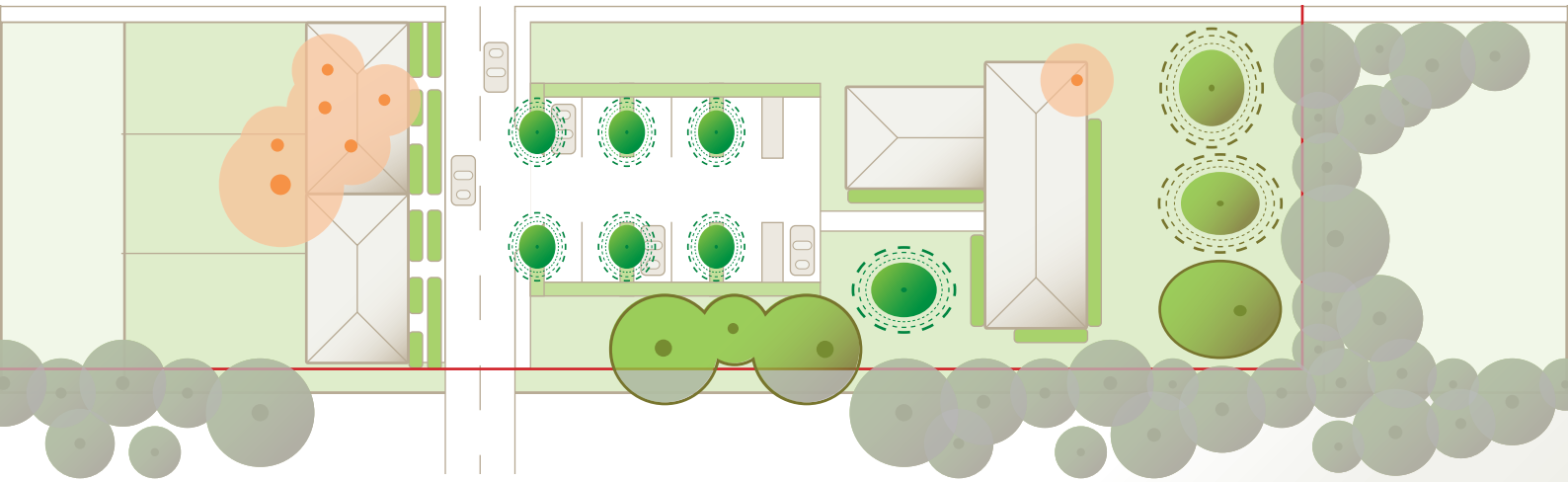
# First Steps in Canopy Cover Assessments

## For All Working in the Built Environment at a Development Site Level



There is not yet a definitive approach to canopy cover assessments

Assessments should be completed by a competent arboriculturist

Protecting existing trees should be prioritised above removal and replanting

Plans for 'Without development' (existing trees) and 'With development' (removed, retained and new trees) show modeled canopy spread which can be compared to assess canopy cover impacts over 10-, 20- and 30-years

Assessment of future canopy spread is a model with all the limitations that models have

Visualising canopy cover now and in the future demonstrates how targets can be met through creative design, assists with planning application communications and helps reduce community opposition

- Trees to be retained
- Trees to be removed
- Trees to be planted
- Trees outside boundary
- Boundary line

Canopy spread:
- 10 years
- 20 years
- 30 years
- No anticipated increase

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**References**

1 Terms highlighted in *green italics* are defined in the **Glossary**.

2 *First Steps in Urban Tree Canopy Cover* (2024) Link

3 Hand, K.L et al (2019) Link

4 Doick, K.J. (2021) Link

5 Hand, K.L. et al (2019) Link

6 *First Steps in Trees and New Developments* Link

7 *Trees, Planning and Development: A Guide for Delivery* – Section One Link

8 United Nations SDGs Link

9 Town and Country Planning Act Link

10 Green Infrastructure Framework Link

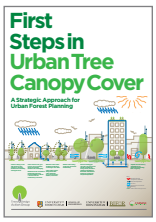
11 Development Plans Link

12 Design Guides Link

13 Biodiversity Net Gain Link

14 For England: Link
For Northern Ireland: Link
For Scotland: Link
For Wales: Link

15 BS 5837 Revision Workshop (2024) Link




***First Steps in Urban Tree Canopy Cover (UTCC)***
Focuses on a strategic approach to UTCC for urban forest planning, summarising how it can be determined at different scales using methodologies that look down from above.

**Trees provide a range of benefits for urban society, and generally, the larger a tree canopy, the greater the benefits. Urban Tree *Canopy Cover* (UTCC)[1] assessment is a method of quantifying how much of a given area is covered by the leaves, branches, and stems of trees. It is usually expressed as a percentage. Urban Tree Canopy Cover assessments can be completed using methodologies that look down from above which are particularly useful when taking a strategic approach to urban forest planning[2]. Assessment can also be performed at local scale. This First Steps guide focusses on Canopy Cover Assessments (CCAs) that are completed using data directly collected on site, for example a proposed development site, for use primarily within the UK planning system to inform decision making.**

Making space for trees in new developments is vital because of the well documented range of *ecosystem services* they can provide[3,4,5,6]. Generally, the larger a tree *canopy*, the greater the *ecosystem services* provided by the tree[4]. Built environment practitioners widely accept and support the need to incorporate existing and new trees in new development design[7]. This is in response to drivers such as the United Nations Sustainable Development Goals[8], the Town and Country Planning Act[9], the Green Infrastructure Framework[10], Local Development Plans[11] and Design Guides[12], *Biodiversity Net Gain (BNG)*[13], a developer's own design ethos, industry-related schemes[6,7] and the National Planning Policy Framework (NPPF)[14], which calls for all developments to have tree-lined streets and sustainable drainage systems (SuDS).

Currently, CCAs for proposed new developments are in the early stages of development, and further detailed exploration is required before a definitive approach is likely to emerge. In the meantime an outline approach is provided in Box 1. The process undertaken to assess the current canopy cover of a site (Steps 1-3) has a detailed methodology and well-established software available to support it. However, the process of projecting *canopy spread* over the coming decades (Steps 4-6) is less understood and more complex but is becoming increasingly important in response to canopy cover targets (Step 7).

## Canopy cover targets

The setting of canopy cover targets should be done locally with consideration of local policy guidelines, design guides, neighbouring urban form and population. In addition, geographical constraints should be taken into account, including the presence of historic monuments or protected areas, soil quality factors such as

Box 1 **Key steps to a Canopy Cover Assessment (CCA)**

**Step 1.**
Reach out to a *competent arboriculturist*.

**Step 2.**
Undertake a *BS 5837* tree survey to identify all trees over 75mm in diameter at breast height on the site[15]. The survey will include details of *canopy spread*, tree condition, species, height and '*quality category*'.

**Step 3.**
Present survey information on a scaled drawing and calculate percentage of the area covered by tree canopy using drawing design software. When two or more tree *crowns* overlap do not double count (Fig. 1) – the crowns should be seen as one combined footprint. Check if the local council has the approach to include or exclude the canopy of trees which originate outside of the new development site but overhang into the development site.

**Step 4.**
Project future canopy spread with and without development (Fig. 1). Appropriate timescales for these canopy cover projections could be 10-, 20-, and 30-years into the future[17-26]. References 17-26 included in this guide point to resources that could be used however these should be considered as useful starting points for advanced interpretation. Base projected canopy spread on the assumption that newly planted trees will be planted and maintained in accordance with the recommendations set out in *BS 8545* and have sufficient rooting volume.

**Step 5.**
Document the reasoning used when projecting canopy spread. Include details on species and cultivar, maturity, physiological condition, microclimate, competition with other vegetation and trees for nutrients, light and moisture availability, aboveground features – buildings, overhead cables – and ground conditions, surroundings, climate change and maintenance regimes including pruning cycles[27].

**Step 6.**
Assess how many years it will take until the canopy cover loss from development will recover to a breakeven point, or when a short-term net loss in canopy cover becomes a net gain.

**Step 7.**
Review and monitor to ensure that any site development targets are met.

pollution, rooting depth, and volume, and/or extreme weather conditions – for example, coastal locations that experience salt spray and stronger winds. The cumulative loss of individual trees on small developments should not be underestimated in terms of the impact on the overall canopy cover of a wider area. Ambitious canopy cover targets for both large and small developments will drive creativity in design.

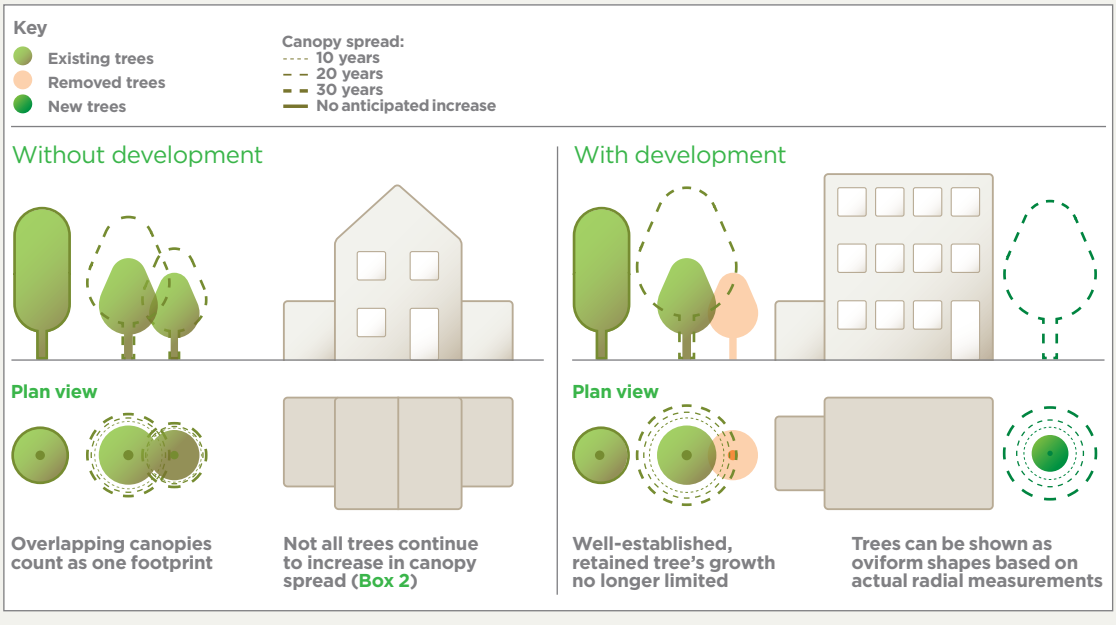
## Canopy cover projections

Projecting canopy growth is a useful tool for providing a proxy for future *ecosystem services* including carbon capture[2]. Visualisations of *canopy spread* can assist planning application communications, help reduce community opposition, and improve understanding of future management costs and inform tree species selection decision making[18]. In the forestry sector, *tree allometry* is used to project tree growth[18,20]. However, the diversity of urban trees species and their planting environments (Box 2) leads to greater uncertainty in tree performance and so there is lower confidence in applying current allometric growth curves to urban trees.

## Urban tree canopy cover projections are uncertain

A *competent arboriculturist* completing the CCA will rely on their personal experiences of canopy spread to inform projections. There are resources available to support this process, however these are guidelines only and require expert judgement to be implemented correctly. It is important to document the rationale and approach when projecting canopy spread for transparency in decision making (Step 5). Projections must be considered within the limitations and uncertainties in their creations and not viewed as definitive[16] (Box 2). Using the same assumptions at all stages of model predictions allows meaningful comparisons to inform planning decisions. 'Tree inventory' and 'urban forest management' software can also be used to project canopy growth. However, some are in the initial stages of development; others are subject to ongoing improvements further to the increasing amount of long-term data sources becoming available[28]. More research in this area – to improve modelling future urban canopy growth – is required[19,20].

Fig. 1 **Comparison of canopy cover 'Without development' and 'With development'**
The below demonstrates canopy cover impacts over 10-, 20- and 30-years, and how an initial loss from development can recover and become a net gain in 30 years' time. Projected growth and timescales should not be viewed as definitive.




Box 2 **Some factors that influence tree growth**

- Species and cultivar: some trees are naturally smaller in stature than others.
- Life stage.
- Physiological condition and quality of nursery stock.
- Vulnerability to prevalent pests and disease.
- Climate: microclimate, extremes of weather and climate change.
- Accidental damage and vandalism.
- Aboveground features: proximity to other trees, vegetation, buildings and roads (exposure to sunlight air pollution).
- Belowground features: soil quality, moisture and rooting volume.
- Planting quality eg correct planting depth, mulching, tree protection.
- Maintenance regimes including planned pruning cycles and previous management.


16 Feng, S. (2024) Link

17 Fennell, J. and Fay. L. (2024) Link

18 White, J. 1998 Link

19 McPherson, E.G. et al (2016) Link

20 Rogers, K. et al (2018) Link

21 Lin, J. et al (2019) Link

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23 The Hillier Tree Guide Link

24 *Tree Species Selection for Green Infrastructure: A Guide for Specifiers* Link

25 Coombes, A. et al (2019) Link

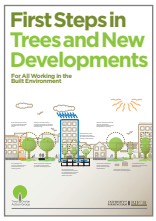
26 Grobosky, J. and Gilman, E. (2004) Link

27 Walters, M. and Sinnett, D. (2021) Link

28 Nowak, D. (2021) Link

29 Chapman, K. et al (2024) Link

30 Urban Forest Accelerator, (2024) Link


***First Steps in Trees and New Developments***
Sets out simple principles of good practice from pre-to post-planning for achieve both housing and tree planting targets.

**Glossary**

**Adoption.**
Agreement to take long term care of a tree.

**Biodiversity Net Gain.**
An approach to development – habitats for wildlife are left in a measurably better state than they were before development. Link

**BS 5837.**
*British Standard 5837:2012 Trees in Relation to Design, Demolition and Construction.*

**BS 8545.**
*British Standard 8545:2014 Trees: from nursery to independence in the landscape.*

**Canopy.**
The collective branches and foliage of trees that make up the tree's crown.

**Canopy cover.**
Two-dimensional representation of the area covered by the branches and foliage of a tree(s).

**Canopy spread.**
Radial spread of the main body of the crown intended to represent the central core.

**Competent arboriculturist.**
Someone with recognised qualifications and expertise in tree management and care.

**Crown(s).**
All parts of a tree above the clear section of the stem.

**Ecosystem services.**
The direct and indirect contributions ecosystems provide for human wellbeing and quality of life.

**Greenwasting.**
Conscious/unconscious decision that wastes opportunities and resources to make a positive contribution to the environment.

**Misplaced tree retention.**
Retaining trees for reasons other than the right one.

**Quality category.**
Categories used in BS 5837 – A (high quality), B (moderate quality), C (low quality) and U (unsuitable for retention).

**Tree allometry.**
Quantitative relationships between different tree measurements.

## Designing with trees

Making space for trees can be contentious, especially when space is restricted, profit margins are tight, and there is concern as to whether some tree planting on new developments is done without foresight and planning for future maintenance, leading to *greenwasting*.

### Top tips for designing with trees:

- Understanding and protecting existing trees should be prioritised above removal and replanting.
- Aftercare and maintenance plans must be in place for all new planting. Ensure tree *adoption* has been settled in advance[29].
- Tree species selection should maintain a balanced approach[12] and should not be biased towards just planting trees with rapid canopy spread.
- Whilst the exact tree species to be planted may be unknown, a decision on the size and stature of each new tree can be incorporated into designs for illustratively informative purposes. The process of deciding what species to plant can then be iterative and include community stakeholder engagement[30].
- Planting extra-heavy standards (stem diameter of greater than 14cm) to have immediate canopy cover on a new development site can be costly, human resource intensive to grow, transport, plant and maintain especially in relation to the quantity of watering needed in the first years of establishment. Well-maintained and watered smaller trees will establish quickly and can soon catch up.
- Although planting many closely spaced new trees can provide an instant and noticeable effect, their individual contribution to future canopy cover will be significantly reduced because of restricted above and belowground conditions. A greater number of trees does not always lead to more canopy in the long-term.
- Trees do have an 'end of life' and sometimes removal is required based on guidance from a *competent arboriculturist*. Retaining trees which are near their end of life to reduce a 'Biodiversity Net Gain +10% biodiversity requirement' or to achieve a canopy cover target may indeed be *misplaced tree retention*.

### The Oxford City Council approach to Canopy Cover Assessment

The National Planning Policy Framework (NPPF) and adopted local plan policies set expectations for new development sites, which differ according to the size of the development. The Oxford Local Plan 2036 states that planning permission will not be granted for development involving the loss of ancient woodland, or ancient or veteran trees, except in wholly exceptional circumstances, nor other trees except where it can be demonstrated that retention is not feasible; and any loss of tree canopy cover should be mitigated by replacement tree planting, with consideration to predicted future tree canopy cover. This policy (G7) introduces the concept of assessing canopy cover over time. Their Technical Advice Note for Greenspaces (TAN9) supports this policy, expands on the concept, and provides guidance on how to prepare such Canopy Cover Assessments for development. The Council elected to set out objectives and parameters for Canopy Cover Assessments, rather than creating a detailed methodology. TAN9 is currently under review with a second iteration being released soon; this may introduce specific percentage canopy cover targets, which is in response to the introduction of tree canopy cover targets from Central Government, as set out in the Environmental Targets (Woodland and Trees Outside Woodland) (England) Regulations 2022.

### The Cornwall Council approach to Canopy Cover Assessment

Cornwall Council Climate Emergency Development Plan Document (DPD): Natural Climate Solutions policy G3 is a local clarification of the national planning requirement and a simple way to quantify an achievable level of canopy provision on development sites. The current level for canopy provision within the policy is 15% after 25 years.

Using provided tools it allows for projected canopy spread of new trees after 25 years and guarantees tree retention (due to being tied in with BNG[13] provision) in the public realm. Existing canopy cover is included but not its incremental canopy spread. Submitted documents will show the canopy projections and enables identification of conflicts with the built environment ensuring a 'right tree, right place' approach to landscaping schemes. Additionally, policy states that new canopy should provide a mix of species that are resilient to pests, diseases and climate change to ensure there is diversity within planning schemes. Further detail can be found on the Cornwall Council Website.

This approach to canopy cover assessment is under ongoing development and changes are being made as more data becomes available. The ambition is to include modelling of canopy of retained trees.

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