

## Green for green — the perceived value of a quantitative change in the urban tree estate of New Zealand<sup>1</sup>

Éva-Terézia Vesely<sup>2</sup>

School of Geography & Environmental Science

The University of Auckland, Private Bag 92019, Auckland, New Zealand

### ABSTRACT

The urban tree estate impacts on the quality of urban life through the provision of a series of benefits that are aesthetic, ecological, social and economic in nature. However, most of these benefits do not have a market price and exact information on the type of values people attach to urban trees is scarce. In order to enhance a more comprehensive inclusion of human values into the planning and management of the urban tree estates, as well as to provide an input into the cost-benefit analysis of related policies and projects, the perceived value of a quantitative change in the urban tree estate of 15 New Zealand cities was measured by contingent valuation.

The results reveal an estimated NZ\$140 per household per year median willingness to pay during a three-year time period for the avoidance of a 20% reduction. The need to measure value using a series of metrics was reinforced by the finding that 58% of those who refused to pay the contingent bid said yes to contributing in the form of volunteer work. Also of interest for managers and policy makers is that 48% of the population find the supply and demand side of the urban tree estate in disequilibrium, indicating the imbalance in the favour of demand (95%) or supply (5%). The perceptions of the importance of a series of benefits and negative effects are different and the motivations behind people's interest in taking care of trees also vary.

If the support of the community for tree programmes is the goal, an understanding of the underlying motivations together with reinforcement of the benefits and management of the negative effects will be needed. If formulation of efficient land-use policies is intended, the comparison of benefits with the provision and management costs will be required. The findings of this study contribute to both.

*'I think that I shall never see  
A poem lovely as a tree  
A tree whose hungry mouth is pressed  
Against the earth's sweet flowing breast  
A tree that looks on God all day  
And lifts her leafy arms to pray  
Upon whose bosom snow has lain  
Who intimately lives with rain  
A tree who may in summer wear  
A nest of robins in her hair  
Poems are made by fools like me,  
But only God can make a tree.'*  
(Joyce Kilmer: *Trees*)

Kilmer's admiration for trees is shared by many of us. Trees are magnificent! They are

considered to be the largest and oldest single living organisms on Earth. Putting monetary value on such outstanding things is repulsive. But we do make choices that have an impact on trees and consequently we do value them. Making this valuation explicit will improve our decision making processes.

Trees in urban areas are collectively referred to as the urban tree estate. They impact on the quality of urban life through the provision of a series of benefits that are ecological, aesthetic, social and economic in nature. However, most of these benefits do not have a market price and exact information on the type of values people attach to urban trees is scarce. Consequently

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<sup>2</sup> Present address: Landcare Research, Private Bag 92170, Auckland, veselye@landcareresearch.co.nz

the optimal allocation of resources towards the management of this natural asset is problematic (Tyrväinen 2001).

Past research provided evidence on the impact that forest characteristics have on the value of properties (Thompson et al. 1999) or how proximity to or view onto urban forests influence the market price of dwellings (Tyrväinen & Miettinen 2000). American Forests developed the City Green software incorporating GIS and Remote Sensing technologies to value the ecosystem services provided by urban tree estates, while in a cost-benefit analysis McPherson et al. (1999) calculated the net annual benefit of Modesto's (California) street and park trees. In New Zealand, Treeby (1997) used the Standard Tree Evaluation Method to estimate the value of the combined tree estate of greater Auckland as a sum of the individual trees' value.

The New Zealand Ministry of Agriculture and Forestry (MAF 2002) commissioned a research project that would use the contingent valuation technique to elicit household willingness to pay for the avoidance of a range of reductions in the quality and quantity of the urban tree estate. The intention was to use the elicited value to estimate the economic impacts of those factors that cause damage to urban trees and to conduct cost-benefit analyses of response options or preventive measures. Consequently, the perceived monetary value of a 20% quantitative change in the urban tree estate of 15 New Zealand cities was measured by contingent valuation (CV). In addition, to enhance a more comprehensive inclusion of human values into the planning and management of the urban tree estates, the residents' current perceptions have been investigated.

Where actual market data are lacking, CV seeks to discover how people would value certain environmental changes by directly questioning a sample of the population concerned. These changes, and the markets in which they are to be valued, are hypothetical — hence the name of the technique. The two concepts most widely used are willingness to pay for an environmental benefit, and willingness to accept compensation for a loss (Winpenny 1991). The first application of CV was by Davis (1963) and

within 10 years, CV studies were becoming commonplace as a means for non-market valuation (Carson et al. 1993). Since then, such studies have been conducted in more than 50 countries by government agencies and international organisations (Carson 2000).

For this study, the survey instrument applied was a self-completion contingent valuation questionnaire. This included attitudinal and ethical questions, an information pack with a payment scenario, the contingent choice question followed by debriefing questions and a request for socio-economic data. The study site comprised of 15 New Zealand cities (Fig. 1) and the target population was the households in which the inhabitants of those cities lived. The household was the sampling unit used, with one adult member being presented the Participant Information Sheet and asked to fill in the questionnaire. The distribution of the sample between the different cities and regions was approximately proportional to the number of inhabitants. The University of Auckland Human Subjects Ethics Committee's ethics consent (Reference 2003/Q/008) was obtained prior to commencing the surveying. The sampling period was from 22 March 2003 to 31 May 2003. Logistic regression and repeated resampling methods have been used for the analyses of the survey results.

The results from the 346 completed questionnaires (63% response rate) reveal differentiated importance given to the listed benefits and negative effects associated with trees in the city environment. The highest average importance score was registered for aesthetics (beauty). In the same range, between 'important' and 'very important', scored nature in the city, fresh air and habitat for wildlife, followed by carbon storage and shade. Protection from wind and noise, as well as slowing the release of rain was ranked between 'slightly important' and 'important', with the latter registering the lowest score. Out of seven listed negative effects, six registered an importance score between 'slightly important' and 'important'. Causing drainage problems was regarded as the most problematic, while dropping leaves everywhere registered the lowest score.



**Fig. 1** 15 New Zealand cities sampled for Contingent Valuation data.

With aesthetics being such a highly regarded benefit, the question of size, type and health of trees becomes relevant, as well as education on the implications of residents' aesthetic preferences for the provision and sustainability of ecological services and indigenous biodiversity. With trees being seen as the source of nature in the city both directly and through the provision of habitat for wildlife, the challenge of planning and managing the tree estate to support urban biodiversity is highlighted.

The revealed relative position of the perceived supply and personal demand of city trees indicate that approximately half of the city residents find the present situation to be in equilibrium. The other half indicates an imbalance, with the majority expressing demand for more trees, while a small minority consider too many trees exist in their city. This provides a baseline for consultation processes between citizens and the authorities involved in managing parts of the urban tree estate. During the consultation process the possibility to intervene with incentives needs to be examined in situations where the public free-riding on the

benefits from the private component of the tree estate is in jeopardy and the public provision of those benefits is more costly than the incentives. On the other hand, the capture of private support for the public provision of tree benefits should be aimed for when there are significant private benefits provided alongside public ones.

The motivational background behind people's interest in taking care of trees is mixed. More than half of the respondents consider the significant benefits that trees provide to be the strongest motivation for care-taking. However, consideration for the benefits to future generations and trees as identity definers also play a significant role, while the respect for the existence rights of trees motivate a smaller proportion of the sample. The complex motivational background identified through this project supports the necessity of implementing the total value concept and consequently promotes the application of those techniques that are capable of assessing this.

The valuation exercise resulted in a median willingness to pay of NZ\$140 per year for a period of three years for the avoidance of a 20% reduction of the local urban tree estate. The repeated resampling revealed that for 95% of the 999 samples generated, the willingness to pay is between NZ\$102 and NZ\$171. The validity of the monetary estimate is supported by the sensitivity of the contingent choices to the amount of money asked to be paid, the perceived seriousness of the loss, and membership to any environmental organisation. The perception of the respondents to the seriousness of the 20% reduction in the urban tree estate varied, with 16% situated at the lower end, 35% in the middle, and 49% at the high end of the 'not serious at all' to 'extremely serious' continuum. When asked to consider volunteering work instead of a monetary contribution, 58% of those who refused to pay the contingent bid said yes to contributing in such a form, while 66% of the total sample gave a favourable answer to this option.

The analysis of the reasons indicated for a positive willingness to pay reveals that in approximately half of the cases the respondents considered city trees are worth preserving

regardless of cost. On the other hand, the reasons given for unwillingness to pay expose two categories of respondents whose answers do not reflect their true unwillingness to pay but rather their refusal to accept the scenario or their belief that urban tree estate management is the responsibility of the council.

Due to preferences not being static, if information on the estimated monetary value of a number of ecological services that city trees provide is communicated to the city residents, it can be expected that this will influence perceptions and future preferences. This means values will change, including economic ones. Consequently, the present study is a snapshot of a dynamic process and the results should be viewed in the context that defined them.

In conclusion, if community support for tree programs is the goal, an understanding of the underlying motivations together with reinforcement of the benefits and management of the negative effects will be needed. If formulation of efficient land-use policies is intended, the comparison of benefits with the provision and management costs will be required. The findings of this study have contributed to both.

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