ECONOMIC VALUATION OF PROTECTED AREAS:
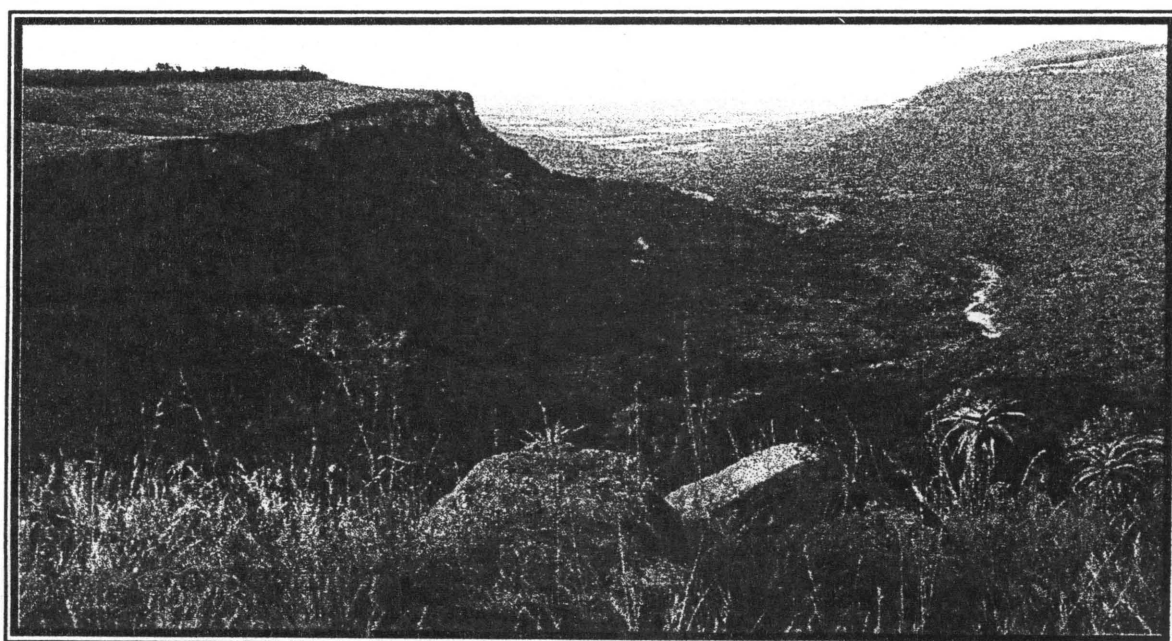# THE UMGENI VALLEY NATURE RESERVE CASE STUDY

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ECONOMIC VALUATION OF PROTECTED AREAS:
THE UMGENI VALLEY NATURE RESERVE CASE STUDY

by

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ABSTRACT

Umgeni Valley Nature Reserve as a natural area preserved from the more disruptive forms of economic activity, provides a multitude of benefits classified as either on-site use values or non-use values. This research addressed the problem of estimating the recreation use value of Umgeni Valley Nature Reserve. Two methodologies for valuing non-market benefits, the travel cost and contingent valuation methods are applied to evaluate the economic value of the reserve. The study reviews recent literature and highlights particular methodological issues characteristic of these techniques.

The data from an on-site survey in the area permitted a description of visitors' socioeconomic characteristics and their trip patterns. Visitor attitudes, both to the recreational activities in Umgeni Valley Nature Reserve and to the proposals for the improvements of recreation provision were identified. Travel cost method results showed significant statistical relationships between number of trips, travel costs and socioeconomic variables. The consumer surplus value was estimated to be R95 800 in 1998. The contingent valuation method produced a true annual willingness-to-pay of R66 336 for entrance fees expressed by day visitors. The analysis of data from overnight visitors in the cottages revealed that 63 % of visitors were willing to pay up to R75 per person per night.

Finally, the research emphasized the importance and the potential use of economic value in assisting the development of economically sustainable policies for the provision of recreation. Whilst Umgeni Valley Nature Reserve is under no immediate threat, having an indication of the economic value of recreational opportunities within the reserve will aid future planning and decision-making.

PREFACE

The research project presented in this dissertation was carried out in the School of Environment and Development, University of Natal, Pietermaritzburg, from August 1998 to January 1999, under the supervision of Mr George Oldham from the Department of Economics.

The study represents the original work by the author and has not been submitted in any form for any degree to any University. Where use has been made of the work of others it is duly acknowledged in the text.

Signed:

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Ramy Razafindralambo

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INTRODUCTION

One of the problems of wildlife conservation is to create economic incentives for the protection of natural resources against irreversible conversion into other land uses or massive extinction. It is important that the holders of natural resources can derive economic benefits from wildlife conservation. The integration of these sources of value into the economic process seems to provide a chance to make wildlife conservation compatible with human development goals (Turner, Pearce & Bateman, 1993). Protected areas such as Umgeni Valley Nature Reserve, play a key role in motivating natural resources conservation by assigning educational, financial and preservation values to the environment. But there is no easy means to interpret these values; environmental goods such as protected areas have no market where prices or values can be established. The entrance fee and other charges for amenities do not reflect the real value of a natural reserve as a whole system of values because intangible benefits like educational, psychological, social, preservation or existence values are not fully captured by these prices. In many cases, the subsidization of the entry fee to private and public parks conveys the idea that the environment is a free good or a low cost good although recreationists who, with full knowledge of tangible and non-tangible benefits from wilderness experience, would be willing to pay a higher price. As a consequence, natural resources have been undervalued or ignored when comparing the net benefits of conservation with those of development projects (Swanson & Barbier, 1992). The market fails to assign a price to environmental goods, whereas conventional private goods are priced in the market. Hence, the relevance of economic valuation which would establish the true costs and benefits of using scarce natural resources. Estimating the economic value of protected areas means enhancing conservation's ability to 'compete' with alternative land uses (e.g., agriculture) (Jakobsson & Dragun, 1996).

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The purpose of this research project is to demonstrate the utility of economic valuation to wilderness recreation policy. More recently, an increasing awareness of the important role that economics can play in the natural resource management arose among managers of protected areas and conservationists in South Africa. With the dynamic expansion of tourism and development activities around protected areas, the parks management has to face more complicated problems which are related more to economics than ecology (Shah, 1995). As outlined by Freeman (1993) the natural environment is a resource that yields a variety of valuable services to individuals in their roles as consumers and producers. The environment is source of our basic foods and energy (air, water, plants, etc.) as well as providing leisure and recreation. But given that the 'consumption' of the environment is limited by its scarcity, it should be managed as an economic resource involving trade-offs between costs and benefits. Managers can no longer confine their management to only conservation strategies without compromising the economic viability of the reserves under their responsibilities. The economic valuation of the reserve provides quantified and accurate information to managers in order to facilitate the long process of management change from subsidy-dependant strategies to financial autonomy strategies. The estimation of the economic value of a recreation site assists in the efficient allocation of total resources to conservation programmes and also in determining priorities among programmes when financial resources are limited (Walsh, 1986).

In order to preserve the quality of resource and recreational services against overutilization in the reserve, managers and planners need information on the demand for recreation. This thesis applies non-market valuation techniques to estimate the use value South Africans place on Umgeni Valley Nature Reserve and to consider the results in relation to policy needs and decision making processes in recreation. There is a need for proving to decision-makers the applicability of non-market valuations to the assessment of protected areas and a necessity to confirm the accuracy of the results from these valuations (Mitchell & Carson, 1989).

This research will contribute to the refinement of non-valuation techniques within the South African environmental context, particularly while the cost-benefit analysis encounters problems of assessing the non-quantifiable value of protected areas. Economic analysis can only be improved and refined through empirical application to case studies. Unfortunately, few studies on the valuation of protected areas have been done in KwaZulu-Natal (Holland, 1993; Oellermann, 1994).

The research project has the following objectives:

❑ Elicit the willingness-to-pay by tourists for some hypothetical environmental change occurring within the reserve by the Contingent Valuation method.

❑ Assess the value of the reserve through implicit prices of travelling costs to the site. The value obtained from this Travel Cost approach provides an appropriate measure of the economic value of the Umgeni Valley Nature Reserve.

❑ Contribute to effective resource management in the area through interpretation and analysis of the project outcome.

CHAPTER 1: NON MARKET VALUATION TECHNIQUES

1.1. ENVIRONMENTAL GOODS AND SERVICES

Environmental goods and services have the *non-rivalrous* characteristics of public goods and the *excludability* property of private goods. A good is excludable if some particular person has exclusive control over the good. The excludability of environmental goods has two elements: physical and legal. For example, public or private nature reserves are excludable when defined property rights constitute the legal claim on use control. In contrast, a pure public good like the air is non excludable since it is physically or legally impractical for one person to maintain exclusive control over its use.

The term non-rivalrous means that more than one person can derive consumption benefits from a given level of environmental goods at the same time (Hanley, Shogren & White, 1997). For instance, to a certain extent bird watching is a non-rivalrous consumption because all visitors in the site benefit from it without reducing the pleasures of others. The presence of a third characteristic, *congestibility*, affects the consumption benefits of an environmental good. As the number of visitors in a park increases beyond a certain level, they begin to interfere with each other so that the satisfaction level decreases. A positive marginal social cost of consumption is then born by visitors beyond a certain level of visitation rate. Therefore, the nature of environmental goods causes normal market mechanisms to operate inefficiently since the prices do not capture the true economic value. In reality, beside the fact that environmental goods cause market failure, the market for some environmental goods such as protected areas does not even exist (Pearce, 1994).

1.2. THEORY UNDERPINNING THE ECONOMIC VALUATION

1.2.1. Non-use and use values

The economic value of a protected area is a measure of the benefits from using and conserving natural resources.

The cost benefit analysis uses the economic value of environmental assets to compare the net benefits of development with conservation benefits which are composed by marketed and non-marketed benefits. The Total Economic Value (TEV) convolutes *direct* and *indirect use values* and *non-use values* (Pearce, Moran & Fripp, 1992). Table 1.1. displays the elements which constitute the total economic value.

Direct use values include ecotourism, wilderness recreation, harvesting natural plants, hunting and similar activities. Most of the direct use values can be observed through market prices though some factors (e.g., externalities like pollution of a river) causing market failure distort the prices of environmental goods. Indirect use values are mainly the ecological functions of species and natural areas (e.g., prevention of soil erosion).

All these values may have an *option value* component when people value the guaranteed option of future supply of wilderness recreation because its availability might be threatened by development (Brookshire, Eubanks & Randall, 1983). The objective of the constitution of nature reserves is to ensure that wildlife will continue to exist in the future. If the existence of these reserves is compromised this option value no longer persists.

Non-use values are composed of existence value and bequest value. *Existence value* includes the valuation of recreation sites as unique resources in themselves with no connection to their use values. In addition to having existence value, protected areas may possess *bequest values* which

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represent the worth of natural resources so that the future generation will still benefit from these resources (Pearce, et al., 1992).

Table 1.1.: An economic taxonomy for environmental resource valuation

Total Economic Value (TEV)				
Use Values			Non-Use Values	
Direct use value	Indirect use value	Option value	Bequest value	Existence value
Outputs directly consumable	Functional benefits	Future direct and indirect values	Use and Non-Use values of environmental legacy	Value from knowledge of continued existence
Food, biomass, recreation, health	Flood control, storm protection, nutrient cycles	Biodiversity, conserved habitats	Habitats, prevention of irreversible change	Habitats, species, genetic, ecosystem

Source: Pearce et al. (1992)

TEV = Use value + Non-use value

   = (Direct use value + Indirect use value + Option value) + (Existence value + Bequest value)

The Contingent Valuation method can measure non-use value of recreation sites as the method elicits directly the consumer's preferences on recreation. Based on behavioural observations the Travel Cost method can only estimate use value. These two methods will be developed in chapter 2.

1.2.2. Theory of consumer demand

1.2.2.1. Welfare measure

The consumer expresses his or her preferences for an environmental amenity through the demand curve by stating, at a given price, the quantity purchased which maximises his or her utility. Knowing a demand curve for an environmental good assists in measuring the welfare or benefits the consumer derives from it. Welfare change can result from a variation of prices and/or qualities of environmental assets (Jakobsson & Dragun, 1996 ; Hanley, et al., 1997).

The Marshallian and the Hicksian demand schedules are used to measure the welfare. Marshallian demand is an ordinary demand curve giving the relationship between price and quantity purchased by consumers. The change in wellbeing or consumer surplus is represented by the area under the Marshallian demand curve and above the price. If that Marshallian demand curve is modified by holding the utility constant at its initial level, it becomes a Hicksian demand schedule which excludes the income effect from price change. Because of the inclusion of the income factor the consumer surplus measured by the Marshallian demand curve is a biased measure of welfare (Braden & Kolstad, 1991).

The consumer surplus under the Hicksian demand curve is called a *compensating variation*, that is the amount of income that would compensate a person for a price change to keep the initial utility level. Conversely, that consumer surplus is an *equivalent variation* if it is the amount of income a person would be willing to pay to avoid a price change so that she would have the same utility level afterwards. The equivalent variation differs from compensating variation in that it takes the utility after the price variation as the reference level rather than the initial utility. Both can be used to measure the individual welfare change expressed in terms of willingness-to-pay (WTP) or willingness-to-accept (WTA) compensation for the change, depending on whether the individual is a loser or a gainer. For example, equivalent variation is measured by asking the WTP to prevent the loss of an indigenous forest; compensating variation is measured by asking the WTA

compensation for that loss (Ng, 1985 ; McKenzie, 1983). However, a number of empirical studies showed that WTA exceeds WTP. The difference is partly explained by the consumer's asymmetric valuation of the same magnitude of loss and gain from policy change (Kahneman, Knetsch & Thaler, 1990 ; Tversky & Kahneman, 1981). The decision whether to use WTP or WTA is left to the analyst's judgement and experience as the debate on theoretical and empirical issues around this choice is still ongoing. Generally, WTP is asked when considering the valuation of a potential environmental benefit.

1.2.2.2. Weak complementarity

An ordinary good is a weak complement with an environmental good if at some price, the environmental good is not demanded when demand for a private good drops to zero. For example, when a visitor decides not to go to a recreation site due to the high entrance fee (i.e. the demand for trip is zero), there is no demand for a wilderness experience as an environmental good; in other words, the marginal utility of the recreation quality offered by the site becomes zero (Randall, 1987). The notion of weak complementarity is the basis of the relationship established by Harold Hotelling between the cost of travelling to the site and the values of amenities within the site. Given that potential visitors have to spend money (e.g. food, accommodation, petrol, entrance fee) to get to the recreation site and to use the amenities provided, the magnitude of expenses on travelling (a surrogate for price) influences the number of trips or the usage of the site made by the potential visitors. The weak complementarity between the ordinary good 'vacation trip' and the environmental good 'recreational amenities' helps to draw the demand curve for recreation. The Travel Cost method uses this relationship to estimate the value of outdoor recreation services. A further development of the Travel Cost method will be the subject of the chapter 2.

1.2.3. Theoretical measure of environmental demand

The methods for measuring recreation value are models of behaviour based on household production function, hedonic pricing approach and constructed markets. The hedonic pricing method has received few applications in recreation valuation because of some pitfalls in the conception of the model.

1.2.3.1. Household production function

The household production function (HPF) approach views goods such as recreation, entertainment and so on as being produced by time and other inputs. The HPF framework states that to produce recreation utility, consumers combine time and marketed goods which prices should have an important effect on the demand for each input. For example, the number of participants in bird-watching in Umgeni Valley Nature Reserve (UVNR) is affected by the cost of the time spent on-site, transportation to and from the site, the price of binoculars and other closely related goods. This approach is very helpful to specify which factors will be important in determining the demand for recreation by imposing restrictions on preferences such as weak complementarity between marketed goods and recreation (Feenberg & Mills, 1980 ; Bockstael & Kling, 1988). Accordingly, the cost of travelling to a recreation site can be used to derive the marginal utility of environmental amenities in the site. The changes in the travel expenses and other meaningful variables that are weak complements to recreation reflect the WTP for the site itself. The appealing feature of the HPF is the use of observable market behaviour to infer the values individuals place on non-market goods. This approach is the basis of the Travel Cost method. However, non-use values cannot be measured with the HPF because quantities of complements or substitutes of non-use values can hardly be observed.

1.2.3.2. Constructed markets

When there are no alternative markets for environmental goods or markets are not well developed to allow any observation of individual behaviour, hypothetical or simulated markets are used to provide acceptable measures of the economic value of environmental goods.

In 1947, Ciriacy-Wantrup introduced the notion of economic valuation of public goods by using survey techniques (1947, 1952). The Contingent Valuation (CV) approach was largely developed with Davis's study on the benefits estimation of outdoor recreation in US (Mitchell & Carson, 1989). Randall, Ives and Eastman (1974) applied the CV to value the aesthetics of recreation sites. Since then, a large number of studies related to the valuation of environmental benefits have been based on the CV technique: from studies valuing the existence value of grizzly bear and bighorn sheep populations to the study of economic and social impacts of tropical rainforests in Madagascar (Brookshire, et al., 1983; Kramer, Munasinghe, Sharma, Mercer & Shyamsundar, 1994). Many government agencies and international organizations recognize and exploit the valuable information from CV studies in policy making (e.g., US Environmental Protection Agency, World Bank, government agencies in Canada, Australia, Norway).

The theoretical foundation of the CV method relies on the welfare measurement theory. The CV method asks individuals directly to reveal their preferences in terms of WTP or WTA compensation for some change in the provision of recreation. The response from that direct elicitation of WTP or WTA provides a point corresponding to a certain quantity and price of the environmental good for some level of utility on the Hicksian demand curve. In other words, the demand schedule for an environmental good, originally inexistent, can be constructed through direct questions on the consumer's preferences (Folmer, Gabel & Opschoor, 1995). For example, a compensating variation from a change in game viewing experience in UVNR can be measured by asking the following question to tourists: 'Suppose the variety of game is increased from level 1 to level 2. What is the most you would be willing to pay for this improvement ?'.

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The recreationist faces two expenditure equations corresponding to the different levels of the wildlife variety. The difference between these two expenditure functions is the amount of WTP (or WTA compensation for a detrimental change) stated by the tourist in order to restore his or her utility at the initial level. Willig (1976) transformed the expenditure equation into an *income compensation function* to measure the environmental benefits in terms of WTP (resp. WTA). This function gives different values of WTP considered as contingent values for various levels or quantities of recreation.

There are two other valuation techniques based on constructed markets: contingent ranking and conjoint analysis. By asking visitors to rank-order a range of alternatives associated with environmental attributes of the site, the contingent ranking and conjoint analysis are an attempt to derive a better understanding of the distribution of consumer preferences for various attributes of recreation sites.

1.3. CHOOSING A TECHNIQUE FOR RECREATION VALUATION

Rather than competing, valuation techniques have some complementarities. Whereas the hedonic pricing and the Travel Cost (TC) method ignore non-use values like existence or bequest values, the CV approach is the only available technique to estimate the intangible benefits from preserving natural areas. The use of two or more techniques is recommended in order to provide a comparison between different estimations and thus, avoid unrealistic and unreliable results. Therefore, the survey was designed in such a way that its results could be used by several methods. The costs and the availability of data also influenced the choice of technique. The travel cost and Contingent Valuation methods are particularly praised by analysts to measure recreation amenities values because of the use of primary data sources (Walsh, 1986).

More important in decision making process is the public involvement which can be implemented through stated-preference approach like the CV method. When public opinion is useful to improve the management of user-based recreation areas, the CV method is the most appropriate technique to elicit people's preferences (Georgiou, et al., 1997).

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CHAPTER 2 : THE TRAVEL COST METHOD AND CONTINGENT VALUATION METHOD

In light of the advantages and disadvantages of using different techniques, the Travel Cost (TC) and Contingent Valuation (CV) methods seem to be the most appropriate to value recreational sites. Although their application encounters some difficulties, these two methods have dominated the estimation of outdoor recreation in US and other countries (UK, Norway, Canada, Australia, etc.), since Clawson's paper in 1959 and Davis's work in 1963.

2.1. THE TRAVEL COST METHOD

The TC method is an approach estimating the demand for a recreation site by using variable expenditures as a proxy for the nonexistent market price. It is assumed that visitors to a park treat travelling and other visit-related costs in the same way that they treat prices for marketed goods. Since recreationists need to transport themselves to the site, they must allocate scarce resources such as recreation time and transport services to produce a recreational experience with maximum utility level. The demand curve for trips per year to the site shows this resources allocation: the number of visits will decrease as the distance to the site, the direct out-of-pocket and time cost increase.

When the unit of observation is the users' zone of origin, the method called 'zonal travel cost method' adjusts for the probability and frequency of participation in recreation by stating the visitation rate as the number of visits per 1000 of population from each zone (Walsh, 1986; Brown, Sorhus, Chou-Yang & Richards, 1983). However, this procedure requires selecting fairly large samples that are proportional to each zone's total population. Because of the small sample size in the study and few observations from some regions that would have been involved if the data was aggregated by towns, the zonal TC method was not used. In addition, this method assumes that

individuals within one zone have similar travel and time costs, which is rarely the case. The aggregation of individual observations into zones renders ineffective the socioeconomic variables which are significant in explaining the demand for recreation (Georgiou, 1997 ; Walsh, 1986).

The individual TC method involves two stages:

(1) estimating an individual demand curve from survey data. A trip generating function, regressing visit rates against costs of travelling and other relevant variables (income, age, tastes and preferences, alternative sites,etc.), was estimated. The trip generating function is used to simulate a demand curve, whereby visitors are assumed to react to hypothetical increases in the admission fee the same way that they are observed to react to variations in travel costs.

(2) deriving an individual consumer surplus from the demand curve. The consumer surplus estimated from this demand curve is summed over the number of annual visitors to UVNR.

2.1.1. Empirical and theoretical issues

Despite three decades of empirical and theoretical studies on TC method, some methodological issues remain and limit the accuracy of TC results:
*   cost allocation to multipurpose trips
*   opportunity cost of travel time
*   functional form of the trip generating function

2.1.1.1. Cost allocation of multipurpose trips

Consumer surplus estimates can vary according to whether respondents are day trippers or holiday makers. Using holiday-makers' travelling costs from their home to the site would be inappropriate as visiting UVNR is rarely their sole reasons for coming on holiday. Including total travel costs of 'meanders' in the use value of the reserve would bias results since a proportion of these costs have been used to go to other sites. The question is how much is the proportion assigned to the study site? Many suggestions are made to overcome this difficulty with less or more success depending on the recreation amenities being valued. The bottom line here is that allocation of joint costs seems to undermine the logical relationship between travel costs and number of visits. Effectively, dividing joint costs between multiple destinations means assigning lower costs to the furthest site than it would otherwise be the case in the single destination trip (Mendelsohn, Hof, Peterson & Johnson, 1992).

2.1.1.2. Opportunity cost of travel time

Early studies (Cesario & Knetsch, 1970) recognized that the travel cost variable should include both money and time costs to avoid bias in the consumer surplus estimation. Creating an independent variable for travel time would result in multicollinearity between travel costs and time cost. Many discussions revolve around the allocation and pricing of the time spent in travelling to and from the site (including on-site time) (Mc Connell & Strand, 1981; Smith, Desvousges & McGivney, 1983; Wilman, 1980). In reality, the notion of opportunity cost is no longer applicable when visitors enjoy driving along roadside scenery or do not associate to travel time any forgone income. On the other hand, a wage rate cannot be used as a shadow price of time if the trade-off between work and recreation does not exist, especially for people constrained by fixed working hours or for retired people. Shaw (1992) suggested that as travellers' value of time is virtually impossible to observe, direct surveys on individuals willingness-to-pay to avoid or reduce travel time would give the best value of time. The difficulty and the cost of undertaking these surveys made unfeasible an accurate measure of travel time.

2.1.1.3. Functional form of the trip generating function

The variance of the welfare measure by TC demand is affected by the choice of functional form. Ziemer, Musser and Hill (1980) proved that the linear form is inappropriate to estimate recreation demand because it provides a poor fit of data compared to the semilog or double log form. There is no specific theoretical guidance on the choice of the functional form. It belongs to the analyst to select the form that best fits the data but also observes the theory of consumer preferences underlying the model specification.

2.1.2. The Travel Cost method 'success story'

The TC method is predominantly used to estimate recreational benefits though many methodological issues persist. Indeed, Randall (1994) attributed the reasons for these difficulties to the inherent subjectivity of travel costs as already raised in the time cost measure. A certain portion of travel costs escapes from the researcher's view. For example, the social, political and cultural environment of the individual or other unpredictable factors like the weather conditions, site congestion and so on, cannot be observed by the researcher but still influence the number of trips made by the visitor. Hence, the benefit estimates from TC method are rather ordinal welfare measure (subject to the individual's decision-making and recreational preferences) than consumer surplus from 'true' costs of travelling.

However, this critique does not undermine the success of the TC approach on the empirical side. The TC estimates do not contradict the a priori theoretical expectations: the demand for recreation is negatively related to the travel price variations and to substitute sites (Smith, 1993). Recognizing the weakness of the TC approach to estimate 'true' user value, Randall (1994) concluded that "TCM cannot serve as a stand-alone technique for estimating recreation benefits; rather, it must be calibrated using information generated with fundamentally different methods."

2.2. THE CONTINGENT VALUATION METHOD

The CV method relies on asking individuals to estimate their willingness-to-pay (WTP) for change in prices of recreational amenities. The total WTP for a nature reserve can be interpreted as a minimum estimate for the recreational value of UVNR (Randall, Hoehn & Brookshire, 1983; Mitchell & Carson, 1989 ; Jakobsson & Dragun, 1996).

Iterative and non-iterative bidding approaches to valuation are by far the most widely recognized form of CV (Randall, Ives & Eastman, 1974; Mitchell & Carson, 1989). The iterative bidding approach gives the respondent a chance to revise his or her value estimate until the maximum WTP is reached. This approach, by providing an incentive to participants to analyse their preferences thoroughly, results in more thoughtful and reliable measure of consumer surplus (Brookshire, Thayer, Schulze & d'Arge, 1982).

In the non-iterative bidding approach, the respondent must choose one answer (e.g., yes/no response or a single amount) to close-ended or open-ended questions. The amount given is considered to be the final response. For example, a close-ended question asks the respondent: 'Would you still come to Umgeni Valley Nature Reserve if the entrance fee is R10 ?'. An example of open-ended question is: 'If the present entrance fee is being increased, what is the most you would pay ?'. These question formats are called 'dichotomous choice' or 'referendum' due to its similarity to voting on an issue (Mitchell & Carson, 1989).

The problem with the open-ended questions format is the possibility of having many extreme responses from zero WTP or protest bid to a large number of high values. In addition, these responses do not reflect the maximum WTP for the reserve since participant cannot reconsider the initial bid.

Although the dichotomous choice format is simple to administer, the analysis of qualitative responses (yes/no) requires more sophisticated statistical procedures. The method requires large samples (at least 1000 respondents) to be correctly implemented (Sellar, Stoll & Chavas, 1985; Cooper & Loomis, 1992).

2.2.1. Methodological issues in Contingent Valuation method

A number of potential biases might affect estimates obtained through CV. The types of bias identified in the literature include strategic bias, starting point bias, scenario misspecification and sampling errors.

2.2.1.1. Strategic bias

The strategic bias stems from the inherent non-rivalrous characteristics of environmental good such as protected areas. Free-riding for payment may occurs when the participants think they may have to pay for the amount stated and therefore they will have an incentive to understate their true WTP (Dixon, et al., 1994). Much empirical evidence fails to support the existence of strategic bias in CV questions. However, the probability that this bias occurs depends on the quality of survey design and administration (Mitchell & Carson, 1989). Bohm (1979) made an interesting reflection about certain "counteracting incentives" which might act to produce responsibly revealed preferences.

2.2.1.2. Starting point bias

A respondent who is unsure of an appropriate answer may interpret the initial price in the bidding process as a clue for the 'correct' bid. Starting point bias exists if the first bid, the bid interval and the length of questioning tend to frame the response and thus, affect the individual's final WTP.

Using payment cards or asking open-ended questions followed by iterative bidding questions format can avoid the starting point bias (Mitchell & Carson, 1989 ; Georgiou, et al., 1997).

2.2.1.3. Scenario misspecification

The market scenario design must satisfy two conditions: one is to formulate the CV questions in a plausible way so that respondents believe the proposed change in the reserve might take place and their answers will affect the proposed change. The second condition is a good communication of the scenario to the respondent to insure that the interviewer and the respondent measure the same thing. The comprehension of the scenario is crucial because insufficient or imprecise description of the recreational amenities valued can distort the WTP stated and increase the number of nonresponses (Boyle, 1989 ; Braden & Kolstad, 1991). Sudman and Bradburn (1982) emphasized the importance of the wording in constructed market scenario as minor change in the question formulation may lead to disruptive responses far away from the true value.

2.2.1.4. Sampling errors

When non-randomly defined, the sampling frame may bias the valuation results by leaving out a major part of the population concerned (e.g., non-users of protected areas). Omission of non-users in the CV will deprive the analyst of useful information on participation decision in recreational activities in UVNR (Edwards & Anderson, 1987). However, the hypothetical market scenario proper to CV method requires that only those who are familiar with UVNR and alternative protected areas be part of the sample. Otherwise, no confidence can be placed on the responses (or nonresponses) from people who are less interested in UVNR (Braden & Kolstad, 1991).

2.2.2. Reliability of the Contingent Valuation method

Improving the survey design and administration, developing our understanding of how the question format and scenario misspecification affect individual WTP, can avoid many of the problems associated with the CV method (Walsh, 1986). Despite of these methodological issues, the CV approach is probably the most reliable technique for valuing environmental gains, particularly when familiar goods such as recreational amenities are involved. "In general, it can be concluded that Contingent Valuation methods will produce results which can be replicated, are consistent with demand theory and are consistent with results from other methods such as travel cost and hedonic pricing" (Jakobsson & Dragun, 1996).

In fact, it is difficult to directly validate CV responses because of the absence of true values for protected areas. Several experiments have been performed to show that CV techniques do reveal true values. Bishop and Heberlein's (1986) report comparing WTP values from CV methods with actual payments and offers, produced mixed results. Other studies confirmed that there is no significant divergences between hypothetical and actual payments (Hanemann, 1994 ; Mitchell & Carson, 1989). It is difficult to draw a precise conclusion from these studies. Factors like using sampling means, consumer's familiarity with the environmental good, shortcomings of surveys, etc, may be the cause of much of the confusion in the results. Freeman (1986) affirmed that differences in expenditures between hypothetical and actual markets exist in many CV models because of the selection of poor explanatory variables.

2.3. RESEARCH METHODOLOGY

Surveys on visitors about the recreation use value in Umgeni Valley Nature Reserve (UVNR) were carried out in the form of questionnaires. A sample of 150 visitors (day and overnight visitors and campers) based on the number of cars entering the reserve during August and September 1998 was randomly chosen.

2.3.1. The questionnaire

The questionnaire contains three main parts:

- questions on the number of trips per year to the site and the related costs of travelling

- questions on the WTP by respondents for price changes in the accommodation and the entrance fee. A hypothetical description of the terms under which recreational amenities changes occur was presented to the respondent.

- questions on socioeconomic characteristics of the respondent

2.3.2. Conduct of the survey

The survey was pretested on a small sample (n = 15) of visitors to check whether the questions are worded correctly and to verify the plausibility of the hypothetical scenario in the CV. Visitors previously interviewed during the pretest were not involved in the final questionnaire. The sample size of 141 cars representing about 1% of the annual visitors to UVNR was appropriate to perform statistical tests and resulted in 64 usable questionnaires from day visitors and 33 usable questionnaires from overnight visitors in the cottages.

On-site surveys were undertaken during weekends to avoid oversampling of visitors from Howick and Merrivale who come more often to the reserve during week days. One representative of each vehicle entering the site was asked to answer the questionnaire after the group had enjoyed the recreational experience in UVNR. Personal interviews were combined with telephone surveys to gather more information from overnight visitors staying in the cottages and camps in the previous months. The principles of Dillman's "total design method" were followed in survey preparation, pretest and administration to avoid divergences of responses between face-to-face and telephone interviews.

2.3.3. Treatment of data

The relationship between the number of trips and the travel costs and other relevant variables was estimated by the ordinary least squares method. One of the most reliable statistical packages available, Minitab, was used to carry out the regression analysis. The estimated coefficients from the ordinary least squares were used to calculate each individual's demand for trips to UVNR. A demand curve estimating the individual consumer surplus was traced out by using the regression equation. The recreational use value for day visitors is measured by the aggregated consumer surplus.

A multiple regression was performed on the data from the CV questions to establish the relationship between WTP, the number of visits to UVNR, and other significant variables like income and age. An individual demand curve measuring the consumer surplus and the WTP per visitor was obtained. The results were aggregated among day visitors in 1998.

CHAPTER 3 : VALUATION OF RECREATIONAL USE BY THE TRAVEL COST METHOD

3.1. THE STUDY AREA

The Umgeni Valley Nature Reserve (UVNR), situated in the KwaZulu-Natal Midlands, a kilometre drive from the centre of Howick, follows the Umgeni river for about 10 kilometres (see the map, figure 3.2.). The UVNR is owned by the Wildlife and Environment Society of South Africa (WESSA), one of South Africa's the oldest and largest non-government environmental organisation. The reserve comprises large range of plants and animals for a 750 hectares reserve. A scenic bushveld area overlooking the Howick falls, UVNR offers a variety of antelope species, a subtropical grassland, giraffe, zebra and other two hundred bird species.

Figure 3.1.: Buck are largely represented among game species in UVNR

: Map of the study area

While ecotourism is encouraged in UVNR, education is an important project aiming to develop environmental awareness and knowledge among children and adult visitors. The environmental education programmes fall into the broad mission of the WESSA in promoting public participation in conservation. For example, practical 'hands on' courses are available to teach relevant skills in environment to students. Structured educational courses as well as interactive and informal ecology courses are open to teachers and field workers.

3.1.1. Recreational amenities and activities

Visitors can stay within the reserve where there are three fully equipped cottages and four rustic camps. The cottages with a panoramic view are self-catering, accessible by car and can accommodate large groups. Overnight visitors in the cottages are charged R60 per person per night and a R5 entrance fee per person. Rustic camps are suitable for large groups of school children and family members. Mattresses, cold showers and flushing toilets are provided. These camps, reached only by foot, are nestled in natural bush and have wooden bungalows raised off the ground with open doors and windows. The normal charge for campers is R25 per person per night plus the entrance fee of R5. Large groups of children benefit from a 40 % of discount on the normal camp fee.

As non-consumptive recreation, the tourism activities in UVNR range from picnicking, game viewing, birdwatching to hiking and swimming. The reserve is currently visited by 6 336 day visitors, local and international, 751 overnight visitors, 2 862 campers and some 8 600 school children.
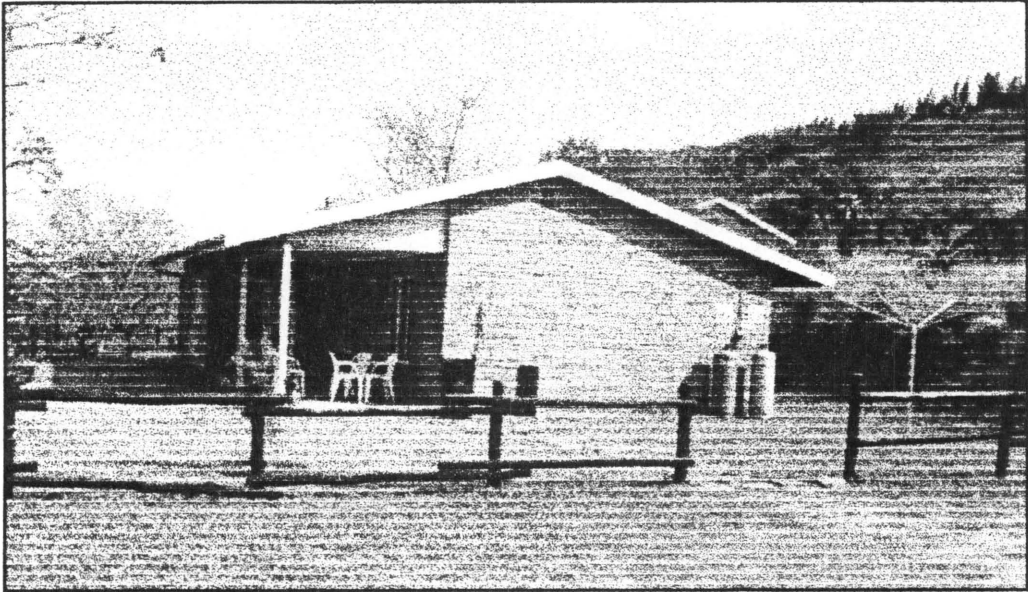
Figure 3.3.: The Hepburn cottage

3.1.2. The Umgeni Valley project

Through its education project, the Wildlife Society committed itself to support the development of environmental education throughout South Africa. This policy dictates strong financial autonomy to cover the costs of environmental education courses as participants do not always have the financial possibilities to pay for the courses and the Wildlife Society "has limited economic capacity to run such courses" (Taylor, 1997). In its efforts and initiatives to motivate conservation activities, the Wildlife Society has to insure that the whole working system is sustained by a long-term financial security plan.

The popularity of UVNR as an ideal site for short field excursion, and as part of the Midlands Meander itinerary, emphasizes the importance of ecotourism opportunities in the area that UVNR can exploit to its benefit. The commercial aspect of wilderness recreation is complementary to the

educational aspect in terms of financial contributions. Effectively, economic sustainability of protected areas such as UVNR, can be compromised by normal operational costs and capital costs if these reserves cannot rely on regular sources of revenues.

Game and veld management is inevitably crucial in a small reserve like UVNR. Probably the most serious problem the reserve faces at present is the invasion of alien vegetation such as wattle, gum, and bugweed. The basic cost of eradicating wattle is estimated to be R5 000 per hectare per annum for a moderate infestation density. This figure may increase depending on the weed density and complexity, the quantity of labour employed, the use of machinery and herbicides, and so on (Goodall & Naude, 1998). In this case, economic sustainability becomes an imperative goal in the long run in order to maintain and improve the environmental quality of UVNR. The policy of economically viable protected areas ensures that long term values and benefits gained from recreational use do not disappear over time.
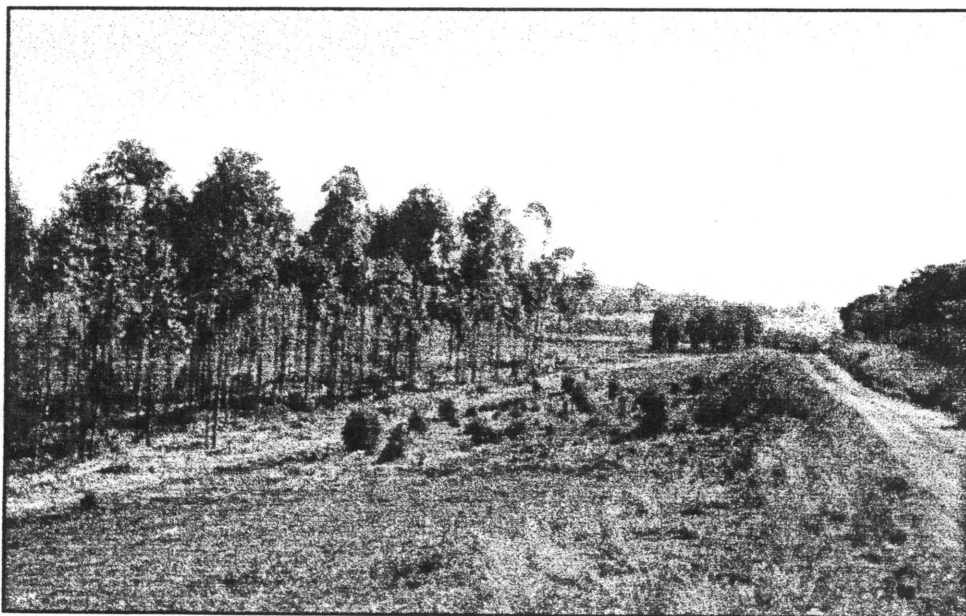
Figure 3.4.: Alien vegetation is a serious threat to the biodiversity in the reserve

The objective of this study is to use and test the TC method to have an indication of the economic value of recreational opportunities in UVNR. The measurement of such a value can aid future planning and decision-making in setting prices and allocating resources among recreational activities and amenities for a sustainable natural environment in UVNR.

3.2. ANALYSIS OF DATA FROM THE TRAVEL COST METHOD

The questions in the table 3.1. were used to obtain the variables in the trip generating function. The number of trips to UVNR was specified as a function of round-trip costs to the site, alternative sites, recreational quality of the reserve, tastes and preferences, income, and age of the visitors. The general form of the trip generating function used in the analysis of questionnaire data was:

$$V_i = f(C_i, S_i, Y_i, A_i, P_i, Q_i)$$

where:

V_i : number of trips per year by a day visitor i

C_i : average cost of travel from the visitor i's residence to UVNR (round-trip)

$C = (r + e)/n$

        r: running costs (petrol, maintenance, hiring, toll road, etc.)

        e: entrance fee at the gate

        n: size of individual i's party

S_i : substitution to recreation in UVNR, estimated by the total of round-trip expenditures per person to the substitute site

Y_i : net income per year of the individual i's household

A_i : individual i's age

P_i : 0-1 variable for tastes and preferences

Q_i : Quality and attractiveness of the site (physical characteristics of facilities, variety of recreation offered, etc.)

Table 3.1.: Synopsis of questions used in personal interview surveys

Questions	Variables
1. Approximate number of visits per year	V
2. Town residence of the respondent	C
3. Whether the trip was a single or multiple destination trip	C
4. Total round trip expenditures for fuel, toll road, car hiring and other	C
5. Total number of people on the trip covered by the expenditures	C
6. Assessment of the quality of roads, nature trails and congestion	Q
7. Comparable site to UVNR the respondent would choose if UVNR was closed or unavailable	S
8. Preferences for active or passive recreation	P
9. Age of the respondent	A
10. Household net income per month	Y

3.2.1. Variables in the recreation demand function

3.2.1.1. Number of trips

Information was obtained about the number of times the respondent visited UVNR during the previous 12 months. Because visits at the site were of one day duration, it was possible in the regression analysis to define the dependant variable as 'total annual trips per person' equal to 'total annual visitor days per person'.

3.2.1.2. Individual travel costs

The travel costs to UVNR are calculated rather than observed, because costs reported by visitors are subject to a great deal of variation as a result of lack of records, poor recall and inherent differences in perceptions of cost.

The travel costs variable accounts for the vehicle operating costs borne during travel to the site. The vehicle cost is calculated by multiplying round-trip distance in kilometre between UVNR and the respondent's origin by the cost of operating an automobile which includes the costs of fuel, lubrication, maintenance and tyres. The Automobile Association of South Africa produced the average running cost per kilometre according to the engine size (figures in August 1998). The amount of toll road and the entrance fee paid on the day of the trip were added to the running costs of the vehicle.

The assumption was made that the costs of making the trip would be shared equally by the members of the respondent's party. Hence, trip costs were converted to average travel costs per day visitor.

As already discussed earlier (section 2.1.1.), travel costs for individuals making multiple destination trips are difficult to allocate among purposes, and attributing all travel costs to UVNR would bias average consumer surplus estimates. Therefore, the likelihood of multipurpose trip bias was reduced by eliminating from the sample 5 vacationers whose main reason for visiting the Midlands area was other than to visit UVNR.

3.2.1.3. Substitute sites

It has been suggested that a TC valuation of a site may be subject to bias if substitute sites to UVNR are not included in the analysis. However, the direction and magnitude of the bias, if it exists, cannot be determined. Respondents were asked to think about comparable sites to UVNR, but a majority either failed to provide sufficient information or found difficulty in responding. Because of the lack of information, it was not possible to quantify the cost of visiting other sites.

3.2.1.4. Income

Twelve household net income categories were used in the model. Monthly income with means ranging from R1 000 to R22 000 were specified in the questionnaire. The category R21 000 and above was entered as R22 000 in the data treatment. The arbitrary nature of this value was not deemed to be a major source of error as less than 1% of the sample fell in this category.

3.2.1.5. Tastes and preferences

Tastes and preferences are expressed in a dummy variable and refer to categorical choices either for active recreation involving physically strenuous activities such as hiking, or for passive recreation including more comfortable activities like picnicking and braaing. As the nature of recreational activities in UVNR is directed to passive recreation, the demand curve for trips to the reserve would shift to the right when patterns of visitors' preferences favour passive recreation. It was assumed that the respondents' answers were representative of the group of persons in the same car as the respondent.

3.2.1.6. Site quality and attractiveness

The level of congestion or crowding at the site, the road conditions, and the nature trails experience were taken as a proxy for measuring the attractiveness of UVNR from the day visitors' viewpoint. The interviewer asked users to rate each of these attributes on a three scales of satisfaction (e.g. from monotonous to fascinating). The higher the level assigned to the quality attributes, the further the demand curve shifts upward.

Prior to statistical analysis, number of trips and costs were transformed to $\log_{10}$ and the square of income was used in order to help reduce the effects of heterogeneous variances among variables in the stepwise multiple regression analysis (Kennedy, 1998).

3.2.2. Results and discussions

3.2.2.1. Estimation of demand for day visits

Functional form of the regression equation

Previous researches (e.g. Strong, 1983) have shown that models based on two forms, the quadratic and semi-log (independent variable), often suffer from heteroskedastic disturbances, making them unsuitable candidates for ordinary least square regression. A visual inspection of residuals plotted against the independent variable confirmed the presence of heteroskedasticity in the data, so these models were rejected. On the basis of the R-square, the log-log model was selected and that equation was used in the estimation of the second stage demand curve. The study of the matrix of correlation coefficients between all pairs of the independent variables does not indicate any multicollinearity.

Table 3.2.: Different functional forms of the regression equation of number of trips

Equations	R^2	Adjusted R^2	F-ratio
Linear: $$V= -1.39 - 0.0185\,C + 0.000086\,Y + 1.30\,A$$ $$(-0.54)\quad(-1.56)\quad(0.58)\quad(2.43)$$	12.5	8.4	3.05
Semi-log: $$V = 3.89 - 4.81\,Log_{10}\,C + 0.000167\,Y + 1.19\,A$$ $$(1.22)\quad(-2.81)\quad(1.14)\quad(2.29)$$	19.2	15.4	5.06
$$Log_{10}\,V = 0.003 - 0.00165\,C + 0.000003\,Y + 0.0910\,A$$ $$(0.02)\quad(-2.06)\quad(0.28)\quad(2.51)$$	15.3	11.4	3.86
Log-Log: $$Log_{10}\,V = 0.146 - 0.341\,Log_{10}\,C + 0.000559\,Y^2 + 0.131\,A$$ $$(0.83)\quad(-3.83)\quad(1.61)\quad(4.39)$$	**39.4**	**36.2**	**12.55**

Numbers in parentheses are T- statistics

The confidence level is 95 %

Results of TC method analysis provided statistically significant relationship between annual number of trips, individual trip costs, and age. Other data obtained from the survey for individual tastes and preferences and site quality were not included in the regression equation. Dummy variables reflecting the respondents' preferences for active or passive recreation failed to significantly explain demand for UVNR visits, possibly because the two levels 'active' vs 'passive' are not sufficient to differentiate the preferences for non-consumptive recreation in UVNR from other forms of recreation.

The resulting demand equation for UVNR explained 36.2% of the variation in average recreational use. The multiple correlation coefficient adjusted for degrees of freedom R^2 has a reasonable value for such an experimental study and this order of value is commonly observed in many TC studies. Obviously, additional independent variables such as travel costs to substitute sites are needed to better explain variation in annual visitation rate per person. Redefining independent variables in the demand equation that describe, for example, such things as physical features and scenic quality of the site and surrounding environment, tourists' preferences in recreational activities, and so on, may be useful for improving the quality of demand function for amenity resources. Part of the answer to the low R-square is also that the mathematical properties of the variables used to describe each visitor did not satisfy many of the underlying theoretical assumptions for multiple regression analysis. Namely, the data for the independent variable and some dependent variables were not normally distributed and their variances were small and not homogenous (as illustrated in figure 3.5. and 3.6.). Logarithmic transformation of the data helped somewhat to alleviate the situation of heterogenous variance.
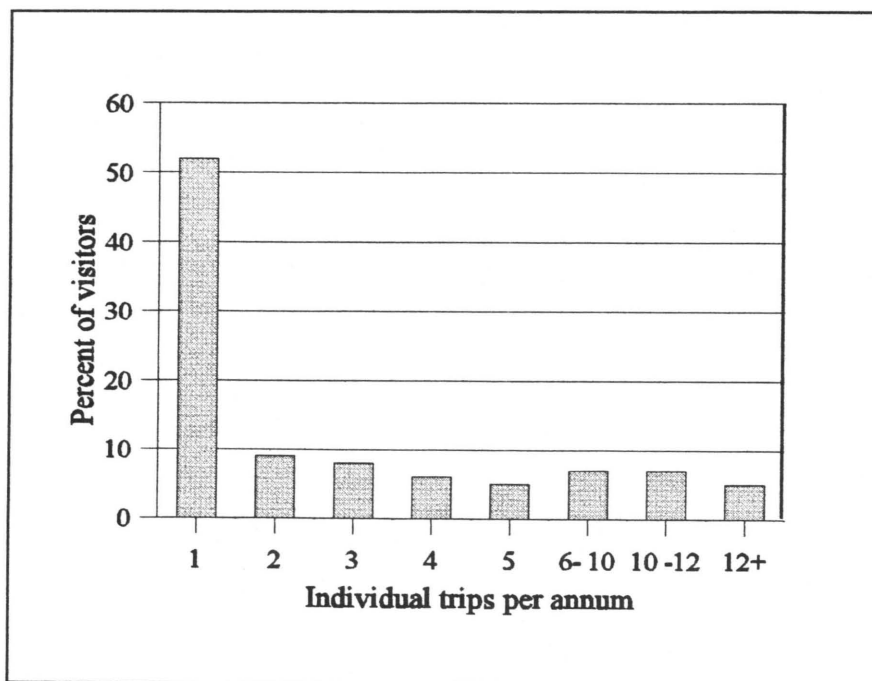
Figure 3.5.: Frequency of individual trips per year

The figure 3.5. shows that almost 50 % of tourists either visited the reserve for their first time or make an once-a-year trip. The mean level of trip per annum is 2.875 per visitor.
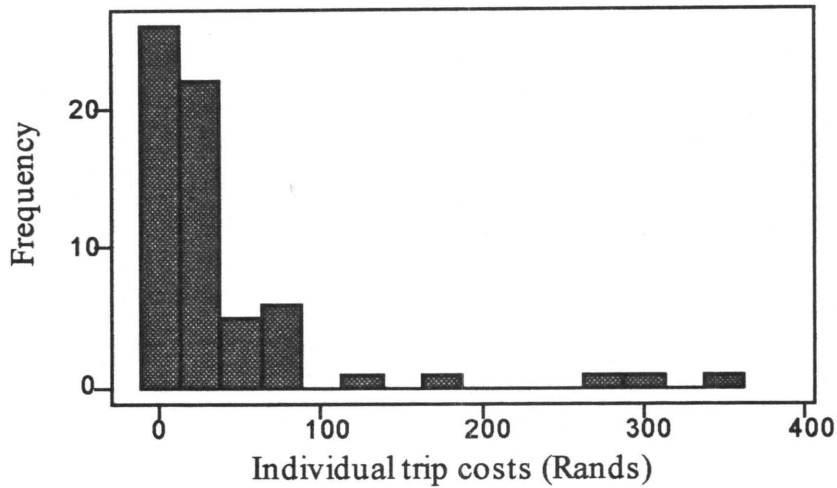
Figure 3.6.: Distribution of the average trip costs

The travel costs of most visitors clustered in the range R 0-100 and had a positively skewed distribution that was explained by the dominance of visitors from Howick and Pietermaritzburg areas. The average travel cost per tourist was R38.76 with 95 % confidence limits of R21.65 and R55.86.

Regression estimates

The regression equation is

$$\text{Log}_{10} V = 0.146 - 0.341 \, \text{Log}_{10} C + 0.000559 \, Y^2 + 0.131 \, \text{Age} \qquad N = 64$$
$$\qquad\quad (0.83) \qquad (-3.83) \qquad\quad (1.61) \qquad\quad (4.39)$$

$R^2 = 36.2\,\%$ (adjusted)   F-ratio = 12.55

Numbers in parentheses under the estimated coefficients are asymptotic t-statistics. Their values indicate that trip costs and age are significantly different from zero at the 95 % confidence level. The intercept and the income are only significant at 90 % of confidence level. The F-ratio shows a significant relationship between the demand for trips and the other predictor variables taken together.

The regression equation indicates that demand for recreational use in UVNR would decrease as expenditures increased. The price elasticity of demand for visits per annum is estimated to be -0.341, as shown by the estimated coefficient of Log_{10} (C) (see table 3.3.). An elasticity of -0.341 indicates that a 1 % increase in individual travel costs would result in a 0.341 % decrease in annual trips per person, holding other things constant. Analogously, the estimated coefficient for squared income shows that a 1 % increase in income would result in a 0.2 % increase in the number of visits to UVNR, other things constant. The income elasticity was low but positive, implying that wildlife recreation in UVNR is a normal good.

Table 3.3.: Estimated elasticity of demand for trips to UVNR

Independent variable	Unit	Estimated mean value M_i	Regression coefficient	Formula of elasticity[1]	Elasticity of demand
1. Cost of travel (C)	Rands	38.76	0.341	b_1	0.341
2. Income (Y^2)	Million Rands	83.5	0.000559	$b_2 * Ln10 * 2M_2^2$	0.215
3. Age (A)	Group	3	0.131	$b_3 * Ln10 * M_3$	0.905

In the regression equation, the increase in age of visitors have a positive effect on the average number of annual trips. The figure 3.7. shows the age pattern of day visitors in UVNR and the visitation rate per age group. The selection of adult respondents in the questionnaire might have misrepresented visitors in the lowest age groups under 18 and between 18-24. But another important factor that should not be overlooked is the passive characteristic feature of recreational activities in UVNR, which mainly involve non-consumptive tourism related with appreciating the natural beauty of the environment. It is widely accepted that the stimulation of exciting activities, the novelty of new experience and the challenge from strenuous physical and mental effort are expected to be higher for young people than older people. Probably these kinds of motives in consumer behaviour are not present in the UVNR case if one looks at the age distribution of

---

[1]Elasticity of $V = \dfrac{dV}{V} \times \dfrac{Y}{dY}$ where d is the symbol of the variation of the variable.

Hence, $dLog_{10} V = 0.000559\, dY^2$ or $dLn\, V = 0.000559\, dY^2 * Ln10$

$\dfrac{dV}{V} \times \dfrac{Y}{dY} = 0.000559\, dY^2 * Ln10 * \dfrac{Y}{dY} = 0.000559 * Ln10 * 2Y * Y$

participants in the reserve. In particular, the high percentage of visitors from the oldest group making more than 6 trips per year, is explained by a number of old people from Howick who enjoy the nature in its primitive state in UVNR during their repeated visits.
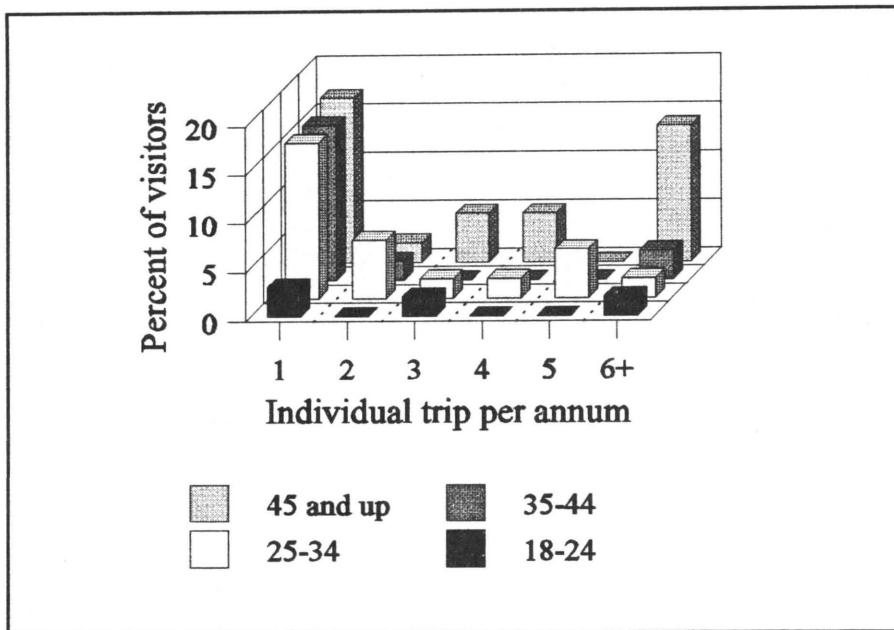
Figure 3.7.: Frequency of individual trips per age group

3.2.2.2. Consumer surplus estimate

The individual consumer surplus is estimated as the area under the recreation demand curve and above the entrance fee R5. Figure 3.8. depicts the estimated recreation demand curve for annual visits to UVNR. It shows the predicted number of trips per person when individual travel cost is allowed to vary, holding age and income constant at their means. An upper bound on the consumer surplus area must be assumed since the estimated recreation demand curve is asymptotic to the

travel cost axis. The upper bound was set as the cost at which the number of visits falls close to one. Average individual consumer surplus is estimated to be R15.12. This amount was multiplied by the number of day visitors during 1998, yielding a consumer surplus estimate of R95 800 per year.

$$C = 105.61 * V^{-2.933}$$
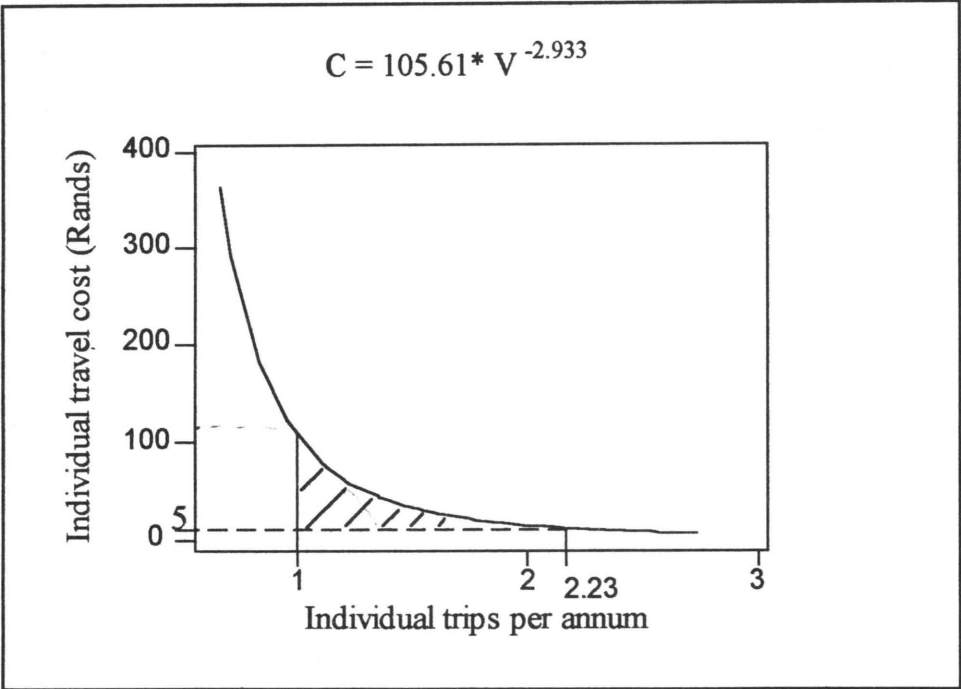
Figure 3.8.: Demand curve for recreational use in UVNR

Although it would indicate the relative importance of use value of UVNR, comparison of benefit estimates is difficult because of the few studies in this kind and the variations in site characteristics and methods of analysis. Characteristics such as size, type of recreational activities and availability of substitutes, all influence benefit estimates. Placed in the South African context, the demand curve for recreation use will shift to the right as natural areas become fewer and smaller in extent, and their value accordingly appreciates. The promising expansion of ecotourism in South Africa and the growth of tourists experiencing the Midlands Meander in particular, will confirm the increase of the recreational use value of UVNR.

CHAPTER 4 : VALUATION OF RECREATIONAL USE BY THE CONTINGENT VALUATION METHOD

Contingent Valuation is a means for potentially interested individuals to participate in choices about non-market goods, such as protected areas, by expressing their expected utility. A visitor's willingness-to-pay for the outcome presented in the hypothetical environmental change is interpreted as their expected value for the reserve.

4.1. THE SURVEY DESIGN

The same sample of day visitors used in the TC valuation was asked the CV questions. The pre-test survey helped to rectify some misunderstanding of the questionnaire formulation and to refine the questions as well as the bid values. The survey obtained 64 usable personal interviews.

The contingent market was designed to be as realistic and credible as possible. The structure of the hypothetical market involves three elements:

- description of the main improvements of amenities and wilderness quality in UVNR: creating picnic sites, shade parking, new trails, upgrading roads, eliminating alien vegetation.

- information specifying that the questions were a hypothetical experiment intended to provide an economic measure of how strongly respondents value the reserve

- range of bids of entrance fee per person

An iterative bidding process was adopted to obtain responsibly and thoughtful maximum WTP from interviewee. Bidding took the form of a series of specific questions. For example, the respondent was asked whether he or she would contribute to some ameliorations (creating picnic sites, shade parking, new trails, upgrading roads, chopping alien vegetation) in the reserve through a higher entrance fee (see appendix 1). If 'yes', he or she was required to give an amount. The stated amount was then incremented by R1 until the respondent answered 'no'. This final amount was recorded as the maximum WTP higher entrance fee for the particular environmental changes cited above. Respondents who gave a R5 WTP bid were asked to indicate their reason for protesting against the increase.

4.2. DEALING WITH BIASES

Bias cannot be eliminated from social surveys but careful pre-testing of survey instruments can minimise the potential problem (Braden & Kolstad, 1991).

4.2.1. Strategic bias

If respondents biased their WTP responses, visual inspection of the frequency distribution may show bimodal clustering of values at abnormally high and/or low levels (Mitchell & Carson, 1989). Distribution of the WTP values in figure 4.1. does not indicate a bimodal distribution, suggesting there may be little or no strategic bias of the study results. Moreover, a review of many CV researches led to the conclusion that "strategic bias in revealing consumer preferences is not likely to be a major problem" (Schulze, d'Arge & Brookshire, 1981). The provision that the survey has a scientific purpose and was conducted independently from the UVNR management was made clear to minimise the possibility that visitors would over- or understate their true values in an effort to influence the interviewer.

4.2.2. Starting point bias ·

Open-ended direct questions on the maximum WTP for entrance fee were combined with interactive bidding technique. Respondents could engage in an extensive discussion before giving an amount. The bid values range from R5 the present entrance fee raised by R1 increment. There is no possibility that an interviewer may bias the answers, nor that a starting point or interval bias might be introduced.

4.2.3. Scenario misspecification

The conversational style of the interview allowed for fuller explanation of the hypothetical scenarios context and therefore may have reduced scenario misspecification. On the other hand, the conversational tactic implemented by three different interviewers may have permitted hypothetical bias to affect the survey as each interviewer has his or her own communication style.

4.3. RESULTS AND DISCUSSIONS

4.3.1. Statistical analysis

Recreational use value of UVNR was estimated by developing an appropriate econometric model of WTP by participants included in the survey and by aggregating values across tourists in the reserve. A priori reasoning suggests that the WTP curve will likely be nonlinear in relation to the number of trips. Stepwise least squares regression was performed to determine what factors contributed to WTP. The model specification (chosen on the basis of economic theory and prior studies) includes socioeconomic variables (income and age), tastes and preferences in recreation, site quality which have already been used in the TC model (chapter 3), as well as the descriptive

variable number of trips. As already encountered in the TC method, the inclusion of substitute sites to UVNR was difficult due to the lack of information and the inability of respondents to name alternative sites. The model was written under the general form:

$$WTP_i = f (V_i , Y_i , A_i , P_i , Q_i)$$

where:

WTP_i : willingness-to-pay for entrance fee by individual i

V_i : number of trips per year by a day visitor i

Y_i : net income per year of the individual i's household

A_i : individual i's age

P_i : 0-1 variable for tastes and preferences

Q_i : Quality and attractiveness of the site (physical characteristics of facilities, variety of recreation offered ...)

First the distribution of WTP bids is discussed and then the results of the regression analysis are presented.

4.3.1.1. Willingness-to-pay distribution

The frequency distribution of WTP bids is shown in figure 4.1. Thirteen R5 bids (19 % of the total sample) included 5 respondents who indicated that they 'could not afford to pay more' and two who indicated that they 'did not believe the hypothetical changes are worth a higher entrance fee'; the rest either did not approve the hypothetical improvements or preferred to pay on season tickets.

Average WTP per visitor was R10.73 annually with 95 % confidence limits of R9.52 and R11.95. Total WTP of R6 7985.28 for the entire visitor population of UVNR was obtained by multiplying the estimate of average annual WTP by the approximate number of day visitors during 1998. The 95 % confidence interval for total annual WTP was estimated to be R60 318.72 - R75 715.20.
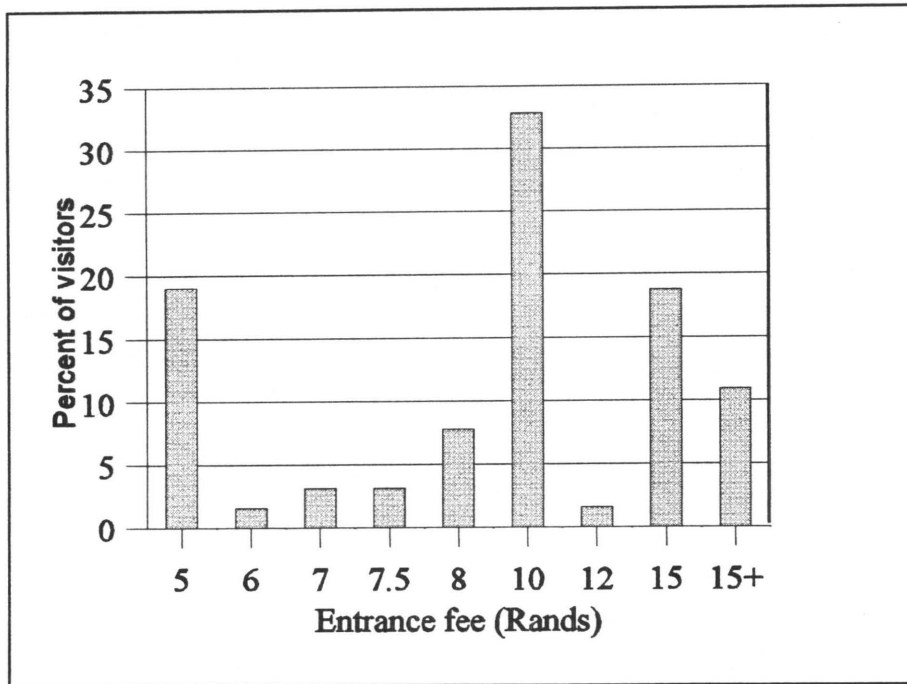
Figure 4.1.: Distribution of willingness-to-pay for entrance fee among day visitors

4.3.1.2. Factors in willingness-to-pay

The hypothesis that WTP was a function of tastes and preferences of visitors did not prove statistically significant. While a tastes and preferences variable should be an important explanatory variable, there was no theoretical basis to pre-select measures that best reflect this variable, and there has been little previous empirical research to serve as a guide in selection of a tastes and preferences variable for this kind of recreational use valuation.

The hypothesis that number of individual trips and site quality determined WTP was supported by a regression that included monthly household net income and age of the respondent. The sample distribution was normalized using a $\log_{10}$ transformation for the WTP variable.

Alternative functional forms of the regression were tried, including logarithmic, with the quadratic

and linear models to check the best fit of the relationships between variables (Table 4.1.).

Table 4.1.: Different regression equations of willingness-to-pay for entrance fee by day visitors

Equations	Adjusted R^2	F-ratio
Linear:		
$WTP = 18.4 - 0.0818\ V + 0.000293\ Y - 0.876\ A + 1.26\ Q$ (4.62) (-0.89) (2.73) (-1.97) (2.01)	17.4	4.31
Quadratic		
$WTP = 18.3 - 0.063\ V - 0.0006\ V^2 + 0.000294\ Y - 0.880\ A + 1.26\ Q$ (4.52) (-0.28) (-0.09) (2.70) (-1.95) (1.98)	16	3.39
Semi-log:		
$Log_{10}\ WTP = 0.886 - 0.0139\ V + 0.000013\ Y - 0.0391\ A + 0.063\ Q$ **(10.49) (-2.37) (3.34) (-2.67) (3.10)**	**43**	**10.99**
$WTP = 18.7 - 1.03\ Log_{10}\ V + 0.000287\ Y - 0.903\ A + 1.30\ Q$ (4.78) (-0.77) (2.67) (-2.04) (2.09)	17.1	4.25

The confidence level is 95 %.

The numbers in parentheses are T-statistics.

After preliminary analysis, the final model was based on individual T-statistics, the sign on the estimated coefficients, and the value of R^2. The table 4.1. summarizes the critical statistics of the variables specified by the regression equation:

$$\text{Log}_{10}\,\text{WTP} = 0.886 - 0.0139\,\text{V} + 0.000013\,\text{Y} - 0.0391\,\text{A} + 0.063\,\text{Q} \qquad \text{N} = 64$$
$$(10.49)\quad(-2.37)\qquad(3.34)\qquad(-2.67)\qquad(3.10)$$

$R^2 = 43\,\%$ $\qquad\qquad$ F-ratio = 10.99

The Pearson correlation matrix indicated an absence of multicollinearity problems. However, the plot of residuals against fits showed heteroskedastic disturbances. In this case, weighted least squares procedures were applied. The use of robust estimates for the parameter standard errors (Huber- White estimates) which requires more specialized softwares would have overcome the problem. The coefficient of determination R-square (adjusted for degrees of freedom) indicates that 43 % of the total variation in WTP was explained by the variables included in the regression function. This R^2 level is acceptable for a cross-section survey of individuals and fell in the range of those from similar studies (e.g. Hadker, et al., 1997).

All coefficients of the explanatory variables were highly significant at 0.05 probability of acceptance. As expected, the number of visits to UVNR was negatively related to WTP. The variable number of trips is an indicator of a visitor's demand for the good 'wilderness recreation'. A person who has expressed his or her demand for the good would be willing to pay less, as the quantity of the good increases according to the law of diminishing marginal utility. The diminution of the WTP amount is about 0.09 % for each 1 % of additional trip (see table 4.2.).

Table 4.2.: Estimated elasticity of WTP for entrance fee in UVNR

Independent variable	Unit	Estimated mean value M_i	Regression coefficient b_i	Elasticity[1] $b_i * Ln10 * M_i$
1. Number of visits (V)		2.875	0.0139	0.092
2. Income (Y)	Rands	6281	0.000013	0.188
3. Age (A)	Group	3	0.0391	0.270
4. Site quality (Q)	9- point scale	4	0.063	0.580

Income levels indicate the capability of paying for the good and one would expect an increase in WTP values with increasing income. The income elasticity for expenditures in entrance fee is positive although slightly low, meaning that a 1 % change in income results in a 0.19 % change in WTP by users.

Age was negatively correlated with WTP showing that WTP is higher among young people than older participants. The degree of participation in recreation depends on the amount of leisure time available to individuals. For most retired people, leisure time is greater compared to the spare time

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[1]Elasticity of WTP = $\dfrac{dWTP}{WTP} \times \dfrac{V}{dV}$ where d is the symbol of the variation of the variable.

Hence, $dLog_{10} WTP = 0.0139 \, dV$ or $dLn \, WTP = Ln10 * 0.0139 \, dV$.
Finally, $\dfrac{dWTP}{WTP} \times \dfrac{V}{dV} = Ln10 * 0.0139 \, dV * \dfrac{V}{dV}$

of the other age categories. This availability of leisure time associated with the passive and non-consumptive characteristics of recreation in UVNR explained the increasing participation with age (see the TC model). However, the more visits are made by aged people, the less is the marginal utility (or satisfaction) obtained from each additional trip; hence, the less is their WTP for further trips.

Not surprising, the WTP estimate is sensitive to the quality of the resource valued. The variable site quality measuring the level of congestion, the road conditions and the quality of nature trails in the reserve (figure 4.2.) attained positive sign and was significant. The magnitude of the WTP variation following an improvement of the site quality is 0.58 % for a 1 % of variation in the variable site quality.
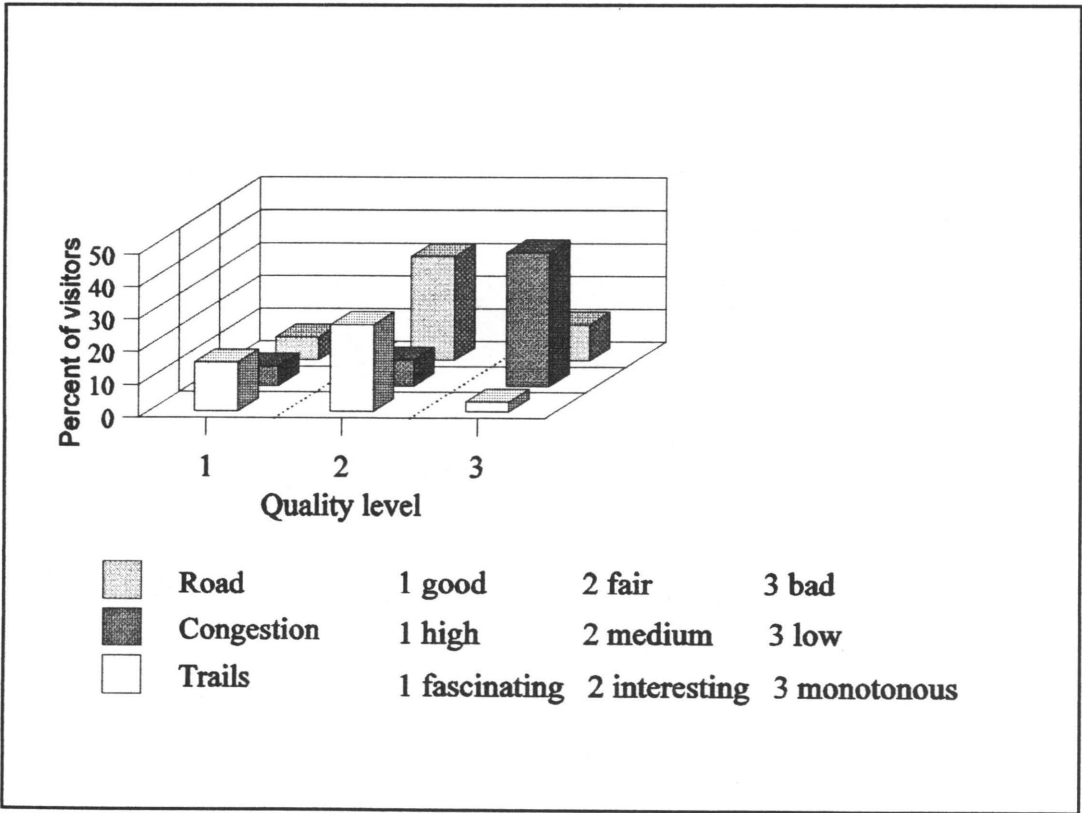
Figure 4.2.: Distribution of site quality levels assessed by day visitors

The majority of visitors found the road conditions acceptable for such a reserve supposed to be kept in its 'natural' state as possible. The site congestion level which is an important factor in UVNR both in terms of carrying capacity and visitors' satisfaction, was very low according to the participants. They rated the nature trails which differ in length (1 to 7 kilometres) and in variety of plant and animal species as 'interesting'(e.g. grasslands trail, black eagle trail).

4.3.2. Consumer surplus estimate

This study has the objective to obtain the net WTP measured through entrance fees for the recreational activities in UVNR. The consumer surplus is computed by subtracting annual entrance fees paid by individual visitor from maximum WTP. The figure 4.3. shows the individual demand curve derived from the marginal WTP function[3]. The consumer surplus is the shaded area above the actual entrance fee born by visitors. Individual consumer surplus is estimated to be R5.48. Total annual consumer surplus is equal to R34 721 with reported 6 336 day visitors in 1998. The total WTP is estimated to be R66 336 per annum.

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[3]The average WTP function is: $\mathrm{Log_{10}\,WTP = 1.1024 - 0.0139V}$ or $\mathrm{WTP = 10^{1.1024 - 0.0139\,V}}$
The total WTP function is: $10^{1.1024 - 0.0139\,V} \times V$. The derivation of this function gives the marginal WTP function: $\mathrm{WTP_m = 10^{1.1024 - 0.0139\,V} \times (1 - 0.032\,V)}$
or $\mathrm{Log_{10}\,WTP_m = 1.1024 - 0.0139\,V + Log_{10}\,(1 - 0.032\,V)}$

$$\text{Log}_{10}\text{WTP}_m = 1.1024 - 0.0139\,V + \text{Log}_{10}(1 - 0.032\,V)$$
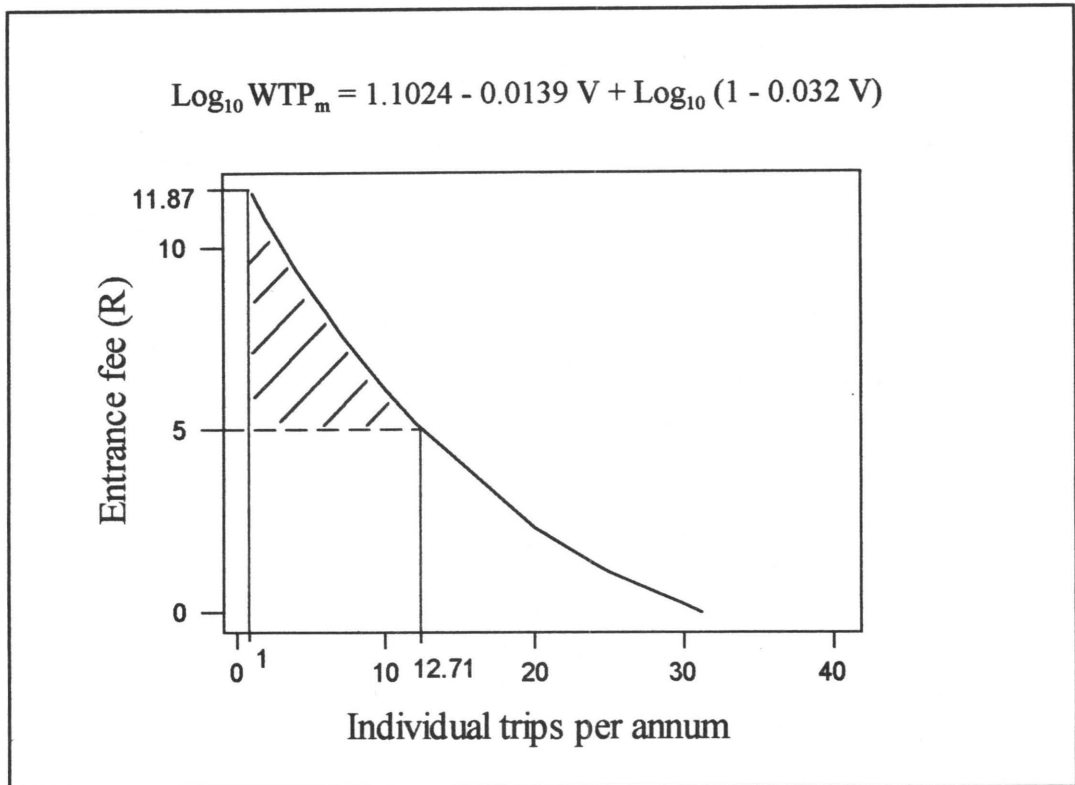
Figure 4.3.: Individual demand curve for recreation in UVNR

These regression estimates suggest that despite many methodological difficulties, CV questions obtain results consistent with actual consumer behaviour or at least, with the demand theory. Careful comparisons of the aggregated WTP are difficult as the results are not known to be dependent on the 'unique' nature of the study site or generalizable to other recreation areas. The values reported here should be considered first approximations subject to improvement with further research. These prior estimates intended to reduce one of the many uncertainties in natural resource planning and management.

4.4. ANALYSIS OF DATA ON OVERNIGHT VISITORS IN THE COTTAGES

The small sample size of visitors from cottages (N = 33) and the small variation for average visitor days (see figure 4.4.), constrained at the start any analytical approach designed to explain the reason for that variation. In the six-weeks survey, the visitation rate of the cottages was too low to allow the construction of a statistically viable sample. However, personal interview results highlight some of the major trends in visitor characteristics.
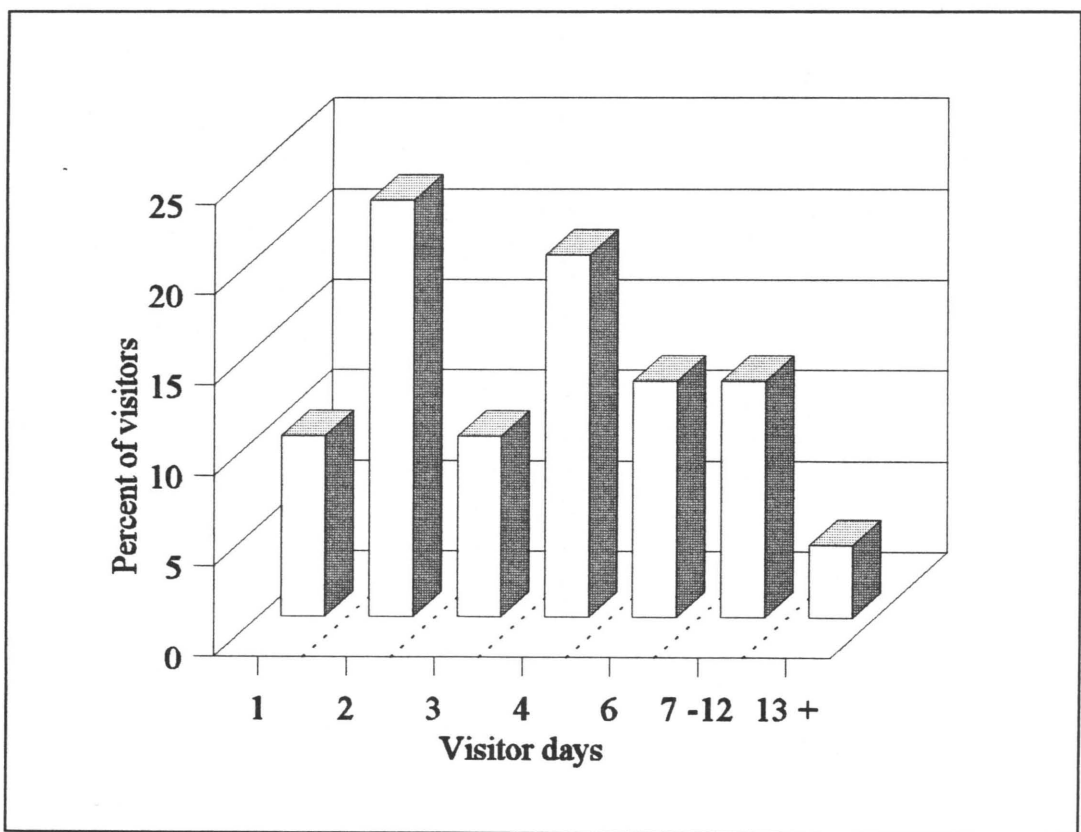
Figure 4.4.: Frequency of visitor days of tourists in the cottages

Fifty-three percent of overnight tourists spent less than 4 days in the cottages and the rest of the visitors are fairly distributed across the other categories of length of stay. A small percentage of overnight visitors made more than one trip a year (less than 30 %).

4.4.1. Income distribution

The overnight visitors staying in the cottages were fairly evenly distributed across most income categories (figure 4.5.). Seventy-three percent of visitors have a household net income more than R5000 per month which implies that wilderness recreation is no longer a privilege of a wealthy minority.
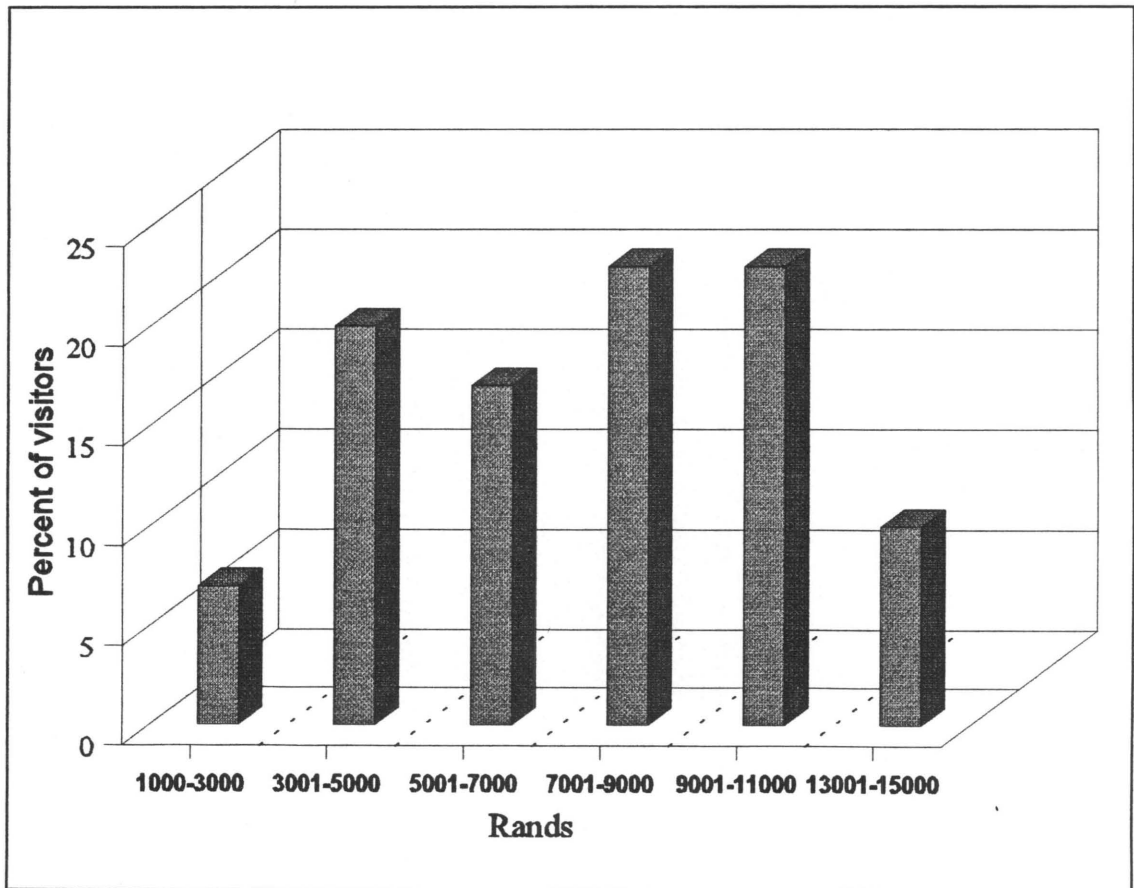
Figure 4.5.: Distribution of household net income of visitors in the cottages

4.4.2. Willingness-to-pay

The visitors were asked to state their WTP for an increase in the entrance fee they have to pay in addition to the accommodation charge. The eventual augmentation of the entrance fee was justified by hypothetical changes within the reserve (e.g. upgrading roads, putting more picnic sites and game). Only 17 % of visitors protest against paying more than R5 of entrance fee per person. Most of visitors are willing to pay up to R10 which is confirmed by the trend in entrance fee that day visitors are prepared to pay (figure 4.6.). Average WTP per overnight visitor, as estimated by the sample mean, was R11.02 with 95 % confidence interval of R9.26 and R12.76.
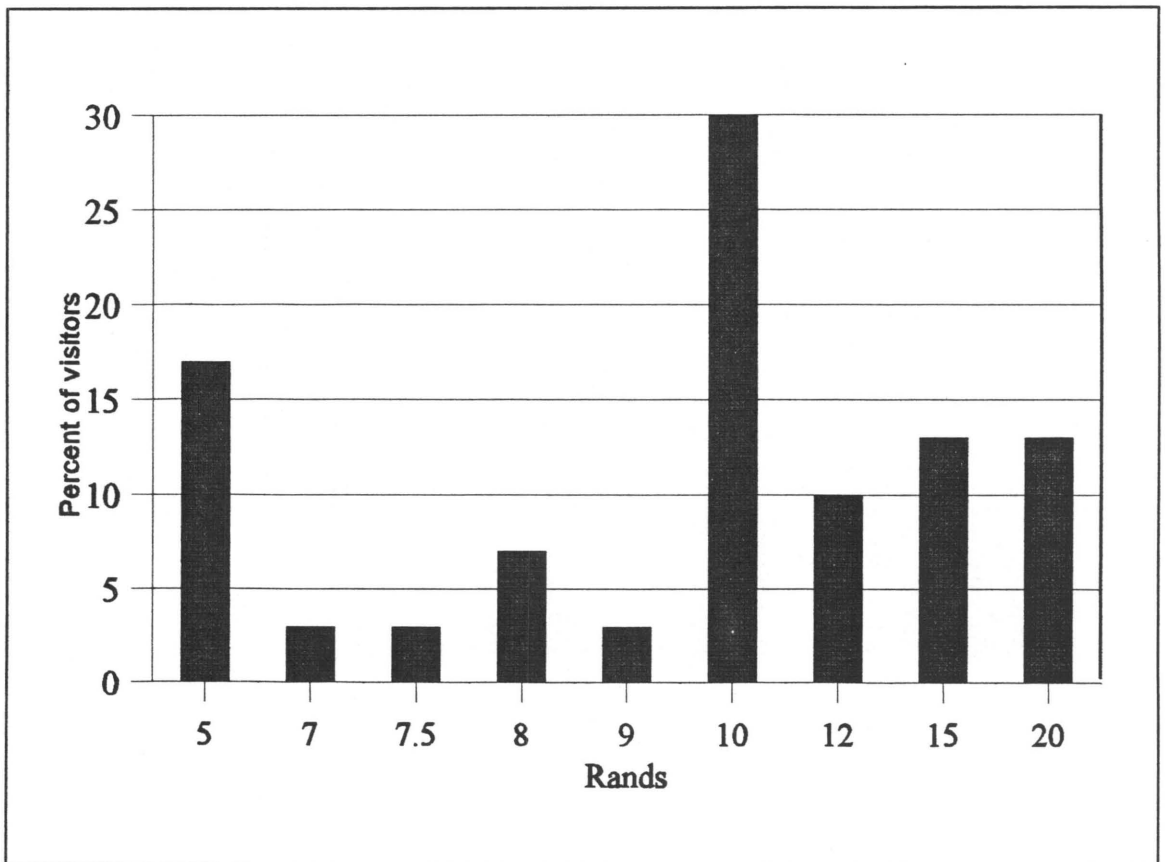
Figure 4.6.: Distribution of willingness-to-pay for entrance fee from visitors in the cottages

When asked to state the maximum charge on cottages they would pay, 63 % of respondents would accept a charge up to R75 per person per night. The percentage of overnight visitors opposed to the increase is 23 % (including those who refused any increase), but on the other hand, another 23% of the respondents are in favour of a raise to R75 (figure 4.7.). The WTP for cottage charge has a mean level of R77.67. The 95 % confidence limits for this WTP were estimated to be R71.37 and R83.96.
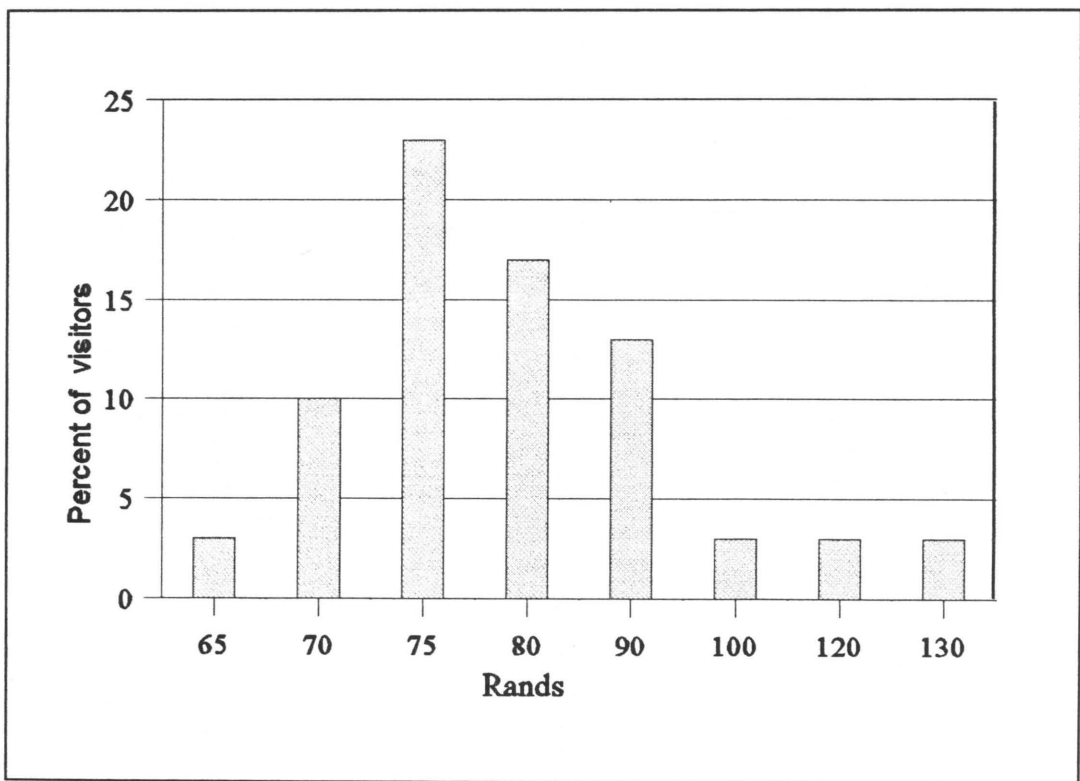
Figure 4.7.: Frequency of willingness-to-pay for accommodation charge

4.4.3. Pricing policy

Because changing the level of accommodation charge will have more important repercussions in the future than now, the purpose of increasing user charge should be carefully defined. The price setting appropriate to the maximisation of fee revenue is different from the fee level raised to meet annual management costs. From the above results, it appears that the management has large margins in which the new accommodation charge may be selected. It is evident that the quality of visitor's experience conditioned the acceptance of higher fees. Quality, as applied to wilderness recreation, is hard to define and measure, but the interviews of on-site users gave insight into the perceptions of quality by tourists.

A fairly common complaint is the general condition of the cottages: cleanliness of the rooms, operational condition of the equipments (e.g. fridge, stoves, batteries), availability of firewood, etc. Another frequent complaint is the lack of communication between the office and the cottages especially when the visitors have problems. Visitors expressed many different opinions and attitudes towards the improvements of the site quality but the main common complaints are related to:

- *the lack of basic amenities*: toilets, picnic and braai facilities;

- *the maintenance of the area*: littering around places usually frequented (picnic sites, trails, riverside), invasion of alien vegetation, and the bad condition of the roads;

- *the deficiency of information*: absence of marking along the nature trails (e.g. identification of trees, signs for the trail directions), difficulty for visitors to read the map of the area. The staff, particularly those on duty during week-ends, should be able to inform and serve tourists with a "professional caring approach to their work" (Clawson and Knetsch, 1966).

Although these complaints seem to be minor factors to influence seriously the demand for recreation in UVNR, they are part of the concept 'quality' which is synonym of meeting users' expectations. Better organisation, efficient information and communication systems, and staff awareness of visitor interaction could improve the service quality in the reserve. The objective is to insure that higher fees, justified by quality service, do not keep visitors from returning and buying repeatedly the good 'recreation'.

One of the key management approaches to win support for conservation and sustainable tourism is communication with visitors (Clawson and Knetsch, 1966). Experience suggests that visitors to protected areas are prepared to pay high fees if they believe that part of the revenue is to be invested into wildlife management or some other worthy cause. Different policy incentives in terms of information can be used to make tourists aware of environmental problems (e.g. advertisements, exhibitions, booklets, maps and education programmes). The Umgeni Valley project is well-placed to design and implement these communication instruments which will facilitate the introduction of new tariffs and thus, minimise the potential negative effects of higher fees on the demand. As Briguglio, et al., (1996) stated, management must certainly work with recreationists, not against them.

CHAPTER 5 : CONCLUSIONS

The question of economic sustainability and efficient resources allocation in UVNR raises the issue of how consumers value and price wildlife within a general framework of protected areas management. For UVNR, management issues within this framework include:

- the need to obtain reliable data to form the basis for a development plan
- ways of estimating the economic and social values of wildlife
- balancing the conservation objectives with recreational activities to act as foci for ecotourism development.

5.1. MANAGEMENT IMPLICATIONS OF THE RESULTS

The acquisition of reliable data is a fundamental necessity in any management planning for ecotourism. It can help managers to identify resource conflicts, determine their objectives, and calculate the costs and benefits of wilderness recreation. This research provided managers with better estimates of the economic value of recreational amenities in UVNR. This valuation was intended to:

1. Increase managers' understanding of the current net economic value of the resources.

2. Make more efficient allocation decisions during current and future wildlife resources management planning.

3. Predict recreationists' travel behaviour.

4.   Forecast economic consequences of physical changes in the quality of the amenity resources involved.

5.1.1. Understanding the current net economic value of the resources

One of the primary purposes of recreation resource development and management is to provide the opportunity for consumers to benefit from recreation activities. Household or individual consumers tend to participate in recreation activities that provide them with the most benefits relative to costs (entrance fee, lodging, transport...). These benefits which may include social, environmental, and educational benefits accruable to the visitor are measured by the net economic value of the reserve. A prudent manager of recreation resources would choose and develop those activities and programmes that yield the most use benefits relative to costs and would continue to do so until the net consumer surplus is exhausted (i.e. until benefits equal costs). If hiking, game viewing and birdwatching are the main kinds of activities undertaken in the area, one needs to ask what characteristics of the area are important to these activities. Many factors, economic, psychological, sociological, will probably interact in determining those characteristics. For simplicity, the TC and CV models transformed the different configurations of characteristics into variables determining the demand for recreation activities. The relationships drawn from the two models reflect the effects of those factors on the value of recreational services in UVNR and thus on the net benefits accrued to each individual from provision of these services. Therefore, the economic valuation of UVNR provides a conceptual framework for rigorous policy analysis of the potential benefits received from ecotourism.

Further, this research demonstrated what would be the net economic value of creating new amenity resources. To the extent that a new site provides comparable services and has similar characteristics to UVNR, the net benefits resulting from the introduction of the new site approximates the consumer surplus determined in the UVNR case. The substitute effects from

alternative sites should not be neglected in the benefit estimation for individuals consider the available substitute sites in their allocation decision.

The economic valuation of recreational use is particularly useful to managers and planners when they are faced with the problem of allocating scarce resources among competing projects (not necessarily environmental projects). The comparison of recreation benefits and costs gives an insight into what could be the wise judgement in selecting alternative projects. If the total cost for each alternative project is known, the appropriate decision rule is to choose the project with the greatest net benefit.

Beside the maximisation of users' benefits, the objective of ecotourism projects is also to preserve the quality of the environment from overutilization. Mc Neely and Thorsell (1987) defined an indicator of the economic capacity of a reserve as "the maximum level of visitor use an area can accommodate with high levels of satisfaction for visitors and few negative impacts on resources." The management needs to determine the maximum sustainable capacity of the reserve in terms of visitation rate. Exceeding this maximum limit can be avoided by the means of price control combined with the provision of wildlife experience of quality. The increase of entrance fee would result in the decrease the visitation rate which could be compensated with a low level of congestion and minor environmental impacts. If the entrance fee in UVNR was doubled, the WTP demand curve (figure 4.3.) estimated the loss in individual consumer surplus to be R5.38 per annum. The amount of R10 entrance fee would reduce the number of annual trips to 3.6 per visitor.

5.1.2. Making more efficient allocation decisions in management planning

Contemporary management of small reserves such as UVNR is largely directed toward having the optimal visitation level and thus reducing the impacts of overuse on the 'solitude' and 'pristine' aspects of the on-site experience (Briguglio, Archer, Jafari & Wall, 1996). The role of economic analysis for the management of UVNR will depend on the objective of managers who need to relate them to the use value perceived by recreationists. The management objective might be the realisation of a certain level of surplus intended to cover the costs of environmental education programmes and to insure the financial autonomy of the UVNR in the long-run. To develop a complete model capable of assisting managers for this objective, it is necessary to have information on the marginal cost of supplying recreation services. The marginal cost is the incremental cost resulting from one additional visit. It mainly includes variable costs related to operation and maintenance of facilities such as cleaning, personnel, patrol vehicles and so on. Assuming that the marginal cost is available to the manager, the optimal number of tourists which corresponds to the maximum net profits, is given by the intersection of the marginal cost curve with the demand curve from the economic valuation. The management will have to decide which entrance fee level would permit to reach the profit target that would be consistent with the managerial objective.

The results of this study are only intended to guide managers in their resource allocation decisions and their policy formulation to get at the maximum use value. The major challenge of these policies is the realisation of the existing great potential use value. For example, achieving the estimated level of benefits in the present study is contingent upon environmental quality actually being improved to the extent that alien vegetation, road conditions, and so on, do not have major negative effects to visitors' satisfaction any longer. The WTP results from the CV can be the starting-point of a new pricing strategy both for day visitors and overnight tourists in cottages. Some differential pricing is inevitable to stimulate and allow local people to visit the reserve. If any substantial rise in entrance fee is envisaged, differential charges on children would be appropriate for large groups or family. The system of season tickets should be promoted to develop off-season tourism and encourage regular visits.

5.1.3. Predicting recreationists' travel behaviour

Recreation is not a commodity in the usual economic sense. The household production function approach defines recreation as an activity that provides households with entertainment that is produced by using market, non-market and time inputs. The more developed is the knowledge of tourists' satisfaction derived from characteristics and other inputs composing the commodity 'recreation', the more precise the prediction of the demand for recreation. This research examined measurable characteristics which are relevant for determining the future demand, by relating the number of visits per annum and WTP to a set of significant characteristics. Reasonable forecasts of future demand for recreation can be obtained from the two multiple regressions in this study.

Equally important in predicting tourists' behaviour, the CV method is a powerful marketing research tool. In fact, the derivation of WTP means appraising and assessing the significance of the prices 'entrance fee' and 'accommodation charges' to visitors, taking into account the interrelationships of the price with other variables influencing demand. For example, the regression analysis equation has potential use in determining optimal fee levels for different income groups by revealing how WTP varies with income. Therefore, if the pricing policy of UVNR was under review, the CV model provides a more focussed market research based on background information regarding visitors' socioeconomic groupings, expenditures patterns, and so on. The flexibility of the WTP function constitutes a strength of the CV method by showing how changes in visitation rates and other covariates affect WTP values.

5.1.4. Forecasting economic consequences of environmental changes

Although limited to three factors (congestion, road conditions, trail experience), the variable site quality included in the CV model gives an indicator of the degree of visitors' reaction to quality variations within the reserve. On the basis of this analytical model, managers can deduce the

decrease or increase of WTP and visitation rates due to the changes in environmental quality. Various kinds of pollution (littering, air and water pollution, degradation of landscape), eradication of exotic species, wildlife disturbance by visitors, and so on, could impinge on ecotourism in UVNR. This forecast has a crucial importance in natural resource management because the current level of recreation consumption should not prejudice the right of future generations to obtain at least the same returns from their natural inheritance.

5.2. SUMMARY

This research started with the theoretical foundation of non-market valuation techniques, the TC and CV methods which attempted to measure the magnitude of use and non-use values for environmental goods and services such as protected areas. The TC method based on the household production function approach used actual market behaviour in estimating recreational use value. The cost of travel was taken as a proxy for price in the model. The CV method, a stated-preference approach, relies on constructed markets to measure the welfare change from improved environmental quality. Individuals are solicited to reveal their WTP for environmental change in the recreation site.

The implications and arguments are numerous regarding the relative worth of these two approaches to measure non-market values. The cost allocation of multipurpose trips, the inclusion of travel time cost and the selection of the functional form of the trip generating equation remain unsolved problems in the TC model. On the other hand, the CV method encounters a certain number of methodological issues peculiar to social science surveys: strategic bias, starting point bias, scenario misspecification and sampling errors. However, for the purpose of the present research and its focus on a familiar good 'recreation', it seems clear that the two methods overcame part of the methodological issues and did produce useful results.

The present research involved face-to-face interviews combined with telephone interviews of overnight visitors. The survey was received positively by the participants who were forthcoming in discussing their views and perceptions about recreational opportunities in UVNR. Unfortunately, it was not possible to run a multiple regression on stated WTP and travel costs for overnight visitors in the cottages due to the small sample size. Nevertheless, the analysis of the bid levels given by respondents revealed that 63 % of visitors accepted to pay up to R75 per person for a night in the cottages.

The regression analysis of trips and WTP from day visitors showed that travel costs, income of respondents, their age, and the site quality are an important determinant of visitation rate and WTP for recreation in UVNR. The study reports an annual consumer surplus of R95 800 and an estimated WTP of R66 336 of entrance fees per annum by day visitors. These figures could be biased either upwards or downwards since the two models do not contain possibly relevant information such as substitute sites.

From the perspective of management policy, the economic valuation of UVNR assists in conceiving an effective recreational strategy based on plausible information about the current demand for recreation. The consumer surplus results represent potential benefits from recreational use that the management of UVNR can explore in the formulation of an appropriate pricing policy.

5.3. CONCLUSION

The ability to put a value on environmental resources is a core problem in sustainable development. The vigorous and contentious debate about the relative merits of the household production function approach and the constructed market approach further complicates the application of non-market valuation techniques to wilderness recreation in South Africa where very few studies addressed the issue of economic valuation of environmental goods. Nevertheless, a general conclusion of this research is that the Travel Cost and Contingent Valuation approaches can produce meaningful and reasonable results. The two methods can be successfully combined to

estimate welfare measures and thus gains in reduced costs of data collection were possible. Despite some methodological issues encountered in this study, the TC and CV models have the potential to describe the demand patterns for recreation in a small reserve, under some conditions. Of particular importance is the fact that hypothetical, starting point and strategic biases are much more limited in the present valuation than for many of the environmental resources valuations.

The economic valuation of UVNR suggests that the value of recreational use extends beyond the present benefits as many visitors expressing their WTP appeared to be considerate of the conservation and recreation potentialities offered by the reserve. The results of the TC model are promising in terms of benefits derived by visitors from recreation, which means that protected areas can be socially and economically worthwhile. The economic use valuation offers a tool for managers to assess the financial and economic returns of wildlife tourism with comparison to other land-use options. In sum, the study gave insight into the contribution of economic models and techniques to clarify resource allocation decisions in policy recreation and natural resources management.

Nonetheless, it is important to recognise that the study also suffers some limitations. The absence of substitute effects in the two models might have overestimated the consumer surplus because many alternative sites are available to visitors along the Midlands Meander itinerary and in the immediate surroundings of Durban-Pietermaritzburg (e.g. Tala game ranch, Shongweni resources reserve...). Furthermore, the variable for individuals' preferences in recreation, an important component of TC models in explaining recreation behaviour, is found to be non significant because of the inadequate criteria in the survey for describing different tastes. Finally, the two models suffer from heteroskedastic disturbances requiring more advanced statistical models. With respect to these limitations, the UVNR case study provides evidence that well-conducted TC and CV studies can provide meaningful information on how people value a familiar good such as recreation.

The results of this research represent only a partial estimate of the total economic value of UVNR. As an environmental education centre, UVNR has potential educational value and facilitates research opportunities. The ecological functions of the natural resources in UVNR, as well as its role of preserving the genetic diversity should not be ignored. Moreover, an important appeal in the wilderness literature suggests that non-use values should be explicitly involved in future resources allocation decisions. Many people besides current users derive economic benefits from knowing UVNR exists (i.e. existence values) or knowing they exist for future generations (i.e. bequest values), yet very little is known about the wilderness preferences of off-site users. Neglecting these non-use values would result in an understatement of economic benefits. Therefore, research is required to determine the characteristics non-users enjoy and the extent to which these attributes are provided by UVNR. Further research directed toward the role of recreational resources in household production activities would be opportune in the present South African context where participation by non-whites in tourism is expected to increase. In any event, management policies that fail to recognize the wilderness-dependent values of non-users will place the future demand for recreation at risk.

As the need to better understand the values of natural resources is becoming more important in decision-making, so will the need to improve economic models adapted to the South African environment to estimate those values. Creative, innovative steps to meet this challenge remain to be explored. The outcome of the present study may help to meet that challenge.

APPENDIX : THE QUESTIONNAIRE

ECONOMIC VALUATION OF THE UMGENI VALLEY NATURE RESERVE

This survey is undertaken by a masters student from the School of Environment and Development at the University of Natal Pietermaritzburg, in order to determine the economic value of the Umgeni Valley Nature Reserve. The economic value includes financial, social, recreational and educational values. These intangible benefits can be measured correctly through visitors' perceptions about the reserve. Your participation in this interview is voluntary and you may refuse to answer any questions. There are no wrong answers. Any information will be kept anonymous. The results of this survey are for research purposes only and do not necessarily reflect the Umgeni Valley Nature Reserve management intentions.

Date:....../....../......

1. From where have you travelled to visit Umgeni Valley Nature Reserve today ?

Town/City...Area code.................(e.g. 3201)

2. How long will you spend driving to and from Umgeni Valley Nature Reserve today ?
.......................hours

3. How many times (approximately) do you visit Umgeni Valley Nature Reserve every year?
.......................times

4. Did your trip to Umgeni Valley Nature Reserve include any trips or visits to other sites?
(circle number)   1 Yes   2 No

5. What is the engine size of your car ?......................cc (e.g. 1300 cc)

6. How much is the fuel consumption ?...................km/litre (e.g. 11 km/l)

7. Cost of travelling to Umgeni Valley Nature Reserve:

Toll road: R...........................

Car hiring: R..........................

Other costs: R........................

8. How many people are with you for this trip ? ....persons

9. Please can you assess the quality and attractiveness of the Umgeni Valley Nature Reserve:

Road conditions all weather (circle number) 1 good   2 fair   3 bad

Nature trails (circle number) 1 fascinating   2 interesting   3 monotonous

Site Congestion (circle number)   1 high   2 medium   3 low

10. What do you prefer :   1 active recreation (hiking, walking, swimming, ...)

(circle one number)   2 passive recreation (picnicking, braaing, bird watching, ...)

11. If you had heard that Umgeni Valley Nature Reserve was closed or unavailable before leaving on the trip today, which comparable site would you go to ?

....

12. Are there any activities or improvements you suggest to make your visit to Umgeni Valley Nature Reserve more enjoyable ?

....

....

Please keep in mind that the next question is a hypothetical experiment intended to provide an economic measure of how strongly you value improvements within the Umgeni Valley Nature Reserve.

13. Assume that the roads inside the reserve are upgraded, the alien vegetation (bugweed, wattle) are chopped, more picnic sites, shade parking and new nature trails are created. Would you be prepared to pay a higher entrance fee to contribute to these ameliorations ?

If yes, what is the amount of entrance fee you would pay per person (please circle one amount)

| 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |

Other (please state) R.............

Please increment by R1 the amount you have circled or stated until you reach your maximum willingness-to-pay per person.

Your maximum amount is R..............

If No, why is this ? ....

14. Age: (circle the number next to answer)

under 18	1	45 - 54	5
18 - 24	2	55 - 64	6
25 - 34	3	over 65	7
35 - 44	4		

15. Please circle your household (husband and wife) net income per month (Rand):

0 - 1 000	1	11 001 - 13 000	7
1 001 - 3 000	2	13 001 - 15 000	8
3 001 - 5 000	3	15 001 - 17 000	9
5 001 - 7 000	4	17 001 - 19 000	10
7 001 - 9 000	5	19 001 - 21 000	11
9 001 - 11 000	6	21 001 and up	12

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