, R.W., Hauer, R.J. and Werner, L.P. (2015). *Urban Forestry: Planning and Managing Urban Greenspaces*, Third edition. Waveland Press, Illinois. 560 pp.

12 Mitchell, R., Richardson, E., Shortt, N and Pearce, J. (2015). Neighbourhood environment and socio-economic inequalities in mental wellbeing: an international study of urban dwellers. *American Journal of Preventative Medicine*, 49 (1), 80-84.

13 Moeller, G.H. (1977). The Pinchot Institute: Toward managing our urban forest resources. *Journal of Arboriculture*, 3 (10), 181-186.

14 O'Brien, L. and Morris, J. (2013). Well-being for all? The social distribution of benefits gained from woodlands and forests in Britain. *Local Environment: The International Journal of Justice and Sustainability*, 19 (4), 356-383.

15 Pham, T.-T.-H., Apparicio, P., Séguin, A.-M., Landry, S. and Gagnon, M. (2012). Spatial distribution of vegetation in Montreal: An uneven distribution or environmental inequity? *Landscape and Urban Planning*, 107 (3), 214-224.

16 Rogers, K., Jarratt, T. and Hansford. D. (2011). Torbay's Urban Forest. Assessing urban forest effects and values. A report on the findings from the UK i-Tree Eco pilot project. Treeconomics, Exeter. ISBN 978-0-9571371-0-3. 46 pp.

17 Rogers, K., Sacre, K., Goodenough, J. and Doick, K.J. (2015). Valuing London's Urban Forest. Results of the London i-Tree Eco Project. Treeconomics, London. ISBN: 978-0-9571371-1-0. 82 pp.

18 SA (Sidmouth Arboretum). (undated). Sidmouth Arboretum Tree Survey: Summary Report on i-Tree Eco Survey Carried out by volunteers in the Sid Valley 2014. Available from: http://www.sidmoutharboretum.org.uk/news.php. 12 pp.

19 UFWACN (Urban Forestry and Woodlands Advisory Committees Network). (2016). Our vision for a resilient urban forest. EHDC, Hampshire. 26 pp.

20 UK National Ecosystem Assessment Follow-on. (2014). The *UK National Ecosystem Assessment Follow-on: Synthesis of the key findings*. United Nations Environment Programme World Conservation Monitoring Centre, Cambridge. 102 pp.

21 UK National Ecosystem Assessment. (2011). The *UK National Ecosystem Assessment: Synthesis of the key findings*. United Nations Environment Programme World Conservation Monitoring Centre, Cambridge. 87 pp.

22 Wilson, L. A., Davidson, R., Coristine, H., Hockridge, B. and Magrath, M. (2015). Enhancing the Climate Change Benefits of Urban Trees in Cambridge. In: Johnston, M. and Percival, G. eds. Conference Proceedings of the Trees, people and the built environment II. Urban Trees Research Conference. 2-3 April 2014. University of Birmingham, Edgbaston, UK. ISBN 978-0-907284-08-6. Institute of Chartered Foresters, Edinburgh. i–vi + 1–252 pp.