Street tree valuation systems

The Capital Asset Value for Amenity Trees (CAVAT) scheme provides a method for managing trees as public assets in London. A literature and methodological review was commissioned to assess approaches to estimating the amenity value of street trees to feed into Forestry Commission England's consideration of the potential extension of CAVAT to valuing street trees in other areas.

A number of urban street tree valuation systems have been developed. Three systems were reviewed: CAVAT and Helliwell (both developed in the UK) and i-Tree (originating in the US). The review showed that the three valuation systems differ significantly in methodology, data input requirements and outputs. At one end of the spectrum the Helliwell system is entirely based on expert judgement, focuses solely on visual amenity value and has very low field data input. At the opposite end of the spectrum, i-Tree requires data collected from a sample or a complete inventory and community-specific information (e.g. programme management costs, city population and price of residential electricity) to output customised benefit and cost data. CAVAT falls somewhere in between, focusing on wider benefits of trees to communities than pure visual amenity, but not outputting detailed benefit and cost data.

Background

Section 198 of the Town and Country Planning Act 1990 covers the public amenity value of trees, and places a duty on local authorities to protect trees in the public interest. However, it does not prescribe how their value should be estimated.

Objectives

This research aimed to:

- review approaches to valuing street trees;
- comment on the potential extension of the CAVAT scheme in London to other areas, and on alternative approaches.

Methods

Literature, methodological and data reviews were carried out, with the focus on assessing the three valuation systems in terms of data needs, coverage, outputs and uncertainties.

Findings

Helliwell, initially developed in 1967, is the oldest of the three systems reviewed. Revised periodically, the most recent version was released in 2008. Its main goal is to aid practical planning and management (e.g. felling, pruning and planting) of woodlands and urban trees by evaluating their relative contribution to the visual quality of the landscape.

The CAVAT system is targeted at local authorities and primarily publicly owned trees, providing a method for managing trees as public assets rather than liabilities.

The i-Tree peer-reviewed software suite was developed by the United States Forest Service which recommends its use by communities of all sizes to strengthen their urban and community forest management efforts.

Of the three valuation schemes, only CAVAT and i-Tree try to address the social/cultural component of the value of street trees. The Helliwell system puts an emphasis on visual amenity and also produces the most variable valuation outcomes.

Table: Matrix of benefits for tree valuation systems

Benefits	CAVAT	Helliwell	i-Tree
Economic (monetary)	Value depends on the size of trunk area adjusted by multiplicative factors: community tree index and accessibility, townscape and visual importance, national/local designations or connections, species characteristics and nature conservation impact.	Valuation of the tree itself, including some social factors listed below.	Management costs: Total net expenditures are summed based on all defined costs associated with street tree management.
			Net annual benefits: Citywide benefits and costs are summed, net benefits (benefits less costs) are determined, and the benefit–cost ratio (benefits/costs) is calculated, including environmental and social benefits listed below.
Environmental	Nature conservation including particular wildlife importance or veteran/ancient tree aspect and species characteristics (rare or unusual species, or shape).	None	Energy conservation due to reduced natural gas use in winter (wind shield effect) and reduced electricity use for air conditioning in summer.
			Reduction of annual stormwater runoff.
			Air quality improvements (O_3, NO_2, SO_2, PM_{10}, VOCs and BVOC).
			Carbon dioxide sequestration.
Social	Community Tree Index (CTI) measures the relative population density potentially able to benefit from the trees.		Aesthetic/other: a measure of the tangible and intangible benefits of trees reflected in increases in property values due to trees.
	Relative accessibility to the public.		
	Townscape and visual importance.	Importance of position in the landscape.	
	National or local designations or connections.	Presence of other trees.	
		Relation to setting.	

Valuation under CAVAT and Helliwell differs fundamentally from that under i-Tree as the former consider the value of a tree over its remaining expected lifetime, while the latter focuses upon the current annual benefits provided.

i-Tree seems to be the most flexible and developed system with strong emphasis on assessing economic and environmental annual benefits. It benefits from being a free, non-proprietary, open-source system.

Recommendations

Both CAVAT and i-Tree amenity tree valuation systems meet the needs of small communities and large city metropolitan areas. However, if limitations on data availability can be overcome, i-Tree offers significant advantages of flexibility, detailed output and allowing a wide range of benefits to be assessed. CAVAT is simpler to implement if data are limited. The Helliwell system seems best suited to single tree and small-scale community evaluations, but can also handle urban woodlands.

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Reports and publications

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