# VALUATION OF TREES IN URBAN PARKS BY CAVAT (CAPITAL ASSET VALUE FOR AMENITY TREES) METHOD

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**ABSTRACT**

The valuation methods can also assist in differentiating lower from higher value trees. CAVAT (Capital Asset Value for Amenity Trees) provides a method for managing trees as public assets rather than liabilities. The Quick method potentially involves three steps, and key variables Basic value, Community Tree Index (CTI) value and Functional Value. CAVAT works by calculating a unit value for each square centimeter of tree stem, by extrapolation from the average cost of a range of newly planted trees. The value was calculated for the twelve tree species growing in urban parks of Isfahan. Results show that *Fraxinus excelsior, Populus nigra, Cupressus arizonica* have the maximum value *Quercus alba, Acer saccharum, Ulmus carpinifolia* have moderate value and *Ailanthus altissima, Robinia pseudoacacia* and *Salix alba* have minimum value in the urban parks of Isfahan.

**Key words**: CAVAT Quick Method, Community Tree Index, Urban Parks

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## Introduction

The terms valuation and appraisal are frequently used interchangeably (Kielbaso, 1979; Watson, 2002; Cullen, 2007; Sarajevs, 2011), they may be distinguished in particular practice settings, as the term appraisal may describe non-monetary values (Litchfield, 2010). Arboriculturists, urban foresters, tree officers and other specialists frequently need to place an economic value on amenity trees. Various methods, often called "expert" methods (Jim, 2006, Price, 2003), have been developed over a period of almost 100 years. Amenity tree value is not a new concern in the UK and Ireland (Mcmillan, 1964; Barry and Murray, 1982). The Helliwell System was introduced 40 years ago (Helliwell, 1967) and has been revised a number of times (Helliwell, 2003). It is widely used in connection with Tree Preservation Orders (Dclg, 2000; Jessop, 2002) and for settling legal claims (Price, 2003, 2004; Eden, 2005). CAVAT (Capital Asset Value for Amenity Trees) provides a way of establishing a financial value for trees in the UK and Ireland. CAVAT provides a basis for managing trees in the UK as public assets rather than liabilities. It is designed not only to be a strategic tool and aid to decision-making in relation to the tree stock as a whole, but also to be applicable to individual cases, where the value of a single tree needs to be expressed in monetary terms. It supplements other tools of arboricultural analysis, such as single tree hazard assessment systems. So far as possible it draws upon objective evidence and published data, but it also relies on expert arboricultural knowledge and in some cases assessments that are specific to CAVAT. It can therefore only be used by arboriculturists who have received relevant training, and who have the relevant skills and experience. The legislation itself does not specify how amenity is to be assessed, leaving it open for the value of trees to be expressed in the most suitable way for the planned purpose, and not necessarily in economic terms. Because CAVAT is specifically designed as an asset management tool for trees that are publicly owned, or of public importance, it does express value in economic terms, and in a way that is directly related to the quantum of public benefits that each particular tree provides. Applied to the tree stock as a whole it enables it to be managed as if it were a financial asset of the community. Applied to single trees it gives a value that is meaningful in it but allows a comparison to be made with the value of other public trees. CAVAT works by calculating a unit value for each square centimeter of tree stem, by extrapolation from the average cost of a range of newly planted trees, and then adjusting this to reflect the degree of benefit that the tree provides to the local community. The adjustment is

designed to allow the final value to reflect realistically the contribution of the tree to public welfare through tangible and intangible benefits. There are two versions of the CAVAT method. The Full Method is recommended for use in decisions concerning individual trees or groups, when precision is required and sufficient time is available for a full assessment. The Quick Method is intended specifically as a strategic tool for management of the stock as a whole, as if it were a financial asset of the community (Neilan, 2010).

## Materials and Methods

The CAVAT Quick Method is designed to give public authorities the information necessary to manage their trees as public assets (Neilan, 2010). The Quick Method potentially involves three steps, and key variables:

1. Basic value/size; 2. CTI value/CTI factor 3. Functional value/functional status

### Step 1: Basic Value

On survey each tree is placed in one of 16 bands according to its DBH (Table 1), which gives its Basic Value. The table of up to date values is available separately. For the purposes of CAVAT the exact size is not needed; if it is being measured precisely in any case as part of the survey it may be possible for the database program to calculate automatically the CAVAT banding.

**Table 1: Value Bands, Capital Asset Value for Amenity Trees (Revised Edition 2008)**

| Band No. | Trunk Diam. (cm) | Value (£) 100% |
|---|---|---|
| 1 | <5.9 | 231 |
| 2 | 6-8.9 | 577 |
| 3 | 9-11.9 | 1,130 |
| 4 | 12-14.9 | 1,868 |
| 5 | 15-19.9 | 3,139 |
| 6 | 20-24.9 | 5,189 |
| 7 | 25-29.9 | 7,751 |
| 8 | 30-39.9 | 12,556 |
| 9 | 40-49.9 | 20,755 |
| 10 | 50-59.9 | 31,005 |
| 11 | 60-69.9 | 43,304 |
| 12 | 70-84.9 | 57,653 |

| | | |
|---|---|---|
| **13** | 85-99.9 | 83,021 |
| **14** | 100-114.9 | 113,000 |
| **15** | 115-129.9 | 147,592 |
| **16** | <130 | 186,796 |

**Step 2: Community Tree Index (CTI) Value**

The basic value of the tree population will be adjusted according to the population density of the urban areas of the Local Authority, using Community Tree Index (CTI) factor (Table 3). Once selected the CTI factor is generally not varied, although some large metropolitan authorities where population densities vary significantly across their area may find that more accurate results will be obtained through having different CTI values for different wards, etc. The CTI factor will in the majority of authorities be 100% but may be up to 250% for the most densely populated boroughs. CTI factors for England may be found in the separate National Community Tree Index table.

**Table 3: CTI Factors, Capital Asset Value for Amenity Trees**

**(Revised Edition 2008)**

| Population Density / Ha | CTI Factor % | CTI Band |
|---|---|---|
| <20 | 100 | 1 |
| 20 – 39 | 125 | 2 |
| 40 – 59 | 150 | 3 |
| 60 – 79 | 175 | 4 |
| 80 – 99 | 200 | 5 |
| 100 – 119 | 225 | 6 |
| <119 | 250 | 7 |

**Step 3: Functional Value**

The Functional Value can be retained at 100%, but may be reduced by a factor of 25%, 50%, 75% or 100%, according to the inspector's assessment of the tree's functional status. Only one combined adjustment of the basic value is required, comprising crown size and functionality, giving the overall functional value. There are similar provisos in respect of any condition, e.g. structural weakness, which does not affect the current functional status of the tree, or a need for any immediate works. Data collection will generally be carried out as part of the annual survey of the tree stock, although a sample approach could be used, and results calculated from this sample, providing a representative selection is made. Life expectancy may be assessed as part of

the survey. Alternatively may be statistical adjustment is made when calculating the value of the stock for reporting purposes. The Safe Life Expectancy adjustment bands are shown in Table 2.

**Table 2: Safe Life Expectancy Adjustment, Capital Asset Value for Amenity Trees (Revised Edition 2008)**

| Life Expectancy (Years) | % Loss of Value |
|---|---|
| 40 – 80 | 5 |
| 20 – 40 | 25 |
| 10 - 20 | 60 |
| 5 – 10 | 85 |
| <5 | 100 |

**Study area**

The city of Isfahan is the capital of Isfahan Province, the capital of Isfahan Sub-province, and the center of the Isfahan comprehensive regional planning complex. Isfahan is situated in Iran and lies at 32° 39' 35" N latitude and 51° 40' 17" E longitude. The climate of Isfahan is generally semi arid with temperature from 24°c to 39°C on July. The average temperature of Isfahan province was estimated as 16.3°C, average relative humidity, at 06:30 h, it was 54% and at 12:30 h, it was 29%; average annual rainfall was 122.7 mm, the maximum amount of rainfall on a single day was 48 mm, average number of days with the temperature below 0°C was 69.1, average number of hours of sunshine over the entire year was 3233.2 and maximum wind speed was 29 m/s; blowing in the direction of 300°.

**Data collection for the Quick Method**

To apply Asset Value Management data handling will need to be integrated with existing database software. Three data fields are needed in respect of each tree:

1) The value band, derived from trunk diameter

2) The functional status

3) The asset value.

The value band may be available through existing DBH data, or may be calculated as part of the annual survey. Functionality is a concept specifically developed as part of CAVAT, and needs to be assessed by inspection; it is unlikely to be realistically judged from existing records. The assessment will generally therefore be done as part of the general survey or resurvey of the stock and so would add minimal cost. For purpose of analysis the software needs to be able to calculate at least:

- Numbers of trees in each value band, total and as divided by percentage function
- Functional value of trees in each category, in total and as divided by % functions
- Adjustment for SLE
- As a whole, for stock or for specified areas

**Results and Discussion**

The values were calculated for the twelve tree species growing in urban parks of Isfahan and they are presented in Table 4.

**Table 4.Valuation of Trees in urban parks of Isfahan by CAVAT Quick Method (Capital Asset Value for Amenity Trees,)**

| | Scientific name | DBH (cm) | Value Bands | CTI Factor (%) | CTI Value | Safe Life Expectancy | Functional Value Factor | Final Value (£) |
|---|---|---|---|---|---|---|---|---|
| 1 | *Acer saccharum* | 42 | 20,755 | 125 | 2 | 40-80 | 0.95 | 39435 |
| 2 | *Ailanthus altissima* | 38 | 12,556 | 125 | 2 | 10-20 | 0.40 | 10045 |
| 3 | *Cupressus arizonica* | 53 | 31,005 | 125 | 2 | 40-80 | 0.95 | 58910 |
| 4 | *Fraxinus excelsior* | 82 | 57,653 | 125 | 2 | 40-80 | 0.95 | 109541 |
| 5 | *Liriodendron tulipifera* | 58 | 31,005 | 100 | 1 | 20-40 | 0.75 | 23254 |
| 6 | *Magnolia grandiflora* | 48 | 20,755 | 100 | 1 | 20-40 | 0.75 | 15567 |
| 7 | *Populus nigra* | 65 | 43,304 | 125 | 2 | 20-40 | 0.75 | 64956 |
| 8 | *Quercus alba* | 49 | 20,755 | 125 | 2 | 40-80 | 0.95 | 39435 |
| 9 | *Robinia pseudoacacia* | 34 | 12,556 | 125 | 2 | 10-20 | 0.40 | 10045 |
| 10 | *Salix alba* | 36 | 12,556 | 125 | 2 | 10-20 | 0.40 | 10045 |
| 11 | *Ulmus carpinifolia* | 51 | 31,005 | 150 | 3 | 10-20 | 0.40 | 37206 |
| 12 | *Viburnum opulus* | 32 | 12,556 | 125 | 2 | 40-80 | 0.95 | 23857 |

Trees with a safe life expectancy greater than 80 years retain 100% value; those with less than 5 years have zero value. The CTI index factor is a means to reflect in the tree stock's asset value the relative population density in the local area and thus the relative number of those potentially able to benefit from the local authority's trees. The basis of CAVAT is trunk area, but the crown area may often be reduced from what would be predicted for an average tree of the size by species characteristics, possibly exaggerated by grafting, as in many flowering cherries, or by pruning, or by natural events such as disease or branch failure. Results show that *Fraxinus*

*excelsior*, *Populus nigra*, *Cupressus arizonica* have the maximum value *Quercus alba*, *Acer saccharum*, *Ulmus carpinifolia* have moderate value and *Ailanthus altissima*, *Robinia pseudoacacia* and *Salix alba* have minimum value in the urban parks of Isfahan.

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