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Valuing landscapes with trees: subjectivity versus objectivity, holistic versus components-based approaches

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Abstract
Recent interest by environmental economists in landscape valuation has reopened a debate from the 1960s and 1970s concerning subjective (holistic) and objective (components-based) approaches to landscape assessment and their relative strengths and weaknesses. Contingent valuation seeks the required holistic value, but limits benefit transfer; besides, there are unresolved strategic and hypothetical biases. Hedonic pricing and choice experiments, by their components orientation, partly resolve these problems. Field exercises have shown that subjective valuations are as consistent and explicable as objective ones. Components-based approaches covertly require subjective judgement, and fail to account for crucial interactions of components in determining landscape quality. A combination of holistic and subjective assessment of landscape quality with objective measurement of willingness to pay for quality is the best means to assess the effect of trees on landscape value.

1. Introduction

When I first became interested in the landscape effects of forestry, it was from a purely aesthetic point of view. I had become irritated by the insensitivity of the large-scale afforestation that had taken place since the formation of the British Forestry Commission in 1919, and was escalating during the 1960s as a result of generous tax concessions to private commercial forestry.

In the course of leisure and through the support of a small landscape trust I had the opportunity to visit and comment on forestry in some of Britain's national parks and in Scotland, casually at first, then more purposefully (Price, 1963, 1966a, 1966b, 1968). Though not dogmatically critical, my comments were often unfavourable to the then-current practice. They aligned with the views of landscape activists, which at the time were regarded in forestry circles as the outpourings of uninformed extremists.

"We must educate the public!" was a phrase not infrequently heard, in response to adverse comment on foresters' activities.

I embarked on a forestry degree course with the intention of promulgating my views, and hoping – in a completely intuitive way – to offer "moderate" trade-offs between aesthetics and economic realities. Through reading and through experience I compiled for myself seven principles of landscape design, which were general ones but formulated particularly with forestry in mind. Their names – naturalness, equilibrium, integrity, contrast and variety, pattern, honesty, and pleasantness – convey a little of their content.

But at the same time I became aware that the economics of forestry was in itself controversial. It became increasingly apparent that there was an urgent need to assess landscape quantitatively, and if possible in a way that allowed comparison with commercial values (Price 1970).

This paper follows the development of formal and quantitative assessment of landscape, starting from the non-economic perspectives of planners and geographers, but moving to the techniques of environmental economics. It draws some cautionary lessons from non-economic studies, that could be applied to the currently fashionable use of contingent valuation, hedonic pricing and choice experiments to value landscape.

2. Subjectivity versus objectivity: the debate of aesthetes

In the 1960s two opposing approaches to landscape evaluation were in discussion among geographers and planners. The holistic or subjective approach scored landscapes according to their overall impression, as judged subjectively by observers. By far the most widely discussed scale was that proposed by Fines (1968), and used as a means of evaluating alternative landscape corridors for an electricity transmission line. Numerical ranges were attached to descriptive categories in a way that suggested the numbers were intended to be interpreted in a cardinal sense, and they were so used in averaging the quality of the alternative landscape corridors. However, in application these ranges proved hard to interpret, and Harding and Thomas (pers.comm.) provided a scale where numbers were equally distributed across categories: this has subsequently been much used in student exercises.

Table 1: Fines's scales for landscape evaluation

Fines's descriptive category	Fines's numerical scores	Harding and Thomas's adaptation
Unsightly	0–1	0–5
Undistinguished	1–2	5–10
Pleasant	2–4	10–15
Distinguished	4–8	15–20
Superb	8–16	20–25
Spectacular	16–32	25–30

The categories are illustrated with annotations in figure 1.

Figure 1: Examples of categories on the Fines scale

Description of pictures:

Unsightly at Tunstead Limestone Quarry, Peak District National Park: “unsightly” means that there is a predominance of elements that offend the eye, often associated with exploitation.

Undistinguished in the Fenland near March, Cambridgeshire: “undistinguished” means that there is nothing in particular to offend the eye, but nothing in particular to delight it either.

Pleasant in the Mendip Hills, Somerset: “pleasant” landscape is such that one would positively enjoy viewing it. Little strong topography, but pleasing woods, pastureland, and walls of the local stone.

Attractive on Caer Caradoc, Shropshire Hills AONB: strong topography combines with intimate field pattern to make a landscape that people would like to holiday in. (I *have* done so.)

Superb at Windermere, Lake District: such landscape is mostly found in mountainous regions. As usual, the presence of water is positive aesthetically.

Spectacular at Romsdalfjorden, Norway: I think this scene would need a vernacular field boundary, to give it a high score in this category.

An alternative approach was based on identifiable components of the landscape, and was said to be objective, and replicable between observers. Perhaps the best known example was Linton’s system (1968), developed in relation to the landscape of Scotland. The system not only identified components, but scored them according to deemed landscape merit, a juncture at which subjectivity potentially intrudes. Table 2 shows the scores for Linton’s two main components, land form and land use.

Table 2: Linton’s components approach

Land form	Score	Land use	Score
Mountains	8	Wild landscapes	+6
Bold hills	6	Richly varied farming	+5
Hill country	5	Varied forest and moorland	+4
Plateau uplands	3	Moorland	+3
Low uplands	2	Treeless farmland	+1
Lowlands	0	Continuous forests	–2
		Urbanised and industrialised	–5

Linton recognised that the land use scores particularly represent subjective judgements, but asserted that “they are judgements to which we largely subscribe in common”: this is not the same as scientific objectivity. That trees and forests sometimes appear as positive features, and sometimes as negative, will be particularly noted.

In addition to these, Linton suggested water should score two bonus points if it formed the foreground of views, and one bonus point if it formed a significant part of the scene. “Detractors” were also discussed, but seemingly aggregated into “urbanised and industrialised” land use. Subsequent commentators (Penning-Rowsell and Hardy, 1973) have included detractors as a separable category.

Linton’s discussion of positive factors in land use referred to “variety”, which led to development of the components approach in Bangor in the 1970s. Linton’s approach to land form was followed quite closely, but, to avoid the charge of prejudice, land use was represented by its variety, simply assessed by recording the presence of each of several uses suggested by Linton.

Table 3: A modified components approach

Land form	Score	Land use: score 1 for each of –	Water	Score
Mountains	5	“Wild” or semi-natural land	Significant in the view	2
Hills	4	Broadleaved woods or trees	Present in the view	1
Steep but low	3	Coniferous woods or trees		
Undulating	2	Cultivated land		
Flat	1	“Attractive” urban		
		Deduct 1 for presence of “detractors”		

Detractors could include (and have included) non-urban activities, such as clear felling of forests, which are deemed to be aesthetically offensive.

But, preceding both of these “aesthetic” assessments of landscape, there had been an evaluation system with an economic output. It was not, as might be thought, the hedonic studies of trees’ contribution to house price by Payne and Strom (1973), nor the contingent valuations of aesthetic enhancements by Randall et al. (1974), but a non-mainstream approach to valuing trees, based on the expert judgement of a forestry graduate (Helliwell, 1967). The system required each of seven characteristics of a tree to be scored by the assessor, as shown below.

Table 4: Scoring tree characteristics according to the Helliwell system

Helliwell score	Size	Useful life expect-ancy	Importance of position in landscape	Presence of other trees	Relation to setting	Form	Special factors
1	small	10–20 years	little	many	barely suitable	poor	none
2	medium	20–40 years	some	some	fairly suitable	fair	one
3	large	40–100 years	considerable	few	very suitable	good	two
4	very large	100+ years	great	none	espec-ially suitable	espec-ially good	three

Scores for each characteristic are multiplied together, and the result is further multiplied by a monetary sum, originally £1, but increased over the years to take account of inflation and of feedback from users of the system. The system is used to this day in assessing tree values, for example in court cases for compensation. Figure 2 shows a tree which has been used in an exercise referred to later.

Figure 2: A cedar tree outside a students' residence in Bangor, which was considered "large"; to have a useful life expectancy of 40-100 years; "considerable" importance in the landscape, in which there were "few" trees of comparable size; to be "very suitable" to its setting; to have "good" [crown] form. No "special factors" were identified.

Apart from the last monetising step, it resembles Linton's method in its focus on components which, it might be hoped, can be objectively assessed or would at least command consensus, that they determine trees' value, in the direction indicated. Like both Fines's and Linton's method, its use of arithmetic requires that the numbers can be considered to have a cardinal nature. Economists might, however, be inclined to dismiss its monetary validity, because it makes no reference to consumers' willingness to pay.

It should be mentioned that the debate of the 1960s and 1970s was not just between supporters of holistic and of components approaches, but included those who deplored any attempt at all to quantify landscape values (Carlson 1977).

3. Relevance to economics: parallels and warnings

So what has all this got to do with economic valuation of landscape?

I suppose that it is not uncommon, at the beginning of one's career as a natural resource economist, to imagine that the world could be optimised by giving a well-formulated dynamic programming problem to a sufficiently large computer.

Similarly, when I first read about the hedonic pricing method (Griliches, 1971), I thought: this could be used to value the impact of forests on landscapes, and of trees on urban scenery. We just find out how far people have travelled to visit rural landscapes (or how much they paid for houses with views including trees). *Then* we shall see whether Dr Linton is right, about continuous forests detracting from the landscape. It didn't take long to disabuse myself of this seductive notion.

In fact the aesthetic effects of trees can be monetised in many ways, each with its problems (Price, 2007). In what follows, particular reference is made to hedonic pricing and contingent valuations, approaches which are as different as were those of Linton and of Fines.

4. Contingent valuation and the holistic approach

The contingent valuation method (CVM) corresponds to the subjective approach. Instead of asking people to score the landscape on a scale 0-30, we ask their willingness to pay for it, on a scale of DK0 to DK3000, or whether they would be willing to pay DK300 for a landscaped tree planting scheme.

In principle, contingent valuation's approach to monetising has beguiling simplicity, asking directly the question to which an answer is needed. In seeking an overall impression of value, without exploring what are the underlying causes of value, it resembles the Fines approach. The difference lies not just in translation into monetary terms, but in the kind of comparisons that are made: in the CVM the comparisons are not "vertical", between different qualities of landscape, but "horizontal", between landscape (or whatever other commodity might be assessed) and a scale of a different kind, money. This is the strength of CVM (and other environmental evaluation methods), enabling trade-offs to be made with other kinds of product and with the resources needed to create them. However, this feature also opens it to biases not present in the Fines method. These have been discussed at enormous length (e.g. Mitchell and Carson, 1989; Price, 1994; Garrod, 2002); but mere discussion does not guarantee that all problems will be resolved.

In particular, if I am asked what I am willing to pay for retention or planting of trees, I may ask myself: can I move the decision in favour of better landscape for me without actually having to pay anything? (strategic bias). Or my answer may be affected by part–whole bias (Bateman et al., 1997), or represent the "purchase of moral satisfaction" (Kahneman and Knetsch, 1992) or expression of symbolic values (Blamey, 1996). These biases are not always clearly separated: they are distinguished by responses to a small-scale questionnaire designed specifically to explore bias, though in relation to nature conservation values (Price, 2001) – see table 5.

Table 5: Reasons for expressing a passive use value for *Rafflesia priceiana*

	Reason for giving this value for the species	**Number of responses**
I	I knew about the importance of this species	2
II	I believe that genetic resources should be maintained intact	9
III	I want to be seen as someone who is concerned about nature conservation	2
IV	I thought you would not have asked these questions if it wasn't important	4
V	I suspected that this species does not really exist	6
VI	I didn't know anything about it	13

Answer II expresses part–whole bias: the question is about maintaining one species, but the respondent has answered as though the interviewer is offering something impossible, the guaranteed maintenance of all species. Answer III expresses moral (self-)satisfaction: the respondent is not concerned for the value of the species *itself*, but for feeling good about him- or her-self. Answer V (which is made plausible by the name of species) must clearly indicate a symbolic value: although the species is thought not to exist (it does, actually, though it has recently been renamed), it *stands for* threatened species. Several respondents who ticked these answers also ticked answer VI: although they had no knowledge about the species, they were willing to pay something for it, because it represented the *kind of thing they approved of*, and *that they wanted to be seen to approve of*.

Similarly, landscape and beauty and tree-planting are "apple-pie and parenthood" values, like sustainability: one should approve of them, and publicly express such approval (Price 1999a). Moreover, by exaggerating one's degree of approval as expressed in willingness to pay, one may be able to enhance the landscape one enjoys, without perhaps having to pay the cost. None of these problems arises in the more circumscribed valuations of the Fines approach.

A further problem arises precisely from the holistic nature of the valuation: it is specific to locality and to the nature of the proposed change, and it must hence be questionable whether the landscape benefit determined is transferable to other circumstances. This hinders validation of the measure against other completed valuations, and brings the need to repeat valuations in all future circumstances. Even using questions about distant and perhaps unknown landscapes does not satisfactorily solve the benefit transfer problem. Such an approach encounters a further serious problem, that of information bias (Price, 1999b), under which *being informed* about a particular landscape raises its importance and, again, makes it symbolic of general landscape concerns.

Hedonic pricing appears to overcome all these problems.

5. Hedonic pricing and the components approach

Being based on real market transactions, hedonic pricing avoids the problems arising from the hypothetical nature of choices in contingent valuation. One actually has to pay for the bundle of characteristics that a house or a holiday location offers, so there is no strategic advantage in misrepresenting what one is willing to pay. One buys not all landscape, not trees as general symbols of beauty, but that part of actual landscape over which purchase gives one command. It is clear that the purchase made is for one's own private advantage, and is not a public statement of support for the notion of beauty, or for its actual existence.

Moreover, the attributed aesthetic value of the views accessed can be distributed across the designated components of the view. Hence it becomes possible to transfer benefits by compiling a value for a landscape or for a change made to a landscape, simply by summing unit values for its components, as derived from studies made elsewhere.

The existence of trees, and even of particular kind of trees, in proximity to houses has been a particularly heavily researched aspect of hedonic pricing (Strom and Payne, 1973; Morales et al., 1976; Anderson and Cordell, 1988; Kim and Johnson, 2002). While there seems general consensus that trees are a good thing for landscape, there is less agreement on the relative benefits of different kinds and locations of trees. A Danish study found a positive effect on house price resulting from nearness of forests (Anthon et al., 2005), while a Finnish one found the opposite (Tyrväinen, 1997). Hanley and Ruffell (1993) considered the results of their attempt to relate travel distance to characteristics of trees constituting forests "disappointing". Willis and Garrod (1992) reached the counter-intuitive conclusion that old Sitka spruce forests – usually deemed more attractive than young ones – reduced house prices. (For possible explanations, see Price (2003)).

Perhaps we just need a bigger model, with more data?

6. Choice experiments and the components approach

As discussed, a major potential problem of contingent valuation arises from headlining one particular issue (conservation of an attractive species) or site (enhancing or preserving its beauty), with the possibility that many related environmental concerns will be hung upon this. Choice experiments attempt to resolve the problem by offering choices among two or more packages in which one or more environmental attributes is offered at several levels along with several levels of monetary sums.

In so doing, they also reduce the stark choice between *either* a monetary sum *or* an environmental gain: comparisons are vertical (between levels of attributes) as well as horizontal (between attributes and money). They seem to weaken the incentive for expressing moral satisfaction values; for embracing "the whole" of the environment rather than focusing on the required "part"; and for seeking strategic gains by misrepresentation of willingness to pay.

They also, by intention, allow monetary equivalents to be attached to *components* of the environmental experience, thereby facilitating benefit transfer, as with HPM.

However, they do not altogether avoid the expression of symbolic values. When Nielsen et al. (2007) offered packages in which various levels of forest characteristics were offered, there was a positive willingness to pay for presence of dead wood. On the other hand the most preferred level of dead wood was the minimum offered, hinting that respondents *knew* that dead wood was "a good thing" for biodiversity and so supported it in principle; but *felt* that it was aesthetically displeasing so should be limited in practice. There is perhaps a parallel with the neo-Gothic liking for gnarled and twisted (and probably dead) trees as shown in the pictures of, for example, Caspar David Friedrich: "sublime" experience is something one should have, but it's good to be able to retreat to "picturesque" and "beautiful" landscapes, once the requisite chilling of the spine has been achieved (Price, 1810).

7. Subjectivity is not inexplicable

Although subjectivity is considered a "bad word" in physical sciences, and even sometimes in social sciences, its existence is not hostile to the application of the scientific method. In fact the whole of demand-side economics is based on the subjective preferences of consumers for particular forms of consumption. Furthermore, as Linton noted, some judgements represent a broad social consensus.

To demonstrate this tractability to systematic analysis, holistic scores in landscape evaluation exercises have been tested statistically.

Consistency

Confirmation of the *consistency* of holistic judgement, compared with the supposedly objective recording of components, comes from a field exercise repeated over a ten-year period, generating 27 replicated evaluations of the same 14 views across a variety of landscapes. Subjective, holistic scores were given using the Fines system as modified by Harding and Thomas; the components are those derived from Linton as modified by Harding and Price.

Table 6: Measures of consistency in subjective and objective scores given to views

Variable	**Range across views of coefficients of variation**	**Mean coefficient of variation across views**	**Mean of [standard deviation÷possible range]**
Mean holistic score	0.079-0.328	0.156	0.068
Land form	0.014-0.197	0.090	0.054
Land uses	0.075-0.632	0.196	0.123
Water	0-0.368	0.132	0.047
Detractors	0-2.367	0.787	0.313
Summed components	0.069-0.288	0.171	0.093

[Source: Price, 2011]

Figures in table 6 are derived in the following way.

For each of the 14 views, for each of the 27 group exercises, the group's mean holistic score and agreed components score are recorded. For a given view, the variability between the groups is calculated.

The calculated variability is expressed in relative terms – relative to the mean value for the view, and relative to the maximum range that the variable could take.

By all measures of variability, the holistic score lies inside the range of values taken by the components scores: subjectivity seems no less consistent than does so-called objectivity. Anecdotally, and consistently over many years, the vigour of discussion within a group as to whether a view was hilly or mountainous, whether a few conifers were or were not significant in the view, and particularly over whether something should be deemed a detractor or not, confirmed that a components approach does not give precise replicability.

In 20 out of 26 cases (in one case it was not possible to include it), one particular view was judged to be the best of 14, and in all cases another particular view was judged to be the worst.

Within groups there is again consistency of scoring, though idiosyncrasy is more evident at this disaggregated level. In a randomly chosen data set – which was, however, typical of all data sets – Pearson correlation coefficients between the scores of pairs of individuals, for all 14 views, were all in excess of 0.4; 70 out of 91 exceeded 0.6; 55 exceeded 0.7; 31 exceeded 0.8.

Similar results were found with application of the Helliwell system to nine trees evaluated by the same groups.

Table 7: Measures of consistency for the attributes of each tree in Helliwell's system

Attribute of a particular tree	Range across trees of coefficient of variation	Mean coefficient of variation across trees	Mean of [standard deviation÷range]
Its size	0–0.301	0.130	0.090
Its life expectancy	0.070–0.508	0.171	0.126
Importance of its position in landscape	*0.107–0.491*	*0.216*	*0.153*
Presence of other trees	0.090–0.856	0.300	0.280
Its "suitability to the setting"	*0.107–0.284*	*0.176*	*0.144*
Its form	*0.061–0.365*	*0.211*	*0.130*
Special factors	*0.000–0.347*	*0.079*	*0.036*
Its value (multiplicative aggregation)	0.328–1.173	0.682	0.015

[Source: Price, 2011]

Some attributes, such as size, have the appearance of objective measurability. Others, such as suitability to setting, depend on personal judgements of appropriateness (and it was evident that judgements did differ, particularly in relation to exotic species such as cordyline palms). Life span will in time prove to fall precisely into one category or another, but expectation is a matter of personal judgement: and over the years covering the exercises that judgement sometimes shifted markedly.

Again, it is clear that the more subjective elements, italicised in the table, are about as consistent as the more objective ones.

Accountability of variation
Social science seeks to account for variation in preference in terms of measurable attributes such as cultural background. For the holistic landscape scores, correlations between pairs of subjective scorers tended to be greatest for those familiar with the landscapes being evaluated. They were least between those of different continental origin.

Although no numerical tests have been run, it appears that well-organised landscapes with square fields and tidy plantations are particularly valued by evaluators from countries where natural forces seem to pose a threat to survival. Obversely, those from countries where survival seems assured and humans are perceived to endanger nature, wild, mountainous landscapes, where nature remains the dominant force and commercial forestry is absent are more appreciated (this, clearly, is also Linton's perspective).

Weather exerted a mild, barely statistically significant effect on overall mean score within an exercise.

By self-report, individuals' personality was considered to influence the scores assigned. In 75% of cases, some individuals did score significantly higher or lower than the group generally, but no attempt was made to relate this to personality indicators.

In praise of relevance
Discovering how individuals respond to landscapes – positively or negatively, weakly or strongly, how they respond to more trees, or different kinds of trees, or trees in different arrangements – is in the end the purpose of landscape *evaluation*. The purpose of landscape *valuation* is to quantify this holistic response in monetary terms. Fines's system therefore in principle gives the relevant measure of landscape quality; and appropriately designed contingent valuation in principle gives the relevant measure of landscape's worth (to humans). Components-based approaches have their own interest, but their relevance to land-use decision making comes only from their ability to model and predict how individuals will respond to landscape and to landscape change.

If, therefore, holistic methods could provide a monetary valuation which is largely free of bias, then they supply what is needed. But it is in the bias that the problem lies. From the discussion above, it is rather clear that biases do not arise from the holistic or subjective nature of evaluation, but that they are inherent in the *monetisation* process – in the horizontal comparison between two scales which not only measure different phenomena, but which are perceived as having different moral content. Hedonic pricing, and to a lesser extent choice experiments, seem to exclude this important sources of bias. Hence if they could deliver an accurate model of what an unbiased holistic valuation would be, they are to be preferred. But this condition may not be met.

8. Objectivity is not all that it seems

It has already been demonstrated that objectivity is quite elusive in relation to landscape attributes. It becomes more so, as we try to relate it to the valuation of those attributes.

To construct a relevant hedonic model or choice experiment requires subjective choices: components of the landscape do not come with labels attached, stating "relevant", "irrelevant", or "marginal". So, should hills be included? rock faces? rivers? lakes? islands? forests? trees? hedges?

How should presence of a tree-based (or other) feature in a landscape be measured – as the counted or estimated number of trees? the linear dimensions of the woodland feature? its visible spatial extent?

What form should the relationship between a physical measure and its value take – linear, such that if one tree is worth DK1, a thousand trees are worth DK1000? or should it be logarithmic? or polynomial?

How should the interaction of features be treated – not at all, as in the widespread implicit assumption of additive separability? or is it acknowledged (and if so, how?) that one component, such as the forest's shape, affects aesthetic qualities in a way that depends on another component, such as one reflecting the steepness and configuration of topography? The latter would be the universal opinion of landscape designers, but this insight is rarely reflected in quantified models.

How is multicollinearity to be treated, such that, despite a relationship between two attribute variables, their influence on quality cannot load onto the "wrong" variable? For example, much conifer afforestation in Britain has occurred in national parks with characteristically mountainous land form. Might a preference for mountainous land form accidentally become associated with conifer afforestation?

How is value to be distributed among landscapes, when a trip may embody hundreds of kilometres of ever-changing landscape experience, some forested, some open, as well as a multitude of recreational and cultural events and eventualities?

Is it just the quantity or state of a component that determines its contribution to landscape quality, or is it the disposition of the components within views, in itself and in relation to other components? This is what artists (and other creative individuals) term "composition". Almost every aesthetic expert would assert that it is a vital determinant of really high quality landscape, for example in the arrangement of groups of trees in the naturalistic landscapes designed by the admired English landscapers of the C18th. And yet statutory ordinances for landscape design, such as the 10% of broadleaves prescribed by the UK Woodland Assurance Scheme

(UKWAS, 2006), may make no reference to it. A quota of 10% of broadleaves can delightfully frame or interpret or soften the margins of a conifer forest. Or it can burden it with an absurd and deceitful screen, or ridicule it with geometrical shapes or strings of planted alphanumeric characters, in the fashion of a municipal flower-bed.

These matters may lie beyond meaningful quantification, and when they *can* be quantified there is no evidently correct way in which the process should be carried out. To choose among the practically infinite set of possible relational equations, one may refer to understandings of how components combine into landscape of high quality: but to do so entails subjectivity, often in an intuitive and unaccountable form. Or one may adopt the model that seems to offer the best statistical fit. However, in theory this has doubtful validity, since out of a large number of mathematical models, one of them may provide a good fit to the data quite by chance, without having the slightest predictive power for new circumstances (Price, 1976).

Consider the evidence from the components exercises referred to earlier. After each exercise, a multiple regression model was constructed which related the mean subjective score to all four component variables. The results from the 27 cases were very diverse.

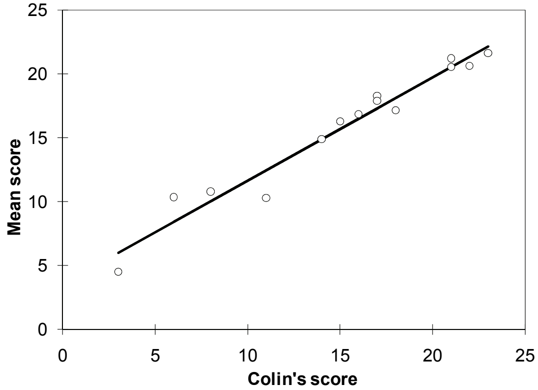
Table 8: The diversity of components models

Component	**Cases out of 27 in which the component was significant at the 95% level**
Land form	10
Land use	3
Water	2
Detractors	5
None	11
All four	0
Some three	1

Out of 16 logically possible combinations of variables, seven were found in practice.

For the power of a components approach to be useful, it must be capable of transfer to different sites, and different configurations of land use. But if the models constructed for a *single, constant* set of views are so diverse, what chance is there that any one of them can reliably be transferred to new circumstances? None whatsoever, is the answer.

Figure 3: A representative evaluator as predictor of a group's score



In each of the 27 cases, the score given by one, representative evaluator (myself) gave a better prediction of the group's mean score than the components model did. A typical result is depicted in figure 3. Not only was subjective, holistic scoring consistent across these exercises: it was more *consistently consistent* than was the supposedly objective components approach.

9. Concluding thought

So if benefit transfer is sought, this is actually the line to follow. A trained evaluator calibrates him- or herself to the subjective judgements of the kind of constituency who will be experiencing the set of landscapes. The evaluator goes on to judge the quality of a landscape or the effects on a landscape of a forestry proposal or tree planting scheme, including the effects that arise through all the subtleties of interaction and composition alluded to above. The influence – experienced, visualised, or imagined – of trees in the landscape is judged, not by referring to a shopping list of their attributes, and of the attributes' prices, but by their overall effect. The comparison is a vertical and holistic one, among landscapes of different quality.

The role of economics is then to determine, via travel cost analysis, or by hedonic house price models, or otherwise, what the willingness to pay is for different levels of landscape quality. This is what makes the necessary horizontal alignments, between landscape scales and monetary ones. It is a separate exercise, carried out in circumstances that encourage no strategic bias, no misunderstanding of the product that is offered, and require no mathematical modelling of the nature of beauty.

This has been recommended before, and has been *done* before (Abelson, 1979; Bergin and Price, 1994; Cobham Resource Consultants and Price, 1991; Henry, 1994, 1999; Price, 1978, 2008; Price and Thomas, 2001). It ought to be done more often: much more often.

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Colin Price is the author of a chapter in a forthcoming title, /The Economic Value of Landscapes/, that will be published by Routledge in 2011. The chapter includes some similar material to that presented above. He is grateful to the publishers for permission to use this material here.

References
Abelson, P. (1979). *Cost Benefit Analysis and Environmental Problems*. Saxon House, Farnborough, Hants, UK, 202 pp.

Anderson, L.M. and Cordell, H.K. (1988). Influence of trees on residential property values in Athens, Georgia (U.S.A.): a survey based on actual sales prices. *Landscape and Urban Planning*, 15, 153-64.

Anthon, S., Thorsen, B.J. and Helles, F. (2005). Urban-fringe afforestation projects and taxable hedonic values. *Urban Forestry and Urban Greening*, 3, 79-91.

Bateman, I., Munro, A., Rhodes, B., Starmer, C. and Sugden, R. (1997). Does part–whole bias exist? An experimental investigation. *The Economic Journal*, 107, 322-32.

Bergin, J. and Price, C. (1994). The travel cost method and landscape quality. *Landscape Research*, 19 (1), 21-3.

Blamey, R.K. (1996). Citizens, consumers and contingent valuation: clarification and the expression of citizen values and issue-opinions. In Adamowicz, W.L., Boxall, P.C., Luckert, M.K., Phillips, W.E. & White, W.A. (eds). *Forestry, Economics and the Environment*. CAB International, Wallingford, pp.103-33.

Carlson, A.A. (1977). On the possibility of quantifying scenic beauty. *Landscape Planning*, 4, 131-72.

Cobham Resource Consultants and Price, C. (1991). *The Benefits of Amenity Trees*. Report to Department of the Environment, London.

Fines, K.D. (1968). Landscape evaluation: a research project in East Sussex. *Regional Studies*, 2, 41-55.

Garrod, G. (2002). *Social and Environmental Benefits of Forestry Phase 2: Landscape Benefits*. Report to Forestry Commission, Edinburgh, UK. 46 pp.
http://www.forestry.gov.uk/website/pdf.nsf/pdf/fclscaperep.pdf /$FILE/fclscaperep.pdf.

Garrod, G.D. and Willis, K.G. (1992). Valuing goods' characteristics: an application of the hedonic pricing method to environmental attributes. *Journal of Environmental Management*, 34, 59-76.

Griliches, Z. (ed.) (1971). *Price Indexes and Quality Change*, Cambridge, Mass, Harvard University Press.

Hanley, N.D. and Ruffell, R. (1993). The contingent valuation of forest characteristics. *Journal of Agricultural Economics*, 44, 218-29.

Helliwell, D.R. (1967). The amenity value of trees and woodlands. *Arboricultural Journal*, 1, 128-31.

Henry, M.S. (1994). The contribution of landscaping to the price of single family houses: a study of home sales in Greenville, South Carolina. *Journal of Environmental Horticulture*, 12 (2), 65-70.

Henry, M.S. (1999). Landscape quality and the price of single family houses: further evidence from home sales in Greenville, South Carolina. *Journal of Environmental Horticulture*, 17 (1), 25-30.

Kahneman, D. and Knetsch, J.L. (1992). Valuing public goods: the purchase of moral satisfaction. *Journal of Environmental Economics and Management*, 22, 57-70.

Kim, Y-F. and Johnson, J.L. (2002). The impact of forests and forest management on neighboring property values. *Society and Natural Resources*, 15, 887-901.

Linton, D.L. (1968) The assessment of scenery as a natural resource. *Scottish Geographical Magazine*, 84, 218-38.

Mitchell, R.C. and Carson, R.T. (1989). *Using Surveys to Value Goods: the Contingent Valuation Method*, Washington, Resources for the Future.

Morales, D.J., Boyce, B.N. and Favretti, R.J. (1976). The contribution of trees to residential property value: Manchester, Connecticut. *Valuation*, 23 (2), 26-43.

Nielsen, A.B., Olsen, S.B. and Lundhede, T. (2007). An economic valuation of the recreational benefits associated with nature-based forest management practices. *Landscape and Urban Planning*, 80, 63-71.

Payne, B.R. and Strom, S. (1973). The contribution of trees to the appraised value of unimproved residential land. *Valuation*, 22 (2), 36-45.

Penning-Rowsell, E.C. and Hardy, D.I. (1973). Landscape evaluation and planning policy: a comparative study in the Wye Valley Area of Outstanding Natural Beauty. *Regional Studies*, 7, 152-60.

Price, C. (1963). *The Cumbrian Peregrinations of Chipps and Myself*. Youth Hostels Association, St Albans. Also available from eimprice@btinternet.com.
Price, C. (1966a). *The Nineteenth Spring*. Available from eimprice@btinternet.com.
Price, C. (1966b). *Afforestation in the Dartmoor National Park*. The Gatliff Trust, London. Also available from eimprice@btinternet.com.
Price, C. (1968). *Forestry in Glen Affric*. The Gatliff Trust, London. Also available from eimprice@btinternet.com.
Price, C. (1970). *Social Benefit from Forestry in the UK*. Oxford Forestry Institute. Also available from eimprice@btinternet.com.
Price, C. (1976). Subjectivity and objectivity in landscape evaluation. *Environment and Planning A*, 8, 829-38.
Price, C. (1978). *Landscape Economics*. London, Macmillan, 168 pp.
Price, C. (1994). Literature review [of landscape valuation]. *Landscape Research*, 19 (1), 38-55.
Price, C. (1999a). Stated and revealed preference analysis. In Helles, F., Holten-Andersen, P. and Wichmann, L. (eds), *Multiple Use of Forests and Other Natural Resources*. Kluwer, Dordrecht, pp.46-65.
Price, C. (1999b). Contingent valuation and retrograde information bias. In Park, A. and Stewart Roper, C. (eds). *The Living Forest*. Proceedings of the International Symposium on the Non-market Benefits of Forestry, Edinburgh, June 1996. HMSO, London, UK, pp 37-44.
Price, C. (2001). Exact values and vague products? Contingent valuation and passive use value. In Sievanen, T., Konijnendijk, C.C. Langner, L. and Nilsson K. (eds). Forest and Social Services – the Role of Research. *Research Paper* 815 of Finnish Forest Research Institute, Vantaa, Finland, pp 205-17.
Price, C. (2003). Quantifying the aesthetic benefits of urban forestry. *Urban Forestry and Urban Greening*, 1, 123-33.
Price, C. (2007). Putting a value on trees: an economist's perspective. *Arboricultural Journal*, 30, 7-19.
Price, C. (2008). Landscape economics at dawn: an eye-witness account. *Landscape Research*, 33, 263-80.
Price, C. (2011). Subjectivity and objectivity in landscape evaluation: an old topic revisited. In van der Heide, M. and Heijman, W. (eds). *The Economic Value of Landscapes*. Routledge.
Price, C. and Thomas, A.Ll. (2001). Evaluating the impact of farm woodland on the landscape: a case of blending perspectives. In Sievanen, T., Konijnendijk, C.C. Langner, L. and Nilsson K. (eds). Forest and Social Services – the Role of Research. *Research Paper* 815 of Finnish Forest Research Institute, Vantaa, Finland, pp.191-203.

Price, U. (1810). *Essays on the Picturesque, as compared with the Sublime and the Beautiful; and, on the Use of Studying Pictures, for the purpose of Improving Real Landscape*. Mawman, London.

Randall, A., Ives, B.C. and Eastman, C. (1974). Bidding games for valuation of aesthetic environmental improvements. *Journal of Environmental Economics and Management*, 1, 132-49.

Tyrväinen, L. (1997). The amenity value of the urban forest: an application of the hedonic pricing method. *Landscape and Urban Planning*, 37, 211-22.

UKWAS (2006). *The UK Woodland Assurance Standard*. UKWAS, Edinburgh.

Willis, K.G. and Garrod, G.D. (1992). Amenity value of forests in Great Britain and its impact on the internal rate of return from forestry. *Forestry*, 65, 331-46.