Valuing Landscape: a Contingent Valuation Approach

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Landscapes can change over time as a consequence of economic demands and technological innovation in agriculture. This study assesses the preferences for and the values of different landscapes which could arise in the future in the Yorkshire Dales National Park. The landscapes assessed comprised images of a range of possible future agricultural landscapes: today's landscape; abandoned; semi-intensive agricultural; intensive agricultural; planned; conserved; sporting; and wild landscapes. A majority of both visitors to and residents of the Dales preferred today's landscapes, although the conserved landscape was also valued highly. A comparison of the costs of maintaining each landscape with their respective benefits indicates that more public expenditure should be devoted to protecting and enhancing environmental attributes such as dry stone walls and stone barns, wild flowers and hay meadows, and small broadleaved woodlands. Methodological tests on the contingent valuation technique underpinning this study suggests that the results are reliable and robust.

Keywords: contingent valuation, landscape, environmental evaluation.

1. Introduction

Landscapes have changed dramatically in the countryside since 1947, both as a result of public subsidies and of technological change in agriculture and forestry. This impact on the countryside of agricultural policy has been eloquently documented by Shoard (1980) and analysed by Bowers and Cheshire (1983). But while the financial costs of landscape and wildlife protection are well known, together with the opportunity costs of the Common Agricultural Policy (CAP) intervention (Black and Bowers 1984; Willis *et al.*, 1988), few attempts have been made to measure the benefits conferred on society by particular landscapes.

The problems of measuring landscape benefits by travel cost and hedonic price models outlined by Price (1978) are still relevant. But recent attention in economics focusing on contingent valuation techniques (CVTs) has opened up new ways of measuring commodities, including landscape, and previously unmeasurable quantities such as the option and existence values for wildlife. CVTs are a simple, and logical,

1

extension of the attitude and preference measurement techniques employed by psychologists and behavioural scientists, and can be applied in a wide variety of scenarios.

This paper makes use of these techniques to value a series of alternative landscapes, each differing significantly from those found in the Dales today; although which, under certain circumstances, could evolve. Such circumstances could include the consequences of policy changes towards agriculture, alterations in the degree of support for conservation and intervention in rural areas, as well as changing economic demands and policies towards sport and leisure.

Any one of a variety of different agricultural landscapes might evolve in the future as O'Riordan *et al.* (1989) have suggested, as a result of:

1. Continued agricultural subsidies which would lead to a change from today's agricultural landscape to a semi-intensive agricultural landscape, with increasing size and productivity of farms, and partial loss of some traditional landscape features such as dry stone walls, heather moor and broadleaved trees.
2. Withdrawal of upland farming subsidies, which would result in hill farmers having to compete with more fertile lowland farms, leading to either an uncontrolled, neglected and abandoned agricultural landscape where normal agricultural activity has been discontinued, or an intensive agricultural landscape, where profits could be made by buying out the smaller farms to create large livestock ranches, and by taking advantage of modern technology. Flower-filled meadows would be intensified for silage, outlying meadows and moorland would be abandoned to scrub and stone barns and dry stone walls would become derelict.
3. Withdrawal of agricultural subsidies and price support, and increasing time and resources for leisure in the future could result in opportunities for the creation of a sporting landscape by landowners, as tenant farms become unviable. The land would be used like a series of large estates for grouse and pheasant shooting, deer hunting and outdoor recreation. Heather moorland would increase to encourage grouse, new large mixed conifer and broadleaved woodlands would be created for game cover and some field barns would be converted to recreational uses.
4. Alternatively, in the absence of agricultural subsidies a wild landscape could consciously be created, with large areas of the Dales set aside for wildlife. Without grazing, much of the land would eventually end up covered by natural broadleaved woodland, with flowery glades replacing meadows, and heather moorland invaded by scrub and bog. Barns and dry stone walls would quickly become derelict.
5. Public money might be available to allow farmers to continue exploiting the land, whilst simultaneously conserving the landscape to a greater extent than that undertaken today. A conserved agricultural landscape such as this would have more hay meadows than today's agricultural landscape, while broadleaved woodlands, barns and dry stone walls would be carefully maintained, and new broadleaved woodlands planted. Alternatively, with limited conservation grants, a skeletal planned agricultural landscape could evolve. The best of the traditional landscape features would be enhanced, while derelict features would be removed. There would be a few more hay meadows than there are in today's landscape; some new conifer and broadleaved woods would be planted, but only some of the field barns and dry stone walls would remain.

The present study employs these images of future landscapes as they are depicted in a

study by O'Riordan *et al.* (1989) to assess preferences and values for different landscapes. Thus, this study differs from those of O'Riordan *et al.* (1991, 1992): their studies were essentially experiments looking into the degree to which an innovative, interpretive approach promoted understanding among participants with relatively little prior knowledge, stimulated in participants a sense of concern for the future of the Yorkshire Dales landscape and generated among them a willingness to support, or participate in, policies that would result in particular landscape features being safe-guarded or created.

The present study has a different purpose, namely to evaluate the preferences of residents and visitors for various landscapes, including today's landscape, through willingness to pay (WTP) for that landscape. Thus, as well as valuing today's landscape, this paper attempts to value the benefits which residents and visitors might derive from alternative landscapes which could arise at some time in the future. Considerable sums of public money are currently spent on producing and maintaining today's landscape (e.g. in support for agriculture, and in protecting and conserving the environment through compensation and other payments). However, little is known about the benefits derived by individuals from such expenditure on the landscape. It is to this issue that this paper is addressed.

The paper is divided into a number of sections. In the next, landscape evaluation methods are reviewed, while the third describes the Yorkshire Dales area, the surveys and the sample. The fourth section documents some of the results of the sample survey in terms of recreational activities undertaken by visitors and residents, and looks at each of these groups' perceptions of the Dales landscape. In the next section the contingent valuation results are presented, and in Section 6 these are aggregated across the entire population. The seventh and eighth sections assess the robustness of the CVT adopted in terms of part–whole bias and a model of willingness to pay. Since these two sections are primarily of interest to CVT methodologists, the general reader may wish to ignore them and move directly to Section 9, the conclusion.

2. Landscape evaluation

The account of landscapes and landscape change by Fairbrother (1970) remains one of the most influential of recent publications. Yet, its actual research component was minimal and its evaluation based on intuitive judgement, anecdotal and impressionistic evidence.

However, there is evidence of a growing recognition that experts can lack consensus in rating landscape features. When landscape architects were asked to evaluate 10 attributes of forests [scale, shape, broad-leaved/conifer, overall diversity, species diversity, age diversity, colour diversity, spacing density, human intrusion and genius loci (spirit of place of its sense of character)] on a scale of 1 to 5, correlation or correspondence between respondents was only moderate. Correlation coefficients between architects varied from $+0.85$ for the broad-leaved conifer attribute, to -0.273 for the impressions of colour diversity (Lee, 1990). These results suggest that expert or professional judgement cannot be a substitute for data-based aids and quantitative techniques. Expert opinion does not form a consistent decision-making, nor diagnostic, process. Therefore, there is a strong case for pressing ahead with further research on the quantitative evaluation of landscapes and countryside attributes. However, these approaches are not without their own problems.

Methods of landscape appraisal fall into a number of categories:

1. Intuitive assessment, entirely subjective by the appraiser.
2. Database surveys of landscape features, to aid judgement by the appraiser.
3. Subjective scoring of landscape components by the general public.
4. Other public preference techniques, such as landscape ranking and CVTs.

Landscape appraisal in a more systematic and database-aided form was undertaken by Westmacott and Worthington (1974). Using sources such as maps, this study recorded changes in the distribution, over time, of such features as hedgerows, trees and wildlife habitats, as well as land use (arable, grassland, orchard, rough grass, woodland, marsh and scrub). The study revealed considerable changes in the distribution and extent of these features since the early 1930s, in each of seven study areas covering different types of farming, soil type and landscape character. New landscapes were being created which, in the authors' opinion, greatly diminished scenic and wildlife interest.

The desire to assess the public's preferences for landscape, as well as more rigorously appraise and quantify landscapes, has long been cherished and was encapsulated in various landscape appraisal techniques which sampled the perception of the general public to landscape features such as relief, texture, colour, vegetation, water, types of buildings and intrusions. Such techniques, where members of the public award scores to various landscape components (e.g. on a scale of 0 to 5, 1 to 10, etc.), have been widely applied, but there is little agreement as to the objectivity of the results. Chief concerns centre on the selection of the components to be appraised, and the weighting between components. It is difficult to ensure that an exhaustive list of components has been provided to the respondent: the components chosen to measure landscape quality, or those omitted, may affect the final score. Moreover, if the components chosen are not mutually exclusive, double-counting of some components may be encountered. In addition, no consensus of opinion exists on a number of important issues: these include the individual scorer's utility, the provision of a measurement scale or scoring point scale within each component, the question of whether the relationship between the quantity/quality relationship of a component is linear or non-linear and the use of an overall landscape score or utility index.

Some of the problems of the subjective scoring of landscape components might be resolved through a hedonic price method (HPM) in which components of the landscape would be valued against people's willingness to pay to live in particular types of landscapes, defined as comprising different bundles of components. Whilst this is theoretically possible with an HPM, and indeed recent HPM studies (Garrod and Willis, 1992a,b) have shown that particular environmental attributes and countryside characteristics can be valued; problems of the functional relation between variables, separability and collinearity mean that composite aggregate values for landscape as a whole are difficult to obtain with this method (Price, 1990). In addition, the varying shapes, forms and spatial relationships between attributes can create an infinite number of independent variables making model specification potentially very difficult.

Linearity means that WTP is a linear or other pre-determined function of the quantity of a feature in the landscape, which implies that the impact of a block of forest increases in proportion to its size, but evidence suggests that this is not so (Garrod and Willis, 1992b). Separability, where the effect of one independent variable is not influenced by the effects of another, is difficult to sustain. As Price (1990) points out, the impact of a geometrical block of forest on the landscape is conditioned by topography: thus, forest blocks in the uplands are deemed more intrusive than rigid field patterns in

the lowlands. It is possible to overcome these problems by creating new variables from combinations of existing ones, both to account for interactive effects, such as scale, and for differences in forest block shape, even when overall size remains constant. However, in doing this degrees of freedom are quickly exhausted. Non-collinearity, where independent variables are not strongly interrelated, is also often difficult to sustain; for example, conifers are associated with highlands and broadleaves with gentle lowland topography.

Despite such reservations, some features of the landscape can be valued with HPMs in a cardinal way. One example of this, which appears to be both plausible and consistent, is the measurement of the value of marginal change in the quantity of a landscape component (Garrod and Willis, 1992b).

The central theme of preference techniques is the evaluation of the total landscape: i.e. one single rating score/value for the landscape unit as a whole rather than ratings/ measurements for a number of components. This is the main merit of public preference techniques over techniques which subjectively score individual landscape components. As Dunn (1974) has argued:

"However diligently the search for the complete set of relevant factors may be, there will inevitably be a proportion of variation in landscape quality which cannot be explained or predicted by the assembled factors. This proportion, it seems intuitively reasonable to suppose, will consist of subtleties of landscape, such as interaction between elements and properties like shape, form, colour, and lighting".

"Measurement techniques ... cannot develop sufficiently to embrace such subtleties; the critical point is that preference ratings inevitably do include them".

"The potential for preference techniques is considerable, chiefly because of the ability to present results as a single statement of total landscape quality, and the possibility of measuring the true value of the landscape to a wide spectrum of 'users'".

In other words, preference techniques value the landscape in its entirety: taking into account the whole bundle of varying attributes in a spatial area. This may be done with respondents on-site, or through pictorial displays which can be used off-site. The latter method is particularly useful if the respondent is asked to state or express a preference for a landscape, or to rank two or more landscapes. Pictorial displays permit an existing landscape to be modified in a montage according to likely impacts from policy changes, e.g. in the scale of subsidies to agriculture, forestry or changes in planning policy towards settlements in rural areas. Such a procedure was adopted in this study of landscapes in the Yorkshire Dales.

A natural extension of preference techniques is into CVTs. These use survey questions to elicit people's preferences for public goods by finding out what they would be willing to pay for them, or what they would require as compensation (so that they would be no worse off) for specified changes in them. Thus, CVTs are aimed at eliciting people's WTP, or willingness to accept compensation (WTA), in monetary amounts. As such, this approach circumvents the absence of markets for public goods by presenting consumers with hypothetical markets in which they have the opportunity to buy the good in question. The hypothetical market may be modelled after either a private goods market or a political market (Mitchell and Carson, 1989). In a CVT study, respondents are presented with material, usually in the course of a personal face to face interview, which consists of:

1. A detailed description of the good(s) being valued and the hypothetical circumstance under which it is made available to respondents.
2. Questions which elicit the respondents' preferences, and their maximum WTP, for the goods being valued (or where an environmental nuisance reduces respondents' welfare, the minimum sum which would just bring the sufferers back to their previous level of satisfaction, i.e. WTA).
3. Questions about respondents' characteristics (e.g. income, preference relevant to goods being valued, their use of the goods, substitutes, age, family size, etc.).

Such a CVT approach forms the basis of this paper.

3. Area, surveys and sample

The landscape of the Yorkshire Dales comprises fells and dales (valleys), rivers and waterfalls. This natural landscape has been moulded by man's activities over thousands of years, and was considered so beautiful and attractive, that the area was declared a National Park in 1954 under the 1949 National Parks and Access to the Countryside Act. The limestone scenery is characterized by a seemingly endless network of dry stone walls, enclosing a patchwork of meadows, stone barns, small woods, stone-built villages, archeological remnants include medieval field terracing and monastic remains, eighteenth and nineteenth century leadmining, while geomorphological features such as limestone caves, sinks, limestone pavement and scars abound (Waltham, 1987). Meadows are cut for hay after being grazed at the beginning and end of the season. Because of this, where meadows are naturally fertilized and seeded, they are full of wild flowers and other plants in the late spring and early summer. The meadows and woodlands of ash and hazel, with oak and birch, form a habitat for many species of birds, butterflies and associated wild flowers, while the heather moorland is burned and grazed to raise sheep and grouse.

The CVT survey of the Yorkshire Dales National Park encompassed both residents and visitors. The survey of residents was based on a sample of 300 households from the 12 largest parishes in the Craven district of North Yorkshire and was undertaken during the last four months of 1990. Using the electoral register as the sampling frame, an equal proportion of households (just under 25%) was selected to be surveyed in each parish (see Table 1). The small sample size demanded by budgetary restrictions meant that a high non-response rate could not be tolerated, so rather than targeting randomly selected households, interviewers were assigned to individual parishes and instructed to fill a numerical quota on a first-come, first-served basis, using as many return visits to the parish as necessary. The form of this sampling procedure may have introduced certain availability and selection biases into the survey; however, the fact that such a high proportion of local households had to be interviewed should have ensured that these sampling biases were kept to a minimum.

Visitors were also surveyed on a first-come, first-served basis. In this case interviews were carried out over a 2-month period beginning September 1990 at visitor car parks in three villages: Grassington, Kettlewell and Malham. Interviewers were given set targets of visitors to interview at each site and these were divided into the three categories: weekday, weekend and half-term school holiday (see Table 2). In all, a total of 300 visitors were interviewed, some of whom had travelled up to 350 miles to visit the Dales. The majority of visitors (86%) travelled to the Dales by car, van or motor cycle, with most of the remainder arriving on coaches.

TABLE 1. Survey quotas for Craven District

Parish	Households	Sample
Arncliffe	28	7
Buckden	68	16
Burnsall	49	11
Conistone-with-Kilnsey	40	9
Grassington	489	113
Hawkswick	17	4
Hebden	82	19
Kettlewell-with-Starbottom	118	28
Linton	71	17
Litton	21	5
Thorpe	17	4
Threshfield	288	67

TABLE 2. Visitor survey quotas

Site	Weekday	Weekend	Half-term	Total
Grassington	60	40	20	120
Malham	60	40	20	120
Kettlewell	30	20	10	60

The questionnaire survey of visitors covered such items as frequency of visits, length of stay, time, distance and mode of travel, expenditure, recreational activities undertaken, attitudes towards congestion, preferences over a range of landscape features, budgetary questions on expenditure towards countryside causes, preferences for different types of landscape, willingness to pay to maintain the preferred landscape and various household characteristics.

The residents' survey omitted questions such as frequency of visits to the Dales, which were obviously not relevant to residents, but otherwise posed questions which were, on the whole, identical to those in the visitor survey. However, two variants of the questionnaire were used in order to test for part–whole bias. The first half of the sample received a questionnaire asking them to estimate their household's budget for the countryside using a question identical to that received by visitors, and this was followed by a question investigating their WTP for the maintenance of their preferred landscape. The remainder of the sample were simply asked the WTP question.

4. Visitors to and residents of the Yorkshire Dales

In the sample survey of visitors and residents, the distribution of household income was practically identical for both groups: the resident population of the Dales does not comprise a high proportion of very wealthy households. However, the age distribution of residents in the sample survey was found to be considerably more skewed towards the older age groups when compared with that of visitors. Of the households interviewed in the Dales, 31·7% had a member who worked outside of the National Park boundaries.

The recreational activities undertaken provide both similarities and contrasts between Dales' visitors and residents. Where activities are such that they are open to large sections of the population, e.g. walking and picnics, participation rates are high among both groups. Other more specialist recreational activities have low participation rates, e.g. cycling, painting and sketching (see Table 3).

While participation rates are often similar between visitors and residents, there are some divergences. For example, residents' participation rate in horse riding is twice that of visitors, and for fishing the differential is 3·5 times. On the other hand, the participation rate in climbing and caving is twice as great for visitors as it is for residents. Perhaps, understandably, residents are also somewhat less inclined to participate in sightseeing and photography than visitors.

Of the visitors to the Dales the majority (77·6%) had visited the Dales at some point in the past. Most visitors (60·4%) were on a day trip to the Dales, while the remainder were on holiday. For 78·8% of day visitors, the visit to the Dales was the main purpose of their trip.

The prospect of increasing numbers of visitors in the future did not appear to affect visitors' visit rate preference. When faced with the scenario of the Dales receiving twice as many visitors as it does at present, and then asked what their visit rate would be in those circumstances, 67·4% of visitors reported that it would remain the same, 11·2% reported some decrease, 12·8% thought they would only visit half as often, 5·6% reported a visit rate of less than half that of present, while only 2·0% said they would not visit at all. However, only 56·3% of respondents said, that under this scenario, their enjoyment of the Dales would be as great as it is today, and while 13·8% thought their enjoyment would decrease somewhat, 17·4% thought their enjoyment would only be half of that today, while the remainder believed their enjoyment would decrease even further or cease altogether.

Residents' attitudes to the prospect of increasing visitors were somewhat different. While 56·3% of residents thought that the Dales were already severely overcrowded because of visitors, only 5·5% of residents thought the Dales were overcrowded by having too many residents. Conversely, a mere 2·7% of residents believed visitors presented no overcrowding problems, while 45·4% of residents thought residents presented no crowding problems. The severity of the perception of overcrowding varied with length of residence in the Dales, being particularly high for residents of 5 to 10

TABLE 3. Recreational activities undertaken in the Yorkshire Dales

Activity	Percentage of households participating in activity	
	Visitors	Residents
Walking	91·1	89·8
Cycling	22·0	23·1
Horse Riding	8·5	16·3
Climbing/caving	20·3	11·5
Observing wildlife	84·9	91·2
Painting/sketching	10·2	17·3
Fishing	7·5	26·1
Picnics	69·5	60·3
Sightseeing	93·8	78·3
Photography	79·7	58·6

years, 62% of whom regarded visitors as causing severe overcrowding, and those of over 40 years' residence (74%). Of new residents (less than 5 years), only 29% believed the Dales were crowded in terms of visitors. However, 75·4% of residents were reasonably satisfied with the way the Dales were being cared for and managed, whilst only 15·4% thought the Dales were being managed unsatisfactorily.

Table 4 documents the preferences of visitors and residents for the landscape in the Dales, when they were asked to choose their favourite three landscapes from the eight pictorial alternatives presented to them. The overwhelming preference of both groups is for today's landscape, a not unexpected choice given known psychological preferences for the status quo (Samuelson and Zeckhauser, 1988) and choice heuristics of individuals based on representativeness, availability and anchoring (Tversky and Kahneman, 1974). Note that the conserved landscape, which is very similar to today's landscape, is also a popular first choice. By comparison, other landscapes are rarely chosen as the most preferred landscape.

For the second choice of landscape, votes were fairly evenly split between the planned landscape and the conserved landscape. Indeed, more than half of those who opted for today's landscape as first choice, voted for the conserved landscape as second choice.

Note, that as one moves away from the first choice (today's landscape), consensus about which landscape is the most desirable breaks down. For the third preference, while the planned landscape receives most votes, there is considerable, and evenly divided, support for four other landscapes: conserved, sporting, wild and today's. However, it is also important to note that the semi-intensive and intensive agricultural landscape options remain the least preferred alternatives for residents and visitors alike.

5. Contingent valuation techniques and the Dales' landscape

It has been shown that CVTs may be used to elicit estimates of people's preferences for specified goods. Although CVTs may be subject to many biases (see Garrod and Willis, 1990, for a review of these), if the good being supplied is defined with precision and the CVT is rigorously applied, then, where appropriate comparisons can be made, the technique appears to be at least as accurate as other valuation methods.

However, in a valuation exercise any description of an aesthetic good may not be a substitute for actual experience, and aesthetic goods themselves are particularly difficult to describe in terms of the sensory impacts they convey. Landscape is an aesthetic good which is qualitative in nature; and it is difficult to ensure that the description captures all of the important attributes in the image it creates in the mind of the respondent. Respondents unfamiliar with the aesthetic good being valued by a CVT can easily be influenced by information contained in the definition of the good, resulting in variations in response values deriving from divergent perceptions of the good rather than from differences in tastes and income.

The Yorkshire Dales CVT sample circumvented these problems of valuing aesthetic goods by:

1. eliciting responses from visitors to and residents of the landscape, who were thus already familiar with the landscape's aesthetic features;
2. establishing today's landscape as a familiar point of reference, then presenting literary descriptions, and paintings, of landscapes which would result from different agricultural policies and government support for rural areas;

TABLE 4. Landscape preferences

Landscape	Percentage of respondents					
	Visitors†	Residents†	Visitors‡	Residents‡	Visitors§	Residents§
Abandoned	2·6	3·1	5·6	4·1	5·3	5·2
Semi-intensive	0·3	0·3	0·7	0·3	0·7	1·0
Intensive	—	—	0·3	0·3	0·7	1·7
Planned	7·3	6·8	31·5	37·8	34·0	31·6
Conserved	28·7	29·5	38·4	36·1	17·3	19·1
Sporting	1·0	2·7	4·0	4·1	10·0	9·4
Wild	12·5	6·8	8·6	9·2	12·7	8·7
Today's	47·2	50·2	10·6	7·5	19·0	22·6

† First choice or most preferred landscape.
‡ Second choice or preference.
§ Third choice or preference.

3. supplementing descriptions of landscapes with sensory aids: paintings with descriptions, painted in a similar daleside backdrop by the same artist.

It was not possible in this study to test whether valuations changed significantly in response to all the different biases which can affect CVTs. However, one of the main aims of this survey is to investigate the phenomenon known as part–whole bias and this is done later in the paper.

Table 5 presents contingent valuation estimates of the estimated expenditure incurred by visitors and residents in enjoying the countryside. This figure includes any donations made to countryside causes, membership fees for countryside organizations and car park and entry fees for visits. The total countryside budget of visitors is more than twice that of residents, reflecting the additional expenditure to gain access to the Dales by visitors, and the failure of residents to recognize part of their house price as a capitalized payment towards enjoyment of the countryside. The standard deviations around this expenditure are particularly large in relation to the expenditure itself, a feature which also occurs with willingness-to-pay estimates for landscape preservation.

WTP by households to preserve their most preferred landscape of the Dales was very similar for both visitors (£27) and residents (£25), although these represented quite different proportions of their countryside budgets. WTP to preserve today's landscape, whether today's landscape was the most preferred choice or not, amounted to approximately £24 for both visitors and residents, and a statistical test concluded that there was no significant difference between the mean WTP values for today's landscape for both groups. Since the majority of people preferred today's landscape, the reader may be curious as to why mean WTP for the most preferred landscape exceeds mean WTP for today's landscape. The answer lies in the fact that households who chose the conserved, sporting or wild landscapes were willing to pay more for these landscapes than today's (see Table 6), but these households were in a minority. Nevertheless, their WTP for their most preferred landscape increased the mean WTP for the most preferred landscape to a figure above mean WTP for today's landscape.

WTP to preserve the most preferred landscape is reported in Table 6; the semi-intensive and intensively agricultural landscapes received no bids from either visitors or

TABLE 5. Total expenditure on preservation and enjoyment of countryside and WTP to preserve landscapes (£ per year at 1990 prices)

	Visitors	Residents
Total countryside budget	126·18	59·20
	(225·16)	(130·87)
WTP to preserve	27·08	25·09
most preferred landscaped	(44·04)	(48·48)
WTP to preserve today's landscape,	22·12	26·03
when most preferred	(32·21)	(57·06)
WTP to preserve today's landscape	26·21	21·71
compared to abandoned landscape	(50·02)	(54·00)
(when today's landscape is not the most		
preferred)		
WTP to preserve today's landscape	24·56	24·05
whether most preferred or not	(42·93)	(55·64)

Standard deviation in brackets.

TABLE 6. Willingness-to-pay to preserve landscapes
most preferred by each respondent

Landscape	Visitors	Residents
Abandoned	23·75	7·67
	(17·68)	(13·33)
Semi-intensive	—	—
Intensive	—	—
Planned	18·18	13·38
	(22·07)	(30·24)
Conserved	34·96	27·44
	(64·50)	(42·79)
Sporting	33·67	22·50
	(57·45)	(32·29)
Wild	34·20	29·75
	(35·50)	(28·88)
Today's	22·12	26·03
	(32·21)	(57·06)

Standard deviation in brackets.

residents. Neither the planned nor the abandoned landscapes were valued highly by those residents who preferred them, though the visitors for whom they were the most preferred landscape valued them somewhat more highly. Indeed, visitors mean WTP values were distinctly higher for the abandoned, conserved, sporting and wild landscapes than the comparable WTP values for resident households. In fact, for those visitors for whom these landscapes were the first choice, WTP was marginally higher than average WTP for today's landscape. This suggests that the intensity of preference for those visitors who preferred these landscapes was much greater than that of those visitors who preferred today's landscape. However, households that chose the conserved, sporting and wild landscapes as their first choice were in the minority.

For residents, intensity of preference, as expressed by mean WTP, was very similar for the conserved, sporting, wild and today's landscape. But quite simply, many more people preferred today's landscape, and it is this phenomenon which contributed to the large aggregate total WTP to preserve that landscape.

Preferences for features or attributes of the landscape were mainly as expected, given the preferences for landscape types (today's, conserved and planned landscapes) recorded by the sample survey of visitors and residents. Table 7 reveals that both visitors and residents generally preferred the same or a greater quantity of dry stone walls, grazing animals, stone barns, small fields of crops (e.g. hay) and heather moorland, to a lowering in the level of these attributes.

For some landscape characteristics there was a distinct preference for an increased, rather than the same or a lesser, quantity. Wild flowers and broad-leaved woodland fell into this category. Predictably, perhaps, an overwhelming majority of respondents preferred to see fewer modern sheds and less wire fencing in any agricultural setting in the Dales.

In the case of coniferous woodland the majority preferred to see the same quantity of this attribute, but a substantial minority would prefer less. Only a small minority had a preference for more coniferous woodland in the Dales.

There were some differences between the preferences of visitors and residents for a number of these countryside characteristics. Residents tended to prefer more wild

TABLE 7. Landscape feature preferences: visitors and residents (%)

Feature ...	Dry stone walls		Wild flowers		Grazing animals	
Quantity	Visitors	Residents	Visitors	Residents	Visitors	Residents
less	2·0	1·4	0·3	0·3	2·6	2·7
same	74·4	70·2	32·1	23·7	75·7	71·5
more	23·6	28·5	67·5	75·9	21·6	25·8
Feature ...	Stone barns		Broadleaved woodland		Coniferous woodland	
Quantity	Visitors	Residents	Visitors	Residents	Visitors	Residents
less	1·0	1·4	0·3	0·3	37·0	45·1
same	70·8	71·5	44·3	45·8	45·2	48·5
more	28·2	27·1	55·4	53·9	17·7	6·4
Feature ...	Small fields of crops		Hay meadows		Modern sheds	
Quantity	Visitors	Residents	Visitors	Residents	Visitors	Residents
less	6·2	7·5	1·3	3·7	68·9	59·3
same	79·7	79·3	55·1	45·8	30·5	40·0
more	14·1	13·2	43·6	50·5	0·7	0·7
Feature ...	Wire fencing		Heather moorland			
Quantity	Visitors	Residents	Visitors	Residents		
less	79·0	80·0	2·6	3·7		
same	20·3	19·3	63·9	69·2		
more	0·7	0·7	33·4	27·1		

flowers and hay meadows compared to visitors (Table 7), whilst visitors preferred more coniferous woodland and heather moorland compared to residents.

A parallel study by O'Riordan *et al.* (1989, 1991, 1992) reached similar conclusions on these issues where survey questions overlapped. However, the purpose of their study was not principally to solicit choices nor to value landscape; thus, a CVT was not employed, and indeed today's landscape was not included when respondents were requested to order their landscape preferences. Furthermore, because the study by O'Riordan *et al.* was dependent upon a sample taken from people visiting an exhibition, the proportion of residents to visitors was not as large as in the present study.

Nevertheless, O'Riordan *et al.* reported a majority of respondents in favour of more hay meadows, dry stone walls, stone barns, broadleaved woodland and heather moor in the landscape. In addition, a majority of those asked also wished to see a reduction in the number of wire fences and wooden sheds. The sample of respondents interviewed in the O'Riordan *et al.* study preferred the conserved landscape (74·3%) to the planned landscape (13·2%), followed by the sporting landscape (6·3%) and the wild landscape (4·5%). Each of the other landscapes was preferred by less than 1% of respondents. Since today's landscape was not included in the choice set, precise comparisons between the two studies are difficult, but general empathy exists, particularly in respect of preferences for the conserved and planned landscapes.

6. Aggregation

Perhaps the most controversial issue in welfare evaluation has been adding up measures of satisfaction, utility or consumer surplus effects over individuals, to produce some global measure of the gain to the community from a particular policy.

At a practical level, should the aggregate welfare measure be:

1. *N*, the population size, multiplied by mean WTP; or
2. *N*, multiplied by median WTP.

The usual convention in economic theory is to multiply average WTP, or consumer surplus of the sample population, by population size, as a measure consistent with potential Pareto improvement criterion. This may be an individual's total WTP for a site, or WTP for particular activities on a site, summed across all activities (assuming WTP measures for each activity are separable and mutually exclusive). If benefits are positive, then in practice gainers could compensate losers.

Public choice literature, in contrast, emphasizes voting criteria in making decisions about public goods. Typically, median WTP is less than mean WTP, so that a programme justified by mean WTP may not be sanctioned using median WTP. However, totally utility is the sum of individual utility benefits, indicating mean WTP as the correct measure in economic theory, whatever the politics of the case.

The Yorkshire Dales National Park has 10 million visitors per year, representing 4 million households. By comparison, residents in the National Park number only 18 600 individuals, in 9100 households. Aggregate WTP to preserve today's landscape is therefore the number of visitors (plus residents) multiplied by their respective average WTP (from Table 5), multiplied by the proportion of the relevant population who gave this landscape as their first preference choice (from Table 6). This provides an aggregate WTP measure of £41 762 560 for visitors and £118 910 for residents, for today's landscape; or £41 881 470 in total (see Table 8). Similar estimates of aggregate WTP for other landscapes can be derived, and these are presented in Table 8.

Today's conserved and planned landscapes all involve, or would involve, substantial public intervention and subsidies to maintain the Dales landscape in varying forms, akin to today's landscape. The conserved landscape would require more public finance than that currently provided. Conversely, the abandoned, sporting and wild landscapes would result from broadly non-interventionist strategies. Table 8 clearly shows that the

TABLE 8. Aggregate willingness-to-pay for first preference landscapes by visitors and residents (£ at 1990 prices)

Today's		Abandoned	
Visitors	41 762 560	Visitors	2 470 000
Residents	118 910	Residents	2164
Conserved		Sporting	
Visitors	40 134 080	Visitors	1 346 800
Residents	73 663	Residents	5528
Planned		Wild	
Visitors	5 308 560	Visitors	17 100 000
Residents	8280	Residents	18 409
Public interventionist total	87 406 053	Non-interventionist total	20 942 901

benefits of some form of intervention to maintain today's landscape, or even spending more public money to create a conserved landscape, outweigh the benefits likely to be generated if government subsidies were withdrawn and an abandoned, sporting or wild landscape developed. The analysis in Table 8 suggests that the net benefits from interventionist landscapes exceed non-interventionist ones by £66·5 million per year.

It would have been desirable to explore landscape valuations across individuals viz their WTP for their preferred landscape, compared to second choice, third choice, etc., rather than between WTP for first preference landscapes by different individuals. However, this was not practical because of budgetary constraints on the study and the need to keep the questionnaire as simple as possible. Such a procedure would have permitted the net WTP for each individual for today's landscape over alternative landscapes to be estimated. Nevertheless, the analysis as it stands may represent an upper bound to WTP for today's landscape, since WTP for an alternative landscape by the same individual is not observed.

Whichever landscape evolves in the future, individuals who preferred some alternative landscape will not be compensated for their loss, thus the policy will not be a Pareto improvement. Thus, any policy adopted is likely to lead to some inequality in income distribution. If benefits are such that gainers could compensate losers, and even if compensation was actually paid, the compensation principle assumes that the initial distribution of income is a desirable goal. However, this assumption is usually arbitrary, and rarely proven.

Countryside recreation and the pursuance of environmental quality are income-elastic goods; but because they are also public goods, any attempt to raise standards above the position preferred by the poor will invariably result in benefits accruing to the rich. It is quite clear from this study that certain types of landscapes have different distributional impacts. For example, the correlation coefficient between WTP (consumer surplus) and household income was $+0·335$ for today's landscape, $+0·869$ for the sporting landscape and $+0·463$ for the wild landscape. Thus, even today's landscape benefits the rich more than the poor, but the distribution of benefits from today's landscape appears to be more evenly distributed across income bands than other possible alternative landscapes. Clearly, the distributional regressive impact would be severely exacerbated if a sporting landscape evolved!

There is no clear solution to the distributional problem. However, it is possible to document the diversity of interests and income strata that make up the sample and population, and record which groups form the main beneficiaries of current policy and who would benefit from any change in that policy.

7. Part–whole bias

CVTs may be subject to a number of biases which are discussed at length in the literature. Because of budgetary and other constraints, no CVT study has been tested for all possible biases. This study is no exception. However, two recent concerns about CVT expressed in the literature concern the existence of part–whole bias, and also the overall validity of CVT results. This study, therefore, concentrates on these two aspects of the methodology.

Part–whole bias, also known as mental account bias, is well documented in marketing and contingent valuation literature (e.g. Walbert, 1984; Thaler, 1985; Hoevenagel, 1991) and is, in essence, a variation of the well-known misspecification bias sometimes present in CVT studies.

In brief, the bias relates to the inability of some individuals to isolate a specific case from overall considerations in a decision-making process (see Hoevenagel, 1990). Thus, when respondents are asked to value some environmental good they may in fact make that valuation on the basis of a much wider range of environmental goods. This practice of allocating utility to groups of commodities rather than to individual commodities was recognized by Tversky and Kahneman (1981) in their paper on decisions and the rationality of choice. It can mean that respondents may allocate all of their available resources for one group of commodities to one particular item, in which case respondents may be observed to be willing to pay as much for a single good as for the whole set of goods from which it is taken. In the extreme case, if particular individuals were asked to respond to enough WTP questions it would eventually be possible for them to pledge more money than the sum of their combined income and savings.

In a recent study by Kahneman and Knetsch (1992) into WTP to maintain the quality of fishing in lakes in Ontario, the authors discover no significant differences between mean WTP for the maintenance of one small group of lakes (representing about 1% of the total lakes in Ontario) and mean WTP for the maintenance of all of the lakes in Ontario. If this result was obtained from a rigorously conducted valuation exercise, it would pose serious doubts about the validity of the contingent valuation technique. Indeed, Kahneman and Knetsch describe CVT values as arbitrary, and as representing the purchase of moral satisfaction rather than the purchase of a public good. In their estimation, respondents are not valuing a particular good, so much as a generalized good cause.

However, this accusation of a fundamental cognitive limitation to the contingent valuation method has been challenged by several experienced CVT practitioners (e.g. Mitchell, 1991). The bulk of their criticisms focus on the design of the survey used by Kahneman and Knetsch and on their survey instrument, a telephone interview, which is often difficult to operationalize in practice. The telephone provides a difficult medium through which to describe a good in detail, and in the Kahneman and Knetsch survey the goods were described only by a single sentence, leading to the criticism that a survey in which a good has only been vaguely described will provide only vague answers. Such lack of definition of the good being valued, has long been recognized as one of the most serious faults that can arise in a CVT exercise, and it cannot be ruled out that a more thorough description of the goods being valued by Kahneman and Knetsch would have eliminated the part–whole bias observed in their results.

The phenomenon of part–whole bias as observed by Kahneman and Knetsch can be explained by the hypothesis that people allocate budgetary resources in terms of some form of mental account. Mental accounts can be related to the theory of two-stage budgeting (see Deaton and Muellbauer, 1980) where total expenditure is first allocated to a broad group of categories such as food, clothing and recreation, and then each allocation is divided among specific items in each category. Thus, an individual will usually employ a variety of mental accounts, often one for each budgetary category, and will then use each account to evaluate some multi-attribute option with regard to the particular multi-attribute reference set that represents the category (Kahneman and Tversky, 1984).

Thus, if a mental account for environmental goods existed, and was used rationally, individuals would allocate any expenditure related to improving some aspect of the environment in relation to their maximum WTP for all environmental goods (Garrod and Willis, 1990). That is, they would value any one part of a large set of environmental goods in logical relation to the whole set (however, that is not to say that the sum of

values of the parts should be equal to the value of whole—this result would neglect the existence of the substitution and income effects which consumer theory would lead us to expect). In this way, people would make individual expenditure decisions in a more or less rational manner, taking into account both their overall budget for environmental goods and the relative importance to them of a particular issue. However, as Kneese (1984) suggests, many people when asked about a specific environmental issue will tend to allocate all or the greatest part of their environmental account to it, neglecting other potential environmental improvements which, if they knew about, they would also value highly. Clearly, this is what was observed by Kahneman and Knetsch when comparing WTP for all of Ontario's lakes with WTP for just a small number of them.

Evidence suggests that people responding to questionnaires often fail to take into account the additional information they possess which is necessary for rational decision making (Slovic, 1972). Thus, in order to make results more rational, it may be necessary to explicitly introduce mental accounts into CVTs by asking some initial questions about the respondents' total yearly budget for all environmental issues, including those donations and subscriptions that he or she might already have made. This would take account of Tversky and Kahneman's (1981) point that decision making is highly context-sensitive, and once this mental account is made explicit, it should prove easier for the respondent to give a rational valuation of the subject under investigation. Inclusion of an introductory question making the overall countryside budget explicit should also limit the potential for the occurrence of strategic bias in survey responses.

Such a procedure was introduced into the Yorkshire Dales surveys, with the respondents being asked to calculate their countryside budget; that is the amount spent by their household on a voluntary basis on the enjoyment and preservation of the countryside. This question was asked to all visitors in the survey ($N = 302$) and to half of the households (Group A: $N = 147$), with the other half used as a control group (Group B: $N = 147$) receiving the same questionnaire without the mental account question. Respondents were then asked how much they were willing to pay to preserve today's landscape. The resulting mean WTP estimates could then be compared with mean countryside budgets to give some indication of the presence of part–whole bias.

When mean WTP is compared with the total countryside budget both for visitors and for Group A in the household survey, there is a statistically significant difference between them at the 1% significance level, suggesting that neither part–whole bias nor strategic bias was a serious problem in either the household or the visitor surveys. However, when the mean WTP figures for today's landscape for the two groups of households are compared statistically, there is no difference between them at the 1% significance levels.

8. Model of WTP for landscape

Modelling WTP for landscape fulfils two functions. First, it permits the identification of those factors influencing WTP, and gives some indication of their impact. Second, it forms part of the overall validation process for the CVT study.

Potential biases in CVTs render testing the validity of CVT survey WTP results extremely important. However, there is no single, definitive test of the validity of a CVT application (Mitchell and Carson, 1989). Four broad types of validation test exist: content (a subjective judgment about the soundness of the procedures and assumptions underlying the CVT exercise), criterion (comparison of CVT estimates with real

payments for the environmental good), comparative (comparison of CVT estimates with those from other techniques) and theoretical (comparison of observed results with those expected in theory).

A frequently used theoretical validation technique involves modelling the dependent variable from a CVT exercise, using a method such as ordinary least squares (OLS) regression. In this way, any *a priori* expectations about the resulting regression equation, for instance which dependent variables should be significant and what direction their coefficients should be in, can be tested. If the model does not agree with the results which prevailing theory suggests, then this may cast doubt upon the CVT estimates.

The WTP of a household for today's landscape was modelled as a function of those variables that might be assumed to influence such demand. The general model is:

$$WTPT_i = F(Y^i, T_i, S_i),$$

where: $WTPT_i = i$th respondent's willingness to pay for today's landscape; $Y_i =$ income of ith respondent; $T_i =$ vector of preferences or tastes of ith respondent; $S_i =$ vector of relevant socio–economic characteristics of the ith respondent.

Only those variables which were statistically significant at the 0·15 significance level were included in the final model, although most variables were significant at the 0·05 level or lower. A number of variables were continuous (income, age, travel to work, number of children and number of visitor days), while the remainder (participation in recreational activities such as art, cycling and walking and residents' perception of overcrowding, etc.) were dummy variables.

Table 9 reports the results of an OLS regression model of residents' WTP for today's landscape, while Table 10 documents the results for visitors. The coefficients for the majority of the independent variables are in the direction expected *a priori*. The variable

TABLE 9. Willingness-to-pay for today's landscape, by residents. Dependent variables: willingness-to-pay for today's landscape per year whether today's landscape is first choice or not

Independent variables	Coefficient	F	Prob > F
INC	0·00139	23·92	0·0001
	(0·00028)		
AGE	0·56433	9·26	0·0026
	(0·18550)		
TTW	0·35291	17·73	0·0001
	(0·08380)		
ART	35·399920	19·17	0·0001
	(8·08545)		
RESC	−11·16704	4·39	0·0371
	(5·33009)		
WALKING	−20·92914	4·13	0·0431
	(10·29563)		
INTERCEPT	−22·22799		
	(0·18550)		

$r^2 = 0·2648$.
d.f. (total) $= 272$.
$F = 15·97$.
Standard error in brackets.

TABLE 10. Willingness-to-pay for today's landscape, by visitors. Dependent variable: willingness-to-pay for today's landscape per year whether today's landscape is first choice or not

Independent variables	Coefficient	F	Prob $> F$
LNINC	0·56229 (0·11787)	22·78	0·0001
LINKIDS	0·35833 (0·14438)	6·16	0·0137
SCENERY	0·26623 (0·13365)	3·97	0·0474
WALKING	0·66720 (0·27389)	5·93	0·0155
CYCLING	0·29098 (0·19163)	2·31	0·1300
NATIONAL PARK	−0·61760 (0·30331)	4·15	0·0427
VISITOR DAYS	−0·01237 (0·00507)	5·94	0·0155
INTERCEPT	−3·84284 (0·11781)		

$r^2 = 0·1816$.
d.f. (total) = 283.
$F = 8·75$.
Standard error in brackets.

based on household income (INC) provides a highly significant and consistent explanatory variable of WTP for both residents and visitors.

In the case of residents, age is a significant variable: increasing age is associated with increasing WTP. Painting and sketching (ART) as a recreational activity also had a positive influence on WTP for today's landscape. In addition, those households who had members travelling to work (TTW) outside of the Dales had a positive influence on WTP; the longer the journey, the greater the WTP. Presumably this reflects a strong commitment to the Dales for the environment, and the willingness of these households to endure a long journey to work for the sake of living in the Dales.

Those households who perceived the Dales to be overcrowded (RESC) were willing to pay less for today's landscape. This is important evidence to support the assertion that overcrowding can reduce the utility provided by National Parks, as expressed through the instrumental variable of WTP. The perceived overcrowding by residents had reached a level where its impact produced a major reduction in the utility derived from the Dales landscape (−£11 per household per year).

The only variable in the residents' WTP model which had an unexpected sign was that for walking: walking as a recreational activity by resident households was associated with a lower WTP for today's landscape.

In the visitor model, the number of children in the household was positively related to WTP for today's landscape. Households who rated the scenery highly also had a greater WTP. WTP for today's landscape also increased if the visitor households participated in walking and cycling as a recreational activity. Households who were aware that the Yorkshire Dales was a National Park were willing to pay less than those who were unaware of the designation. This may appear at first sight to be an inconsistent

finding, casting doubt on the CVT estimates or the model or both, but it may simply reflect the fact that such households perceive the Yorkshire Dales National Park as a "public good" for which the government rather than themselves should contribute towards maintaining the landscape. The number of days the visitors spent in the Dales per year was also associated with a lower WTP: this merely indicates that WTP declines with increasing consumption of the good, and indicates the usual downward sloping demand curve between value and quantity consumed. Nevertheless, in terms of total impact on WTP, income remains the single most important variable.

Despite one or two queries, both residents' and visitors' models do provide general credence to the CVT WTP estimates for today's landscape. The overwhelming majority of variables have the sign on the coefficients whose direction was specified *a priori*, while the variables themselves selected as statistically significant for inclusion in the models appear intuitively reasonable.

9. Conclusion

This paper has used a contingent valuation approach to estimate WTP for a variety of different landscapes, each of which could evolve in the Yorkshire Dales as a result of policy changes in the countryside.

CVTs in landscape evaluation are seen as a natural evolution from landscape evaluation methods based on the scoring of landscape components and other public preference techniques such as landscape ranking. By valuing landscape as an entity, CVT avoids many of the problems, such as those of separability and collinearity, often associated with travel cost and hedonic price methods of landscape valuation.

The CVT results demonstrate that individuals have a strong preference for the status quo. Indeed, decision-making experiments show that individuals disproportionately favour the status quo. The CVT results also support the theories that preference order and value depend upon the current reference level, endowment effect and loss aversion. Any analysis of change in the countryside which ignores the status quo or the current reference level will tend to predict greater instability than is observed in the world.

Various laboratory experiments in economics have demonstrated the importance of the endowment effect: that those individuals who start with a particular good are much more reluctant to part with their endowment. That is, anticipated trade and transactions do not materialize at an expected level, even when goods and money are allocated randomly. In the case of landscape, the majority of respondents preferred what exists today, and when this landscape becomes unavailable (i.e. on their second and third choice) a landscape close to their initial endowment and status quo position was chosen.

Alternative landscapes involve a risky choice: there is no certainty that the alternative landscape will be preferred when it is actually seen or consumed, as distinct from how it appears in a montage representation, and such landscape change is probably considered irreversible with a loss aversion value.

Willingness to pay to preserve today's landscape in the Yorkshire Dales across all visitors and residents amounted to some £42 million per year. The conserved and planned landscape alternatives both stem directly from today's landscape, and both involve some measure of public finance to maintain them. The benefits from such interventionist landscapes exceed the benefits from non-interventionist ones (abandoned, wild and sporting landscapes) by £66·5 million per year.

The estimated costs of maintaining these alternative landscapes in the Yorkshire dales National Park area to all relevant agencies (i.e. Ministry of Agriculture, Fisheries

TABLE 11. The estimated costs of maintaining alternative agricultural landscapes in the Yorkshire Dales National Park Area (£ millions at 1989 Prices)

Abandoned	2·8
Semi-intensive agriculture	6·0
Intensive agriculture	10·4
Planned	14·0
Conserved	19·0
Sporting	18·4
Wild	8·1
Today's	9·0

and Food, the National Park, water authorities, etc.) are outlined in Table 11. A comparison between Tables 8 and 11 reveals substantial differences between the benefits and the costs of different landscapes.

Today's landscape generates the highest benefit/cost ratio: benefits are four times higher than the cost of maintaining this landscape. By contrast, the benefits produced by the sporting landscape would only be a fraction of the costs incurred by the public exchequer for its maintenance.

The consumer surplus benefits accruing from the planned landscape are also considerably smaller than the costs which would be incurred in maintaining it.

Most respondents who chose an alternative landscape to today's, perceived marginal benefits from greater public spending involved in the conserved landscape to exceed the additional costs involved. Thus, the consumer surplus benefits derived from the conserved landscape are still twice the costs involved in maintaining it.

The analysis presented in this study suggests that the excess landscape benefits produced by today's landscape would justify further public expenditure on its maintenance. It also suggests that some movement towards greater provision and increased quality of some environmental attributes, e.g. more expenditure on improving dry stone walls, protecting and promoting wild flowers and hay meadows, and planting small broadleaved woodlands, encapsulated in the conserved landscape, would be justified in terms of public expenditure.

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