Tree valuers work with a new valuation method to express the value of trees in financial terms. As a result, the Raad method has been abandoned. The new calculation method contains elements of the German Koch method, but is not a copy of that.

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Valuing trees using a new method

The increasing number of events involving damage to trees, especially due to the construction of cable and pipe lines and roads, induced André Raad in the early 1970s to develop a method to regulate, reduce and/or recover this damage. Subsequently in 1972, as Head of the Public Greenery Department of the City of Rotterdam he wrote an article entitled *Outline of a valuation method*. The instrument to express the value of a tree in financial terms put forward in this way by Raad made many people realise that 'something as natural as a tree' is actually worth a certain sum of money.

The first Dutch calculation method was born and was eventually baptised the Raad method. Since its birth the calculation method has been improved several times. Even so, tree valuers continued to feel the need for a fundamental revision of the method. More than two years ago a six-person committee of the NVTB, the Dutch Association of Tree Valuers, started the renewal process of the calculation method.

Why a new method?

When the Raad method is used, the value of thick trees sometimes reaches excessive amounts. This is because the calculation is based on the surface area of the trunk cross-section in cm². This increases exponentially with the increase of the trunk diameter. Furthermore, five of the six multiplication factors (location, planting method, maintenance, condition and replanting indication) usually remain the same. With Raad the tree value decreases only if the depreciation factor and/or the condition factor decreases.

The new NVTB method uses a number of calculation features which enjoy wide support because of their market approach and legal correctness. An important feature is that in the early period the tree value rises rapidly. In the early years a tree costs a lot of money. Apart from the cost of purchase and preparation of the growing locality, also the required tree management in the initial phase is much more intensive. Consequently, a street tree may be worth more than €3,000 after three to five years, although it is still very small. With the NVTB method such a young, thin tree has a higher value than with the Raad method. In the large middle group between young and old, the values calculated by the two methods are not very different.

When the maximum tree value has been reached, at the moment that the tree starts its functional life, a long period of decline in value follows due to depreciation. This is just the point that often solicits an emotional reaction: "Surely an old tree is worth more than a young tree?" Tree valuers tend to feel the same way, but for economists it is quite logical that at some point in time a product is finished and from then on gradually declines in financial value.

An important practical feature is that the new calculation method is in keeping with the tree valuation methods used in other countries. It is hoped and expected that this will eventually lead to a uniform European tree valuation method.

Calculation of tree values

When assessing the tree value the valuer should ask him/herself the question: 'What would it cost to put a comparable tree at a comparable location again, according to present-day standards and at the current price level?' This question leads to a few 'subquestions', to which the tree valuer should provide the answer:

- What is the function of the tree? What tree could perform that function in a comparable way?
- What size is customary and reasonable for the tree to be planted?
- How many years will the tree need after planting and establishment to perform its function?
- What age will a tree of that species reach on average at that specific spot and under the specific conditions, in other words, what is the rotation period?
- Is the value of the tree reduced by, for instance, damage or defects, or by depreciation due to age?

The value of a tree is built up from a careful listing of the costs in the first two phases of its life (see Figure 1).

Establishment phase:
The cost of purchase, planting, transportation, and the like. Furthermore, the cost of maintenance (plus guarantee) during the first three years, including interest over the expenses incurred during this period.

Period up to start of functional life:
The cost of annual maintenance up to the start of the tree's functional life, including interest during this period. The tree value reaches its peak at the end of this period, as this is when the tree starts performing its function: the product is more or less finished.

Depreciation phase:
It is unavoidable that after the start of the tree's functional life its value starts to decline due to depreciation. This is a gradual decline in value. The tree value $B_1 = B - N^3/L^3 \times B$. The depreciation factor determines the rate of depreciation: $N^3/L^3 =$ hyperbolic, which is the most gradual and the most commonly used factor for trees ($N^2/L^2 =$ parabolic; $N/L =$ linear).

NVTB has prepared tables for the costs of purchase, planting and maintenance of a tree. Tree valuers can make use of these, but they may also choose to use different data geared to the specific situation. Expert underpinning is then required.

The strong point of the new method is the rather dry listing of the costs incurred in planting the tree, its maintenance, etc. This is a generally accepted method of assessing the value of an object or project.

Calculation of damage to trees

NVTB has also formulated a method to calculate the effect of damage to trees. We distinguish six categories of damage and costs related to it.

Early write-off
The tree's life expectancy changes when it suffers damage. For instance: the tree may be left in place, but instead of the original eighty years the life expectancy is now only forty years. This is called early write-off. The reduction in value due to early write-off can be calculated with the model for tree valuation (in Figure 2: D_1).

Increased risk of write-off:
In spite of special care, a tree runs the risk of being written off. This may be a consequence of, for instance, damage caused by fungal attack. This extra risk of write-off is expressed as a

percentage of the tree value after deduction of the depreciation and the decline in value due to loss of functionality and/or early write-off. Usually this decline in value is between 1 and 5%.

Decline in value due to loss of functionality:
Loss of functionality causes a decline in value, for instance after removal of branches or roots. Such a loss of functionality can be temporary or permanent. The guidelines contain a table with examples for this category of damage (in the figure: D_3).

Direct treatment costs:
After the damage has occurred, expenses will be incurred for actions such as wound treatment, lopping or soil improvement: the cost of direct measures aimed at limiting the consequences of the damage as much as possible. Both hours and materials are taken into account.

Additional management costs:
The damage may necessitate extra management measures, for instance, additional tree inspections. The costs have to be added to the regular management costs.

Additional costs:
Reporting and registration of the damage, traffic measures during execution of works, clearing costs, legal aid, tree analysis, damage assessment and other items come under the category of additional costs.

A few terms in this calculation method of damage to trees are new. Unusual, if not unknown, so far were terms like 'loss of functionality of a tree' and 'early write-off'. They make the valuation in case of damage more realistic.

The new NVTB calculation method for valuation of trees became effective on 1 April 2005. The approx. 35 tree valuers associated with NVTB have followed an in-house training programme. Updates of the calculation method will be published annually, with a view to indexation of the table values, but also as a result of the continuing exchange of views between Dutch and overseas experts in this field.

[photos]
This kind of damage leaves only one option: replacement.
This monumental plane tree in Amsterdam falls in the 'top category'.

Figure 1. Development of the tree value over time.
Figure 2. Development of the tree value in case of damage.

[Example]
Calculation of the value of poplars along the Noordhollands Canal
A row of poplars has been standing along the Noordhollands Canal for fourteen years now. The trees have reached a trunk diameter of 30-35 cm and a height of 12-14 m. Important for the valuation are the determination of the rotation period and the start of the trees' functional life.

- **The rotation period:**
A poplar, as part of such a row, reaches an average age of 45 years: then the crowns start to touch each other, dead wood occurs in the crown, etc. Although after 45 years the trees are still far away from their biological end of life, they are replaced anyway. To the west of this road the road management authority does not accept an increased risk of branches breaking off.

- **Start of functional life:**

The function of the trees here is to provide traffic guidance, to embellish the roadside and to serve as windbreaks and dust collectors. Furthermore, they have an ecological function: they harbour a wide range of animals of all sizes and they provide shadow, which is highly appreciated by motorists stuck in traffic jams during summer. All these functions are being performed. When the trees are lopped and crowned up one more time, now or next year, then the phase of guidance lopping will have been completed. The major part of the expenditures will have been incurred by then. At the age of fifteen years the product is finished, even if the poplars are only at one-third of their rotation period. The poplars have reached the top of their tree value, the depreciation phase has started. Yet the trees will grow to twice their present height in the coming years.

According to the Raad method the trees would have a value of approx. €1,200. This value would continue to increase for some time.

According to the NVTB calculation method the trees have a value of approx. €1,750. From now on this value gradually decreases.

For trees with an entirely different function, for instance, a permanent solitary tree on a station square, which is meant to be a real eye-catcher there, the choices will be quite different. The start of the tree's functional life could then be set at eighty years, with a rotation period of, for instance, 180 years.