A DETERMINATION AND ANALYSIS OF PRESERVATION VALUES FOR PROTECTED AREAS

by

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ABSTRACT

The premise upon which this thesis rests is that recreationists in protected areas place a value on such areas which is higher than the price they are presently paying to use them.

The aim of the thesis is twofold, first to demonstrate how the value of natural resources can be quantified and the results made rigorous enough to be included in the arithmetic of decision making. The contingent valuation technique is applied in order to value protected area consumption at selected Natal Parks Board protected areas. The second aim is to derive a better understanding of environmental preferences by examining the nature of the relationship between protected area use, socio-economic variables and the utility derived by recreationists from various attributes of wilderness areas.

The economic good chosen for this study is four selected game and nature reserves in Natal. Visitors to these protected areas were interviewed and a broad selection of social and economic data collected from both individuals and households.

Stepwise multiple regression is then used to develop a model consisting of four equations, one for each of the dependent variables: total preservation, option, existence and bequest values. The regression equations developed were found to be

moderately reliable indicators of respondents' willingness to pay for the non-market values associated with wilderness areas.

Augmenting the results of the model is the application of conjoint analysis to identify demand factors associated with the consumption of protected areas. This is achieved by rank-ordering and measuring utility levels associated with recreationists' preferences for different attributes associated with a wilderness experience.

The results of the research are analysed in detail and conclusions are drawn, observations made and future research recommendations suggested.

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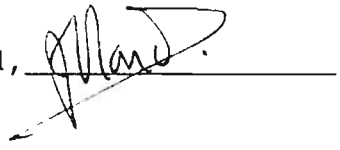
PREFACE

This thesis was done through the University of Natal, Pietermaritzburg under the supervision of George W. Oldham and Professor Charles M. Breen.

This study represents original work by the author and has not been submitted in any form to another University. Where appropriate the work of others has been acknowledged.

Signed, 

DEDICATION

To Mike Holland, my brother and closest friend, who died recently in Zululand.

"Despite the vigorous debate and the profusion of terminology that characterize the literature, we believe that the issues are now sufficiently well addressed to permit CV researchers to measure with confidence the total benefits respondents receive for goods which include non-use components" (Mitchell and Carson, 1989).

"The fastest growing literature in non-market valuation involves using contingent valuation surveys to elicit how people would respond to hypothetical changes in some environmental resources" (Kerry Smith, 1993).

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GLORIA IN EXCELSIS DEO

I am grateful for the guidance of my supervisors, George W. Oldham and Professor Charles M. Breen.

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Natal Parks Board

Thank goodness for the rivers and the bush, the Lunga, Lufinyama, Luswishi, Mindola, Kafue, Solwezi, Kitwe Nkana and the Zambezi - real schools with real playgrounds.

INTRODUCTION

Typically, conservation managers and their professional staff in South Africa are natural scientists and environmental economics has played no role in guiding policy. Only very recently have planners and managers of wilderness areas in South Africa begun to recognise the useful role that economics can play in conservation matters. Conversely, for at least the last quarter of a century, economics has played a pivotal role in wildlife management in the USA and other developed countries where efforts to quantify wildlife values have become common. The principal thrusts in the use of values information by managers and planners have been in impact analysis and budget justification (Decker and Goff, 1987). Increasingly, wildlife administrators are able to use economics analysis in order to compete for scarce resources more confidently.

South African protected area managers are now being forced to ask strategic questions regarding the economic sustainability of the reserves they administer. A long history of subsidy-dependant management strategies has led to a situation where these institutions are characterised by large scientific research departments which gives rise to

development strategies which may be ecologically balanced but are not necessarily economically sustainable. The mission statements of many conservation agencies juxtapose a "money-is-no-obstacle" mission with a declining revenue base.

Managers of natural resources need to move beyond an understanding of the resources themselves to include the many ways in which resource management interacts with attitudes and values of the public. Historically it appears as if management has felt its sole responsibility has been to protect natural resources by ensuring human action did not threaten to destroy them. This attitude is changing as the perspective of protected area managers in this country widens.

In order to examine the relationship between protected area consumption and the provision of such goods, this study investigates a valuation technique that has been developed and applied in other countries. In many ways this is an ambitious study in that it is attempting to apply in the real world a technique which is still undergoing development. Clearly there are perils in that theoretical developments may cast doubt on some of the empirical findings. However, in the absence of analysis such as the one presented here, there is currently no way in which natural resources can stand their ground against the forces of development in South Africa which threaten to overwhelm them. Therefore we face a stark decision; either to begin introducing economic

techniques which, in some respects, are still being developed or we continue to confine natural resource management to the application of preservation strategies based upon criteria established by natural scientists alone.

The choice here has been made quite bluntly: it is better to augment the existing decision-making efforts with economic techniques as they currently exist, however imperfect they may be, than to see South Africa's resources swamped as a result of the lack of ability to provide them with a better defence.

The analysis presented in this thesis needs to be seen in this light. Although it has been written in the context of an incomplete theoretical framework, it has been necessary to provide a pragmatic method of establishing values for elements of the natural environment which are robust and convincing enough to persuade decision-makers of their general acceptability. It is necessary to persuade the decision maker that the results obtained are 'accurate' enough to be taken seriously when weighed up against the counter claims of 'developers'. The purpose of experimenting with this technique is to understand its strengths and weaknesses in the South African situation in the belief that this type of analysis will play an important role in South African environmental management.

Apart from one study (Holland, 1988) this type of work has not been done in South Africa. A case study is undertaken so as to judge the applied usefulness of the results.

In addition to the benefit estimation study a conjoint analysis model is developed in order to analyse consumer utility for wilderness areas. This appears to be the first application of conjoint analysis to the assessment of preservation values for protected areas.

The fundamental problem of the homogeneity of consumers was incurred at the outset. Consumers of wilderness areas in South Africa, it will be shown, are typically high income families. Given this, it was assumed that the opportunity cost of a wilderness experience to most South Africans is very high. As a result the survey targeted present consumers and did not involve a random sample drawn from South African society. The study attempts to estimate whether visitors are willing to pay more for wilderness recreation than the current subsidised fees. Expressed differently, the study investigates whether visitors expect park maintenance and capital funding to remain the government's responsibility alone.

The usefulness of estimating the value of a protected area is that the opportunity costs of alternative uses of the resource can be compared. For example, the value of benefits from using the park in its current conservation state can be

compared with the value derived from using the resource for grazing, cropping or mining.

Wilderness administrators need to develop anticipatory policies for guidance in the event of sudden structural changes in their operating environment. A demonstration of the monetary values of protected areas in terms of willingness to pay would provide a useful contribution. Economic values are essential to the policy decisions regarding the trade-off between economic development and environmental protection. It is important, therefore, that money values be attached to preservation areas. These are the grounds upon which the battle for funding will be fought.

It is important to begin attaching money values to preservation areas in South Africa so that, as public sector funds become more scarce, rational economic decisions can be made about future utilization of land and other natural resources. Attempts have been made to do this internationally with reasonable success and with reasonable acceptance (Harrington, 1987, p.3). With respect to protected areas in this country, it appears that little effort has been devoted to quantitative economic analysis.

If public owned assets such as nature reserves are to be managed in the best interests of the public, managers should maximise the net benefits that society realises from the existence of the reserves. Economics attempts to clarify the

costs and benefits to society as a whole of alternative possible policies.

Cost-benefit analysis has been widely used in many countries for decades and the South African government is currently doing work to determine whether this form of analysis should be mandatory for public investment programmes and projects.

While cost-benefit analysis is conceptually simple, its application can be fraught with problems. For reserve managers the challenge of allowing individuals to maximise their welfare functions is extended to trying to maximise the net benefits that society as a whole derives from the existence and use of wilderness areas. Economists have agreed that, generally, the equilibrium or market value of an item is the price which equates what a buyer is willing to pay to what a seller is willing to accept for it. However when commodities, services or assets are not exchanged in the market place, as is the case with publicly owned wildlife-related goods and services, then special techniques are needed to measure value.

In this study it is not intended to produce streams of costs and benefits derived from alternative development strategies, but rather to focus on the determination and analysis of those wildlife benefits which are not exchanged in the market place. Against this background, the thesis sets out to examine these techniques and their transferability to the

South African situation. However, because of the very limited manpower available in South Africa, it would be extremely idealistic to believe that thousands of man-hours of effort could, or would, ever be devoted to this sort of valuation. Therefore, the study focuses on what seems from the literature to be the most promising variant of this theme of valuation with a view to, first, providing a benchmark by which other techniques may be judged and, second, establishing a basic understanding to guide future analysis.

It should be clear from the above discussion that valuation is only one of many issues associated with the sustainability of protected areas. Nevertheless valuation is an important and fundamental task for several reasons: the environment is not a 'free' good even though markets for its goods frequently do not exist; quantification of environmental goods can provide a more secure basis for policies associated with environmental use and; it helps redress the imbalance between quantifiable and non-quantifiable goods in cost-benefit analysis (ibid.).

CHAPTER 1

ECONOMICS AND WILDERNESS AREAS

In 1962 Milton Friedman suggested that national parks should be closed down if the commercial value of their natural resources, for example timber or minerals, exceeds the willingness of consumers to pay for recreation (Walsh, et al., 1984). He argued (from the standpoint of economic efficiency), that when benefits to recreationists are lower than the opportunity cost, the park should close down.

Weisbrod (1964, p.471), who developed the concept of option values, countered that the use value which recreationists attach to a recreation area like a national park, protected reserve, or public wilderness area "understates its value to society because many persons expect that they may possibly visit the park and would be willing to pay for an option that would guarantee their future access" (Walsh et al., 1984, p15). Existence values and bequest (intergenerational) values were also presented by Weisbrod to support a more accurate measure of the value recreationists attach to wilderness areas (these values are discussed in chapter 2). Walsh goes on to note that without preservation value data, insufficient public land may be protected in future. Authorities the world over

are presented with a similar problem of how much land should be set aside as protected reserves. Protected area managers are now accepting that a more integrated, multi-disciplinary approach to management is required and appreciate the contribution that economic analysis can make.

In many of the more developed countries cost-benefit analysis presented by economists has been at the core of decision-making regarding natural resources but only recently have ecologists turned their attention to the quantification of costs and benefits associated with recreation in protected areas (see for example Dixon and Sherman, 1990, p 99). As mentioned previously a major obstacle is that environmental goods are often not traded in the market place and it is therefore difficult to attribute monetary values to these goods.

In a situation of perfect competition, (certainty, no transaction costs, and perfect information) allocative and productive efficiency would be achieved. Equilibrium prices would reflect the value of each commodity which is traded in the market place, in the sense that the price of each factor of production would equal the opportunity cost of using that factor in an alternative way, whilst the price of each consumption good would be what consumers (recreationists in this case) would be prepared to pay for the last additional unit of that good. However, in a real world economic system

the value of non-market goods is not revealed in the market. Without an accurate assessment of the value of non-market goods, the efficiency aspects of decisions with respect to their allocation or provision are not known. There exists, therefore, a need for alternative approaches to calculating the value of non-market goods, and indeed, a need to create markets for such goods.

As a decision-oriented social-science, economics couples a concern for values with methods of identifying and analysing alternatives for the purpose of developing decision criteria. As such, economic methodology can act as one of the contributing disciplines to guide managers and planners of wilderness or protected areas.

Problems at the core of protected-area management and planning, include: common property resources, externalities, non-market goods, government versus private sector control and equity. The application of economic methodology to derive decision criteria for protected area management is an important aid to policy makers.

Typical questions which have daunted resource managers for years include how to calculate the value of a natural resource such as an indigenous forest or a rhino population, whether protected areas should remain intact in their present form or be used for alternative activities. The problem of assigning

monetary values to flora and fauna can be approached in a number of ways, but has historically been tackled by attaching a monetary value to a day of recreation consumed by the user, for example a hiker, fisherman or caravanner.

Greenwalt (in Churchman et al., 1984, p51) attested to the fact that, armed with somewhat arbitrary values, the resource manager has "climbed into the arena of cost-benefit analysis and done battle on behalf of the country's living resources, including habitat, and too often has emerged feeling less than victorious". Observing that these forays have not always been in vain, Greenwalt notes that the conviction remains that "the full story has not been told". Neither the decision makers nor the public is fully aware of the values attached to the issues they are debating.

Alternative uses of protected areas may often appear to be attractive. Frequently, however, the financial analysis used to support alternative uses of protected areas is misleading. A financial analysis is concerned with determining cost and benefits as measured by market prices and may altogether ignore key components which are not traded in the market place. This leads to a situation where the value of maintaining a protected area as opposed to some alternative development is often underestimated.

This bias which favours the development of protected areas as

opposed to maintaining them as natural areas contributes to market failure. Market failure refers to the inability of the market to provide a price. Because of this financial analysis tends to favour development projects where prices are available. The benefits associated with protecting an area may be seen by the authorities to be much smaller than the benefits associated with development.

The managers of natural systems face mounting problems. Even if land is made available for conservation and protection, there may be inadequate funds to maintain and manage these systems. One of the reasons is that many of the benefits are not quantified and taken into account when allocations are made.

This thesis will show how certain economic techniques such as benefit estimation analysis can contribute towards the quantification and valuation of natural areas and by so doing provide more information to managers to improve their decision-making ability.

Despite the masses of data available on recreationists and the supply of resources, it is often scattered and incommensurate. Many of the problems facing managers of natural resources are conceptual, from both the demand and supply side. There is disagreement on what issues recreation policy should address, the allocation of supply, the

understanding of demand and how these issues should be quantified.

This thesis attempts to formulate a more precise concept of the demand for protected areas and to evaluate its usefulness in formulating policy or guidelines for recreation and the management of conservation areas. Attention is given to the type of data and empirical analysis required to measure the demand for protected areas. The objective is to develop a concept of natural resource scarcity which can be equated to that used to analyse marketable natural resources, like timber. Harrington (1987, p3) notes that "a measure of resource scarcity has but one essential property, it should summarise the sacrifices, direct and indirect, made to obtain a unit of the resource". For conventionally marketed commodities this property is conveyed by the price of the good. The price of the good - and consequently its relative scarcity - is determined by the forces of supply and demand.

In reality, however, prices are often not a clear indication of scarcity. Several relevant, but different, prices may send apparently conflicting signals about the scarcity of a good (for example, production prices, raw material prices, retail prices). Further, prices are prone to distortion as a consequence of market intervention by the authorities. A distinction must also be made regarding the difference between short-term and long-run prices. Finally, the "price" of a

good may differ from the value of the good when the opportunity cost of time, risk and uncertainty are considered by the consumer.

The measurement of protected area supply and demand, and hence relative scarcity, are particularly difficult to quantify because of the incompatible nature of the units of measurement. Generally the supply of recreational resources is measured in terms of physical units like hectares, kilometres of trails, number of campsites, hectares of dams, and so forth (see Natal Parks Board, 1990[a]). These units can be misleading because they fail to account for how people use the facilities. Consumers of recreational areas attach utility to the activities they pursue (for example, bird watching, game viewing, fishing) and not, usually, to the physical measures of supply. While similar measurements of consumption may be used at different sites, the results may be incompatible or inconsistent. For example, five fishing days in a mountain area may have a higher utility value than the same number of fishing days spent at a municipal dam in an urban area.

The quantification of recreational experiences leads to another problem. Inputs for recreation are not only provided by the supplier of a protected area, but also by the recreationist. This means that the sacrifices that are made so as to participate in a recreational experience are not

confined to pecuniary ones. While non-pecuniary costs can arise in the consumption of market goods, they can be even more significant for non-market goods. Since many of these values are not attached to market transactions, they must be derived by other methods.

Scarcity of protected areas can be approached in a way which is consistent with concepts used to analyse the demand for market commodities, by converting recreationists' utility for protected areas to a common metric that will serve as a measure for demand.

1.1 Problem Statement, Hypothesis, and Objectives

In this section both the problem being addressed and the reasons for selecting this problem will be presented. The hypothesis to be tested will be introduced and various objectives of the study clarified.

The "good" which has been chosen for this study is selected Natal Parks Board reserves. In South Africa there is mounting pressure on protected area managers and decision-makers to make their reserves more self-sustainable (Natal Parks Board, 1991[b]). In the past the government heavily subsidised Provincial conservation bodies. This funding source is becoming threatened and alternative revenue sources are required, according to the Natal Parks Board (Financial Mail Survey, 1991).

In the light of declining budgetary allocations, one of the problems facing protected area managers is that of valuing their resources. Determining a value of a protected area is becoming more and more important to support motivations for government budget allocations and for determining what willingness to pay for recreation in protected areas.

The problem is how to determine the total economic value of selected areas in order to calculate the "consumers' surplus" derived from the good. Consumer surplus is measured by the willingness-to-pay over and above what is actually paid. For goods with a very low (or free) market price such as admission to a protected area or free air, the consumer's surplus may be very large.

The reasons for addressing the problems outlined above are principally threefold. First, a clearer idea of the true economic value of a protected area would form a stronger motivation for government subsidies (or higher user charges) than would otherwise be the case. Second, an understanding of the economic value of specific protected areas would enable managers to make better decisions, for example with respect to development and commercialisation strategies. Third, estimating the economic value of protected areas would assist public authorities in policy formulation as they would have a better idea of the demand for such areas as well as the

variables which influence demand.

The hypothesis or premise upon which the study rests is that recreationists in protected areas place a higher value on the satisfaction they are deriving from visiting such areas than the price they are paying for its use.

The primary objective of this thesis is to evaluate the usefulness of various valuation techniques applied to protected areas. These techniques are designed to place a monetary value on non-market goods or services (Dixon and Sherman, 1990). The areas chosen for the case study are selected Natal Parks Board sites. There are two secondary objectives. First, an attempt is made to improve understanding of the determinants of an outdoor or wilderness experience through the use of multiple regression analysis and conjoint analysis techniques. Second, total economic value of the protected areas, namely user value, bequest value, existence value, and option value will be derived.

1.2 Study Area Under Review

Selected game and nature reserves in Natal were chosen for this study. Four separate sites were chosen to represent a cross section of the reserves available. These were the Royal Natal National Park (mountain area), Midmar Public Resort

Nature Reserve (resort area), Hluhluwe Game Reserve (bushveld area) and Sodwana Bay National Park (coastal area). The map shown further on in this section gives the location of each site.

Although analytical research has been carried out on Natal's protected areas and their contribution to economic growth, the existing studies are generally broad in scope and fragmentary in their findings (personal interview, Alletson, 1991). Moreover, little is known about the users of Natal's wilderness areas, although tourist fishermen and their fishery resources have been researched (personal interview, Van der Elst, 1990).

The control and management of many parks, game and nature reserves, as well as public resort nature reserves in the province of Natal, is entrusted to the Natal Parks Game and Fish Preservation Board (Natal Parks Board Conservation Areas, 1990[b]). The Board was established as a statutory body in 1947, prior to which the reserves in Natal were the direct responsibility of the Provincial Administration. The Board maintains 74 areas totalling 627 240 hectares or about 11,4 per cent of the surface area of Natal (ibid.).

The Royal Natal National Park is 8 094 hectares in size, has 130 kilometres of paths and is situated in the northern Drakensberg Range- one of Southern Africa's natural wonders.

The main attractions in this mountain area park include spectacular scenery, the Amphitheatre (an eight kilometre escarpment wall), Mont-aux-Sources (forming the continental divide), the Tugela Falls (850 metres), yellowwood forests, Bushman paintings, bird watching, game viewing and trout fishing. The facilities and amenities within the park include guided walks, a visitors' centre, camping and caravan sites, Tendele camp with huts provided, a privately run hotel, horse riding and picnic sites (Levy, 1982, p239). During the 1989/90 year there were 92 668 visitors to the park, of which 70 per cent were day visitors (Natal Parks Board, 1990[a],p.171).

The Midmar Public Resort Nature Reserve is 2 831 hectares in size and is situated on the Midmar reservoir, Howick. The main attractions include game viewing, water birds, water sports (sailing, wind-surfing, water-skiing, canoeing, power boating) and angling. The facilities and amenities include chalets, cabins, tent and caravan sites, cafe, restaurant, playground, tennis, squash, bowls, horse riding and launch tours (Levy, 1982, p219). During the 1989/90 year there were 278 818 visitors, of which 88 per cent were day visitors (Natal Parks Board, 1990[a],p.171).

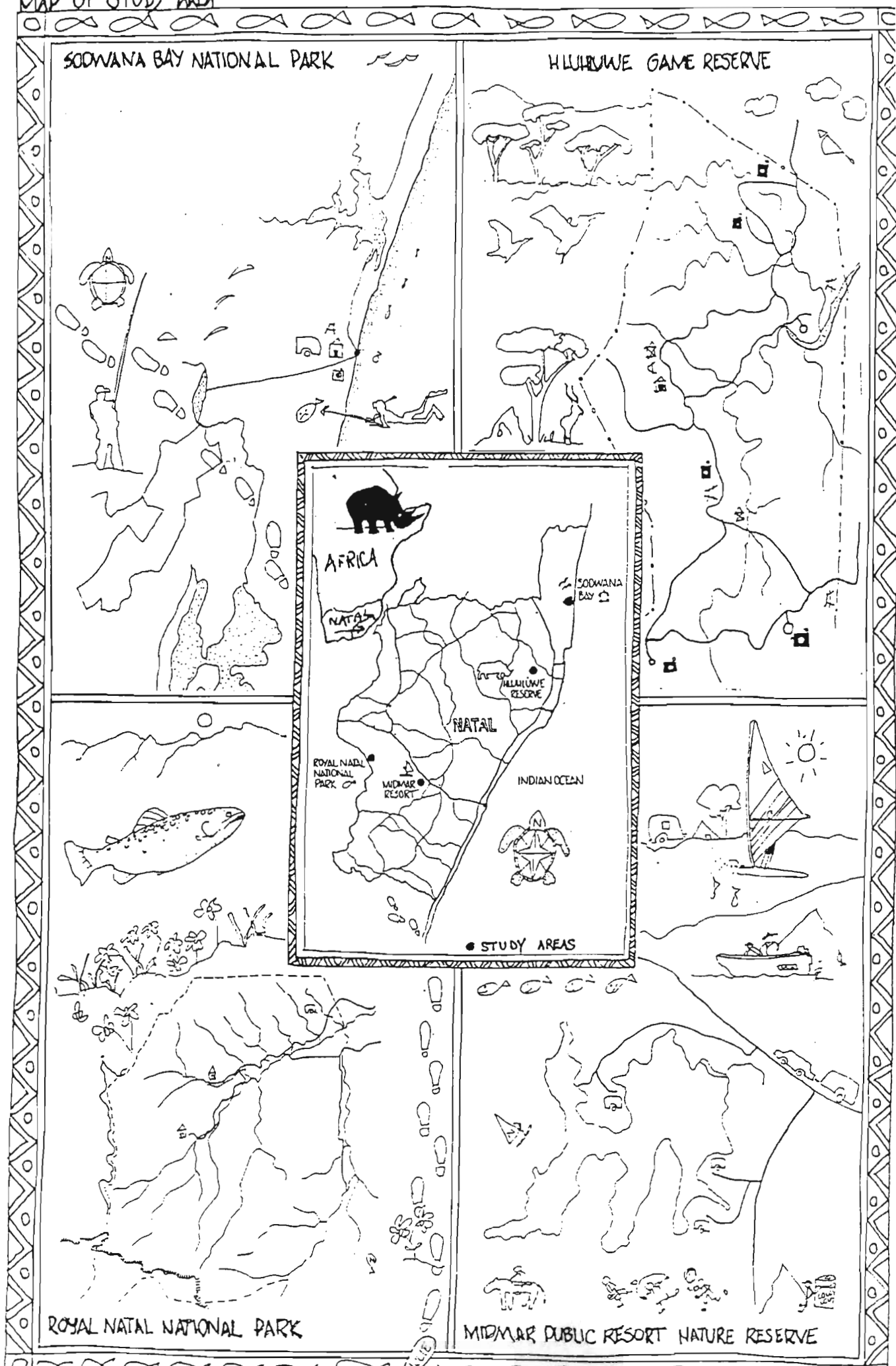
The Hluhluwe Game Reserve in Zululand is some 23 000 hectares in size and along with Umfolozi and St Lucia game reserves, is one of the oldest existing wildlife sanctuaries in South Africa, having been established in 1897. Wildlife is varied,

including rhinoceros and other representatives of the "big five". There are also over 200 species of birds in the park. The facilities and amenities include a single camp with four self-contained cottages and 20 two-bedded rest huts. Talks, film and slide shows are presented in the interpretive centre. There is a game viewing hide and picnic sites where visitors may leave their cars (Levy, 1982, p211). During the 1989/90 year there were 52 741 visitors to the park, of which 66 per cent were day visitors (Natal Parks Board, 1990[a],p.171).

Sodwana Bay National Park is 413 hectares in size and is situated on the Indian Ocean coast in northern Zululand. The main attractions include beach and tidal pools, coastal game fishing, self-contained underwater breathing apparatus (SCUBA) diving and bird watching. The facilities and amenities include paths, a store, garage, 20 fully self-contained log cabins, as well as open camp sites (Levy,1982, p188). Visitors during the 1989/90 year totalled 41 997, very few of whom were day visitors (Natal Parks Board, 1990[a],p.171).

Given the changing political realities and tightening state budgets, the Natal Parks Board is facing new challenges. In a special survey supplement to the Financial Mail Survey (22 March 1991) the directors of NPB outlined the challenges and how they aim to keep pace with a changing South Africa. Dr. George Hughes, the chief director, stated that a new model was required to meet the challenges of the future. The model, he

MAP OF STUDY AREA



stated, required two legs. First, there should be as much biodiversity as possible, and second, conservation has to be an economic force. The view of the NPB is that wildlife and the associated wilderness areas are the backbone or foundation of the tourist industry in this country and is a renewable, sustainable resource of relatively high monetary value. Hughes stressed that conservation authorities would increasingly move away from traditional public sector approaches to management and model themselves on private-sector business principles as well as including the private sector in the management of protected areas.

The NPB was aware that the days of large subsidies were over and stressed that user-pay principles should form an element of a new conservation strategy (Financial Mail Survey, 1991). Day visitor facilities such as picnic sites will not attract user fees, but overnight guests will be charged "self funding rates". The Board further adds, "these things should not be self-funding, otherwise we could price the public out of areas which they, the taxpayers, have paid for". While one understands this sentiment it will not contribute towards ensuring the economic sustainability of the natural systems. The Board is facing the fact that future government funding is, at best, tenuous. Recreation is an economic good the value of which should be reflected in market prices. The NPB faces a problem similar to that faced by the Deparatment of Transport where they permit existing roads to be tolled. NPB

are endeavouring to ultimately cover recurrent expenditure on their operational initiatives from their own account and fund the capital elements, for example infrastructure development, from public funds.

The user pays principle can be expressed more fully as "the user pays for what he gets and gets what he pays for". The user pays condition is efficient because it rations the supply of resources, for example roads, to sources of demand. Such rationing is absolutely essential to the achievement of efficient economic outcomes, and is the fundamental factor that causes free market mechanisms to be efficient in their resource allocation. A corollary of this is that privatisation as such is not necessary for the efficient provision of roads (recreation facilities) but a rationing system is.

The NPB believes the correct route is to use the state subsidy to pay for statutory functions like roads, fencing and game guards and user-pay principles for the rest.

1.3 Organization of the Study

This study is divided into six chapters. In Chapter 1, general problems associated with protected area resources are discussed. There is also a discussion regarding the need to

incorporate economic principles into the inter-disciplinary approach which wilderness managers employ to manage resources effectively and efficiently. This approach is particularly relevant given the changing political process in Southern Africa and declining real budgetary allocations to environmental affairs, as well as the unique problems facing Natal Parks Board and the plans they are making to face the future. This chapter also outlines the purpose and objectives of the study undertaken.

In Chapter 2 there is a discussion regarding which type of benefit estimation technique is most appropriate to the problems being analysed. The theoretical framework of the contingent valuation method is discussed in some detail, including the theoretical difference in the three welfare measures: the Marshallian consumer surplus and the Hicksian compensating and equivalent variations. In a subsequent chapter of the thesis the theory is applied to a case study and an economic value for a protected area is derived.

Chapter 3 is devoted to the methodological issues associated with using the contingent valuation method of research. The chief criticism of this technique lies in the bias which affects consumer valuation of a good. This issue is dealt with in considerable detail and the lessons learned from the experiences of others are incorporated into the criticism.

Chapter 4 is divided into a number of sections. The first section addresses the design of the survey instrument and its implementation. The second section examines the validity of the data collected as well as a report on the socio-economic and demographic results. The third section addresses the determination of the total economic value of protected areas. The final section of this chapter is a statistical analysis of the relationship between recreationist willingness-to-pay bids and their independent variables, which determine an individual's consumption or enjoyment of a wilderness area.

Chapter 5 presents an extension to the traditional approach of placing pecuniary values on a non-market good. This is done by means of a conjoint analysis technique which is designed to value individual utility or part-worth levels for various attributes of protected area consumption. The theory and methodology of conjoint analysis are presented and the results of this exercise are used, where appropriate, to verify the results obtained from the analysis in Chapter 4. Chapter 5 concludes with a number of observations derived from the conjoint analysis model which have a bearing on the management and planning of protected areas under the control of Natal Parks Board.

Chapter 6 summarizes and draws conclusions from the analysis, together with recommendations from it.

CHAPTER 2

ESTIMATION TECHNIQUES

Introduction

Although many of the finer points surrounding the application of benefit estimation techniques are still the subject of debate in the professional journals, the core of the theory which supports the analysis in this thesis is no longer, after more than fifteen years, a matter of argument. Mitchell and Carson, (1989, p.64) declare that, "Despite the vigorous debate and the profusion of terminology that characterize the literature, we believe that the issues are now sufficiently well addressed to permit CV researchers to measure with confidence the total benefits respondents receive for goods which include non-use components". It is presented fully in Mitchell and Carson (1989) and Braden and Kolstad (1991) who assert that, "The art of economics is in full bloom in the application of contingent valuation methods" (p.13). V. Kerry Smith (1993, p.8) further contends that "...The fastest growing literature in non-market valuation involves using contingent valuation surveys to elicit how people would

respond to hypothetical changes in some environmental resources".

This chapter sets out to identify the valuation technique best suited, in terms of theory and application, to estimate consumers' value of the wilderness areas chosen for this study. To assist the researcher to choose the most appropriate valuation method the various classes and classifications of goods are considered in this chapter.

The rationale for the approach adopted in the empirical chapters of the thesis stems from a study of the options available to the researcher in terms of the nature of goods, valuation frameworks and estimation techniques. More specifically, subsequent sections address: the concept of total economic value; measurement strategies; an extension of the traditional market-related concept of value to incorporate non-market values; general approaches to measure environmental demand; a behavioural framework to assist the researcher to choose the appropriate estimation technique for a specific task and finally; consumer surplus measures.

2.1 Classes and Classification of Goods

Kopp and Portney (1985) identify three categories of goods which enter an individual's utility function: pure private

goods, quasi-public goods and pure public goods.

Pure private goods are those traded in a formal marketplace, with full property rights. A property right needs to have three characteristics: it needs to be specific, it needs to be enforceable, and it needs to be transferable.

Quasi-public goods are, according to Kopp and Portney (ibid.), similar to private goods except that they are not freely traded in the formal marketplace. An example would be a trout fishing permit in Natal. The price is not determined by demand and supply but by the provincial authority (often below the market price). While the market does not determine the price at which these goods are bought, it is nevertheless still possible to quantify the units consumed by individuals.

Pure public goods, such as national defence, have no specific, enforceable, tradeable property rights attached to them - the principles of exclusion and rivalry do not apply. Table 2.1 summarises the abovementioned categories and illustrates how these classifications relate to recreation.

Increasingly economists are giving preference to the term "non-rival" instead of public goods (Randall, 1987, p.176). Non-rivalness applies to many goods up to a certain point, beyond which rivalry does occur. Recreation is an example of such a good - one may enjoy a mountain trail with the presence

of others not diminishing one's own enjoyment of it. However, beyond a certain point congestion means that individual utility begins to decline.

It is difficult to estimate a true demand curve in cases where

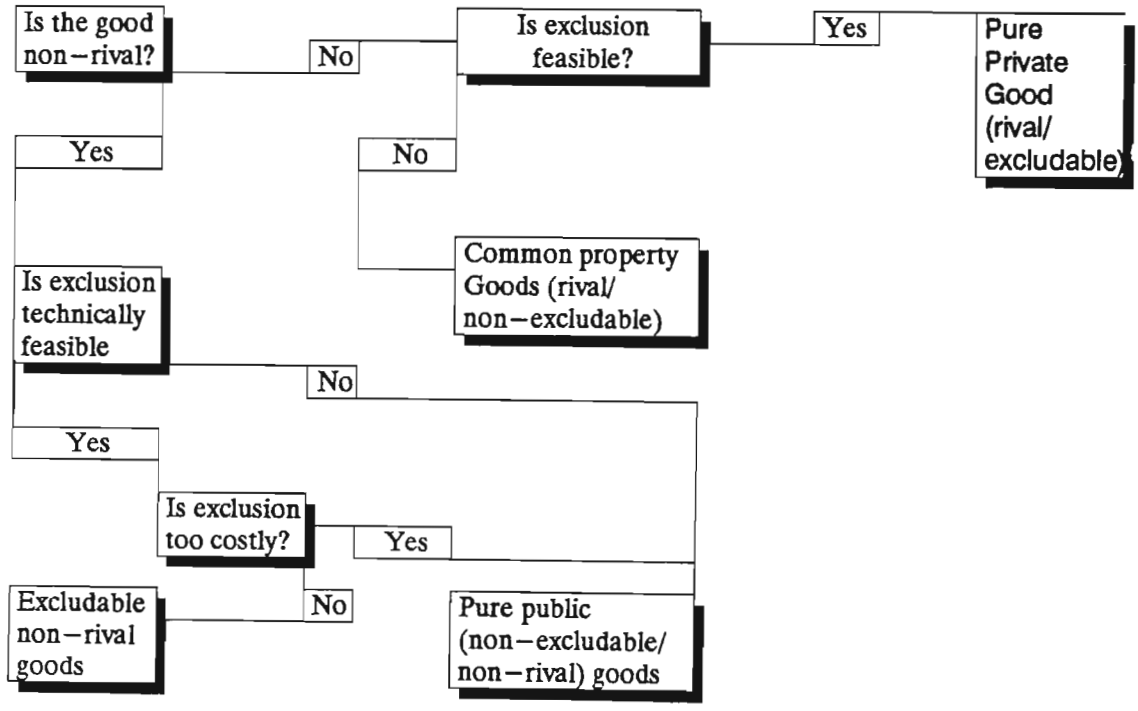
Table 2.1 Characteristics of Goods

Class of Goods	Characteristics	Examples
Pure private	Personal property rights Ability to exclude recreationists Traded freely in competitive markets	Agricultural product Private game reserve Financial services
Quasi–public	Personal property rights Ability to exclude potential recreat–ionists Not freely traded in competitive markets	Public libr–raries Recreation in parks TV frequencies
Pure public	Collective property rights Cannot exclude potential recrea–tionists Not traded in any organized market	Environmental risks National defence

Source: Adapted from Mitchell and Carson, 1989, p57

goods are non-excludable because there is no requirement for consumers to reveal their preferences. Non-excludable goods often lead to externalities - that is the unintended effect of the actions of one party upon another. If property rights or regulations are not present, the producer of the externality will maximise his own utility irrespective of the effects of his actions upon others. This leads to either positive (acceptable) or negative externalities. In the case of the latter the producer of a negative externality is not paying the full

Figure 2.1 Classes and Characteristics of Goods



Source: Adapted from Randal, A., 1987

economic cost of his actions. On the other hand there is the phenomenon of "free riders" where users who benefit from the existence of a good, such as a protected area, do not pay for it.

The alternative method of illustrating the characteristics of goods is presented in Figure 2.1. As far as this study is concerned protected wilderness areas like Hluhluwe and Royal Natal are regarded as excludible, non-rival quasi-public goods (because of temporary individual property rights, excludability and non-congestability which makes them non-rival), but with public good attributes like scenic beauty. The public good attributes or characteristics lead to market failure - it may be impossible to completely exclude free-riders as off-site benefits may accrue to indirect consumers by way of, for example, books, photographs or films of a protected area. As a result of this, there is a need to develop techniques to estimate demand for environmental attributes to help frame public policy decisions.

So long as there is a negative relationship between price and quantity, the demand for a private good which depends on individual utility maximising behaviour, yields a consumer surplus as a welfare proxy. However, in the case of a public good the derivation of a demand curve and its associated consumer surplus is more difficult because of the non-market values associated with (quasi-) public goods like the Hluhluwe

game reserve. Even though NPB is able to regulate consumption of its parks through an entrance fee mechanism and limited accomodation, this only accounts for one element of the resource value - it will be shown that, because of market failure, there are also significant non-market values associated with the resource which are not revealed by the market (user) price of the good. This is where the strengths of the contingent valuation method become clear.

One of the objectives of this study is the estimation of consumer WTP for protected area preservation. As stated previously, market prices do not necessarily adequately reflect the benefits an individual or society derives from a good or service. This is because there are many individuals prepared to pay more than the market price for the good and as a result the benefits received exceed market prices. In the next section the general approaches used to measure economic values will be discussed.

2.2 Total and non-use values

A number of use and existence classes of benefits measuring the demand for environmental quality have been recommended to researchers. One framework presented by Randall (Braden and Kolstad, 1991 eds., p.304) includes existence values (Krutilla, 1967), vicarious use value (ibid.), option value (Weisbrod, 1964) and, quasi-option value (Arrow and Fisher, 1974, p.313).

Existence value refers to the notion that people value a good despite the fact that they may never have access to it. Vicarious use value is based on deriving satisfaction from a good without direct consumption of it. Instead people would see a film, read a book or enjoy seeing photographs of the good. Option value refers to a person's willingness to pay now to ensure future accessibility to a good. Finally, quasi-option values are similar to option values except the value of the good to a person is associated with future discoveries which would make the good more or less valuable in a future time period.

There is an ongoing debate amongst economists regarding the various categories of non-use and use value and how these add up to the total value of a good (Randall, in Braden and Kolstad, 1991 eds., p.308). This is demonstrated in other benefit typologies (Mitchell and Carson, 1989) which include the existence (non-use) class and stewardship (inherent and bequest values). Stewardship is very similar to the concept of a bequest value which will be discussed in a subsequent section. From a theoretical perspective Randall's (op. cit.) total value framework is comprised of a number of use values and existence value. He adds the caveat, however, that total value may be incorrect if independent or component values are simply aggregated.

Randall presents total value in a deterministic framework which entails adding existence values and use values that have been

independently constructed. He demonstrated that non-use value is the difference between total value and use value only if all components are valued in a given sequence. A common procedure is to calculate total value by adding together all the independently determined use and non-use components. This method is referred to as independent valuation and summation (IVS). Summation and sequence biases can influence the results of a study and are discussed in the chapter covering the research methodology. Hoehn and Randall (1989, in Braden and Kolstad eds. 1991, ch.10) showed that, in general, IVS does not equal total value - they demonstrated that the consumer surplus of a group of goods is not the same as the sum of the consumer surpluses for each good. The sum of the parts does not necessarily equal the whole.

Randall maintains that when uncertainty is introduced no new categories of value emerge, rather, it permeates all the value categories that existed in the deterministic framework.

The traditional approach to demand uncertainty implies that if a potential consumer is required to have a future use contract or if they have the choice to take out this contract in the future, then uncertainty about what their demand will be when it comes to consuming the good in question, may reduce the maximum willingness to pay for the option contract. The total value framework presented by Randall allows for this traditional approach or concept to be included in it.

The essence of quasi-option value lies in the possibility that information can be acquired at a future time which would allow the person valuing the amenity to make a better decision. Quasi-option is always positive because it is the value of information conditional on undertaking a particular current action. Mitchell and Carson (1989, p.73) highlight that, "knowledge can be sought or it can be acquired in a passive manner. Particular bodies will have quasi-option value to the extent that they promise to create knowledge or make passive learning possible, or both. Where this is the case, CV surveys of such policies should inform respondents of these possibilities so that respondents will take them into consideration in determining a WTP for the amenity. The value of additional information is likely to be of greatest importance when valuing goods subject to possibly irreversible changes, such as endangered species, and the damming of wild rivers".

The quasi-option or 'time sequence' value can easily be incorporated into the total value framework by extending the time frame in order to include a series of decision points as well as decisions made some time previously which could influence the costs associated with unperceived or unexpected alternatives presented in a 'future' period.

A number of studies were published during the 1980's which focused on the determination of use and non-use values (see Appendix III). However, the conceptual understanding of non-use values has been the subject of continued debate. Randall

(ibid.) notes that many of the earliest empirical applications preceded the systematic development of the relevant theory and several issues are still not resolved. Notwithstanding this, the work that has been done clearly demonstrates that the collection of non-use values is feasible and that these values can be fairly large.

"Despite several key developments in the 1980's...the researcher is still faced with ambiguity about correct methods of evaluating non-use benefits" (Braden and Kolstad, 1991, p.320). In either a deterministic framework or under uncertainty, total value is defined and can be decomposed into existence values and various kinds of use values (ibid.). Randall further concludes that either holistically or in a piecewise sequential framework, total value may be derived and that a concern with total value, existence value and uncertainty tends to swing the balance, with respect to valuation techniques, toward contingent valuation methods.

In view of the difficulty of separately valuing benefit components, how can these be meaningfully measured? The following section outlines the strategies adopted by researchers to date.

2.3 Measurement strategies

Given that there is a problem with respect to the separate

valuation of total use components the researcher incurs the problem of how to collect the value components. Four measurement strategies have emerged from the literature (Mitchell and Carson, 1989, p.74). These strategies have either been used by researchers or are presented as possible methods to collect meaningful benefit estimates. The first three are a function of somewhat subjective information given by the respondent. The fourth method uses information supplied by the respondent to infer lower bound existence values.

Strategy I. In this method the benefit categories are described to the interviewees who then value each benefit category separately. If use values are collected then they may be added to existence value to obtain total willingness to pay for the good. This technique is susceptible to a phenomenon known as the 'fallacy of motivational precision'- this refers to the error of believing that respondents are fully aware of what motivates their value judgements and how precisely it does so.

Strategy II is a decompositional approach which elicits a lump sum willingness to pay from the respondent who is then asked to divide this sum into the various benefit categories. This is better than the first strategy because of a more valid willingness to pay amount before the breakdown. It also helps the respondent to understand the concept of aggregation more clearly. Total willingness to pay includes use and existence values. Existence value, theoretically, is the amount the respondent would be willing to pay for the good if he was

previously unable to use or have access to it. The method could avoid the fallacy of motivational precision provided that the contingency was plausible to the respondent.

Strategy III uses two (or more) scenarios in separate subsamples. This method uses different scenarios for each component of existence value. The difference between total willingness to pay for the two scenarios gives a more accurate estimate. The fallacy may be avoided because a value estimate is only given for a single scenario. This approach, however, is expensive to undertake.

Strategy IV is an objective assessment which avoids the fallacy of motivational precision. This method employs data collected from the respondent on past and expected use of the good to indirectly measure the existence value. Two groups are formed - those who use the good and those who do not. The willingness to pay amounts are collected and the existence value expressed by non-users is interpreted as a relatively accurate expression compared with the users willingness to pay bids. This will lead to lower bound existence values.

A variation of Strategy I was employed in this study. The strategy was improved by having the respondent examine his budget in the event of him placing a value on two or more components. The survey instrument was designed and tested more than three years prior to writing this section and in the

interim events have overtaken the approach employed and this is recognized in the text. At the time, however, the researcher proceeded with the best method available. Other more practical constraints also influenced the researcher's options, these included limited funds and time.

The next section outlines the concept of value employed in this study.

2.4 Preservation Value

In this study there are two classes of values; use and non-use (Walsh et al., 1984; Krutilla and Fisher, 1975; Mitchell and Carson, 1989, p.62; Brookshire et al., 1983; Rahmatian, 1982, p.6; and Brown, 1984). This concept is presented in figure 2.2 which shows use value further divided according to the applications of the resource. On-site use, for example, includes a scenic drive through a park and an off-site use example would be to read or watch a film about that park.

Certain recreationist non-use values constitute a bundle of preservation benefits which Krutilla (1967), Weisbrod (1964), Rahmatian, (1982, p.7) and Walsh et al.,(1983, pp.1-15), termed option, existence and bequest values. The preservation value is measured by the summation of the three different bids, option value, existence value and bequest value. Total economic value for the wilderness areas under discussion comprises the combination of use value and preservation value.

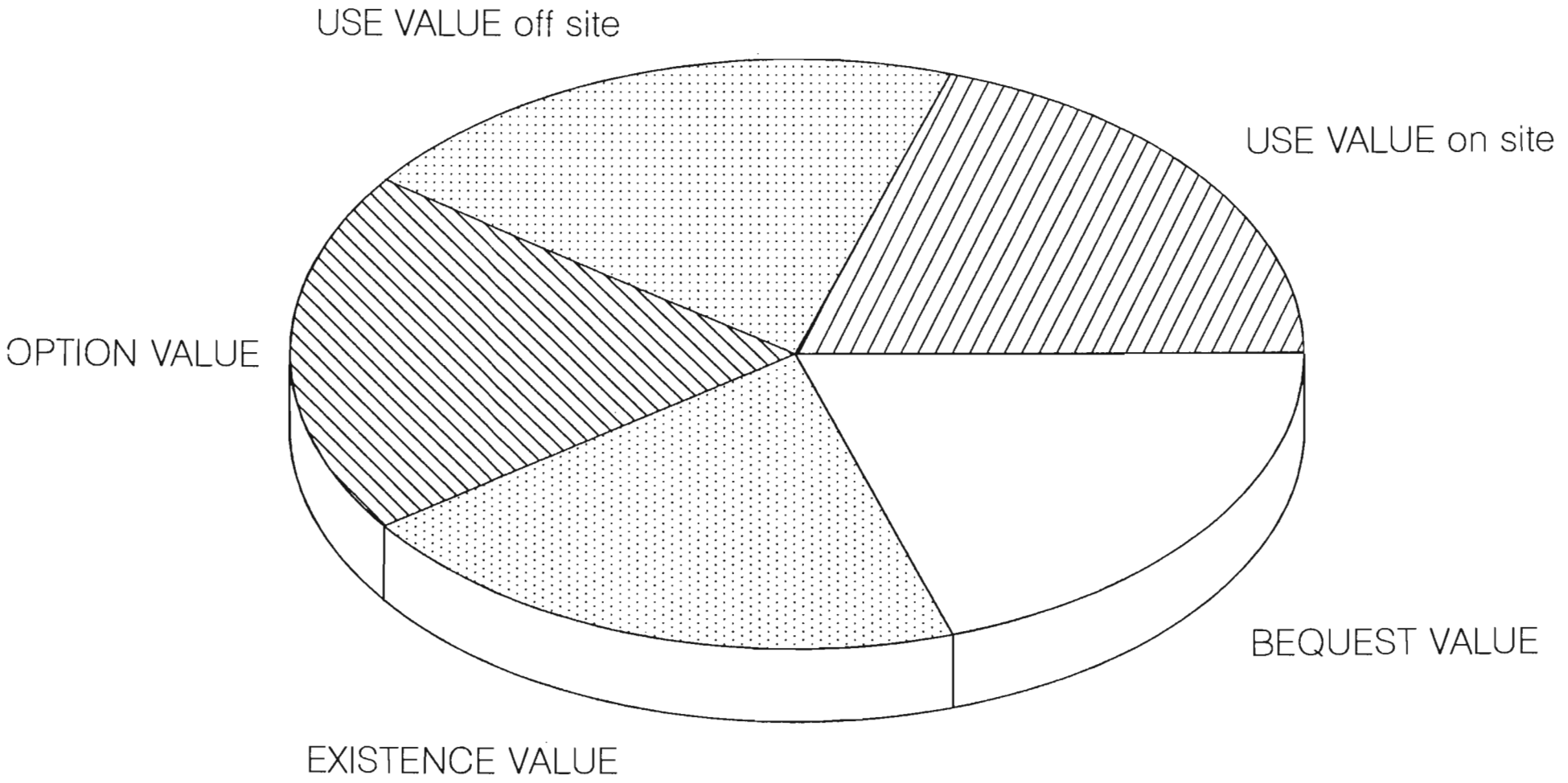


Figure 2.2 Total Value Paradigm

Option value can be viewed as a risk-aversion premium individuals are willing to pay for retaining an option for future use of a good (Decker and Goff, 1987). It is an additional source of benefit related to future time periods and is the maximum amount which recreationists under conditions of supply or demand uncertainty are willing to pay for an option to have a resource available for consumption in each subsequent year (in which payment is made).

Existence value is the willingness-to-pay for the knowledge that a natural system or protected area exists, even though no consumption of the good is anticipated. A number of motives which have been suggested to support the notion of existence values can be traced back to one or other form of altruism - caring for people or things. Economists can conveniently accommodate the notion of altruism in the traditional model of rational economic behaviour and in terms of utility maximizing behaviour, it can be argued that altruism gives utility to the giver. Another motive for existence value posited by Pearce and Turner (1990, p.233) not related to altruism, is stewardship or a Gaian motive (after Gaia, the Greek goddess of the earth). This motive is based on the idea that the earth is more important than the people it supports and that mankind has a responsibility to ensure its survival.

Bequest value represents an individual's WTP for the knowledge

or satisfaction gained from endowing future generations with protected areas. It is recognised that the concept of a bequest value can create confusion when separated from option and existence values. In this study, as in Krutilla's (op. cit.) bequest values are specifically isolated to determine an intergenerational value. Bequest value refers to the willingness of a person to pay for endowing future generations with the same good. As this definition implies, bequest value could be considered an intergenerational option value. Krutilla (1967) however, considered it a separate category of value as he wanted a more precise distinction to be made between bequest, existence and option values (Decker and Goff, 1987). In this study the aggregate of option, existence and bequest values is called preservation value, which together with use value equals total economic value (Walsh et.al., 1984 and Greenley et.al., 1981). This differs from conventional estimates of value which are based on market prices and use.

The literature suggests that option values are significant under conditions of uncertainty and will be positive for risk-averse individuals demanding irreplaceable environmental systems. Bequest values depend upon the desire of this generation to pass on the assets (natural resources) it inherited intact. Existence values appear to be related to the uniqueness and sustainability of the system which does not have to be irreplaceable (Walsh, et al., 1984).

Without information about preservation values, decisions made by

managers concerning the allocation of public land to protected area status are based on natural science criteria and the use values which recreationists reveal. The gross expenditure methods used to calculate the latter are an understatement of demand (Walsh et al., 1983, pp.195-210) leading to the argument that the benefits of additional protected areas do not exceed opportunity costs. The determination of economic values for protected areas should help in the formulation of environmental policies for the future. Further, economic analysis cannot place a financial value on unknown ecological effects. This suggests that the total values calculated may be conservative.

Having considered the concept of value, in the next section broad approaches as to how nonmarket values may be measured will be discussed.

2.5 General Approaches to Measure Environmental Demand

Because of the lack of both property rights and efficient pricing of environmental goods and services, special techniques are needed to account for consumer preferences of such items in order to compare them with goods and services for which markets do exist. Three approaches have been used to measure non-market goods and services (Smith, 1993; Braden and Kolstad, 1991, p.43): the first is household production function techniques - which are based upon the demand for substitutes and complements. Second, hedonic methods - which refer to breaking

down or decomposing the prices of market goods in order to extract implicit or embedded values of attributes related to the good being measured. The third measurement type is experimental methods to elicit consumer preferences. This method uses hypothetical settings called contingent valuation, or a constructed market where none existed previously.

All of these methods stem from common roots in welfare economics (ibid) and share the premise that consumers make utility-optimizing decisions which are captured in the consumer demand functions associated with available goods and services - of which environmental attributes form a part. Sometimes the consumer is able to directly choose the amount of an environmental good or service he wishes to consume, for example going fishing at a lake. Other environmental attributes may not be directly chosen by the consumer but changes in the amount experienced or consumed by an individual will influence the person's consumption of other goods and services.

The household production function approach is linked to changes in the consumption of goods which are substitutes or complements for the environmental good or service under consideration. An example of this is the travel cost technique whereby travel costs and visitation rates to a site are used as a proxy for consumer willingness to pay for the site. The travel cost method will be discussed in greater detail in the next section.

Another example of the household production function approach is calculating averting costs to infer values. For example, in order to derive the value of the impact of air pollution on individuals, the cost of air filters to mitigate the effects may be calculated. The central feature of this method is that changes in quantities of complements are used to estimate the value of a change in quality. Behaviour is used as a basis for valuation. A limiting feature of this technique, however, is that because no direct consumption by individuals occurs, looking at complements and substitutes does not enable a researcher to determine non-use values (Smith, 1993, p.1-26; Braden and Kolstad, 1991, p.201).

The hedonic price analysis method involves the estimation of implicit prices for selected attributes of a good for which a market exists. For example, property prices reflect environmental effects such as water and air quality in a neighbourhood or proximity to unique features such as a beach on the coastline. Unlike the household production approach, the hedonic method of valuing goods focuses upon prices as opposed to quantities. Use of the hedonic technique means that the demand for attributes associated with the good needs to be estimated and then changes in prices associated with different quantities of the attributes are observed. Implicit prices of attributes reflect supply and demand as would commodity prices for a market good. The main advantage of this method is that confusion is avoided because it employs observable market

behaviour. As with household production function methods, a limitation of the hedonic approach for this study is that it cannot measure non-use values (Mitchell and Carson, 1989, ch.3; Smith, 1993, pp.1-26).

The direct elicitation approach to determine consumer preferences is based upon responses to a questionnaire. In this approach the survey technique is designed to determine individual preferences for goods by eliciting their willingness to pay for specified changes in the good. Both quantity and price dimensions can be analysed and compensated demands can be developed directly (Braden and Kolstad, 1991). Using this estimation technique obviates the need for analysing the consumption of substitutes, complementary goods or indirect pricing. Most significantly for this study is the fact that this is the only method which can be employed to collect non-use consumer preferences (Randall, 1987; Mitchell and Carson, 1989; and Braden and Kolstad, 1991).

One of the difficulties associated with direct elicitation methods is that reliance is placed upon consumer intentions and anticipated or expected behaviour in a hypothetical situation. Invariably the consumer's budget is unaffected by his participation in a survey which could mean that the questions may not be as carefully considered as they would be were there a direct budgetary implication. Meticulous design of the survey instrument is required to avoid the various types of bias which

could influence a respondents' choices. This issue will be dealt with in detail in the following chapter which covers the research methodology employed for this study.

Having now looked at the general approaches to measuring consumer demand the following section contains a discussion of a framework developed by Mitchell and Carson (1989, p.75) which is designed to assist the researcher to determine the correct estimation technique to be employed in a particular study. The framework is based upon behaviour centred linkages.

2.6 Behavioural Framework for Estimation Techniques

Over the years a number of methods to calculate the demand for non-market goods and services have been explored. The analytical techniques for determining demand prices for public goods may be broadly grouped into either physical or behaviourally linked techniques (Smith and Krutilla, 1982). The question is, which of the techniques identified should be employed to determine a preservation value for protected areas of the kind represented by the case study?

The valuation methods in Table 2.2 are classified according to how preferences are shown and the type of behavioural linkage. The result is four categories of behaviour-centred techniques to estimate benefits. The basis of contingent valuation is a behavioural linkage between a change in amenity and its effects on the user.

Table 2.2 Behaviour–based Methods of Valuing Non–Traded Goods

	DIRECT	INDIRECT
Observed market behaviour	OBSERVED/DIRECT TECHNIQUES Referenda Simulated markets Parallel private markets	OBSERVED/INDIRECT TECHNIQUES Household production Hedonic pricing Actions of bureaucrats or politicians
Response to hypothetical markets	HYPOTHETICAL/DIRECT TECHNIQUES Contingent valuation Allocation game with tax refund Spend–more–save–less survey questionnaire	HYPOTHETICAL/INDIRECT TECHNIQUES Contingent ranking Willingness to pay or accept Priority evaluation technique Conjoint Analysis

Source: Mitchell and Carson, 1989, p75

2.6.1 OBSERVED/DIRECT TECHNIQUES

With this set of methods preferences are revealed in observed markets with the benefit measures linked directly with consumer's preferences. These methods are useful to validate the measures calculated from the other three categories.

The referenda approach is based on whether or not voters are willing to support, for example, a plan to increase the supply

of a public good. The voter would either support the motion or not, depending on whether it was considered to be value for money. Unlike the hypothetical direct method, where there is no market, the amount and payment method are stipulated and politically enforced. For example, there would be no need to undertake a contingent valuation study of people's willingness-to-pay for a new school where the citizens can express their binding preferences in a referendum vote.

Another of the observed/direct techniques is simulated markets. These are experimental markets established by researchers where people trade goods under controlled conditions. These markets fall short as a benefit measurement technique because they are confined to addressing quasi-public goods (because of the need for excludability to create the market). They are also both expensive and difficult to operate.

Private goods markets also apply to quasi-public goods, but it may be possible to use the results to infer the value of public goods.

The final observed direct technique refers to the fact that parallel private markets in, for example, hunting sites may be used to infer the value of a parallel public or quasi-public good. Vaughan and Russell (1982) did this to measure fishing opportunities.

2.6.2 OBSERVED/INDIRECT TECHNIQUES

The value of the benefits is derived by observing the market choices of individuals for goods which are indirectly related to behaviour. For example, deciding on a holiday. The value of non-market goods may be inferred from market data for other goods which are indirectly linked to the good being assessed.

An ingenious method of estimating the demand for a wilderness recreation site was proposed by Harold Hotelling to the Director of the USA National Parks Service in 1947 (Krutilla and Fisher,1975). Hotelling's proposal, which came to be known as the "travel cost approach", was developed in greater detail by Marion Clawson in 1959 and subsequently modified by Clawson and Knetsch (1966) into a more general approach which looked at the economics of outdoor recreation.

The first step in the implementation of the Clawson method is to divide the area surrounding a recreational site into concentric zones at various distances from the site. These zones are considered to be those areas within which the travel costs of visitors are homogeneous. If recreation is treated as a normal good, then it can be argued that the travel costs to and from a recreation site indicate a portion of the demand for this good. The relationship between the visitation rate (number of visitors per zone divided by the population of the zone) and the cost of a visit can be used to derive a demand curve for the whole

recreation experience (Everett, 1979). The information from the sample of visitors and the data generated are used to determine the relationship between visitation rates, travel costs, and various socio-economic variables. This method contains two basic assumptions. First that each zone is homogeneous with respect to the socio-economic factors that influence the visitation rate and second, that visitors will not distinguish between different types of costs, such as entrance charges and travel costs.

Drawbacks of this technique include:

(a) the inability to adequately capture the value of time as an opportunity cost;
(b) option, existence and bequest values are not captured;
(c) limited assumptions which may not capture all relevant behavioural characteristics of the trip;
(d) the entrance fee may be a minor decision for the trip;
(e) being very site specific, this technique generally ignores the fact that recreationists can substitute one site for another.

The final method in the observed/indirect category concerns the actions of bureaucrats and politicians, who make decisions concerning the provision of public goods. This technique assumes that voting for candidates is one way of imputing values for public goods because politicians want to be re-elected and

will therefore identify the preferences of the public and implement them.

2.6.3 HYPOTHETICAL/INDIRECT TECHNIQUES

The market is hypothetical in this category and people's responses to it are only indirectly related to valuing the good being considered.

Willingness-to-pay and conjoint analysis can be viewed as hypothetical analogues to the observed/ indirect techniques discussed above. All indirect techniques (observed and hypothetical), can be viewed as two-step procedures. Instead of being asked to place monetary values on, for example, trout fishing waters, people are asked what distance they would travel to get to these waters. The contingent ranking (CR) technique requires the person to rank his preferences according to the different descriptions. The researcher then translates the actions or responses into implied (Rand) values.

Priority evaluation techniques and allocation games are somewhat similar in that they require a person to allocate a budget (fixed) amongst specified categories. These types of techniques may be useful for the allocation, say, of a department's budget. The problems associated with allocation games include: the difficulty of describing budget categories to show how amenity values will be affected; no clear indication of a

person's opportunity cost for a given good; and the lack of ideal situations for the technique's application.

The objective of conjoint analysis is to enable a researcher to determine a person's priorities for a given set of options or alternatives. The various attributes of the alternatives which influenced the person ranking them are broken down further into separate scores, called utility values or part-worths. The technique is designed to reveal a decision maker's preferences in a utility function which will rank order the set of multi-attribute choices. This can be accomplished if the attributes and the respondent's priority ranking of the alternatives, are known (Page and Rosenbaum, 1987).

Contingent ranking, like contingent valuation, relies on data from individual responses in a hypothetical situation. But, instead of requiring a person to respond with the maximum willingness to pay for a good, CR requires that people prioritise outcomes, which are made up of hypothetical payments and a corresponding increase in utility, from the most favoured to the least favoured. In the utility-maximising framework underpinning the CR technique, a person's prioritisation of alternatives is a function of his ability to maximise utility within the set parameters.

An advantage of contingent ranking over contingent valuation techniques is that the answers will be more accurate because it

is less demanding to prioritise a small set of cards than answering willingness-to-pay questions for a hypothetical change to a good or amenity (Smith et al., 1986).

Disadvantages of the CR technique include: the fact that the behavioural model underpinning the technique and its theoretical properties are not completely understood, Mitchell and Carson (1989), Ruud (1986), and Rae (1982); the researcher elicits prioritised attitudes rather than behavioural intentions.

2.6.4 HYPOTHETICAL/DIRECT TECHNIQUES

These measure directly the value people attach to hypothetical changes in the quantity/quality of goods provided, thereby reducing the large number of assumptions required by indirect valuation methods. Smith and Krutilla (1982) conclude that individual responses to hypothetical circumstances or transactions are directly comparable to individual responses revealed in transactions.

The spend-more/less survey approach is derived from survey instruments which ask whether 'we' (the country) allocate too much, too little, or the right amount for certain projects or programmes. The weakness of this method is that it elicits superficial and uninformed answers. Hypothetical markets are not elaborated upon and even current expenditure patterns are not divulged.

Allocation games that offer tax refunds are another method of estimating benefits. Instead of the person allocating a budget (allocation technique) among goods, the respondent is allowed to decline payment in favour of a tax refund for the public good being investigated. This encourages the individual to evaluate the utility of a bundle of goods simultaneously rather than individually, as in the CV method.

In the contingent valuation approach an individual is surveyed to determine whether or not he is willing to pay for or be compensated for not having access to, in this case, a recreational site. The researcher must therefore design a questionnaire which will induce the respondent to reveal his willingness to pay. The researcher then decides how to conduct the survey: for example, on site, at home, over the telephone or by mail.

Of the various measures recommended to estimate economic values of recreation activities and resources, the contingent valuation approach is the only one able to measure public benefits from the preservation of resource quality, namely option, existence and bequest values. Given that this study focuses on, among other things, the estimation of the preservation value of selected NPB parks, contingent valuation is, therefore, the appropriate estimation method.

The willingness to pay for environmental goods is related to the consumer satisfaction that the individual expects to receive from that good. Total willingness to pay (WTP) comprises the intended expenditure on the good plus the non-use value. The benefit to the individual will therefore be the excess WTP over what is actually paid, since the latter is the cost to the individual.

There are many ways in which questions can be addressed to the respondent. The most common approaches include the bidding game (Knetsch and Davis, 1973; Randal, Ives and Eastman, 1974); the open-ended question (Hammack and Brown, 1974); and a checklist (Desvousges, Smith and McGivney, 1983).

The contingent valuation method incorporates any approach to valuation which relies on the responses of individuals to contingent circumstances posited in an artificially structured market (Stoll, 1983, p.2). The bidding approach to valuation has been used since 1963 but did not really become popular until the mid-1970s with the work of Hammack and Brown (1974). Bidding approaches are normally iterative in nature.

The iterative bidding process requires the interviewer to carefully describe all the attributes of the good and the right to use the good for a fixed period of time. The respondents are given a starting bid and asked if they would be prepared to pay the opening bid for the good. If the reply is in the

affirmative, the bid is raised until a limit is reached which the respondent indicates he is not willing to pay. The interviewer then lowers the bid progressively to estimate an exact amount that the hypothetical consumer is willing to pay. This is known as a converging-bid approach. A variation of this willingness-to-pay approach is used in this thesis.

By the same token individuals could be surveyed to determine how much they would be prepared to pay to avoid the loss of a good. The minimum amount of compensation people are willing to accept in exchange for the loss of a good does not usually equate to the amount they are willing to pay to prevent the loss of the same good (Hufschmidt et al, 1983, p.252). This is because willingness to pay estimates would be constrained by limited household income and time budgets as well as other variables. Compensation estimates (willingness to accept payments) are less restrained by income constraints.

Theoretically, (from an environmental perspective in this case) any economic measure of welfare change is the payment that leads to consumers being indifferent between having or not having a change in quality or quantity of the environmental attribute being considered. Any change in 'price' reflects what consumers are willing to pay for a desirable change in the attribute or be compensated for an undesirable change in it (Braden and Kolstad, 1991). "Essentially 'what people want' - individuals' preferences - should be the basis of benefit measurement. The

easiest way to identify these preferences is to see how people behave when presented with choices between goods and services. We can reasonably assume that a positive preference for something will show up in the form of a 'willingness to pay' for it" (Pearce and Turner, 1990, p.125). Individual's willingness to pay can be aggregated to secure a total willingness to pay. However, this aggregated amount need not reflect market prices and the relationship between WTP and the market will be discussed in a subsequent section of this chapter. The distinction is important when determining total economic values of protected areas. The USA federal guidelines recommend the willingness to pay measure (US Water Resources Council, 1979).

A single bid or open-ended game is another straightforward approach but has drawbacks. In this approach individuals are asked how much they would be willing to pay for a good, or accept as compensation for its loss. This method tends to result in a much higher standard deviation about the mean. This is especially true if no range of values is presented.

One difficulty with the converging-bid approach is that the opening bid may give the interviewee some indication of the order of magnitude of his expected response. In this way a bias may be built into the results but Thayer (1981) in an analysis of this bias showed that it was not as extensive as believed.

The advantages of the hypothetical/direct methods are

highlighted in Table 2.3. The table shows the different classes of benefit measurements based on the following criteria: ability to measure option value, ability to value goods not previously available, and ability to estimate existence benefits and the demand curve for the good. It is the flexibility of the hypothetical approach to valuation that makes it so useful. Sen

Table 2.3 Important Properties of Benefit Estimation Methods

Desirable Properties	Observed/ Direct	Observed/ Indirect	Hypo-thetical Indirect	Hypo-thetical Direct
Able to obtain option price estimates in the presence of uncertainty	No	No	Yes	Yes
Able to value goods not previously available	Yes	No	Yes	Yes
Able to estimate all existence class benefits	Yes	No	Yes	Yes
Relevant ordinary demand curve is directly estimable	Yes	No	No	Yes
Relevant Hicksian compen-sated demand curve is directly estimable	No	No	No	Yes

Source: Mitchell and Carson, 1989, p88.

(1977, p.339) noted "once we give up the assumption that observing choices is the only source of data on welfare, a whole new world opens up, liberating us from the informational shackles of the traditional approach." Given the prerequisite that the contingent scenario must be believable, a CV

researcher can specify any number of conditions upon which a good may be provided and valued. The hypothetical nature of contingent valuation allows for ex ante estimates to be obtained as well as willingness-to-pay bids that include the existence and bequest classes of values, where methods which depend upon observed behaviour are likely to be unable to determine existence and bequest values. It is the prospect of realizing these values that has led to the adoption of the contingent valuation method in this study.

Circumstances determine which valuation technique would be most appropriate in a given situation. If information based on observations is not readily available then survey based approaches can be employed. Techniques are being developed to estimate the benefits of protected areas and these techniques are becoming recognised standard approaches, for example by the USA Water Resources Council, first documented in 1979, and the Environmental Protection Agency of the United States.

Having reviewed the four categories of behaviour-centred techniques to estimate benefits it can be seen that there is a behavioural linkage between a change in amenity and its effects on the user. With respect to protected area utilization, the most appropriate measurement techniques to estimate the benefits are those elicited from a hypothetical/direct approach.

This section has considered various techniques by which environmental goods could be measured. In the next section consideration is given to quantifying this. The extent of a change in economic welfare will be dependant upon the importance of the good or service to the individual. An individual's welfare change can be used to measure the change in consumer surplus. This attaches a monetary value to the welfare change. The use of the consumer surplus concept is therefore crucial in the evaluation of welfare change expressed in monetary values.

2.7 Choice of Measure

There are three concepts of consumer surplus mooted in the literature: the Marshallian consumer surplus theory, and the compensating and equivalent variations both advanced by Hicks.

Mitchell and Carson (1989) and Braden and Kolstad (1991) reaffirm that at the core of consumer surplus is the law of demand which implies that individuals participating in voluntary exchange will always, as a group, pay less for a given quantity of goods than they would if that quantity were offered on an all-or-none basis. Building on this, the basic supposition of the Marshallian consumer surplus is that a consumer is willing to pay more for all units of the good other than the last unit (goods are divisible). Marshall (1961, p476) noted, "The excess of price which he (the

consumer) would be willing to pay rather than go without the thing, over that which he actually does pay, is the economic measure of this surplus satisfaction. It may be called consumer surplus." This is the difference between the individual's maximum willingness to pay and his expenditure on a good. With respect to the implications of theory for the design of contingent valuation studies it is important that "the scenario should be designed to ensure that the respondents express their consumer's surplus for the good and not some other type of value such as a 'fair price'" (Mitchell and Carson, 1989, p52). The WTP components of preservation value revealed by respondents during the interviews is discussed in greater detail in a subsequent chapter.

In recreation economics, especially in the evaluation of quasi-public property resources like a wilderness area, the Marshallian consumer surplus measure is the most widely used because of the practical simplicity and the availability of market data. The fact, however, that Marshallian demand curves do not hold utility (satisfaction) constant but rather hold income constant presents a problem. Hicks (1943) developed the notions of compensating and equivalent variation which hold utility constant at the initial level (compensating variation and surplus), or hold utility constant at some specified alternative level (equivalence variation and surplus). In effect these Hicksian consumer surplus measures can be thought of as Marshallian consumer surplus measures calculated from demand curves where total utility is held

constant at different specified levels. Depending on the consumer's property rights position vis-a-vis the good in question, each of the measures may involve either payment or compensation in order to maintain utility at the specified level. Hicksian variation measures are used when the consumer is free to vary the quantity of the good considered, and the surplus measures when the consumer is constrained to buy only fixed quantities of a particular good (Randall and Stoll, 1980). Since policy interest usually lies in the potential benefits as measured from the consumer's current or initial level of utility, the choice of Hicksian measures is often narrowed down to the two compensating measures.

If this study were addressing the measurement of a change in utility of a wilderness experience brought about by price changes then, given the excludable and non-rival nature of protected areas, consumers would be asked how much they would be willing to pay to maintain utility at a specified level. Given, however, that the consumer is entitled to his current level of utility and that a protected area is of a fixed size and he therefore consumes a fixed quantity, the appropriate measure is the Hicksian compensating surplus measure which is contained in the preservation values elicited in the survey. Mitchell and Carson, (1989, p.41) reaffirm that, "a compensatory surplus WTP measure is also indicated for a proposed decrease when a given quality level is currently available. The respondent would be asked to state the maximum payment (which could be the present payment) that she is

willing to make to preserve this quality level before she would prefer a quality reduction. To use a referendum analogy the consumer is asked to set the highest amount she would be willing to pay annually in taxes for a given programme which guarantees to maintain the present level of supply of a good for the next and succeeding fiscal years. It should be noted that the WTA format is clearly inconsistent with the nontransferable character of this property right". Details of how these values are collected from responses to the questionnaire are presented in chapter four.

The mean preservation values and use values used in the study are based on the annual average number of days spent at wilderness areas. The study has not differentiated the consumer by type of visit (holiday, day trip or weekend trip) which would yield different levels of consumer surplus.

In addition to calculating preservation values for protected areas, a technique known as conjoint analysis will be employed to analyse demand factors associated with the consumption of protected areas as an economic good. This requires rank-ordering and measurement of consumer preference levels associated with different attributes of a wilderness experience. The use of this technique is consistent with the study's primary objective of evaluating the usefulness of techniques to value protected areas as a non-market good. The application of this technique also adds to the analysis of

preservation value variables which are to be determined in the study.

2.8 Conclusion

In this chapter a number of classes or classifications of environmental goods have been reviewed. In addition, benefit estimation techniques with specific reference to behaviour-based methods have been discussed. These were classified into four types depending on whether the technique was a function of preferences revealed in observed or hypothetical markets and on whether the linkage between the method and the willingness-to-pay value was direct or indirect. The hypothetical/direct methods which included contingent valuation, were revealed to be the only set of methods which could value non-market classes of benefits. The choice of the contingent valuation approach has been adopted for the study. To show it is practically possible to calculate a measure of consumer surplus for recreationists making use of a good like a protected area, a field study was conducted on the selected Natal Parks Board sites previously identified.

CHAPTER 3

RESEARCH METHODOLOGY

Introduction

This chapter highlights the design of the survey instrument and pays particular attention to the theoretical pitfalls inherent in sampling procedures.

3.1 Sources of Bias in Survey Design

This section examines the construct of the survey instrument from the perspective of sample design and benefit aggregation procedures. Specifically, the section will deal with the development of the survey from the perspectives of (i) misrepresenting WTP amounts, (ii) examining valuation cues and (iii) misinterpretation of the survey scenario. The discussion on the various forms of CV bias is adapted largely from Mitchell and Carson (1989, p237). Here existing typologies are expanded to include a broader range of factors than those usually considered by economists to include the insights of, for example, behavioural psychologists like Etzioni (1985). It is felt that by investigating and avoiding as many potential sources of bias as possible, the results of the survey can be used with greater confidence.

3.1.1 Sample Design

Efforts were made to avoid population-choice bias which could affect the reliability of the valuation procedure. Population choice bias can enter a calculation when the survey population chosen does not adequately correspond with the population to whom the benefit (and cost) of the provision of the public good will accrue. Sample populations may be defined in terms of four elements: the sample element (who); the sampling unit (what, e.g. visitation rates); location (where); and time (when).

A variety of uses of protected areas may be identified, for example agriculture, forestry, communal grazing, recreation, research or combinations of these. The population interviewed comprised recreationists and the purpose was to identify their willingness-to-pay for the use of protected areas.

The sampling unit was typically the head of the household or someone representing the household per se. Because payments for most goods are made at the household level, the household as opposed to the individual is most often the appropriate economic respondent for CV surveys.

The greater the difference between sample choice and the

recipients of the benefit, the greater the problem facing the researcher (see Randall, Ives and Eastman, 1974). As is demonstrated by Table 3.1, the optimum respondent to a CV questionnaire is relationship I. Where appropriate, the payment vehicle which encourages category I responses should be used. Vehicle payment devices will be discussed further on in this chapter.

Table 3.1 Payment/Benefit Relationship of a Good

		Benefit from the good: Yes	Benefit from the good: No
Pay for the good	Yes	I	II
	No	III	IV

Irrespective of the survey method employed in a CV study, non-response biases and problems are inevitable, thereby potentially reducing the number of useful WTP bids that can be employed in the analysis. Non-response problems can be either unit non-response or item non-response. The first refers to the situation when the respondent refuses to participate in the survey or cannot be contacted. Item non-response occurs when a person will not answer critical questions within the survey instrument. With respect to

ordinary surveys and with the exception of personal income questions, item non-responses exceeding 6 per cent are fairly rare (Craig and McCann, 1978). For this study there were no non-responses.

Mitchell and Carson's (1980) exhaustive analysis of CV surveys conducted (some 120 in all), reveal that it is not uncommon in a CV survey to have a non-response rate of 20 to 30 per cent for WTP questions if the sample was random and the scenario complex. Within reason, a level of non-response is welcome - rather have a respondent give no bid than a poorly considered one; after all, not everyone will have the time for a well thought out reply. Procedures can then be used to adjust the zero bids which are a result of protests. This is as opposed to the zero bid, which is a true reflection of the fact that a person would rather do without the public good than pay for it. The other two forms of a zero bid are those that do not meet an edit for minimal consistency and "don't knows".

During the course of this study it was easy to distinguish the protest zeros. The respondent was asked his reasons for not giving a value. In CV studies which have been undertaken, the outliers are often from low income respondents who bid WTP amounts which were out of proportion to their incomes. These are detected during the consistency edit. Alternatively, upper income respondents can give zero

bids which are inconsistent with their answers to other parts of the questionnaire which reveal their strong demand for a good. Consistency edits can be logically based or statistical techniques employed. The protest zeros were allocated a mean bid value in the analysis.

To identify whether non-response bias is introduced into a study one must determine whether there is a differential response from various categories and if there are differences within a particular category where WTP bids could not be elicited. If the between-group and within-group differential response rates are related to the value of the good then bias will occur. With regard to the zero bids in this study, the sample elements from whom valid WTP responses were obtained did not differ significantly from the population of interest regarding any observed characteristics influencing their bids for the good. The zero WTP bids were, in turn, not related to the respondent's value for the good.

Sample non-response bias (the between group bias mentioned) is often a problem in surveys. Certain categories can easily be undersampled. For example, younger, unmarried people are seldom home to be included in a sample. As mentioned elsewhere in this study, there is some scope for sample non-response bias because part of the stratified sample (protected area recreationists) was not adequately represented, namely families with children of a school-going

age. Owing to time and budget constraints, this survey was conducted during the school term (March/April), as a result of which many of the residents interviewed had children too young for school, had no children or had children who were away from home or working. Cost constraints made it impossible to re-survey the project areas at different times of the year. Given the fact that many people did not have families to add to their budget constraint, the responses may be less conservative than from a random, multi-seasonal sample survey. The WTP values elicited should therefore be viewed appropriately (Alletson, 1991).

Sampling frame bias can come into survey design and distort the findings. This form of bias occurs when the sampling frame does not give every member of the chosen population a known and positive probability of being included in the sample. When there is a divergence of the sample frame and the population, the results cannot be used with any confidence when they are generalised as characteristics of the population.

The design was a single stage, stratified quota sample. In stratified sampling, the cost of obtaining random samples for the individual strata is so expensive that a quota system is often used. This was considered particularly appropriate for this exercise as the sample required (35 per site) represented a number usually well in excess of the households

present at the site on any single day. The interviewers questioned all the families at a site for as many days as it took to fill the quota. The reserves/resorts where different amenities existed were treated differently. A larger number of people were interviewed because of the different facilities available, namely chalets, caravans, tents and an hotel - in other words sub-quotas, in order to survey a cross-section of visitors.

A sample population taken from the broader South African population was considered during the design of the survey. However, it was reasoned that it would be more rational to draw the sample from existing protected area recreationists. It was recognised that the sample is a very restricted one and may not be representative of those who may benefit in the future. The survey results would likely understate preservation values because of existence and bequest values held by individuals who don't visit protected areas but derive off-site value. This concept will be addressed in greater detail in chapter 4.

Non-response biases were not a problem in this survey. Without exception the people approached to be interviewed complied with the request. This applies to both unit and item responses. It is suggested that this was, in part, because of the nature of the research being undertaken and the environment in which the respondents were approached.

People were generally very relaxed and, more importantly, expressed interest in the nature of the work being undertaken. This was due to the novel nature of the research as well as the fact that the questions seemed to stimulate rather than antagonise respondents. The only difficulty encountered was in trying to allocate time efficiently, invariably respondents wanted to "chat" about the research and this made it difficult to move on to the next respondent. Survey procedures and data collection is discussed in detail in Chapter 4.

Sample selection bias occurs when the chance of obtaining a WTP value from a respondent is related to his utility for the good. In other words, a person may not respond to a questionnaire or a particular elicitation question when he holds a different expected value for the good compared with individuals who do respond. This normally occurs when the survey instrument allows the respondent to choose whether he wants to answer certain questions. Once again, this was not a problem in the implementation of this survey, as there were no non- responses.

3.1.2 Incentives to Misrepresent Responses

Incentives to misrepresent responses refers to potential biases as a result of individuals perceiving incentives to not reveal their true WTP amount. This leads to two types of

reaction. Respondents resort to (a) strategic behaviour, which deliberately distorts payment questions, and (b) compliance behaviour, whereby they anticipate what they believe the interviewer (or instrument) would like them to reply, and act accordingly.

One form of strategic behaviour which is examined is the concept of "free riding". This occurs when someone reveals a value less than the actual value to him of a public good in the hope that with other people to pay the rest of the cost he will have all the benefits without having to pay his full share of the costs. In a CV context the respondent offers a lower amount than his true WTP.

Free riding is the form of strategic behaviour that has received the greatest attention in the literature (Mitchell and Carson, 1989). During the 1970s Bohmn (1972), a Swedish economist, conducted a rigorous set of experiments to test the free-riding hypothesis. The results showed that participants were not as sensitive to strategic incentive bias as was generally considered. Mitchell and Carson (1989, p150), examined the theoretical and empirical literature from a number of disciplines to examine the incidence of strategic behaviour and concluded that the "theoretical literature showed that free riding behaviour postulated by Samuelson is irrational outside of a naive, one-time prisoner's dilemma game representation". They then examined empirical evidence

regarding free-rider problems. The results of their research were in line with the notion that strategic behaviour is not always associated with preference-revelation situations.

> Despite attempts by experimentalists to induce free riding, this form of behaviour was the exception rather than the rule in all the experiments reviewed ... overall, the theoretical and experimental evidence examined supports the view that strategic behaviour is not nearly as severe a phenomenon ... as many economists had feared (ibid).

The potential for strategic bias in the survey has been minimised by the creation of a plausible payment vehicle. The questionnaire does not draw unnecessary attention to the hypothetical nature of the exercise by avoiding words like "assume' and "assume a hypothetical situation", when trying to collect WTP bids. Indirect bias is avoided through the presentation of a plausible payment vehicle. Possible overbidding was also avoided by not emphasising the importance of the questionnaire answers to policy makers. This subject is discussed further in Chapter 4.

Compliance bias is discussed by Schuman and Presser (1981), who maintain that essentially people are constrained to be truthful to an interviewer, but may shape their responses according to what they believe the interviewer would like to hear. This is said to be especially true if the interviewee

has no strong views on the subject. Sponsor bias is one form of divergence from the truth when the respondent may try to please the sponsor. This is why surveys conducted by a party who may have a conflict of interest with the outcome are not highly valued. This form of bias was not easy to associate with the survey instrument under consideration because of the fact that it was motivated as the independent work of an economics student. It was specifically stated in the introduction that it was not a Natal Parks Board survey.

Interviewer bias is another form of compliance bias. This occurs when responses are designed to please or impress the interviewer. The key requirement to eliciting consistent answers is by asking consistent questions. It is essential that the questions be asked exactly as they appear in the questionnaire.

3.1.3 Implied Value Cues

During the implementation and design of the survey instrument implied value cues are another set of biases that need to be avoided. They have to do with respondents picking up unintentional cues from the survey design which they use to value the good "correctly". People who are not sure about something are prone to "value" a phenomenon by starting from an initial "value" which they subsequently review until they arrive at their final answer. In a nutshell, this can be

seen as a case where "first impressions count". This is a phenomenon known as anchoring (Tversky and Kahnman, 1974, pp1124-1131), and leads to bias towards the original value or impression. The implied value cues biases for which appropriate allowances had to be made included starting point bias; relational bias; importance bias; and position bias.

The ultimate objective of any contingent valuation exercise is to determine the respondent's willingness to pay (or willingness to accept compensation) for the good in question, in this case, recreation. Respondents, however, usually find

Table 3.2 Bidding Methods

	Iterated Questions	Single Questions
Discrete WTP indicator	Take-it-or-leave it (with follow up)	Take-it-or-leave-it Spending question offer Interval checklist
Actual WTP obtained	Bidding game Verbal auction	Open-ended/Direct question Payment card Sealed bid austion

it difficult to come up with a Rand value. As a consequence a great deal of research has gone into developing elicitation systems to help the respondent simplify his choice process around what is known as starting point bias. Table 3.2 identifies the methods which have been used to date. (See Thayer, 1981, pp34-36; Randall, 1987, pp263-264; Smith and

Desvousges, 1986, p290; and Rowe, d'Arge and Brookshire, 1980, pp1-19.)

There is some disagreement amongst researchers as to whether an iterated series of questions or a single bid approach is the most appropriate. The thoroughness of the iterated approach, say some, elicits a more well thought-out answer (See Hoehn and Randall, 1983). Others (Mitchell and Carson, 1989, p99) have argued that the use of the open-ended approach avoids compliance bias which is the result of respondents feeling pressured to bid a higher amount than they believe to be acceptable.

The main issues associated with the use of different elicitation methods can be seen by looking at the four main methods used by contingent valuation practitioners. From table 3.2 it can be seen that these techniques include bidding games, take-it-or-leave-it offers, bidding games and take-it-or-leave-it bids with follow up questions.

In this study the direct question approach was combined with a bidding game. Survey respondents were asked how much they would be willing to pay to acquire an option to use the protected areas in the future. A bidding procedure was then employed to determine maximum willingness to pay which includes existence and bequest values (see questionnaire format in Appendix I). If more than one of the three

identified bids was greater than zero, the respondent was reminded of his monthly budget constraint and invited to revalue each of the bids accordingly.

Relational bias occurs when the good is described in such a way that the respondent draws a relationship between it and other goods that influence the respondent's WTP amount. In the case of protected wilderness areas this did not present a serious problem. There were, however, a small number of respondents who were "new" users of Natal Parks Board amenities and therefore drew comparisons between these wilderness areas and the exclusive, privately run game reserves in Southern Africa.

Provincial bodies like Natal Parks Board recover a portion of the costs of providing quasi-private goods by levying entrance fees, fishing permits and hiking permits. The amount charged is not a function of the market process, but usually a political decision. These charges are probably lower than market-related charges would be. The problem is that respondents relate the prevailing subsidised 'prices' as being a fair value for the good and then condition their WTP bids to these lower prices, which are used as reference points. For this reason the use of licence fees or entrance fees as a payment vehicle in the analysis should be avoided. For example, when Sorg and Brookshire (1984) used an open-ended bidding technique to determine a value for elk

hunting in a county of the United States, more than 50 per cent of the respondents gave the current value of a hunting licence as their bid.

Importance bias is a form of distortion which the application of CV methods to natural environmental areas may be particularly prone to. This potential distortion is not caused by inadequate survey instrument construction but is a consequence of the respondent thinking that the good must be important, otherwise the trouble and cost of the exercise would not be undertaken. The tendency is to overbid or overrank elements of the instrument. In an effort to reduce the likelihood of this type of reaction the respondents were assured that there were no "wrong" answers. The introduction to the survey stated that, "This survey is not a Natal Parks Board survey. Your participation is anonymous and voluntary and you may refuse to answer any questions. Most of the questions have to do with your attitudes and opinions and there are no wrong answers." The questionnaire was designed to elicit the attitudes of respondents to outdoor recreation and socio-economic data before attempting to collect the WTP amounts. This was done to make the respondent familiar and comfortable with the format and at ease when the WTP bids are elicited.

If the desirability or otherwise of a good is exaggerated in a questionnaire this can also lead to importance bias. The

use of striking adjectives when describing the good being considered was avoided.

Position bias in the design of a survey instrument needs to be considered. Respondents may attach relevant importance to a question or a characteristic which needs to be ranked depending on where it appears in a survey. The question on the highest level of education reached by the respondent is an example of this. Five levels of education were presented, from primary school to post-graduate degree. It was felt that if a respondent saw the list he might feel embarrassed that he had, for example, the second lowest level of education (secondary school) on the list. The interviewers therefore asked the question directly and elaborated if the respondent needed the question to be explained further.

3.1.4 Scenario Misspecification

When the respondent of a CV survey mistakenly perceives certain aspects of the good being valued, scenario misspecification is said to occur. This can be either theoretical or methodological.

Theoretical misspecification is a result of an incorrect description, on the basis of theory or fact, of the scenario being portrayed. This would lead to a value being collected

for an inappropriate contingency. Methodological misspecification results from a correct scenario being poorly communicated and the result is an incorrect perception of the scenario by the respondent. Misspecification can be reduced if the appropriate economic framework for a contingent survey is constructed before survey design and by carefully testing the questionnaire beforehand. The draft questionnaire took account of these considerations and was tested on individuals from a cross section of people (based on profession and education) and modified accordingly.

Methodological misspecifications which influence WTP bids fall into two categories: those involving the amenity and those involving the context in which the valuation is made.

3.1.5 Amenity Misspecification

Amenity misspecification is typified by four biases (ibid, p249): symbolic; part-whole; metric; and probability of provision.

Symbolic bias occurs when a respondent values something symbolic of the good rather than the good itself. It could be easy for a respondent being questioned on the preservation of Natal's protected areas to vote instead for "all" wilderness areas. The wording of a scenario is critical to

overcome the natural inclination of people to think that a CV survey is the same thing as a public opinion survey. Other scenarios which can induce symbolic bias include those which involve a controversial issue which the respondent may have strong feelings towards or may in fact be threatened by.

During the course of the study only one individual was encountered who felt that protected areas were something that "everyone was making a mess of ..." and had a hostile attitude towards all conservation management bodies. His feelings were the result of not being allowed into certain areas to photograph endangered plant species. Although he was not hostile towards the interviewer, he gave a zero bid for existence and bequest WTP measures.

Another amenity misspecification is one known as a part-whole bias. This is manifest when respondents incorrectly view the description of the good offered in the CV scenario and instead focus on some global symbol which they believe may typify the researcher's scenario. Geographic part-whole bias is one which CV surveys attempting to value wilderness areas may be particularly prone to. This study focused specifically on the protected areas in Natal.

Benefit part-whole bias can be a problem in CV studies. This occurs when a person is not easily able to differentiate the various benefit measurements which make up a total

preservation value. For example, there may be some confusion in discriminating between a bequest value and an existence value. The format employed in this particular study made a clear distinction between the associated preservation values when each was elicited and the respondent was invited to revise his component values at the end of the section.

3.1.6 Context Misspecification

Context misspecification bias occurs when the individual being surveyed perceives a context different from the one intended by the researcher. Essentially the biases that may result in the WTP bid are related to the following factors: the payment vehicle, property rights, provision methods, budget constraints, elicitation questions and instrument context.

Typical payment vehicles used in CV studies include entrance fees, electricity and water bills, rates, sales tax and special funds. Work done by Brookshire, Randall and Stoll (1980) indicates that the type of payment vehicle used in a study can influence the WTP of respondents. Vehicles like higher prices, taxes and water bills appear to create negative reactions and tighten budget constraints. A special fund was chosen in this study which has the advantage of not appearing to be at the disposal of other central government

votes. A number of respondents questioned whether the "special fund" would be independent of the Government coffers.

A bias with respect to property rights perceptions is also important when designing a CV questionnaire. This bias results from a respondent's uncertainty as to whether he has an ownership right to a good, or whether it is appropriate that he has to pay for the use of the good. With respect to protected areas in this country, it is normal practice to pay for the right to use a wilderness area, whereas in America, for example, wilderness areas are much more easily available to citizens. This issue, therefore, presented no problems in the implementation of this survey.

Linked with the previous discussion on payment vehicles is the method of provision bias. Some producers of public goods have an altruistic nature, for example the Samaritans (dealing with people facing personal crises). These may elicit a higher WTP amount than a relatively unknown central government department. As mentioned earlier, the image of NPB would evoke a higher WTP than the same format with the Department of Environment Affairs. The results of the questionnaire show that 80 per cent of the people interviewed thought NPB did a good job with respect to conserving protected areas, while 76 per cent of respondents believed that the Department of Environment Affairs did not perform

adequately or were unsure of what the Department did. The results are presented in Table 4.4.

There is a risk of a budget constraint bias distorting the results of a CV questionnaire when a respondent does not reflect carefully enough on his ability to pay for a good in a hypothetical market. In an effort to reduce this risk respondents were reminded of their budget constraints and invited to reconsider their benefit bids when the section had been completed. In a further effort to make the contingent market as realistic as possible, respondents were asked to give a monthly WTP amount. This facilitated budget comparisons and avoided unrealistic "payment" based on sentimental or emotional values. It was also stressed that the budget constraint was household and not personal income.

A budget constraint bias can enter into a WTP bid when the good is already being adequately paid for in the form of a tax on the price of a good. To determine the full willingness-to-pay value, a respondent must be aware that he is not being asked to reveal a WTP bid which would duplicate the existing payment, but what he would pay if there was no other source of payment. If this is not made clear, the WTP amounts would be scaled down by the respondent. The questionnaire used made this clear to respondents in the preamble. Participants were given a scenario that the budget for the Department of Environment Affairs had been declining,

on average, throughout the 1980s. Given the advent of a "new South Africa" it is possible that, while there may be an intuitive embracing of environmental demands, government requirements for health, education, urbanisation and such like would put extreme pressure on expenditures for environmental goods which might be given a low priority. In the light of this scenario, respondents were asked to express their WTP for the various benefit categories identified.

Elicitation question bias plays a crucial role in CV question formats. This exists when the elicitation question used does not clearly communicate a request for both the highest bid a person will pay before foregoing his utilisation of the good as well as a commitment to pay the amount. The converging bidding technique attempts to secure a maximum WTP amount, while the reference to the respondent's budget constraint is also designed to reinforce a commitment to the amount. Avoidance of this form of bias requires that the scenario put before the respondent be clear and that pretesting be undertaken to strengthen this section of the survey instrument.

Another issue to be addressed in the design of the survey instrument was to take cognisance of possible context bias. This is concerned with the notion that WTP amounts are subconsciously influenced by the questions in a survey instrument which precede the WTP scenario. The notion that

instrument context bias may be a factor in survey instruments is based on the theory of how humans process information. However, the evidence suggests that this form of bias is not as pervasive as was once thought. According to Wyer and Srull (1981), the theory holds that when people are called upon to judge an event, they sample only the most easily accessible subset of the information available in their memory. For this reason, the survey instrument was designed to elicit information of a more general nature before moving on to the WTP questions. While there is recognition that context effects can potentially create bias in a CV survey, no studies could be found which related to this problem in a CV survey context.

3.1.7 Subcomponent and Sequential Aggregation Bias

Researchers often want to add together separate measured components of benefit. These components may be different benefits which combine to form a larger programme (multiple good sequence aggregation bias), or be different geographical regions which are added together, (geographical sequence bias). Under certain conditions it has been shown that these aggregations can lead to double-counting (Hoehn and Randall, 1987). They also show that when benefits are sequentially measured in the same study, the order in which the sub-components are presented will influence the values ascribed to them. Goods presented first will have the

highest value attributed to them. This behaviour is explained by the fact that respondents value each good sequentially as if it were a marginal increment to the existing set of environmental goods which they currently consume, instead of valuing each good as an initial possible increment.

This implies that studies conducted at different sites cannot be aggregated to obtain estimates of the larger area under consideration. In the case of this study, however, this has been taken into account. The survey instrument does not refer to any of the sites' attributes but to NPB as a single entity - this circumvents the aggregation bias which may otherwise influence total value. Mitchell and Carson (1989, p.293) conclude that the CV method is best equipped to handle this ubiquitous bias because of the technique's flexibility in sequencing components. The iterative bidding process employed in this study and the fact that respondents were reminded strongly of their budget constraint and invited to change their bids, countered the sequencing bias to some extent.

CHAPTER 4

CONTINGENT VALUATION ESTIMATES OF PRESERVATION VALUE

Introduction

In the preceding chapters, the theory and methodology of valuing public goods using the contingent valuation method was reviewed. The purpose of this chapter is threefold. Firstly, the design of the survey instrument is discussed as well as the criteria employed to select the sample. Secondly, the data collected are analysed and thirdly, the results are presented.

Before the survey instrument was taken into the field it was extensively tested and then reviewed by a number of people who have dealt with survey design and implementation (personal interviews with Butler-Adam, 1991; de Gasperis, 1991; and Tapson, 1991).

4.1 Survey Procedure

The survey was initiated with interviewers introducing themselves to respondents at the Park and outlining the

purpose of the study. The following steps were taken to collect information from respondents.

The survey instrument was divided into five broad categories. The aim of the first category was to determine the current value of recreational equipment. Other categories included socio-economic data, personal taste preferences, willingness-to-pay (WTP) data and scores for the conjoint analysis.

Individuals were sampled from four survey areas,namely Royal Natal National Park, Hluhluwe Game Reserve, Sodwana Bay National Park and Midmar Public Resort Nature Reserve.

4.2 Data Collection

The following section describes the survey instrument used in this study (see Appendix I).

The first section of the survey is designed to collect information on both the quantity and current value of selected recreation equipment owned by households. The list is not exhaustive and was included for two reasons. Firstly, to determine whether there is a correlation between the value of the equipment and WTP elicited from the respondents' bids and secondly, to assist in the logical editing of

questionnaires to see if there was consistency in the respondents' replies.

In addition to the information collected on recreation equipment, the survey instrument contained a number of questions pertaining to the socio-economic status of the respondent. One of the reasons for collecting socio-economic data was to enable construction of a multiple regression equation. The equation attempts to establish a relationship between WTP bids and indicators which reflect the tastes and experiences considered important by recreationists.

Another broad range of questions was included in the survey instrument to determine taste preferences which individuals associated with recreation in protected areas. Variables were included which, at first glance, appear to be outside of the usual basket of goods people associate with wilderness recreation. For instance, respondents were asked, in the context of outdoor recreation, what their personal feelings were towards having golf courses, tennis courts, bars, restaurants and supermarkets in a protected area. These were included to examine whether there is any relationship between these items and a WTP bid and also to determine how such facilities would be perceived by recreators. This information will assist planners and managers of protected areas with their development plans.

With regard to outdoor recreation and facilities, respondents were asked to choose from five categories in ranking their attitudes towards various activities and amenities. The categories given were: would avoid (-2); dislike (-1), neutral (0); like (+1), and essential (+2). The 29 items listed were fresh water fishing, sea fishing, game viewing, bird watching, hiking, physical exercise, relaxing, risk taking, horse riding, boating, cycling, bird hunting, game hunting, preserving unique ecosystems, family activities, diving, solitude, canoeing, education, scenic beauty, organised entertainment, restaurants, spiritual inspiration, supermarkets, golf, tennis, bars, entertainment for children, and being with others.

An individual's preference for various types of holiday accommodation is influenced by a number of factors. Respondents were asked to rank their preferences from the following alternatives: hotel, camper/caravan, tent, and chalet/cottage (see Table 4.5).

Individuals were also asked,whether certain bodies adequately represented their interests with respect to conservation areas. The bodies listed included the Department of Environment Affairs, Natal Parks Board and non-government organisations (for example, the Wildlife Society). Their responses were categorised under the

following options: yes, no, and unsure.

Respondents were asked to rank order their preferred destinations from the following selection of habitats: mountain, bushveld, coastal zone areas and protected area resorts. Each of the environment types was accompanied by a short description to assist individuals. The survey was conducted in each of these environment types in an effort to avoid sample selection bias.

In the fourth section of the survey, WTP bids were elicited from respondents. Before answering the questions respondents were provided with some background information concerning the allocation of funds by government to protected areas' management authorities (like Natal Parks Board) which, in real terms, have been declining over the last ten years.

Allowing for a changing political profile in the future South Africa the scenario was presented that even less funding may be available in a "new South Africa". Protected areas would not be seen as unimportant, but other priorities, for example, health, education and urbanisation, would take precedent. Natal Parks Board would have to add a survival strategy to its sustainability policy.

Given this scenario and the fact that tax money earmarked in the past for protected areas may no longer be available,

respondents were asked to give their responses to the following three questions, bearing in mind that the questions referred to the parks and reserves of Natal and not all reserves in South Africa.

Respondents were asked to state their willingness to pay under three benefit categories: option value, existence value and bequest value. With regard to the first, respondents were asked, "Given that it is becoming more and more difficult to visit unspoilt conservation areas, and the number in fact may decline in the future, would you be prepared to pay a certain amount each month into a special fund to secure your own option to visit an area in the future?" When an amount was elicited from this direct question, a converging bidding technique was employed to determine a maximum WTP amount. This was done by adding five Rand increments to the elicited bid until the respondent answered in the negative. The bid was then dropped in one Rand increments to the point where the respondent's maximum WTP was determined. The option value was then noted.

To determine the existence value, the same bidding procedure was employed in response to the question whether, given the increasing number of factors which are threatening protected areas today, respondents would be prepared to contribute towards a special fund used exclusively to ensure the continued existence of protected wilderness areas, bearing in

mind that the respondent may well never visit them.

The final benefit measurement which was determined was the bequest value. The WTP amount elicited was in response to the question whether respondents would be prepared to contribute towards a special fund which would guarantee that future generations have the opportunity to visit protected areas. Once again the converging bidding technique was employed.

If more than one of the benefit options listed above was allocated a WTP amount, the respondent was reminded of his monthly budget constraint and asked if the bids were affordable given the demands on his budget ceteris paribus. The respondent was then asked, in the light of his monthly budget, if he would like to change the option, existence and bequest values from the amount initially indicated.

The final section of the survey instrument was the conjoint analysis (CA) survey. The technique, objectives and results will be discussed in detail in the next chapter.

4.3 Data Compatibility

The data collected from the different sites was analysed to test whether the results were significantly different. If they were significantly different it would have indicated

that they came from different populations.

Given that WTP values are central to this study, the three WTP amounts reflecting option, existence and bequest values were tested for compatibility. Variables of income and education were also tested. Analysis of variance was used to test the null hypothesis that the data collected from each of the four sites was from the same population in each of the five categories of variables named above.

The analysis revealed that there was no significant difference between sample means obtained for WTP option, existence and bequest values and for income and years of education, consequently the data could be meaningfully aggregated. For details of the analysis of variance exercise, refer to Appendix IV.

"That economic value is given by individual preferences also means that even if a site is judged to have a high ecological value by ecologists, it will have a low economic value unless that judgement is shared by the public. Indeed, potentially, the public might want, and hence be willing to sacrifice other opportunities for, very different sites than ecologists" (Coker and Richards, 1993). The low weights attached to visitor features like restaurants, golf courses, and tennis courts in this study (table 4.1) highlight the point which Coker and Richard make. The data shows that

visitors to NPB sites attach a greater value to the environmental value of a wilderness area than the recreational value of the sites.

TABLE 4.1 VISITORS' TASTES AND PREFERENCES ASSOCIATED WITH WILDERNESS EXPERIENCES

	Mean *	Standard Deviation
Freshwater fishing	3.2	1.1
Saltwater fishing	3.3	1.1
Game viewing	4.4	0.7
Bird watching	4.0	1.0
Hiking	3.9	1.1
Physical exercise	4.0	0.9
Relaxing	4.4	0.8
Risk taking	3.1	1.3
Horse riding	3.0	1.3
Boating	3.6	1.2
Cycling	3.1	1.1
Hunting – birds	1.8	1.2
Hunting – animals	2.0	1.4
Unique ecosystems	4.6	0.8
Family activities	4.3	0.9
SCUBA diving	3.1	1.4
Solitude	3.8	1.1
Canoeing	3.0	1.1
Educational	4.1	0.9
Scenic beauty	4.6	0.6
Spiritual inspiration	3.7	1.1
Being with others	3.6	1.0
Provision of: Supermarket	2.6	1.2
Restaurant	3.1	1.1
Golf course	2.4	1.3
Tennis courts	2.8	1.2
Bar/pub	2.4	1.4
Entertainment for children	3.6	1.1
Organized Entertainment	2.6	1.3

* 1 avoid, 2 dislike, 3 neutral, 4 like, 5 essential n=246

4.4 Socio-economic and Demographic Statistics

From the results of the previous section it was determined that it is statistically acceptable to compare the results taken from one of the survey sites with that of any other site. In this section the survey results are presented and where appropriate, results from the various sites are compared.

Mean values for socio-economic and demographic variables are presented in Table 4.2. The highlight of the table is the

Table 4.2 Socio–Economic Characteristics (*)

Site	N	Days at NPB over 5 years	Average educat–ion (years)	Average age of head of house	Average monthly income	Average house–hold size
Royal National	83	43.9 (49.9)	14.8 (1.6)	43.9 (13.7)	4945.4 (2605.9)	2.8 (1.3)
Sodwana	84	87.5 (68.4)	15.4 (1.3)	36.4 (11.0)	5824.2 (3387.6)	2.3 (1.5)
Hluhluwe	39	37.6 (36.9)	14.9 (1.3)	39.1 (12.0)	5907.3 (2843.7)	2.9 (1.3)
Midmar	40	37.1 (37.2).	14.8 (1.3)	42.0 (11.2)	6709.6 (3232.0)	3.4 (1.4)
TOTAL	246	56.7 (58.1)	15 (1.4)	40.3 (12.6)	5684.4 (3091.9)	2.8 (1.4)

* Numbers in parentheses are standard deviations

visitation rate to Sodwana (87,5), which is approximately twice that of the other sites included in the survey. Unlike the activities offered by other parks, Sodwana's unique SCUBA diving opportunities cannot be replicated at any other NPB resort. This, along with the natural harbour for ski-boat fishing make Sodwana very popular because of the geographical monopoly it enjoys.

On average, visitors to NPB's protected areas use the Board's amenities for about 11 days per year, are well educated (tertiary qualification), about 40 years old (head of household), with joint pre-tax earnings of approximately R5 700 per month (1991 prices). The distribution of days spent at NPB is negatively skewed because, as previously noted, the survey was not conducted during a school holiday and retired people without children spent more time in the parks than the majority of visitors.

The explanation for the relatively higher age of visitors to RNNP is that 26,5 per cent of the visitors interviewed were retired people. This compares with 2,4 per cent, 10,3 percent and 10 per cent for Sodwana, Hluhluwe and Midmar respectively. As mentioned earlier in this chapter, one of the biases in this survey is a time bias. The survey was conducted during the school term, at a time of the year where NPB experiences relatively low visitation rates.

One section of the survey instrument was designed to collect expenditure data on outdoor recreation equipment. The equipment presented in Table 4.3 is by no means exhaustive, but does give

some indication of expenditure on durable recreation goods. Not all of the recreation equipment presented in the table is normally distributed. For example, the total value of fishing equipment is negatively skewed with a modal value of R100 and a median of R500. This is not surprising as fishing is one of the most popular sports in South Africa but most people do not possess very sophisticated equipment. There is however a wide gulf between the quality and price of good equipment. An adequate fly fishing rod made of glass fibre costs around R100 while a good graphite fly rod can easily cost around R900. A 'boat rod' outfit can cost around R3000.

The information was collected for two reasons. Firstly, the responses can be used as an indicator of the socio-economic milieu of the respondent. This helps with the logical editing of the data because it serves as a guide to a consumer's profile. For example, one would query the data collected from a person who indicated that birding and caravanning are important to him and he owns neither binoculars nor a caravan. The second reason is to incorporate the information into the multiple regression equation previously mentioned. The objective of the latter is to determine whether any of these variables have explanatory properties as determining variables of individuals' WTP bids.

Table 4.3 shows that the mean value of boats at Sodwana is R32 047. This expensive investment explains, in part, the high visitation rate to Sodwana. A survey of preferred destinations

distinguished between mountain areas, bushveld areas, coastal areas and resorts. The results indicate that 61 per cent of visitors to Sodwana would visit a coastal area in preference to other parks or resorts (Table 4.4). From Table 4.3 it can be seen that the mean expenditure on fishing equipment by the 52 per cent of visitors identified at Sodwana is R1 456. This is similar to the value of fishing equipment at Royal, and more than three and one half times what visitors to Midmar spend on fishing equipment. The value of recreation equipment belonging to Sodwana visitors exceeds that of visitors to other reserves in every category except caravans and leisure vehicles.

Table 4.3 Mean Value of Selected Recreation Equipment a. (Rands)

Survey Site	Binoc-ulars	Fishing equip.	Nature books b.	Tents	Boats	Caravans	Leisure Vehicles
RNNP	673	1003	634	536	8875	12842	43714
Std. dev. c.	(800)	(1090)	(571)	(431)	(3802)	(7663)	(16449)
% d.	32	51	90	54	12	28	10
Sodwana	972	1456	1142	974	32047	13964	33333
Std. dev.	(753)	(1406)	(1369)	(600)	(17270)	(7284)	(23327)
%	72	52	94	67	22	21	40
Hluhluwe	585	869	632	486	3738	28000	30625
Std. dev.	(573)	(601)	(1307)	(423)	(2007)	(6775)	(16543)
%	80	26	86	29	11	6	23
Midmar	500	408	434	481	8960	12000	25695
Std. dev.	(333)	(356)	(437)	(353)	(9779)	(5888)	(19375)
%	78	61	87	44	47	22	28
TOTAL	717	1018	771	631	16340	13756	32845
Std. dev.	(695)	(1079)	(1055)	(503)	(11281)	(7138)	(19805)
%	78	78	90	52	21	21	25

a. Calculated at current 1991 values
b. For example, birds, animals, plants, trees, grass, etc.
c. Numbers in parentheses are standard deviations
d. Refers to the percentage of respondents owning this equipment

Respondents were asked to rank their preferred destinations out of the four environment types, namely mountain, bushveld, coastal areas and protected area resorts (Table 4.4). This question was included in the survey to obtain some idea of substitute destinations for wilderness area holidays. While visitors to mountain, coastal and bushveld areas all strongly prefer these environment types to all others, the visitors interviewed at Midmar Resort showed no definite preference for a particular environment type. They were equally divided between visiting either mountain area or coastal areas. This information would be useful in the design of multidestination packages in the marketing of NPB's resources.

Table 4.4 Highest Ranked Recreation Destinations (%)

Survey Site (N)	TYPE OF ENVIRONMENT			
	MOUNTAIN AREAS	BUSHVELD AREAS	COASTAL AREAS	RESORTS
RNNP (83)	55.5	24.1	13.3	7.2
MIDMAR (40)	30.0	17.5	37.5	15.0
HLUHLUWE (39)	13.5	62.4	21.4	2.7
SODWANA (84)	20.3	19.0	60.7	0

The information provided in Table 4.5 summarises the respondents' perceptions with regard to the impact and usefulness of selected authorities and associations concerned with natural habitat protection and management.

This question was included to determine how recreationists perceived the role played the by Natal Parks Board in maintaining protected areas. If the Board was held in low esteem by respondents, this could cause biased responses to the survey instrument.

Individuals were asked, "Do you think the following bodies adequately represent your interests with respect to conservation areas?" Given the choice of answering "yes", "no", or "unsure", the respondent was asked about the Department of Environment Affairs in Pretoria, Natal Parks Board and non-government organisations, for example the

Table 4.5 Recreationists Attitudes towards Environmental Agencies

		How well do the following agencies/societies represent the interests of recreationists? (%)								
		Department of Environment Affairs			Natal Parks Board			NGO's (eg Wildlife Society)		
Survey Site	N	YES	NO	UNSURE	YES	NO	UNSURE	YES	NO	UNSURE
RNNP	83	27	20	53	87	2	11	71	2	27
MIDMAR	40	15	20	65	90	5	5	68	5	28
HLUHLUWE	39	23	21	56	82	0	18	85	3	13
SODWANA	84	25	38	35	68	10	23	50	13	36
TOTAL	246	24	26	50	80	5	15	65	7	28

Wildlife Society of Southern Africa. Some 76 per cent of the people interviewed indicated that either they were unsure

what the Department of Environment Affairs does, or that they believe it does not represent their interests. This is in sharp contrast to NPB, where 80 per cent of respondents believe the Board adequately represents the interests of the recreationists in protected areas. Most people (65 per cent) thought that private societies represented their interests adequately.

During the survey individuals were asked what type of accommodation they preferred when visiting a protected area. The results are summarised in Table 4.6.

Table 4.6 Preferred Accommodation (%)

SURVEY SITE (N)	HOTEL	CAMPER/ CARAVAN	TENT	COTTAGE/ CHALET
RNNP (83)	6.0	31.3	15.7	47.0
MIDMAR (40)	10.0	27.5	12.5	50.0
HLUHLUWE (39)	7.7	10.3	7.7	74.4
SODWANA (84)	13.1	19.0	21.4	45.2

The results do not reveal any surprises. It is interesting to note that 18 per cent of respondents indicate a preference for camping at Hluhluwe but facilities for this do not exist. Other supply and demand anomalies concerning this

reserve are discussed in the following chapters.

Respondents' attitudes to 29 different outdoor taste and experience variables were included to estimate a relationship between these variables and the WTP bids. This is discussed in a subsequent section of this chapter.

4.5 Use Value and Willingness-to-Pay Bids

The user costs are a function of the cost of using the site plus the cost of travelling to the site. The travel-cost component was calculated in two stages. Firstly, the kilometre distance between the postal code of the recreation site and the postal code of the visitor's residence was calculated. During the survey individuals were asked what vehicle they usually use to travel to protected areas, as well as the size of the engine. The kilometre rate for fuel, tax and maintenance used by the Automobile Association of South Africa for the appropriate size engine was multiplied by the return distance to the site. The use value then comprises the site costs plus the travel costs per family. The use value has been calculated to be an average monthly amount per family of R133,07.

Given this use value and the average number of recreational days as 11,31 per year (3,9 days per trip multiplied by 2,9 trips per year), the average user cost per recreational day

in any one year is R141,19 ((R133.07*12)/11.31)). The preservation value, as discussed in chapter 2, refers to the willingness-to-pay over and above the user value. The preservation value is the summation of the three different bids: option value, existence value and bequest value. The WTP bids collected during the survey are presented in Table 4.7. It has been calculated that the average preservation value per recreational day is R47,21 ((R44,5*12)/11.31).

Zero bids were included in this analysis in order to calculate the mean WTP of the sample population and not the mean of WTP bids. The inclusion of zero bids contributes to a higher than otherwise standard deviation. The distributions are highlighted in Figure 4,2 and Figure 4,3 depicting use values and preservation bids respectively. The difference between mean and median is evident at a glance. This skewness is evident with option values where there is greater uncertainty. The standard deviations of the WTP bids are consistent with similar work in the literature (Rahmatian, 1982, p.63).

4.6 Statistical Analysis of Survey Results

As discussed earlier, the survey instrument was designed to minimise opportunities for respondents to engage in strategic behaviour or to overstate or understate their WTP values.

Table 4.7 Average Monthly Preservation Value Bids (Rands)*

SITE	OPTION VALUE	EXISTENCE VALUE	BEQUEST VALUE	PRESERVATION VALUE
RNNP	15.4 (16.5)	12.2 (10.4)	12.5 (9.6)	39.2 (26.4)
SODWANA	15.7 (20.4)	20.7 (18.5)	19 (14.7)	55.1 (37.5)
HLUHLUWE	18.9 (14.7)	9.6 (9.5)	11.8 (11.4)	40.8 (28.8)
MIDMAR	13.3 (10.7)	13.3 (12.8)	10.9 (13.6)	38.1 (28.4)
FULL SAMPLE	15.4 (16.5)	14.7 (14.5)	14.2 (12.9)	44.5 (32.0)

* Numbers in parentheses are standard deviations

Distribution of the bids is indicated in Table 4.8, and these results show that bimodal clustering of values was not present, which suggests little strategic bias. Schulze et al. (1981) reviewed a number of contingent valuation studies and concluded that "strategic bias in revealing recreationists' preferences is not likely to be a major problem". From the table it can be seen that 69 per cent of the sample are prepared to pay between R1 and R50 per month and six per cent indicated that they would pay more than R100 per month - mostly as a result of higher Sodwana option bids as supported by their higher visitation rates which is a function of Sodwana's geographic monopoly.

It was calculated that the number of individuals who gave zero bids on the grounds of rejecting either the payment vehicle or the hypothetical market is at the upper limit recommended in

Fig. 4.1 Distribution of User Values

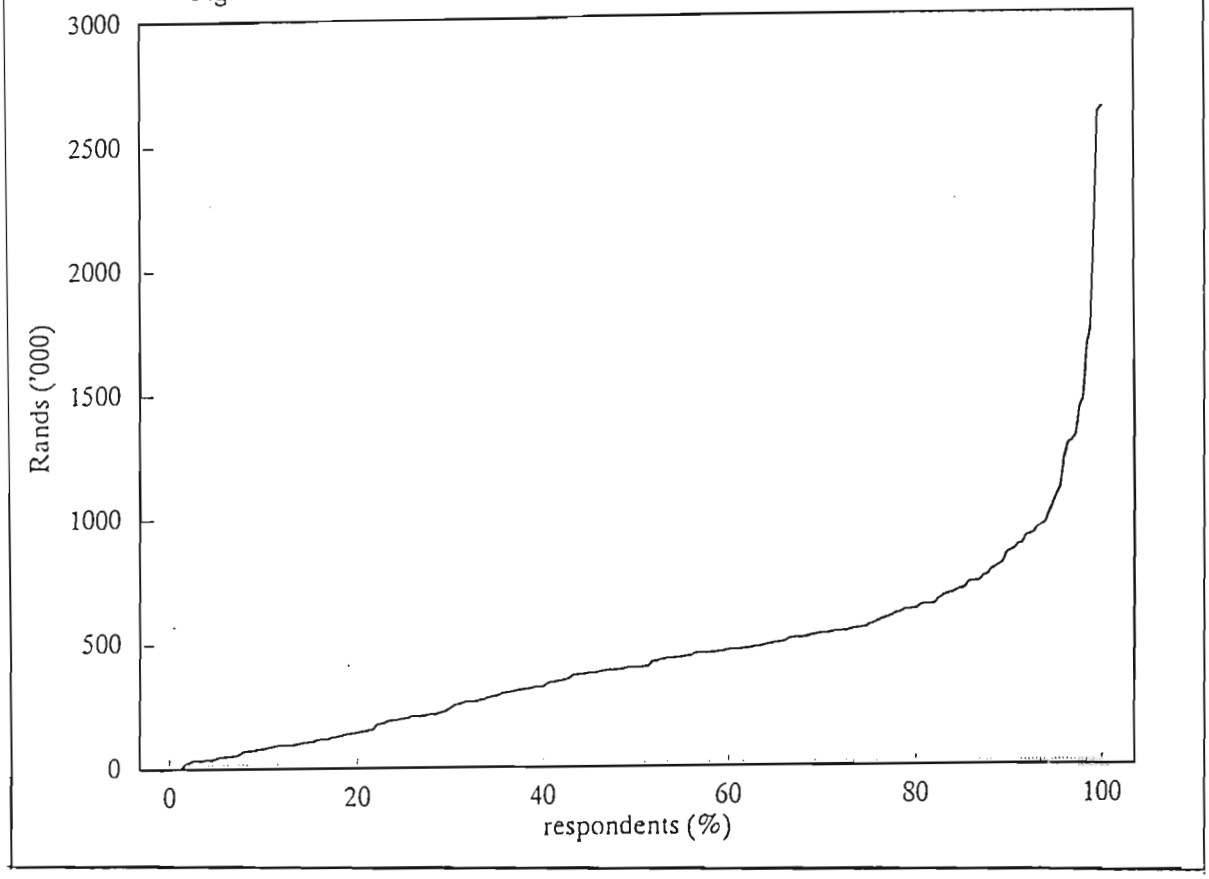


Fig. 4.2 Distribution of Preservation Bids

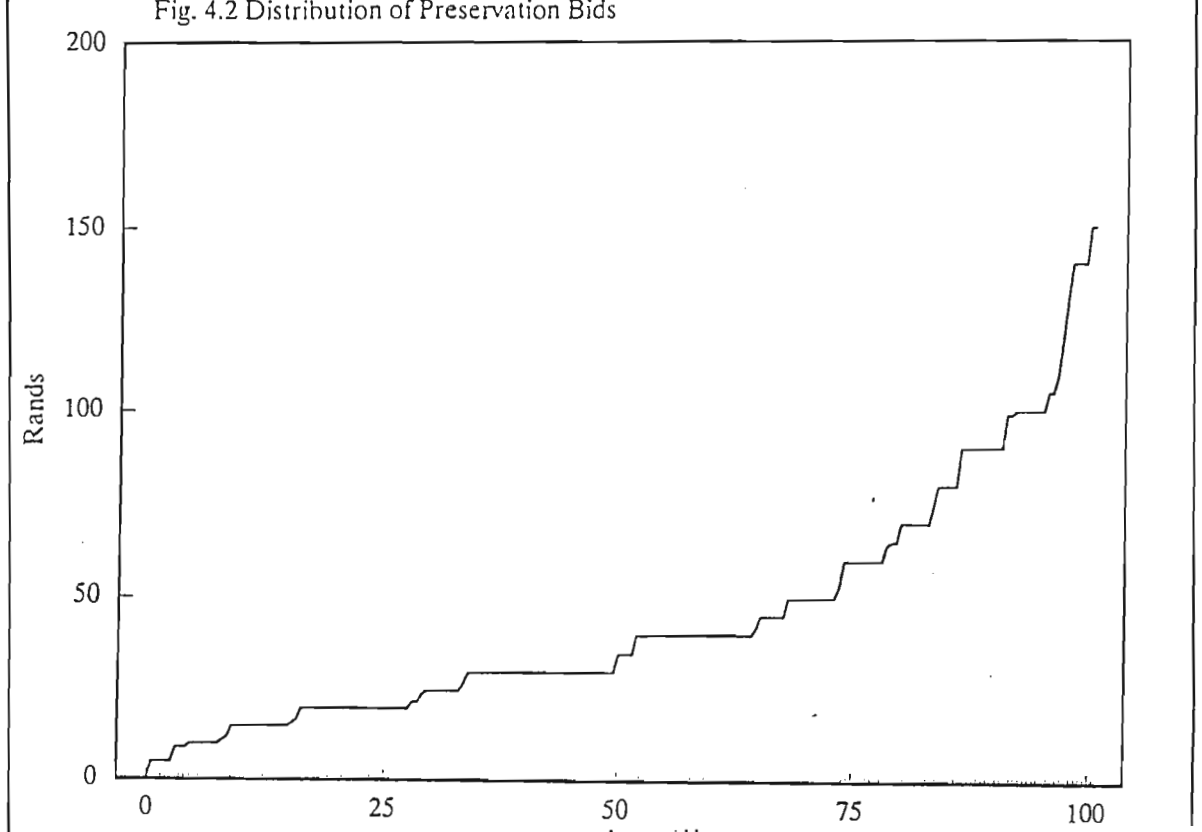


Table 4.8 Distribution of Preservation Bids (Rands/month)

Descriptive Statistics						
Bin	Lower	Upper	Count	%	Cum. Total	%
1	1	9.28	12	4.9	12	4.9
2	9.28	17.56	27	11.0	39	15.9
3	17.56	25.83	38	15.4	77	31.3
4	25.83	34.11	38	15.4	115	46.7
5	34.11	42.38	34	13.8	149	60.6
6	42.38	50.67	20	8.1	169	68.7
7	50.67	58.94	4	1.6	173	70.3
8	58.94	67.22	15	6.1	188	76.4
9	67.22	75.5	11	4.5	199	80.9
10	75.50	83.78	8	3.3	207	84.1
11	83.78	92.05	13	5.3	220	89.4
12	92.05	100	12	4.9	232	94.3
13	100	150	14	5.7	246	100.0

the U.S. Water Resources Council guidelines (1979).

The effect of adding preservation values to user value is presented in Table 4.9. The aggregates were derived by multiplying the mean value bids by the number of household visitors to Natal Parks Board protected areas.

Combining the preservation value with the use value had a large effect on the total value of the survey. The annual preservation value was R22,87 million. Added to the annual use value of R68,38 million, increased total value by 33 per cent. Walsh, Loomis and Gillman (1984) calculated a preservation value of $35 million which was increased by 60 per cent after adding consumer surplus for recreation use of wilderness preservation in Colorado. Meyer (1974) added 54

Table 4.9 Use and Preservation Value of Natal Parks Board, 1991

CATE-GORIES	ROYAL	SOD-WANA	HLUH-LUWE	MID-MAR	TOTAL SURVEY	TOTAL NPB
OPTION VALUE						
Per household / mth.	15.4	15.7	18.9	13.3	15.4	15.4
Total / mth. R'000	153	188	117	126	659	2353
Total / year Rmill.	1.83	2.26	1.4	1.51	6.94	28.24
EXISTENCE VALUE						
Per household / mth.	12.2	20.7	9.6	13.3	14.7	14.7
Total / mth. R'000	121	248	59	126	629	2246
Total / year Rmill.	1.45	2.98	0.71	1.51	7.55	2695
BEQUEST VALUE						
Per household / mth.	12.5	19	11.8	10.9	14.2	14.2
Total / mth. R'000	124	228	735	103	608	2170
Total / year Rmill.	1.49	2.74	0.87	1.24	7.3	26.04
PRESERVATION VALUE						
Per household / mth.	39.2	55.1	40.8	38.1	44.5	44.5
Total / mth. R'000	389	661	258	361	1905	6799
Total / year Rmill.	4.67	7.93	3.02	4.33	22.87	81.59
USE VALUE						
Per household / mth.	86.24	233.52	53.03	68.56	133.07	133.07
Total / mth. R'000	858	2810	327	1252	5698	20329
Total / year Rmill.	10.3	33.72	3.92	15.02	68.38	243.95
TOTAL VALUE / YR. Rm.	14.97	41.65	6.94	19.35	91.25	325.54
Visitors (excl.day)	27800	42000	17900	32200	119900	427800
H/hold or group size	2.8	3.5	2.9	3.4	2.8	2.8
No. h/hold visits	9945	12034	6161	9461	42821	152771

per cent to estimated benefits of salmon fishing in the Fraser River Basin, British Columbia, Canada.

Visiting groups to Sodwana are often not made up from a single family but rather they consisted of a group of people with similar interests who joined together to bring down unit

costs of a trip. These visitors were usually going to visit for a specific reason, for example SCUBA diving or ski-boat fishing. This accounts for the high average monthly use value (travel costs and accommodation and fees) of R233,52 . Typically these groups (averaging 3,5 persons per group) would visit Sodwana about four times per annum. This site-specific destination is explained by unique coral reefs which the divers visit and well known deep sea angling sites. Existence and bequest values for Sodwana are considerably higher than those for the other sites in the survey. Again, the site-specific destination and lack of substitute sites explain, in part, this phenomena.

The results summarised in Table 4.9 show the use value per household as well as a component value breakdown for preservation bids for protected areas. These monthly bids are extrapolated to a total annual protected area value. The table gives the results obtained from each of the four protected areas surveyed as well as the values for the total sample. The last column shows values for all visitors to all NPB protected areas (based on 1990 visitation data). At first glance the monthly use value for Midmar may appear to be quite high - this is partly explained by the fact that it enjoys a relatively high visitation rate of 4,27 trips per year (RNNP is 2,33 and Hluhluwe is 1,33). Sodwana's high visitation rate (4,47) has already been noted as one reason for its high use value.

The household preservation value for the four sites surveyed, as measured by the contingent valuation technique, (that amount above the use price that consumers are willing to pay pay for protected areas) is equal to R22,87 million per annum. This is calculated by multiplying total preservation value of R44,50 per household per month by the number of households and converting to an annual amount. When added to use value a total recreation value of R91,25 million per annum is estimated. If this analysis is extended to all visitors to all NPB protected areas during the period under review, then total annual use value is estimated to be R243,95 million. The total annual preservation value for all Natal Parks Board visitors during 1991 is estimated to be R81,59 million. This is a conservative estimate as day visitors are excluded from the analysis.

During the financial year ending 31 March 1991, Natal Parks Board's total operating expenditure was R65 million and capital expenditure totalled R23 million. Income on the other hand totalled R97 million of which R56 million was subsidies from the provincial administration and R12 million was loan funds (Annual Report of Natal Parks Board, 1991). Thus income not directly generated by the Board totalled R68 million or 70 per cent of current income. The remaining 30 per cent of current income came from income generating activities. In light of this significant shortfall it is

noteworthy that visitors to NPB's wilderness areas are conservatively estimated to be willing to pay R82 million per year more than they are currently paying. The question of how these results can be included in future planning strategies will be extended in subsequent chapters when the results of the conjoint analysis can be integrated with the results of the WTP analysis.

The development of instruments and mechanisms, for example environmental taxes, stamps and recreation equipment levies, which would enable a portion of these values to be realised should be the challenge NPB's planners address now.

Three distinct phases of analysis are identified during the course of the contingent valuation exercise. First, respondents were presented with a detailed description of the wilderness areas and the hypothetical circumstances under which it would continue to be available to them. Second, questions were asked to elicit their willingness to pay for the wilderness areas of Natal Parks Board. The final phase was to collect information regarding respondents' socioeconomic characteristics (for example education, age and income) and their taste and experience preferences relevant to visiting wilderness areas, and their use of the good. This information is used to estimate a valuation function by means of regression analysis of wilderness areas. Statistically significant estimations present evidence for

the reliability and validity of respondents' willingness to pay bids for protected areas. Tests for the reliability of each of the non-use values as well as total preservation value are undertaken in the following section.

4.7 The Determination of WTP

A model was developed to establish the determinants of preservation values revealed by recreationists and shown by the option, existence, bequest and preservation value bids. The usual format to determine WTP was adopted (Walsh et al., 1984; Mitchell and Carson, 1989, p.207; Smith et al., 1986; Randall, 1987; Majid, et. al., 1983; Knetsch and Davis, 1966).

Willingness to pay (WTP) by household i for protection motive j is expressed as: $WTP_{ij} = f(S, T, R)$

where S = a vector of socio-economic variables; T = a vector of taste and preference variables; and R = a vector of information related to recreation use of the protected area.

Various transformations of the variables and equations were investigated to determine the best statistical fit of the relationships. The log transformations of income, the value of recreational equipment and expenditure on books proved to

be more statistically satisfactory than the linear relationships and were used in the analysis. An inspection of scatter plots indicated no apparent evidence of heteroscedasticity. A study of the simple correlations among pairs of independent variables and the multiple correlation coefficients of each of the independent variables indicated that multi-collinearity is unlikely to be a problem.

It was hypothesised that taste variables would be important explanatory variables. However, there is no theoretical basis to determine what factors should be included in a survey to reflect these taste variables. This problem becomes evident when a number of variables reflecting taste and attitudes are good proxies for one another. Walsh et al.(1983) noted that little empirical research has been undertaken on preservation values to act as a guide to the selection of variables. Stepwise regression was therefore employed to isolate the significant independent variables from the selection of socio-economic and taste variables included in the study.

Four separate multiple regression equations were estimated, one for each of the dependent variables: total preservation, option, existence and bequest values. The results are presented in Table 4.10. The equations were significant at the 0,05 level using an F test. The regression coefficient of each of the independent variables included in the

equations had a t value which indicated that the variable was significantly different from zero at the 0,05 but in some cases the 0,10 significance level.

The coefficient of determination, R^2, ranged between .24 and .46 indicating the percentage of the total variation in willingness to pay that was explained by each of the four functions presented. This may be considered a moderate level of explanation. Note should be taken of the fact that the R^2 values are not out of line with other studies and that the high t values and significant F ratios do establish statistically significant relationships, even though the predictive powers of the models are only moderate. Each of the models is discussed below.

Important variables associated with preservation value appear to be age and expenditure on books. A one year increase in age reduces total preservation willingness to pay by 54cents. The sign of the coefficient is negative indicating that the relationship is inverse, which is the case for participation in most recreation activities (Walsh, 1986, ch.6). A one per cent increase in expenditure on outdoor books leads to a 41 cent increase in preservation willingness to pay. This relationship would be expected given both the on-site and vicarious off-site value of information and reading pleasure. Income is an important variable which is positively associated with preservation values. A one per cent increase in income leads to a 51 cent increase in WTP.

TABLE 4.10 REGRESSION ESTIMATES OF WILLINGNESS TO PAY FOR OPTION, EXISTENCE, AND BEQUEST DEMANDS FOR SELECTED PROTECTED AREAS IN NATAL, 1991

Variables	Units	Preser-vation	Existence	Option	Bequest
Intercept		−3.726 (−1.72) *	0.375 (0.18) *	0.908 (0.43) *	−5.772 (−3.40)
Fishing tackle log	Rands	—	—	—	0.188 (2.09)
Outdoor books log	Rands	0.411 (4.79)	0.262 (3.01)	—	0.334 (3.65)
Income log	Rands	0.507 (3.87)	0.430 (3.11)	0.286 (1.89) *	0.507 (3.84)
Age	Years	−0.539 (−1.97)	−0.803 (−2.55)	−0.589 (−1.94)	—
Physical Exercise	1 – 5	—	−0.178 (−2.23)	—	—
Cycling	1 – 5	−0.123 (−1.58) *	—	—	—
Freshwater Fishing	1 – 5	0.371 (3.20)	0.443 (3.67)	0.262 (2.90)	0.405 (3.26)
Saltwater Fishing	1 – 5	−0.331 (−2.71)	−0.413 (−3.28)	—	−0.241 (−1.99)
Game hunting	1 – 5	−0.166 (−2.80)	—	—	—
Bird hunting	1 – 5	—	−0.227 (−2.88)	—	−0.209 (−2.51)
Solitude	1 – 5	0.176 (2.08)	—	—	—
Unique Ecosystems	1 – 5	—	—	—	−0.232 (−2.08)
Spiritual Inspiration	1 – 5	0.128 (1.62) *	—	—	0.135 (1.66) *
Organized Entertainment	1 – 5	—	0.145 (1.77) *	—	—
Bars	1 – 5	0.220 (2.98)	—	—	—
Entertainment for Children	1 – 5	—	−0.173 (−1.98)	—	—
Adjusted R sq.		0.46	0.45	0.24	0.43
F significance		6.85	6.51	6.68	7.02
Observations		246	246	246	246

Numbers in parentheses are t−ratios. Entries left blank did not meet with the significance levels specified (0.05 confidence level and 0.10(*) confidence level).

Taste and experience variables positively associated with preservation value include the importance of freshwater angling, solitude, spiritual inspiration and, ironically, bars or pubs. Saltwater fishing and game hunting are negatively associated with preservation value. This is probably because of the negative sentiments the majority of people associate with hunting as well as the fact that Sodwana's anglers may feel they pay enough for their sport already.

The coefficient of determination, R^2, for the preservation value equation is 0.46 or, expressed differently, the equation explains 46 per cent of the changes in the dependent variable. This indicates a moderate level of explanatory power and approximates other research findings (Walsh, 1986, ch.6).

Existence value is related to the same socioeconomic variables as preservation value. Other variables positively correlated to existence value are freshwater fishing and the importance of organised family entertainment. Variables inversely related to existence value include physical exercise, saltwater angling, bird hunting and entertainment for children. The coefficient of determination for existence is 0.45, again a model of moderate explanatory power.

The estimated equation for option value only includes three variables and explains only 24 per cent of the variation in option willingness to pay. Age, income and angling are the

significant variables associated with this value. The relatively poor results associated with option values are somewhat difficult to explain. Additional explanatory variables associated with uncertainty may be missing from the equation.

Variables associated with bequest values are similar to those that explained existence and preservation values. Income, the importance of angling and the value of books associated with wilderness activities were the most important variables. Others include expenditure on fishing tackle and the association of spiritual inspiration with a wilderness experience. Variables that are negatively associated with bequest values are hunting, saltwater fishing and, curiously, the importance of unique ecosystems. The coefficient of determination indicates that 43 per cent of the variation in bequest values is captured by the explanatory variables.

4.8 Summary

In this chapter the discussion centred on data collection and data compatibility and the estimation of preservation values for selected Natal Parks Board wilderness areas. Empirical procedures were adopted to explore the relationship between recreationists' WTP for these areas and socio-economic, taste and experience variables. The results support the contentions of Walsh et al. (1984), Schulze et al. (1981), Randall (1987) and others, that consumers of protected areas may be willing to pay

more for the preservation of natural systems and that the option, existence and bequest values should be added to the use values to calculate the total economic value of protected areas to recreationists. It is important to note that the estimates calculated in this exercise are based only upon the recreationists at NPB's resorts and are therefore likely to be conservative. It is reasonable to assume that there are non-consumers who place a non-use value on protected areas.

WTP regression equations were estimated and found to be moderately reliable indicators of respondents' willingness to pay for the non-market values associated with wilderness areas.

CHAPTER 5

CONJOINT ANALYSIS OF PROTECTED AREA PREFERENCES

Introduction

In this chapter the preferences and judgement processes which recreationists use when making decisions regarding the utilization of a protected area will be analysed. This builds on the work of the previous chapter where the contingent valuation technique was employed to determine the pecuniary value of selected wilderness areas. To augment these findings, conjoint analysis will be used to examine demand factors associated with the consumption of protected areas as an economic good. This requires rank-ordering and measurement of consumer part-worth levels associated with preferences for different attributes of a wilderness experience.

The concept of conjoint analysis was introduced in Chapter 2 as a hypothetical, indirect behaviour-based method of valuing non-market goods.

5.1 Background and Methodology of Conjoint Analysis

In this section the concept of conjoint analysis is presented. The discussion also addresses the relevant terms and definitions, the design of the questionnaire, data collection and analysis of the results.

5.1.1 Conjoint Analysis

Conjoint analysis is proposed as a method for analysing consumer preference judgements in terms of characteristics that represent the good in question. Lancaster's (1983) treatment of the 'characteristics of goods' underlines this approach. He notes that consumer choice is partly determined by his own personality (his preferences) and partly by the properties of the goods themselves.

The product or output of conjoint analysis are a set of "part-worths" for each level of each attribute. The roots of this technique are found in mathematical psychology, but have been subsequently refined and the technique is now used, principally in the USA, to assess consumer preferences for various goods or services. The objective of the analysis is to assess respondents' overall evaluation of given combinations of the attribute and reduce them to individual

scores (part worths) for each of the attributes that led the respondent to order his preferences in the way that he did (Greenhalgh and Neslin, 1981).

The researcher constructs a hypothetical product which is presented to respondents and the importance of each attribute is determined from the overall ratings. To achieve this the attributes and the categories within each attribute must be known. Each attribute may have a number of levels or categories. For example a single attribute like 'environment type' may have two levels associated with it such as 'mountain area' and 'coastal area'. The categories may be nominal (as in the above example) or scalar.

5.1.2 Defining Attributes

Although a large number of features or attributes can be presented to examine individual preferences, realistically only a limited group or collection can be evaluated thoroughly. This is due to the cognitive limits on the ability of an individual being interviewed to differentiate multidimensional stimuli meaningfully (Greenhalgh and Neslin, 1981). For this reason the number of attributes is limited to about seven generic variables. It has, however, been reported that as many as 25 attributes have been listed on a survey instrument! (ibid.). Irrational or inconsistent choices may result in this situation.

Each of the identified attributes is typically generic in nature. To each attribute specific 'levels' or categories are assigned, as mentioned above. The analysis depends upon the attributes being either dichotomised (at least two levels) or polychotomised (many levels) into these definite, differentiable levels, which may be nominal classifications or reflect a scale of money, distance or suchlike. A dichotomisation of an attribute will enable the researcher to identify the trade-off the respondent makes between levels.

5.1.3 Questionnaire Design

After the attributes and the associated levels of each are determined, the outcomes can be calculated as factorial combinations of attributes. The conjoint analysis (CA) technique estimates part-worth levels based upon the rank ordering of the various combinations of attributes. The problem, however, is that the number of possible outcomes can become very large indeed. A five-attribute analysis is used in which two attributes were dichotomised, and the others divided into three, four and five levels respectively, which leads to 2x2x3x4x5 = 240 possible outcomes. As mentioned earlier, cognitive limitations make this an impossible combination for a respondent to rank in order of preference. The statistical design and analysis in this exercise were

conducted using the Bretton-Clarke Conjoint Designer and Conjoint Analyser technique (Bretton-Clarke, 1986). This system employs an orthogonal factorial design which ensures independence and full representation of all the levels of the attributes using the minimum number of combinations. In this study, the potential 240 combinations was reduced to 28 using this factorial design technique.

5.1.4 Data Collection

The resulting combinations of attributes derived from the factorial design are printed on cards (28 in total) and presented to respondents. The method of collecting data is to ask the respondent to rank his choices in order of preference. Other methods include category rating scales, graded paired comparisons, constant sum paired comparisons and trade-off analysis. Empirical research has shown that there is no substantial difference between these data collection options (Greenhalgh and Neslin, 1981).

5.1.5 Data Analysis

The respondent's part-worth of protected areas is estimated (for the rank orderings employed in this study) using a monotonic analysis of variance (monanova). The algorithm employed finds the set of part-worths or utilities which best

predict or model the original ranked data. The total worth function is calculated from the mean of each measure of part-worth (Bendixen, 1990).

Monanova is the computational basis of conjoint analysis. It involves coding each of the factorial combinations into a set of dummy variables and then the performance of an iterative set of dummy-variable regressions of the criterion variable on the dummy predictors. Each successive analysis of variance however has its criterion value adjusted so that the original rank order is retained. The programme then finds that set of parameter values (part-worths) so that these appropriate sums correlate maximally with a monotonic function of the original ranks (also found by the software). The term "monotonic analysis" applies because each successive analysis of variance maintains the original rank order constraints (Channon, 1990, p.37).

If a part-worth of a particular feature has a negative sign, this does not mean that respondents do not like it. Since the sum of all part-worths of an attribute sum to 0, as long as certain features are positive, by definition others must be negative. Part-worths are thus a relative measure of the value placed on the attribute by the respondent.

A holdout card is used to support the design of the Conjoint Designer model. It is used to validate the design of the

study. The respondent's ratings or rankings of the card is withheld from the initial analysis of the data. Then the results of this initial analysis are used to "predict" the respondent's ratings from the holdout card. If the data are reliable, the predictions will be accurate, and will correlate highly with the data (Bretton-Clarke, 1986, p.9).

Holdout cards are additional cards, over and above the cards required by the factorial design, and are included in the pack to be evaluated and ranked by the respondent. These cards are either to test a specific hypothesis or, as is the case here, to assess the predictive accuracy of the conjoint model which has been developed. A correlation coefficient between the holdout data and the predicted scores is calculated. Each respondent's value function for the good is used to estimate his rating of the holdout card, and the predicted ratings are then compared to the ratings for the holdout card. A perfect coefficient of variation is 1. The results for the models in this exercise ranged from 0,41 to 0,76 which is regarded as satisfactory. The Bretton-Clarke Conjoint Analyser package uses ordinary least squares regression techniques to obtain the value functions.

Essentially three types of analysis are performed in this exercise. First, the relative importance of each of the features is calculated. Second, the average part-worth for each level of each feature is determined by calculating the

highest and lowest values, as well as the magnitude of this difference. For example, the sum of ranges for all features is calculated and the relative importance of feature (i) is then: relative import (i) = 100 * range (i)/sum of ranges. The third form of analysis used is a simulation model. This allows the researcher to simulate various "products", using different features, to determine the choices each respondent would have made if offered a choice of only one of the simulated products. The simulation technique uses a first choice model and is based on the assumption that a respondent will select the most valued product (Bretton-Clarke, 1986).

5.2 Determining Protected Area Consumption Using Conjoint Analysis.

This section addresses the formulation, application and interpretation of conjoint analysis. More specifically the section looks at the research procedure, preliminary interviews and assessment, attribute levels, administration of the questionnaire, results, relative importance of features, part-worths and conclusions.

5.2.1 Research Procedure

The features analysed in this study, which are related to the consumption of protected areas, are derived from the analysis

carried out in Chapter 4. A table of association between visitor willingness to pay for protected area consumption and variables associated with taste, experience and socio-economic factors is presented in Table 5.3. The variables in this table were formulated from the literature review and pilot studies. During the survey every effort was made to describe and define the variables clearly. Visitors were questioned about various tastes and experiences which satisfied their needs or expectations when visiting protected habitats or wilderness areas. Consumers were also questioned regarding factors which had a negative impact upon their outdoor recreation experience.

5.2.2 Preliminary Interviews and Assessment

The preliminary interviews undertaken during the design of the survey were conducted with potential recreationists, protected area managers and planners as well as specialists in the field of survey instruments. Many variables were analysed and five generic attributes were agreed upon which incorporate many of the variables discussed. The attributes which were subsequently built into the conjoint analysis model are presented in Table 5.1.

In practice, most conjoint studies use between five and eight features. Too many features eventually lead to diminishing returns as cognitive ability declines.

No reference could be found in the literature regarding the application of conjoint analysis to wilderness area use but the following results seem to confirm the validity of the method for assessing consumer preferences for protected areas.

5.2.3 Attribute Levels

After the features had been identified, the appropriate classification levels for each feature were determined (see Appendix II). Generally, few respondents will be prepared to work with more than 35 cards and with more than about eight attributes. To this end an effort was made to keep the levels of the features to a minimum. The conjoint designer software makes the process of generating a design very simple. Once the design specifications are entered, the model computes the combinations and thus the number of cards required. The levels which were associated with the attributes of a wilderness experience are given in Table 5.1. The environment types listed on the cards represent a cross-section of the major geographical/habitat types under the jurisdiction of Natal Parks Board. While there are others, many of them are differentiated in a more complicated or scientific manner which would add confusion to respondents asked to rank their preferences. Pretesting of the format revealed that respondents were most comfortable in ranking environment levels described in attribute number one.

Table 5.1 Selected Attributes and Levels of a Wilderness Experience

ATTRIBUTES	LEVELS
1. Environment	– Bushveld – Mountain – Coastal – Resort
2. Activity	– Golf, tennis, etc. – Hiking – Fishing – Water sports – Game/bird watching
3. Accommodation	– Camping/caravaning – Chalets – Hotel
4. Restaurants/ Shops/pool/etc.	– Yes – No
5. Indigenous Habitation	– Yes – No

Attribute number two has five levels associated with it. These activity levels could be expanded substantially, but pretesting revealed that, on balance, they represented most activities. The level "golf, tennis, etc." was included to determine whether these facilities should be incorporated

into the design and planning of parks and resorts in the future.

Levels associated with the accommodation attribute are self explanatory, although it could be argued that tenting and caravanning should be separate. The reason they were left together was that they essentially use the same facilities and it was thought that including another level would add several unnecessary additional cards to the bundle which had to be ranked by respondents.

The levels linked to attribute four reflect whether the presence of shops, restaurants, pool, etc. in a protected area are considered by visitors to affect their enjoyment of the park. The same argument applies to attribute five, where respondents indicate the importance of indigenous fauna and flora to them.

The conjoint design package revealed 25 combinations of the features were necessary to complete the factorial and produced 25 cards to which three holdout cards were added. Checks for cross-correlation and repetition were made. The cards were each checked to determine whether the combinations appeared realistic, and adjustments were made where necessary.

5.2.4 Questionnaire Administration

It took respondents an average of 23 minutes to complete the entire survey instrument. The ranking of the 28 conjoint analysis cards took an average of ten minutes. The data were collected during March and April of 1991 and there were 238 respondents. This differs from the sample size in the contingent valuation analysis because eight of the respondents either did not have time or the weather (usually wind) prevented this part of the survey from being conducted.

Prior to the respondent rank ordering the cards, the attributes and levels were carefully described so as to avoid confusion. The respondents were asked if they clearly understood the principles, as any misunderstanding would distort the results of the survey.

As with the first phase of the survey instrument, no problems were encountered and respondents were willing to complete the questionnaire. This is largely attributed to the fact that the survey was conducted in a relaxed environment. Respondents did not have any time constraints and generally expressed an interest in the research being undertaken.

5.2.5 Results

Respondents were each presented with a set of 28 cards. Each

card described a hypothetical "product" which could be offered in a protected area. The respondents were asked to classify cards into one of five groups, those activities they would either (1) avoid, (2) dislike, (3) feel neutral towards, (4) like or (5) consider essential. Relative part-worth values generated by the model are presented in Table 5.2.

After all 28 cards had been assigned to one of the five piles the respondent was asked to rank order each of the piles. The piles were then put together with the 'avoid' pile at the

Table 5.2 Attribute Part-Worths (%)

ATTRIBUTES	HLUH-LUWE	SOD-WANA	RNNP	MID-MAR	FULL SAMPLE
ENVIRONMENT	17.82	29.60	23.79	21.40	23.38
ACTIVITY	41.01	47.85	36.38	38.64	40.90
ACCOMMODATION	29.06	7.98	17.91	17.64	16.28
SHOPS/POOLS/RSTRNT	0.93	2.25	3.75	6.98	3.33
INDIG. HABITATION	11.18	12.33	18.17	15.34	16.11

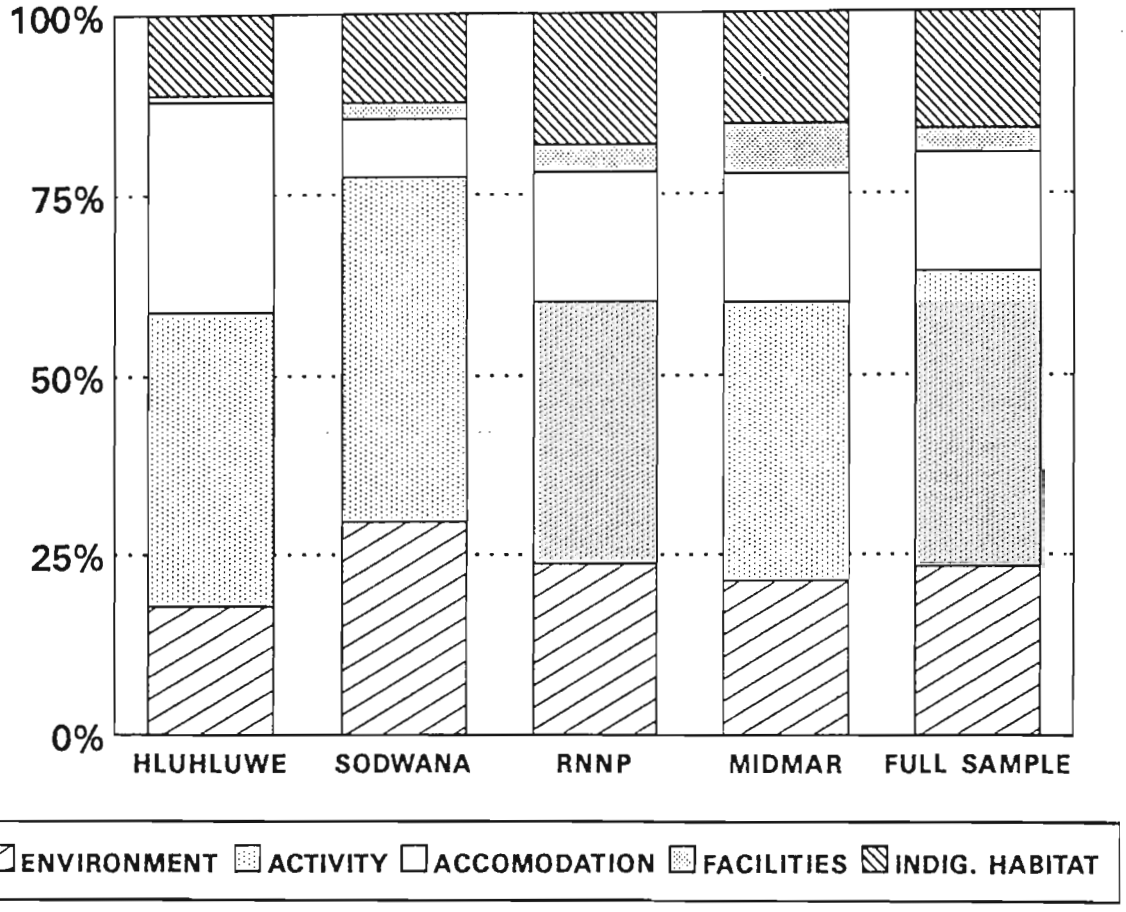
bottom and the essential pile at the top. In effect this served to rank all 28 cards with the most preferred product at the top. The number at the top of each card was recorded so as to reflect the rank order. The results were collated and analysed by the model.

The relative importance of each attribute in Table 5.2 is expressed as a percentage so that the sum of all the attributes is 100 per cent. The table shows the results for each protected area separately as well as for the full sample. A graphical representation of the relative importance of each feature is presented in Figure 5.1. It can be seen at a glance that activity is the most important attribute determining the choices of respondents. This is particularly true of respondents surveyed at Sodwana. The relative part-worths graph shows that activity accounted for 41 per cent of the decision to visit NPB.

The type of environment was the next most important feature and accounted for 23 per cent of respondents' utility. Accommodation type and the importance of indigenous habitation accounted for 16 per cent each, while the presence of amenities like shops, restaurants and swimming pools was relatively unimportant (3 per cent). Activity is more important than environment when deciding to visit a NPB facility. This has important policy implications as NPB's Planning Division have assumed that the attribute 'environment' has been a more important decision factor than 'activity' (personal discussion with NPB Planning Division staff, 1992).

The distribution of recreationists' preferred levels within

Figure 5.1 PART-WORTH RELATIVE VALUES



the attributes is presented in Table 5.2. This table summarises individuals' choice or ranking of levels of attributes (see Appendix V for a graphical representation of this table).

From the table it can be seen that there is no great difference between three of the four levels relating to the environment namely, bushveld (33 per cent), mountain (30 per cent) and coastal (27 per cent). However, only 10 per cent of respondents revealed a preference for resorts above the other types. Recreationists at Hluhluwe showed the strongest preference for bushveld. Given that Hluhluwe is a bushveld area this result is not surprising. Of interest is the relative indifference that Hluhluwe visitors show for an alternative to a bushveld destination. They attach much the same value to mountain areas as they do to coastal areas.

The data for preference levels show that game viewing and bird watching are popular activities. The remaining activities in order of popularity are watersports, hiking and fishing. The least popular combination of activities include golf, tennis, squash and similar recreation centre activities. Surprisingly, respondents at Midmar showed no interest at all in the latter set of activities. The NPB only has four wilderness trails on offer and yet 22 per cent of respondents revealed a high utility for such an activity.

TABLE 5.3 TABLE OF ASSOCIATION OF WILLINGNESS TO PAY FOR OPTION, EXISTENCE, AND BEQUEST DEMANDS FOR SELECTED PROTECTED AREAS IN NATAL,1991

Variables	Units	Linear Regression Coefficients			
		Total preservation	Existence	Option	Bequest
SOCIOECONOMIC					
Income	Rands	9.031 (2.84)	2.598 (1.79)	3.496 (2.13)	2.642 (2.04)
Education	Years	0.685 (2.39)	1.908 (2.75)	—	1.208 (1.93)
Age	Years	−0.536 (−2.96)	−0.186 (−2.25)	−0.191 (−2.03)	−0.147 (−1.98)
Binoculars	Rands	0.006 (1.77)	—	0.003 # (1.63)	0.003 (2.54)
Cameras	Rands	0.001 # (1.62)	—	0.001 (2.39)	—
Equipment	Rands	3.490 (2.37)	—	—	1.624 (2.74)
ENVIRONMENT					
Mountain area	0 −1	0.139* (2.00)	—	−0.147 * (−2.12)	—
Bushveld area	0 −1	—	—	0.131 * (1.88)	—
Coastal area	0 −1	0.092* (1.32)	0.119 * (1.71)	—	0.142 * (2.05)
Resort	0 −1	—	—	—	—
ACCOMMODATION					
Hotel	1 −4	—	—	—	—
Camper/caravan	1 −4	—	—	—	—
Tenting	1 −4	0.063 ** (1.86)	—	—	4.867 ** (1.97)
Chalet	1 −4	0.137 ** (0.95)	—	—	−2.872 ** (−1.59)
ACTIVITY					
Bird watching	1 −5	0.093 * (1.33)	0.104 * (1.49)	—	0.111 * (1.60)
Phys. exercise	1 −5	0.130 * (1.88)	—	0.176 * (2.56)	0.108 * (1.56)
Relaxing	1 −5	0.124 * (1.79)	—	—	0.184 * (2.68)
Cycling	1 −5	0.118 (1.70) *	—	—	0.117 * (1.68)
INDIGENOUS HABITAT					
NB of unique ecosystems	1 −5	—	—	0.176 * (2.55)	—
FACILITIES					
Restaurants	1 −5	—	—	—	0.096 * (1.37)
Supermarkets	1 −5	—	—	−0.101 * (−1.45)	—
Entertainment for children	1 −5	—	—	0.090 * (1.29)	−0.118 * (−1.69)

Numbers in parentheses are t−ratios. Entries left blank did not meet with the significance levels specified below.
Variables included in table are significant at the 99% to 90% confidence levels (# indicates significance at the 85% c.l.).
* =Variables which showed significant association with WTP using Spearman's rank correlation coefficient at a 90 % confidence level

Analysis of preferences for types of accommodation reveal that 43 per cent of respondents at protected areas prefer tostay in cottages or chalets. Camping and caravanning is the second choice of respondents and accounts for some 31 per cent of respondents while 26 per cent of families prefer to stay in hotels. Only about half of the residents at Hluhluwe

Table 5.4 Distribution of Preference Levels (%)
The percentages reflect the preferences of respondents for different attributes at selected sites.

ATTRIBUTES	LEVELS	HLU–HLUWE	SOD–WANA	RNNP	MID–MAR	FULL SAMPLE
ENVIRONMENT	mountain	19.23	21.43	38.89	44.19	30.46
	resort	7.69	7.14	11.11	13.95	9.66
	bushveld	51.28	30.95	28.47	27.91	32.98
	coastal	21.79	40.48	21.53	13.95	26.89
ACTIVITY	Watersport	15.38	39.88	14.58	25.58	25.63
	Hiking	25.64	18.45	29.17	13.95	22.06
	Golf/Tennis/etc.	7.69	2.98	8.33	0	4.83
	Fishing	10.26	17.26	4.17	32.56	14.92
	Game/Bird Watching	41.03	21.43	43.75	27.91	32.56
ACCOMMODATION	Chalet	56.41	44.05	34.03	46.51	43.49
	Camp/Caravan	25.64	27.38	39.58	27.91	30.88
	Hotel	17.95	28.57	26.39	25.58	25.63
FACILITIES shop/pool/etc.	Yes	41.03	57.14	61.11	67.44	57.56
	No	58.97	42.86	38.89	32.56	42.44
INDIGENOUS HABITAT	Yes	55.13	55.95	69.44	76.74	63.66
	No	44.87	44.05	30.56	23.26	36.34

are satisfied with the type of accommodation offered, with a fairly strong preference for camping. Given that accommodation accounts for 29 per cent of the decision to visit Hluhluwe the type of accommodation available becomes an important factor. A quarter of Midmar respondents would prefer to stay in a hotel. However, given the absence of a hotel at Midmar and the lack of camping facilities at Hluhluwe, the results point to a number of opportunities for future developers.

It can be seen that the majority (58 per cent) of respondents favoured the presence of facilities like shops and restaurants. The strong exception is at Hluhluwe, where 59 per cent of respondents rejected the idea of having shops, restaurants and suchlike at the site.

The table also shows that 64 per cent of respondents valued natural habitat in protected areas. The concern was reflected mostly by respondents at Midmar and RNNP - 77 per cent and 69 per cent respectively. Surprisingly, only about half of the visitors to Hluhluwe and Sodwana were concerned whether the habitat was indigenous or not.

5.3 Simple Regression Analysis Comparison

A selection of variables were regressed against revealed

consumer willingness-to-pay for wilderness protection and the maintenance of natural systems. The regression variables are similar to the conjoint analysis attributes. The correlation coefficients associated with wilderness area recreation and willingness-to-pay value support many of the attribute level choices. For example, the activity levels of bird watching and physical exercise; the environment levels of mountain, bushveld and coastal areas; the accommodation levels of camping and chalets; the facility level of restaurants and supermarkets; and the importance of indigenous habitation.

5.4 Conclusions

The usefulness of this exploratory study is that it identifies and measures the value consumers attach to selected attributes and levels of these attributes of protected area consumption. By studying the results of the sample, one is able to develop a "feel" for visitors' needs pertaining to different geographical regions. The attributes of activity and environment type are the most important, accounting for 65 per cent of total worth. The research is also valuable because it concerns defined, actionable issues, which may be tackled objectively. By using an approach such as conjoint analysis to estimate consumer values for a good, better informed decisions regarding the management and planning of protected areas should be made.

A moderate level of confidence can be placed on the results of the conjoint analysis. The coefficient of determination, R^2, derived from regressing the attributes selected in the study against total part-worths generated by the model, explains 64 per cent of the changes in consumers' total worth of protected area utilization.

The conclusion drawn from the relative utility score of the activity attribute is that managers and planners could consider further development of watersports at Sodwana and the development of hiking trails at, in order of utility preference, Hluhluwe, RNNP and Sodwana. Formalising bird-watching activities at Hluhluwe, RNNP and Midmar would be welcome along with possibly introducing birding courses. One particular venture that authorities could investigate is hotel development at Hluhluwe. At Sodwana however, while site chalets are the preferred accommodation, hotels are preferred to camping by respondents.

The 'amenity' attribute accounts for only 3,3 per cent of the variation of the aggregated model. Notwithstanding this, the results show that a majority of recreationists at Midmar would welcome this attribute, while at Hluhluwe only a minority were in favour. Of interest with respect to this result is a statement in the Financial Mail (March, 1991) made by the Chairman of Natal Parks Board that "... One

change will be that NPB reserves - largely self-catering before - will have more shops and restaurants." This approach would appear to be at odds with the demonstrated preferences of the majority of users of the reserves.

The respondents at RNNP indicated a preference for indigenous habitation in protected areas. This attribute accounts for, overall, 16,1 per cent of the total variation.

The results of this analysis indicate that the technique is sufficiently rigorous to be profitable to the NPB.

CHAPTER 6

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This thesis has addressed a number of economics-related topics which are associated with protected areas. The work has approached the question of quantifying the benefits to recreationists of using protected areas and identified the attributes which attract recreationists to protected areas. It has been shown that users or consumers of wilderness areas pay an amount which is conservatively estimated to be only 65 per cent of the value which they place on the outdoor experience.

This chapter is divided into two broad sections. The first section consists of a brief summary of the work undertaken. The second section presents conclusions which have been drawn from the research and analysis. The focus of this thesis is first, to demonstrate how the value of natural resources can be quantified and the results made rigorous enough to be included in the arithmetic of decision making. This requires the application of the contingent valuation technique to value protected area consumption at four selected Natal Parks Board sites. Second, it attempts to derive a better

understanding of environmental preferences among recreationists by examining the nature of the relationship between protected area use, socio-economic variables and recreationists' value for various attributes of wilderness areas.

The research has shown that users place a value on the preservation of current levels of consumption of protected areas under the jurisdiction of Natal Parks Board. These values have been calculated using a contingent valuation method of estimating the value of non-market goods. The survey instrument was carefully constructed so as to avoid potential bias. Further, a measure of the relative preference visitors have for the use of protected areas has been identified and analysed.

These results should provide managers and planners of protected areas with useful insights into valuation and consumption patterns and preferences for a scarce economic good, that is, protected wilderness areas.

6.1 Conclusions

Used together the contingent valuation and the conjoint analysis techniques should yield results in terms of resort planning, marketing and increased earnings. Administrators of protected areas should benefit from this type of

socio-economic analysis and move towards identifying what the consumer wants from NPB. It is not enough to simply declare an intention to be more competitive in the business of recreation and still have a purely supply side approach to business. It is essential that resources go into studying the opposite side of the wildlife industry - people or, expressed differently, the consumer.

A number of conclusions may be drawn from the analysis; some are specific and others of a more general nature.

6.1.1 Specific conclusions

(i) The use of economic analysis to assist in management and planning of protected areas introduces valuable perceptions to the decision making process. The role played by economists in assigning economic values to quantitative data associated with natural systems is important, especially where cost-benefit analysis is used to assist decision-makers trying to justify budget allocations, resource usage, pricing and commercialization strategies. Financial analysis of alternative uses for natural areas can be extremely misleading. Financial analysis is designed to measure costs and benefits using market prices and excludes factors which are not traded. Since many of the benefits associated with the preservation of

wilderness areas are very difficult to measure and are often not traded in markets - this leads to the value of the conservation alternative as opposed to some other development alternative, being understated. This could lead towards a development bias if conservation benefits are excluded from the economic analysis of alternative uses of natural resources.

(ii) Given that budget allocations to protected area managers are declining, the results of the type of research undertaken in this study could assist managers in their motivation for funding. Even though adequate land may be made available, these areas may not have sufficient funds allocated to them to be correctly managed. This could be because many of their benefits are unnoticed and are dispersed over time and space (Dixon and Sherman, 1990, p.21). Often exacerbating the situation is the fact that because the government is not compensated for many of these benefits, there is little motivation to allocate appropriate funds to ensure proper management and provision of these benefits.

(iii) While it is not possible to value the protection of systems directly, it is possible to infer values associated with either direct or indirect benefits.

The analysis of taste and experience variables may be useful to decision-makers in a number of fields, for example recreation, tourism, emerging businesses and education.

(iv) Where market data are not available the contingent valuation method (CVM) attempts to discover how people would value envisaged environmental changes by asking direct hypothetical questions of a survey population. The CV technique is widely applicable and is often the only instrument available. For example it is the only method which can be used to derive option and existence values. CV shows promise as a powerful tool for measuring the economic benefits of the provision of nonmarketed goods. The results obtained indicate that the contingent valuation method can be used to determine recreationists' valuation of protected areas.

(v) The CV approach produces consistent responses. The bids elicited from respondents are plausible in the framework of socio-economic influences. The technique provides empirical results which can be meaningfully incorporated into analysis of the value of wilderness areas.

(vi) There is a considerable methodological challenge to

conducting a CV exercise. It is difficult to convey to respondents the message of the policy-maker in a manner which is both technically and theoretically understood as well as being credible to respondents.

(vii) Obviously the quality of a CV study can influence the results. However, the results obtained even from a crude CV study can reveal insights if the CV's shortcomings are identified and taken into account during the interpretation of the results.

(viii) Often the factors which make it difficult to quantify benefits are the same factors which prevent public institutions like NPB from capturing these benefits - one of the fundamental factors is nonexcludability. Many of the benefits of a protected area are not confined to visitors to such areas. Scenic views are enjoyed by outsiders. Local farmers and communities benefit from the animals that breed in the park. Private reserves may benefit from traversing rights granted to it and downstream water consumers may benefit from hydrological regulations enforced in the reserves. Governments are forced to carry the costs of these social benefits which accrue to society without receiving direct financial returns from them. People have no incentive to pay for nonexcludable goods - basically they are free riders

and the only way to have people pay for such social benefits is to make them realise that without help some of these benefits may cease to exist.

(ix) Effective control over wilderness areas requires management which in turn is often severely constrained by the lack of money. Given that the results of this CV analysis indicate that there is a significant preservation value, protected area managers need to focus on how to realize some of this surplus. It should be feasible to increase revenue in a number of ways. Possible opportunities (highlighted by Dixon and Sherman, 1990, pp.194-197) include:

- Increasing user charges to collect some of the consumer surplus identified in this study. The typical visitor to the NPB reserve has been shown to be relatively wealthy (joint income of R73 000), well educated (tertiary level), mobile (owns a car) and is willing to pay considerably more for their wilderness experience than they currently do.

- A two-tier fee system whereby domestic visitors pay a lower entry fee than international visitors. Given the high costs of international travel it is unlikely that a nominal additional fee on foreign

visitors will effect their visitation rate significantly.

- A user fee could be levied against researchers entering protected areas where the research conducted does not benefit the host country.

- Concession fees to those providing services to visitors to reserves should be levied. Such levies need not be confined to on-site facilities. For example, the ruins at Angkor Wat in prewar Cambodia "was maintained by the government but was completely open to visitors without any formal payment. This policy enhanced the visitor's enjoyment of the site and allowed casual exploration. The government, however, collected a special tax on all hotel rooms in the nearby town of Siemreap to support its conservation and preservation efforts. Since virtually all visitors to Angkor stayed in these hotels (and the ruins were the main reason for people coming to the town), this was an unobstrusive means of revenue collection. In fact, since the charge was built into the room rates, the visitors did not even realize how the system worked" (ibid.).

- The same principle as the one outlined above could

be applied to recreation equipment produced in or imported into South Africa. For example SCUBA diving is most often undertaken in waters under the jurisdiction of protected area managers, given the identified preservation value, an additional tax could be collected at the sale point of such items and go directly into a special revenue account earmarked for conservation agencies. Obviously the same principle could apply to the sale of other recreational goods to be used in protected areas.

- Royalties could be realized on research products as well as on off-site use activities associated with the protected area, for example, books, photos or films. Concessions could be granted to producers of these products in exchange for a percentage of sales of these products. The Conservation Corporation applies these principles fairly successfully in South Africa. They have exclusive contracts with Walt Disney Productions based on films produced at their Londolozi Game Reserve.

(x) The study revealed that consumers of protected areas have little or no idea how the Department of Environment Affairs (DEA) represent their interests. This is disturbing as it is the government institution involved with the allocation and

distribution of funds from central government. Further, it is the department which has the greatest influence in securing funds for environmental initiatives. Bodies like NPB stand to loose out if their public is unable, through ignorance, to support regional conservation bodies (like NPB) at the national level.

(xi) The results of the non-market valuation study indicate that coastal areas represented by Sodwana have the highest existence and bequest values associated with them. Visitors to these areas should be targeted more carefully with the NPB 'Golden Rhino Card' initiative as they have the greatest unselfish value for the area.

(xii) The high option values exhibited by visitors to bushveld areas like Hluhluwe would indicate that there are opportunities to generate additional revenues from securing the option value. One way this could be achieved would be to accept paid-up bookings in advance for high demand sites during peak times for a premium and the greater the advance period of the booking the greater the premium that would have to be paid. The premium portion of the payment should be non-returnable. This facility could be made available on a differentiated basis,

for example, the option premium to Midmar should be lowest because its option value (R13.30) is lowest. The option premium visitors would pay to reserve mountain and coastal areas would be higher. In this instance they could have the same premium attached to them as the option values are fairly close (R15.40 and R15.70 respectively). Low demand sites would probably sell better on the basis of a discount for advance bookings.

(xiii) Existence and bequest values could be collected through mechanisms such as the 'duck stamps' sold in the USA whereby contributions are made to a special fund via a payment mechanism of stamps. The funds go toward purchasing wetlands to ensure that the breeding grounds of ducks are preserved. Similarly in some countries there is an opportunity to allocate a portion of one's tax refund to a conservation agency. Another mechanism of collecting bequest values may be through bequests themselves.

(xiv) Conjoint analysis (CA), as a proposed method for measuring preferences, can be used as a reliable indicator of both individual and group values of wilderness area attributes.

(xv) One of the values of the CA study comes from

dramatising the utilities that people attach to the attributes identified. By studying these in detail the researcher is able to develop a feel for what recreationists require from an outdoor experience. The research is valuable because it has defined issues which can be acted on to improve the marketing and supply of recreation sites. For example:

- The fact that 'activity' is more important to consumers than 'environment type' when making decisions regarding recreational or wilderness experiences came as a surprise to the planning department of NPB (personal presentation, 1992). The fact that it is almost twice as important should make planners take careful note of who the consumer is and what he wants from NPB. The results showed that in all cases 'activity' was the most important attribute. Hiking is an activity which ranks fairly high on the list of most consumers but it seems NPB does not attach much significance to this activity beyond a low level operation in some of the reserves. At Sodwana respondents attached greater significance to hiking and bird watching than they did to fishing which should not only be interpreted as an opportunity to merely provide further services to visitors but

should also be seen as an opportunity to generate revenue.

- At the opposite end of the scale is the relatively insignificant role played by the existence of facilities such as shops, pools and restaurants. The Board appears to be out of touch with consumers as it has embarked upon an exercise to provide these facilities in reserves. While the existence of these facilities is supported by about 63 per cent of the visitors overall it only contributes about 3 per cent to the value of the wilderness experience. Hluhluwe is the exception, the majority of visitors there strongly oppose the existence of these facilities.

- From the results of the conjoint analysis the ideal wilderness holiday would, on balance, be to stay in a chalet in the bushveld where the main activity is game and birdwatching, the habitat is indigenous and facilities such as restaurants, shops, and swimming pools are available. The worst case scenario would be staying in a hotel at a resort where the main activity was golf or tennis or suchlike, where there were no facilities and the habitation was not all indigenous

- With the exception of Sodwana, hotels are the least attractive form of accommodation to all visitors. Camping/caravanning (27%) is marginally less attractive than hotels (29%) but less preferable than chalets (44%) which are the most popular form of accommodation.

6.1.2 General Conclusions and Observations

Three important themes can be drawn from this research. These include the integration of economic and natural sciences, the promise of CV and CA models and, policy issues emanating from the study.

6.1.2.1 Integrating Economics and Ecology

While economists may believe they have useful analytical insights, many conservation professionals are less than enthusiastic about adding economics to their conceptual tool kits (Churchman et al., 1984, p.4). The tension between the disciplines arises because conservation professionals are often biased in favour of wildlife while the economist, in general, has no such predilection. The conversion of a natural habitat area to agriculture may be viewed by the conservationist as a defeat for nature conservation, while the economist, on the other hand, may view such a

reallocation as entirely rational. For the environmentalist to fully embrace economics, it would require that he loosen his grip on deeply held personal commitments, and for an economist to have a biased view on any particular scarce good would violate the prerequisite of objectivity.

This underlying difference in the respective values of economists and biologists will ensure continued dissent. Economists have, however, invited professional conservationists to consider the advantages of joining forces (Decker and Goff, 1987). It is inevitable that economic arguments will arise in public debates regarding projects or policies which have an impact on natural habitats or systems. The objectives and goals set by environmental organisations have to compete with the goals and objectives of other agencies. In other words, environmental agencies which argue in terms of biodiversity, gene pools and other non-pecuniary measurements have to compete for the same public funds as others for whom most costs and benefits are measured in money terms . In reality politicians assume, all too often, that goods or services without a market value have little economic value. It is this misconception that economists concerned with resource and environmental issues wish to redress. In instances where economics can augment the wildlife or protected area aims, a powerful argument can be presented.

During January 1990 in Stockholm, a Policy Seminar entitled "Towards an Ecologically Sustainable Economy" was arranged by the Swedish Council for Planning and Co-ordination of Research on behalf of the Environmental Advisory Council of the government. Among other things, the following six points on economics and ecology evolved out of discussions between prominent economists and ecologists (Anionsson and Svedin, 1990, p.66):

a. There is a widespread perception that economics and ecology are in conflict. However, economic and ecological approaches to environmental problems represent complementary and potentially harmonious standpoints.

b. Economists and ecologists must work together to develop further the integrated science of ecological economics in order to remove scientific misunderstandings between the two disciplines and to convey the message of integrated science to the public.

   The foundation for believing that economics and ecology can be in harmony is that both sciences look at their subject areas as systems: interlinked ecological systems on the one hand, and interlinked economic systems on the other hand. They share many analytical tools and approaches. There is also a growing realisation that adequate understanding and prediction can only be achieved by treating them as interlinked ecological-economic systems.

c. Economic decisions have an impact on ecosystems and, likewise, ecosystem changes impact on economics. Preservation of ecological capacities is, therefore, a prerequisite for a sustainable economy.

d. Economic valuation is applicable to ecological system functions. Such functions include the <u>direct use</u> made by man of ecosystems, the <u>indirect values</u> of eco- systems such as watershed protection and the <u>intrinsic</u> <u>values</u> of ecosystems. These are reflected in mankind's stewardship role in respect of nature. However, to say that economic valuation is applicable in principle does not mean that such valuations can always be made.

e. Economic valuation may fail to reflect the values of future generations with regard to ecosystem functions and may fail to capture wider concepts of nature. Ecological

sciences can assist in the search for a pluralism of valuation techniques.

f. Economists and ecologists share a concern to develop effective instruments for the control of environmental quality. Such instruments include, but are not limited to: regulation, charges, taxes, and the creation of markets in rights to use the environment. The guiding principles for the selection of instruments are that such instruments should function efficiently and be consistent with minimising the impact of human action on the environment. In addition issues of distribution of benefits and costs as well as fairness need to be addressed.

Clearly, in the context of a developing country, many of the points raised above may be intuitively embraced and lip service paid to the principles. In reality, however, the challenges facing developing countries make some of the abovementioned objectives untenable (Hufschmidt et al., 1983, p.6). Some specific problems facing developing countries with respect to the management and planning of natural systems include:

1. The inability to monitor and enforce existing laws and regulations pertaining to natural systems.
2. A level of poverty which puts a premium on current income-producing activities and, therefore, natural systems protection is something that is not affordable.
3. Scarce public funds.
4. Institutional capacity problems which hamper management programmes.
5. Inadequate socio-economic and environmental data.

Developing countries face greater challenges with respect to environmental management than developed countries faced in the past.

Historically in South Africa planners and managers of protected areas have made very limited use of economics. Economics has been limited to calculating the expenditure on outdoor recreation (including fishing and hunting) in order to compare the results with expenditure on other goods or to demonstrate how important contributions from a particular source are to the economy.

In the USA, managers prepare net economic value results so that budgetary allocations are associated, at least to some extent, with economic efficiency. In South Africa even if one wanted to do net value calculations the data available at Natal Parks Board, for example, are poor - indeed much of the historical data have been destroyed. Estimation techniques and data need to be continually evaluated and improved upon in order to contribute efficiently to the management and planning of protected areas. The planning and management of protected areas in South Africa is a dynamic process which, as new challenges appear, must respond appropriately if natural systems are to survive in the future.

The analysis and quantification of alternatives open to park

managers as well as the description of the social and economic trade-offs will significantly contribute to the decision making process. Cost-benefit analysis is the standard economic approach to describe management alternatives and their implications for society. The measurement of economic benefits has been an area where economists have contributed significantly to protected area management over the last two decades. This area is expected to provide most of the improvements in wildlife and natural systems evaluations in the future (Decker and Goff, 1987).

Since there may be no marketplace to determine the value, for example, of a day's fishing, one must use other means to derive an angler's willingness to pay for recreational opportunities. These methods, including the contingent valuation method, have led to better net value approximations of what could be expected under market conditions.

Environmental and resource economics have a positive role to play in the evaluation of recreation associated with protected areas. The results derived from the benefits estimation technique can help wilderness area managers to attain an efficient allocation of resources.

As in other countries of the world, it is hoped that the derivation of net economic values will become an important

research area in South Africa. One could expect significant improvements in evaluations of fisheries and wildlife as a result of improvements in both the methodology and the quantity and quality of data in these areas.

6.1.2.2 Conclusions on the Models

A primary purpose of this study is to establish a CVM framework that can be used to determine selected Natal Parks Board visitors' willingness to pay for the preservation of protected areas. A second purpose is to establish part worth levels for various attributes of outdoor consumption.

The evidence indicates variables which are statistically significant determinants of preservation values. These include socio-economic factors such as income, education, age and membership of environmental organisations as well as the importance of game viewing, relaxing, fishing and spending on outdoor books and binoculars. Further, the willingness to pay categories of option, existence and bequest were collected and analysed. The form of the results were found to be consistent with those of CVM studies conducted in the USA for similar public goods.

A contingent valuation model is potentially able to directly measure a broad spectrum of economic benefits for a wide range of goods, including those not yet supplied, in a

manner consistent with economic theory.

Alternative techniques, in contrast, are only able to measure some of the benefits and specifically those which already exist.

As to the reliability of CV measures, numerous economists have supported the technique, for example Arrow (1986, p183) states, "Neither the empirical evidence nor the theoretical arguments convinced me that strategic bias is liable to be significant in CV studies." The hypothetical nature of the CV market has not been found to be an impediment to the usefulness of CV studies. Mitchell and Carson (1989) stated that, "On the basis of our reading of the literature on attitudes and behaviour we believe that the properties which have been found to maximise behavioural predictions are largely compatible with the fundamental structure of most contingent valuation scenarios." Further comparisons of results of simulated and hypothetical markets, which are identical, have shown that markets for quasi-private goods are able to predict market results when real payments are involved (Bishop and Heberlein, 1986).

The application of the conjoint analysis (CA) technique in this exercise represents an effort to systematically value individual worth or the relative level of satisfaction associated which form part of the WTP method. The

usefulness of this study is that it highlights the ease with which CA may be applied to recreation planning.

The table of association reflecting individual variables regressed independently against willingness to pay bids reveals results which are supported by the outcomes of the CA exercise. It should be noted, however, that a comparison will only reveal a number of attributes and levels which mutually support the findings. This can be ascribed to the fact that the CA was not designed to specifically test the findings of the CV analysis, but rather to determine part-worth levels limited to given attributes with a relatively small range of levels.

The research outlined in Chapter 5 proposed, illustrated and implemented conjoint analysis as a technique for understanding multi-attribute part-worth outcomes. The applied empirical case study substantiated the practical use of this technique, as well as its ability to present operational alternatives to planning challenges.

In the light of the important role that tastes, experience and socio-economic variables play in the determination of protected area consumption, conjoint analysis should prove to be a useful technique in its own right and certainly as one of the methods to be employed to analyse recreationists' preferences.

6.1.2.3 Policy Implications

The study highlights the problem managers face in identifying and capturing the benefits of protection. Admission fees, accommodation charges and revenue from curio shops are smaller than the identified benefits recreationists enjoy. Furthermore, the benefits which accrue from research, gene pools, and possible natural system benefits (for example, hydrological) are not shown in statements which reflect the value of protected areas (Dixon and Sherman, 1990, p.16).

Budgetary votes should, however, reflect the value policy-makers attach to the importance of protected areas which are undervalued when one looks only at the revenue-generating capacity of a park. Reserves could be viewed by some as a drain on financial resources when compared with alternative uses like agriculture, mining or forestry.

A policy issue which NPB could consider giving some urgent attention to is the lack of economic analysis at the regional development level as well as the applied recreation and environmental economics level. The NPB should subject selected projects and programmes to economic cost-benefit analysis.

The impact of this omission is and will be felt at the practical level as well as the strategic planning level. At a time when the Board is facing particularly challenging issues it needs to play a proactive role in policy development. For example, while reference has been made to user-pay approaches to fund recurrent expenditure, no research regarding the economic principles underpinning these approaches could be found. Another example may be an analysis of costs and benefits associated with the development of roads and camps or the purchase of buffer zones around reserves which could be funded by long-term lease payments from coastal mining operations.

The NPB has made tremendous strides in natural resource management in South Africa and its scientists are highly regarded. A caveat is required however. As funding has declined in many countries, successful management of protected areas reflects a multidisciplinary business approach which responds to market signals like any private sector business. NPB managers may find that they ignore the useful role that social scientists can play, to their detriment.

Assuming that some economic work or research is undertaken, consideration could be given to:

- Developing an economic cost-benefit procedure for wilderness area projects and programmes.

- An evaluation of the net economic value of NPB's existing reserves to assist management to prioritise their assets / liabilities.

- Establish a socioeconomic data base of NPB customers to enable economic analysis to be undertaken. This can be done easily and cheaply using current systems to collect socio-economic data from visitors which would be invaluable for strategic planning.

- Investigate economic mechanisms to reduce consumer surplus. This study has highlighted the correlation between recreation equipment and willingness-to-pay bids. These mechanisms could include levies on equipment (as per fishing equipment in Australia), special funds and taxes.

- An evaluation of the economic benefits from increased on-site user charging for activities such as fishing, hunting and hiking.

- An economic analysis of differentiated pricing policies based on the demand for certain sites and activities as well as upon customer ability to pay criteria.

- Analysis on the economic impact of wildlife and recreational benefits on the local, regional and national economy. How else will the NPB justify to a future government that selected natural resources are efficiently allocated?

- Make recommendations on mechanisms to benefit communities adjacent to protected areas.

- Extend the application of the conjoint analysis technique to profitability analysis by attaching financial values to the levels of each attribute.

In conclusion, the importance of people when planning and managing protected areas was clearly highlighted in 1966 by the USA director of the Bureau of Sport Fisheries and Wildlife (Decker and Goff, 1987, p286), now known as the Fish and Wildlife Service, who stated that:

> The problems besetting wildlife conservation in 1966 are reasonably clear and have scarcely changed in fundamentals in recent decades... We need habitats... We need access... We need know-how... And we need public support. ... Obviously public support is what is required to get more healthy habitat, and access to it, and scientific know-how. ... Fish and wildlife will share the benefit when we have the facts to justify a larger role. To get the facts we need increased research - and I don't mean life history or population dynamic studies - as valuable as they are for management purposes. We need to know our <u>customer</u> better. We need to study the markets - beyond the usual consumptive public. Who is our public - and what do they really want - and what are they willing to pay?

This study has attempted to clarify who NPB's customers are, what their needs are and their willingness to pay. It has provided a framework within which analysis can be conducted by management of wildlife areas and policy makers in order to identify the demands of a particular segment of the recreation and conservation market.

In conclusion it should be noted that the work conducted during the course of this study has resulted in the researcher being able to implement the results in a number of practical ways. For example:

- The approach presented was adapted to evaluate economic costs and benefits of agricultural land and associated roads adjacent to two game reserves - one public reserve and another private game reserve.

- The preliminary results of the thesis have been adapted by the Development Bank of Southern Africa to contribute towards determining opportunity costs associated with water resources in the north-eastern portion of South Africa.

- An instrument is being designed to record socio-economic data from visitors to the National Parks of South Africa.

- The economic benefits of hunting in South Africa is being studied.

- The researcher has received requests from a number of Provincial nature conservation bodies in South Africa regarding the application of the conjoint analysis model developed in this study to assist with their strategic planning assocated with tourism development in nature reserves.

*****

What would the world be, once bereft
Of wet and wilderness? Let them be left,
O let them be left, wilderness and wet;
Long live the weeds and the wilderness yet."

Gerard Manley Hopkins, Inversnaid

APPENDIX 1

SURVEY INSTRUMENT

Survey to estimate the demand for protected conservation areas in Natal

Place of interview:_____ Date:_____

Good morning/afternoon. My name is _____. I'm collecting data for a doctoral economics student of the University of Natal, Pietermaritzburg. The research focuses on environmental economics

This survey is not a Natal Parks Board survey. Your participation is anonymous and voluntary and you may refuse to answer any questions. Most of the questions have to do with your attitudes and opinions and there ar no wrong answers.

1. In order to determine the amount each family spends on selected outdoor recreational equipment, how many of the following items does your family own?

	NUMBER	APPROX. VALUE
1 Binoculars	_____	_____
2 Cameras	_____	_____
3 Fishing equipment	_____	_____
4 Nature books	_____	_____
5 Tents	_____	_____
6 Boats	_____	_____
7 Caravans	_____	_____
8 Leisure vehicles	_____	_____
TOTAL		_____

2. Which conservation/outdoor area described below would you prefer to visit in order of preference?

TYPE	DESCRIPTIVE WORDS	RANK PREFERENC
1. Mountain areas	(trout dams, cool climate, streams horse riding, walks, birds)	____
2. Bushveld areas	(game viewing, walks, indigenous flora, birds, warm climate)	____
3. Coastal zone areas	(fishing, diving, boating, game viewing, walks, birds, generally hot climate)	____
4. Resorts	(picnic sites, braais, swimming pools cycle tracks, boating, fishing, restaurants, play grounds)	____

3. How many days have you spent visiting NPB in the last five years? How many days have you spent in other wilderness areas over the last five years?

NPB _____

OTHER _____

4. Home town _____
Area code _____
Foreign country (if applicable)_____

5. Please circle your household (husband & wife) annual income grouping, before tax. If unsure put combined monthly incomes (R_____).

If a foreigner put total annual income and indicate what currency (income_____), (currency _____)

1	0 - 5 000	11	50 001 - 60 000
2	5 001 - 10 000	12	60 001 - 70 000
3	10 001 - 15 000	13	70 001 - 80 000
4	15 001 - 20 000	14	80 001 - 90 000
5	20 001 - 25 000	15	90 001 -100 000
6	25 001 - 30 000	16	100 001 -110 000
7	30 001 - 35 000	17	110 001 -120 000
8	35 001 - 40 000	18	120 001 -130 000
9	40 001 - 45 000	19	130 001 -140 000
10	45 001 - 50 000	20	140 001 and up

(If an individual cannot or does not want to reveal his monthly income, give him a hypothetical monthly income on mutual agreement, and then continue with the survey.)

6. What is your highest level of education? (circle number)

primary school	1
secondary school	2
non-degree tertiary	3
bachelor's degree	4
post-graduate degree	5

7. What is your age grouping? Circle number next to answer.

Under 18	1	45 - 54	5
18 - 24	2	55 - 64	6
25 - 34	3	65 and up	7

8. Sex (circle number) 1 Male 2 Female

9. How many members are in your household (incl. you)? _____ persons

10. Are you the primary income earner? (circle number) 1 yes 2 no

11. How many days leave does the breadwinner have per year? _____

12. What is the engine size of the motor car you use on your holidays? (circle number)

1300cc	1
1600cc	2
1800cc	3
2000cc	4
2500cc	5
3000cc	6
3500cc	7
>3500cc	8

Make of car _____

Year of manufacture _____

13. Does the distance you have to travel in order to have a holiday in a protected area influence your decision to go there? Y=1 N=2

14. Are you a retired person? Y=1 N=2

15. Are you or your spouse a member of any environmental organisation, e.g. Wildlife Society? Y=1 N=2

16. In the context of outdoor recreation, what is your personal feeling with regard to the following factors? (circle answer)

-2 WOULD AVOID	-1 DISLIKE	0 NEUTRAL	+1 LIKE	+2 ESSENTIAL

	-	-	0	+	+
1 fresh water fishing	2	1	0	1	2
2 sea fishing	2	1	0	1	2
3 game viewing	2	1	0	1	2
4 bird watching	2	1	0	1	2
5 hiking	2	1	0	1	2
6 physical exercise	2	1	0	1	2
7 relaxing	2	1	0	1	2
8 risk taking	2	1	0	1	2
9 horse riding	2	1	0	1	2
10 boating	2	1	0	1	2
11 cycling	2	1	0	1	2
12 bird hunting	2	1	0	1	2
13 game hunting	2	1	0	1	2
14 preserving unique ecosystems	2	1	0	1	2
15 family activities	2	1	0	1	2

	-	-	0	+	+
16. diving	2	1	0	1	2
17 solitude	2	1	0	1	2
18 canoeing	2	1	0	1	2
19 educational	2	1	0	1	2
20 scenic beauty	2	1	0	1	2
21 organised entertainment	2	1	0	1	2
22 restaurants	2	1	0	1	2
23 spiritual inspiration	2	1	0	1	2
24 supermarkets	2	1	0	1	2
25 golf	2	1	0	1	2
26 tennis	2	1	0	1	2
27 bars	2	1	0	1	2
28 entertainment for children	2	1	0	1	2
29 being with others	2	1	0	1	2

17. What holiday accommodation do you prefer? (circle number)

1 hotel 2 caravan/camper 3 tent 4 cottage/chalets

18.User value data:

a. How many adults_____and children_____are in your party?
b. How much did you pay for your car to come into the park or reserve? R_____
c. How long will you be staying in the park? _____days.
d. What was the total entrance/accommodation fee per person (excluding car)? R_____

SCENARIO

Before answering the next few questions it may be helpful to provide some background to them.

During the last 10 years or so the government's allocation of funds towards protected areas' management authorities (like Natal Parks Board) has been dropping.

Given the advent of a "new South Africa" it may be that even less funding may be available in the future. This would not be because protected areas would not be seen to be important, but that there may be other priorities for example health, education and urbanisation, which may be seen as more important in the short term. Natal Parks Board would have to add a survival strategy to its sustainability policy.

Given this scenario and the fact that tax money earmarked in the past for protected areas may no longer be available, I would like to get your responses to the following three questions in particular. Bear in mind that the questions refer to the parks and reserves of Natal and not to all reserves in South Africa.

19.Given that it is becoming more and more difficult to visit unspoilt conservation areas, and the number may in fact decline in the future, would you be prepared to pay a certain amount each month into a special fund to secure your own option to visit an area in the future?

Answer (circle number) 1 yes, 2 no -> Why? _____

If answer is yes ask, "How much would you be prepared to pay per month?" (Continue bidding process by adding R5 increments to total till the respondent answers in the negative. Then drop the bid by R1 increments to determine maximum willingness to pay).

Option value R_____ per month

20. Given the increasing number of factors which are threatening the protected areas today, would you be prepared to contribute towards a special fund used exclusively to ensure the continued existence of protected wilderness areas? Bear in mind that I am talking about the existence of an area and you may well never visit it.

Answer (circle number) 1 yes 2 no -> Why? _____

If answer is yes, ask "How much would you be prepared to pay per month?" (Continue bidding process by adding R5 increments to total till the respondent answers in the negative. Then drop the bid by R1 increments till you have determined maximum willingness to pay).

Existence value R_____ per month

21. Are you prepared to contribute towards a special fund which will guarantee that future generations have the opportunity to visit protected areas?

Answer (circle number) 1 yes 2 no

If no, Why? _____

If answer is yes ask, 'How much would you be willing to pay per month?' (Continue bidding process by adding R5 increments to total till the respondent answers in the negative. Then drop the bid by R1 increments till you have determined maximum willingness to pay).

Bequest value R_____ per month

If yes to >1 for last 3 questions then give chance to change amounts.

22. Do you think the following bodies adequately represent <u>your</u> interests with respect to conservation areas?

Circle answers	YES	NO	UNSURE
Dept of Environmental Affairs	1	2	3
Natal Parks Board	1	2	3
Private societies e.g. Wildlife Soc.	1	2	3

23. Do you generally visit more than one game reserve or park per holiday trip?

(circle number) 1 yes 2 no

If yes, how many destinations do you normally visit per trip? _____

24. CONJOINT ANALYSIS SCORES

APPENDIX II

CONJOINT ANALYSIS CARDS

CARD # 1

ENVIRONMENT:	RESORT
ACTIVITY:	FISHING
ACCOMMODATION:	HOTEL
RESTAURANT/SHOPS/POOL/ETC.	NO
INDIGENOUS HABITAT:	YES

CARD # 2

ENVIRONMENT:	MOUNTAINS
ACTIVITY:	WATERSPORTS
ACCOMMODATION:	CHALETS
RESTAURANT/SHOPS/POOL/ETC.	NO
INDIGENOUS HABITAT:	YES

CARD # 3

ENVIRONMENT:	COASTAL
ACTIVITY:	GAME/BIRD WATCHING
ACCOMMODATION:	CAMPING
RESTAURANT/SHOPS/POOL/ETC.	YES
INDIGENOUS HABITAT:	NO

CARD # 4

ENVIRONMENT:	MOUNTAINS
ACTIVITY:	GOLF, ETC.
ACCOMMODATION:	CAMPING
RESTAURANT/SHOPS/POOL/ETC.	NO
INDIGENOUS HABITAT:	NO

CARD # 5

ENVIRONMENT:	MOUNTAINS
ACTIVITY:	HIKING
ACCOMMODATION:	HOTEL
RESTAURANT/SHOPS/POOL/ETC.	YES
INDIGENOUS HABITAT:	YES

CARD # 6

ENVIRONMENT:	RESORTS
ACTIVITY:	WATERSPORTS
ACCOMMODATION:	HOTEL
RESTAURANT/SHOPS/POOL/ETC.	YES
INDIGENOUS HABITAT:	NO

CARD # 7

ENVIRONMENT:	RESORT
ACTIVITY:	HIKING
ACCOMMODATION:	CAMPING
RESTAURANT/SHOPS/POOL/ETC.	NO
INDIGENOUS HABITAT:	NO

CARD # 8

ENVIRONMENT:	MOUNTAINS
ACTIVITY:	HIKING
ACCOMMODATION:	CHALETS
RESTAURANT/SHOPS/POOL/ETC.	NO
INDIGENOUS HABITAT:	NO

CARD # 9

ENVIRONMENT:	RESORT
ACTIVITY:	GAME/BIRD WATCHING
ACCOMMODATION:	CHALETS
RESTAURANT/SHOPS/POOL/ETC.	YES
INDIGENOUS HABITAT:	NO

CARD # 10

ENVIRONMENT:	COASTAL
ACTIVITY:	GOLF, ETC.
ACCOMMODATION:	CHALETS
RESTAURANT/SHOPS/POOL/ETC.	YES
INDIGENOUS HABITAT:	YES

CARD # 11

ENVIRONMENT:	RESORT
ACTIVITY:	GOLF, ETC.
ACCOMMODATION:	CHALETS
RESTAURANT/SHOPS/POOL/ETC.	YES
INDIGENOUS HABITAT:	YES

CARD # 12

ENVIRONMENT:	MOUNTAINS
ACTIVITY:	FISHING
ACCOMMODATION:	CHALETS
RESTAURANT/SHOPS/POOL/ETC.	YES
INDIGENOUS HABITAT:	YES

CARD # 13

ENVIRONMENT:	BUSHVELD
ACTIVITY:	GOLF, ETC.
ACCOMMODATION:	HOTEL
RESTAURANT/SHOPS/POOL/ETC.	NO
INDIGENOUS HABITAT:	NO

CARD # 14

ENVIRONMENT:	COASTAL
ACTIVITY:	FISHING
ACCOMMODATION:	HOTEL
RESTAURANT/SHOPS/POOL/ETC.	NO
INDIGENOUS HABITAT:	NO

CARD # 15

ENVIRONMENT:	COASTAL
ACTIVITY:	HIKING
ACCOMMODATION:	HOTEL
RESTAURANT/SHOPS/POOL/ETC.	YES
INDIGENOUS HABITAT:	YES

CARD # 16

ENVIRONMENT:	MOUNTAINS
ACTIVITY:	GAME/BIRD WATCHING
ACCOMMODATION:	HOTEL
RESTAURANT/SHOPS/POOL/ETC.	YES
INDIGENOUS HABITAT:	NO

CARD # 17

ENVIRONMENT:	MOUNTAINS
ACTIVITY:	WATERSPORTS
ACCOMMODATION:	HOTEL
RESTAURANT/SHOPS/POOL/ETC.	YES
INDIGENOUS HABITAT:	NO

CARD # 18

ENVIRONMENT:	MOUNTAINS
ACTIVITY:	FISHING
ACCOMMODATION:	CAMPING
RESTAURANT/SHOPS/POOL/ETC.	YES
INDIGENOUS HABITAT:	YES

CARD # 19

ENVIRONMENT:	MOUNTAINS
ACTIVITY:	GAME/BIRD WATCHING
ACCOMMODATION:	CHALETS
RESTAURANT/SHOPS/POOL/ETC.	NO
INDIGENOUS HABITAT:	YES

CARD # 20

ENVIRONMENT:	COASTAL
ACTIVITY:	WATERSPORTS
ACCOMMODATION:	CHALETS
RESTAURANT/SHOPS/POOL/ETC.	NO
INDIGENOUS HABITAT:	NO

CARD # 21

ENVIRONMENT:	MOUNTAINS
ACTIVITY:	GOLF, ETC.
ACCOMMODATION:	HOTEL
RESTAURANT/SHOPS/POOL/ETC.	YES
INDIGENOUS HABITAT:	NO

CARD # 22

ENVIRONMENT:	BUSHVELD
ACTIVITY:	WATERSPORTS
ACCOMMODATION:	CAMPING
RESTAURANT/SHOPS/POOL/ETC.	YES
INDIGENOUS HABITAT:	YES

CARD # 23

ENVIRONMENT:	BUSHVELD
ACTIVITY:	GAME/BIRD WATCHING
ACCOMMODATION:	HOTEL
RESTAURANT/SHOPS/POOL/ETC.	NO
INDIGENOUS HABITAT:	YES

CARD # 24

ENVIRONMENT:	BUSHVELD
ACTIVITY:	HIKING
ACCOMMODATION:	CHALETS
RESTAURANT/SHOPS/POOL/ETC.	YES
INDIGENOUS HABITAT:	NO

CARD # 25

ENVIRONMENT:	BUSHVELD
ACTIVITY:	FISHING
ACCOMMODATION:	CHALETS
RESTAURANT/SHOPS/POOL/ETC.	YES
INDIGENOUS HABITAT:	NO

CARD # 26

ENVIRONMENT:	BUSHVELD
ACTIVITY:	GAME/BIRD WATCHING
ACCOMMODATION:	CAMPING
RESTAURANT/SHOPS/POOL/ETC.	NO
INDIGENOUS HABITAT:	YES

CARD # 27

ENVIRONMENT:	COASTAL
ACTIVITY:	FISHING
ACCOMMODATION:	HOTEL
RESTAURANT/SHOPS/POOL/ETC.	YES
INDIGENOUS HABITAT:	YES

CARD # 28

ENVIRONMENT:	COASTAL
ACTIVITY:	GOLF, ETC.
ACCOMMODATION:	HOTEL
RESTAURANT/SHOPS/POOL/ETC.	YES
INDIGENOUS HABITAT:	NO

APPENDIX III

SUMMARY OF CONTINGENT VALUATION SURVEYS

Key to the numbered items in the surveys listed in the following pages, with key to abbreviations included:

1. Good being valued

2. Year survey was conducted

3. Research procedure(s) used

Mail	ML
Telephone	TLP
Personal interview	PI
Focus group	FG

4. Sample size (usable sample in parentheses); multiple numbers indicate that the study used multiple samples.

5. Willingness to pay (WTP) and/or willingness to accept (WTA)?

6. Were separate benefit categories estimated? Yes or No.

7. Type of geographic area from which sample was taken

Local	L
State	S
Nationwide	N

8. Regression equation/valuation function? Yes or No.

9. Were aggregate policy estimates made? Yes or No.

10. Was a comparison with other techniques made? Yes or No.

11. Elicitation method(s) used

Iterative bidding or bidding game	BG
Direct or open-ended question	DQ
Payment card or checklist	PC

Bohm (1984)	1. Government statistics / 2. 1982 / 3. M / 4. 279 (274) / 5. WTP/ 6. No / 7. N / 8. No 9. Yes / 10. No / 11. DQ
Brookshire, Eubanks, and Randall (1983)	1. Grizzly bear, bighorn sheep / 3. ML / 4. 3,000 / 5. WTP / 6. Yes / 7. S / 8. Yes / 9. No / 10. No / 11. DQ
Brookshire, Ives, and Schulze (1976)	1. Air visibility / 2. 1975 / 3. PI / 4. 104 (82) / 5. WTP / 6. No. / 7. L / 8. Yes / 9. Yes / 10. No / 11. BG
Brookshire, Randall, and Stoll (1980)	1. Elk hunting / 2. 1977, 1978 / 3. PI / 4. 108 / 5. WTP, WTA / 6. No / 7. L / 8. Yes / 9. No / 10. No / 11. BG
Cocheba and Langford (1978)	1. Waterfowl hunting / 2. 1976 / 3. ML / 4. (169) / 5. WTP / 6. No / 7. L / 8. Yes / 9. Yes / 10. No / 11. PC
Conrad and LeBlanc (1979)	1. Development rights / 3. PI / 4. 22 / 5. WTA / 6. No / 7. L / 8. Yes / 9. No / 10. No / 11. DQ
Cummings, Schulze, Gerking, and Brookshire (1986)	1. Municipal infrastructure / 2. 1980 / 3. PI / 4. 486 / 5. WTP / 6. No / 7. L / 8. No / 9. No / 10. Yes / 11. BG
Darling (1973)	1. Urban water parks / 3. PI / 5. WTP / 6. No / 7. L / 8. Yes / 9. Yes / 10. Yes / 11. BG, DQ
Daubert and Young (1981)	1. Instream flows / 2. 1978 / 3. PI / 4. 134 / 5. WTP / 6. No / 7. L / 8. Yes / 9. Yes / 10. No / 11. BG
Deaton, Morgan, and Anshel (1982)	1. Rural-urban migration / 2. 1971 / 3. PI / 4. 396 / 5. WTA / 6. No / 7. S / 8. Yes / 9. No / 10. No / 11. DQ
Devine and Marion (1989)	1. Price comparison information for supermarkets / 2. 1974 / 3. TLP, ML / 4. 1,800, 1,500 (507, 363) / 5. WTP / 6. No / 7. S / 8. No / 9. Yes / 10. No / 11. DQ
Harris (1984)	1. Water pollution control program / 3. PI / 5. WTP / 6. No / 7. L / 8. No / 9. Yes / 19. No / 11. BG
Jackson (1983)	1. Environmental quality / 2. 1969 / 3. PI / 4. 1,248 / 5. WTP / 6. No / 7. N / 8. Yes / 9. No / 10. No / 11. BG

Majid, Sinden, and Randall (1983)	1. Public parks / 2. 1982 / 3. PI / 4. 140 / 5. WTP / 6. No / 7. L / 8. Yes / 9. No / 19. No / 11. BG
McConnell (1977)	1. Day at the beach / 2. 1974 / 3. PI / 4. 229 / 5. WTP / 6. No / 7. L / 8. Yes / 9. No / 10. No / 11. BG
Randall, Ives, and Eastman (1974)	1. Environmental damage / 2. 1972 / 3. PI / 4. 747 / 5. WTP / 6. No / 7. L / 8. Yes / 9. Yes / 10. No / 11. BG
Randall, Grunewald, and coauthors (1978)	1. Surface coal mine reclamation / 2. 1977 / 3. PI / 4. 220 / 5. WTP / 6. No / 7. L / 8. No / 9. Yes / 10. No / 11. BG
Rowe, d'Arge, and Brookshire (1980)	1. Atmospheric visibility / 3. PI / 5. WTP, WTA / 6. No / 7. L / 8. Yes / 9. No 10. No / 11. BG
Sellar, Stoll and Chavas (1985)	1. Recreational boating / 2. 1981 / 3. ML / 4. 2,000 (275, 211) / 5. WTP / 6. No / 7. S 8. Yes / 9. No / 10. Yes / 11 DQ, TILI
Stoll and Johnson (1985)	1. Whooping crane / 2. 1982-83 / 3. ML, PI / 4. 1,800, 800 / 5. WTP / 6. Yes / 7. N / 8. Yes / 9. Yes / 10. No / 11. BG
Sutherland and Walsh (1985)	1. Freshwater quality / 2. 1981 / 3. ML / 4. 280 (171) / 5. WTP / 6. Yes / 7. S / 8. Yes / 9. Yes / 10. No / 11. DQ
Walsh, Loomis, and Gillman (1984)	1. Wilderness protection / 2. 1980 / 3. ML / 4. 218 (195) / 5. WTP / 6. Yes / 7. S / 8. Yes / 9. Yes / 10. No / 11. DQ
Walsh, Miller, and Gilliam (1983)	1. Congestion in ski area / 2. 1980 / 3. PI 4. 236 / 5. WTP / 6. No / 7. S / 8. Yes / 9. Yes / 10. No / 11. BG

Adapted from Mitchell and Carson, (1989)

APPENDIX IV

ANALYSIS OF VARIANCE

Analysis of variance expresses the total variability of a set of data as a sum of the terms, each of which can be attributed to a specific source, or cause, of variation. The measure of the total variation of a set of data used in analysis of variance is:

$$SST = \sum_{i=1}^{k} \sum_{j=1}^{n} (x_{ij} - x_{..})^2 \qquad (4.1)$$

where x_{ij} is the jth observation of the ith sample (i = 1, 2, ..., k and j = 1, 2, ..., n), and $x_{..}$ is the overall mean, namely the mean of all the n.k observations.

As is customary, the quantity which measures the variation among the samples is referred to as the treatment sum of squares SS(Tr), and the measure of the variation within the individual samples as the error sum of squares SSE. The error sum of squares refers to the experimental error, that is, to chance.

The calculations for the sums of squares are as follows:

$$SST = \sum_{i=1}^{k} \sum_{j=1}^{n} x_{ij}^2 - \frac{1}{kn} . T_{..}^2 \qquad (4.2)$$

$$SS(Tr) = \frac{1}{n} . \sum_{i=1}^{k} T_{i.}^2 - \frac{1}{kn} . T_{..}^2 \qquad (4.3)$$

where $T_{i.}$ denotes the total of the observations corresponding to the ith treatment (i.e. the sum of the values in the ith sample), and $T_{..}$ denotes the grand total of all the data.

$$SSB = \frac{1}{k} \cdot \sum_{j=1}^{n} T_{.j}^2 - \frac{1}{kn} \cdot T_{..}^2 \qquad (4.4)$$

where $T_{.j}$ is the total of the observations for the jth block.

In a two-way analysis of variance we compute SST and SS(Tr) according to formulas (4.2) and (4.3), SSB according to formula (4.4), and we then obtain SSE by subtraction:

$$SSE = SST - SS(Tr) - SSB \qquad (4.5)$$

A two-way analysis of variance is presented as follows:

Table A4.1
Two-way Analysis of Variance Categories

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F
TREATMENTS	k-1	SS(Tr)	$MS(Tr) = \frac{SS(Tr)}{k-1}$	$\frac{MS(Tr)}{MSE}$
BLOCKS	n-1	SSB	$MSB = \frac{SSB}{n-1}$	$\frac{MSB}{MSE}$
ERROR	(n-1) (k-1)	SSE	$MSE = \frac{SSE}{(n-1)\ (k-1)}$	
TOTAL	nk-1	SST		

The results for an analysis of variance for the income variance is given in Table A4.2.

Table A4.2
Income Variables from Samples

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Statistic
Treatments	3	13 538,1	4 512,7	2,6
Blocks	38	42 800,1	1 126,3	0,7
Error	114	194 412,9	1 705,4	
Total	155	250 751,7		

At a 5% level of significance, we find that for 3 and 114 degrees freedom $F_{.05}$ equals 2,68, and that for 38 and 114 degrees of freedom $F_{.05}$ equals 1,5. Since the first of these two values is not exceeded by F = 2,6, we can accept the null hypothesis concerning the treatments; and since the second is not exceeded b F = 0,7, we can also accept the null hypothesis concerning the blocks. In other words, the differences between the sample means obtained for the different groups are not significant, as is the case for the difference obtained from the different ecosystem type

There was no significant difference between sample means obtained for income, WTP option values, existence values, bequest values an years of education which are presented in Tables A4.3, A4.4, A4.5 and A4.6 respectively.

Table A4.3
WTP Option Value from Samples

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Statistic
Treatments	3	1 188,9	396,3	1,1
Blocks	38	7 515,0	197,8	0,5
Error	114	41 117,3	360,7	
Total	155	49 821,3		

Table A4.4
WTP Existence Value from Sample Sites

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Statistic
Treatments	3	1 218,9	406,3	2,4
Blocks	38	3 319,2	87,3	0,5
Error	114	19 138,6	167,9	
Total	155	23 676,7		

Table A4.5
WTP Bequest Value from Sample Sites

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Statistic
Treatments	3	1 324,6	441,5	2,5
Blocks	38	4 288,3	112,8	0,6
Error	114	20 264,9	177,8	
Total	155	25 877,8		

Table A4.6
Years Education from Sample Sites

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Statistic
Treatments	3	14,2	4,7	2,4
Blocks	38	79,2	2,1	1,0
Error	114	227,6	2,0	
Total	155	320,9		

Figure 1 ENVIRONMENT ATTRIBUTE PREFERENCES

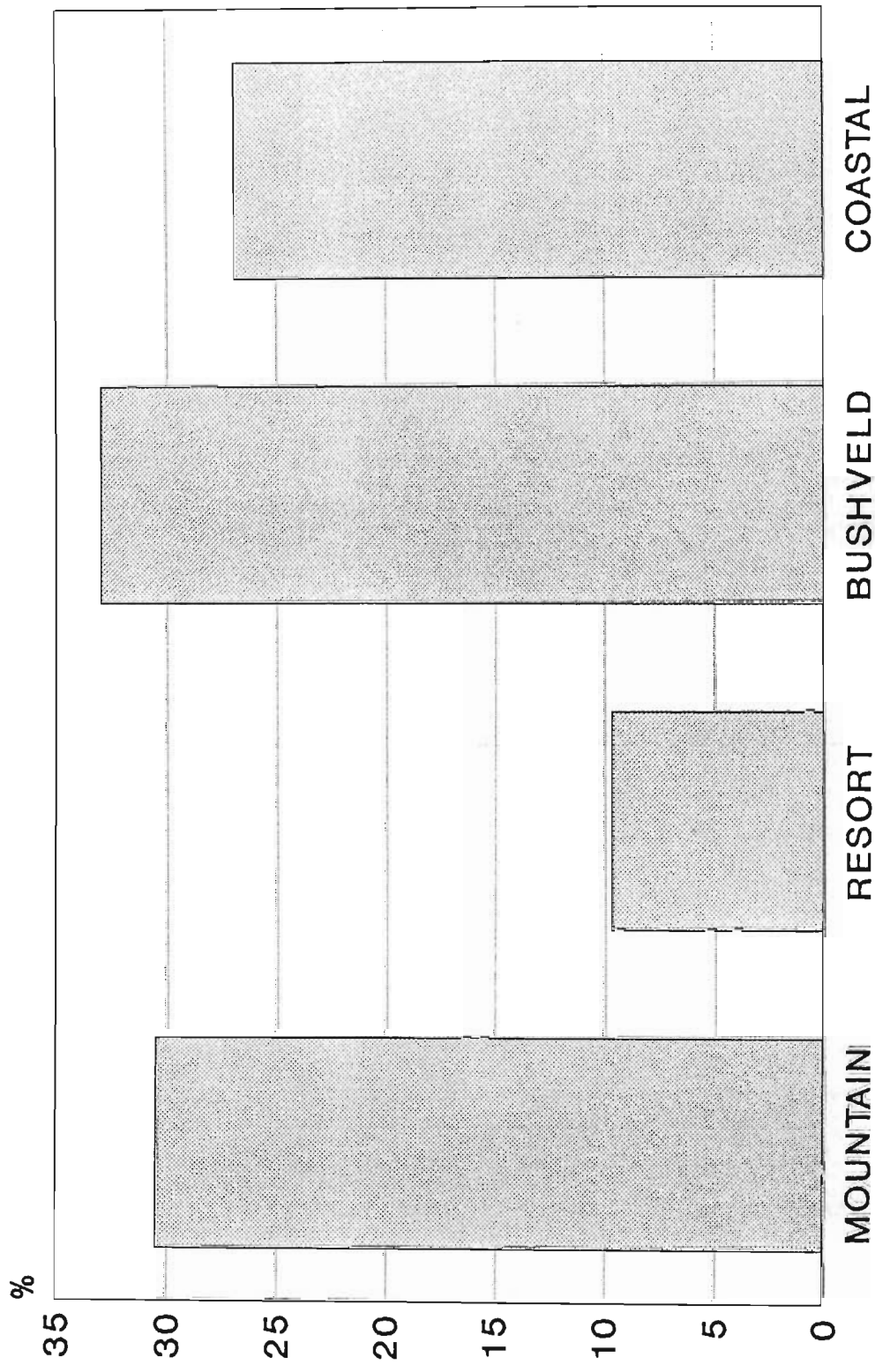
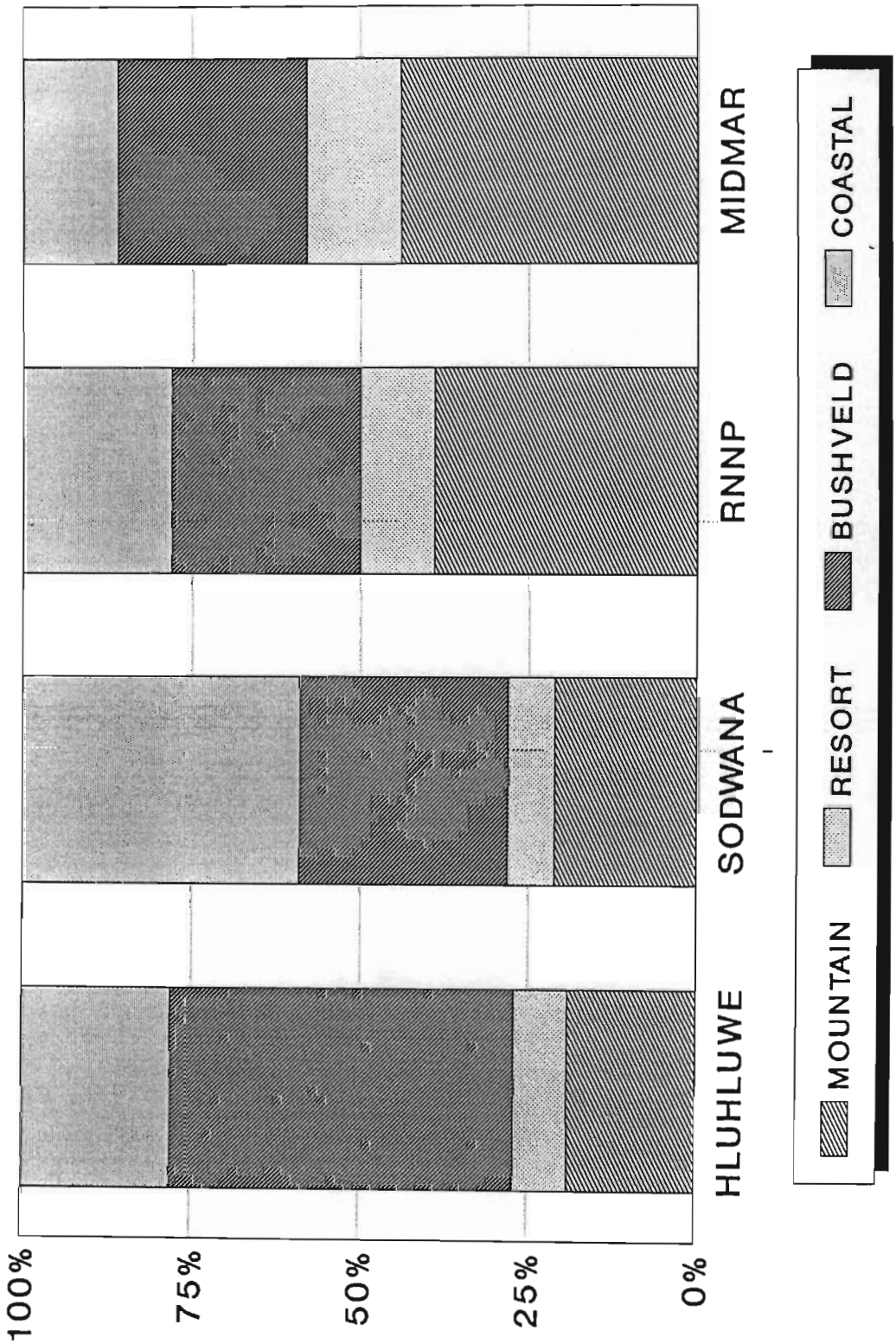


Figure 2 ENVIRONMENT PREFERENCE LEVEL



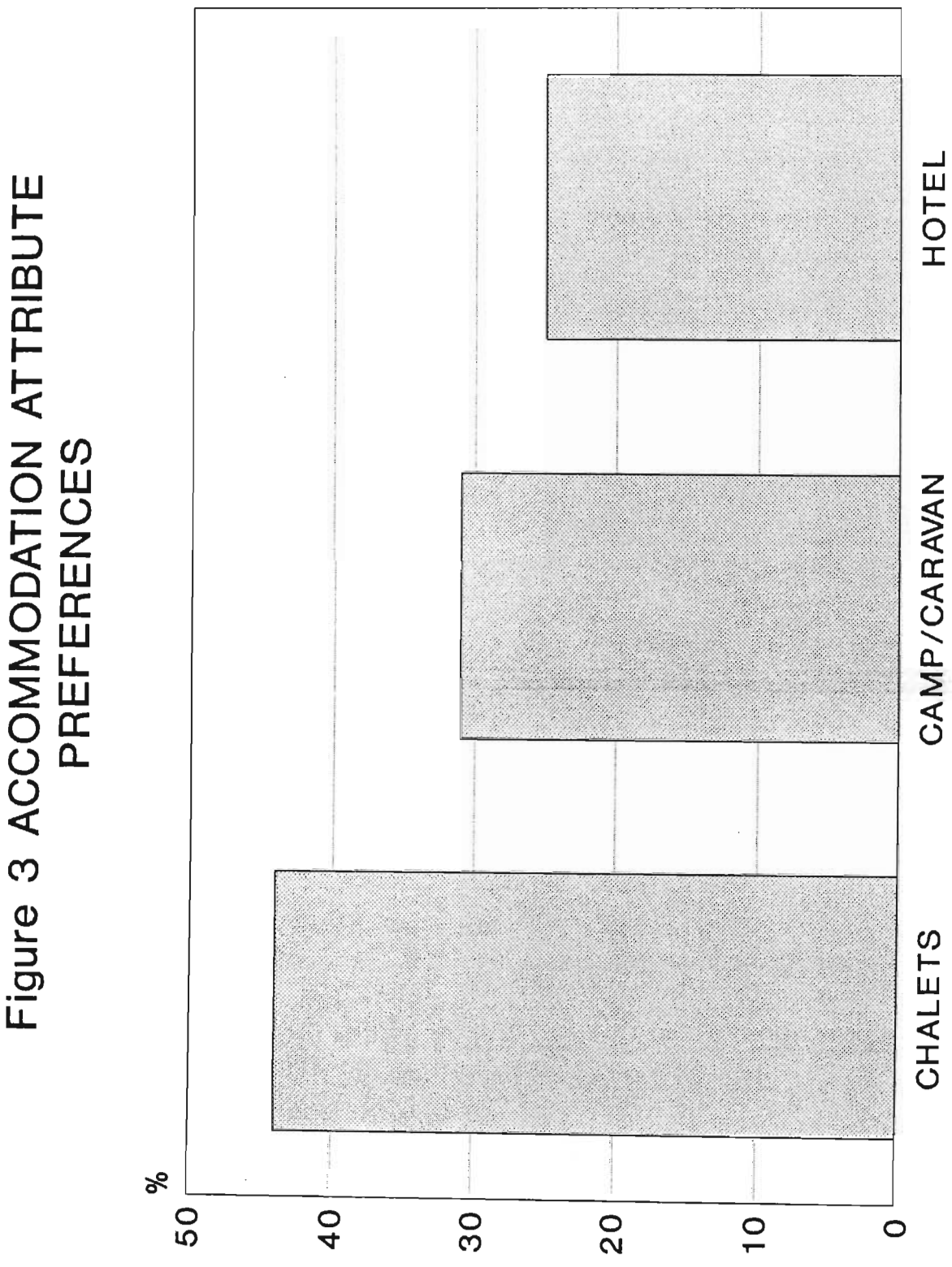


Figure 3 ACCOMMODATION ATTRIBUTE PREFERENCES
%
50
40
30
20
10
0
CHALETS
CAMP/CARAVAN
HOTEL

Figure 4 ACCOMMODATION PREFERENCE LEVELS

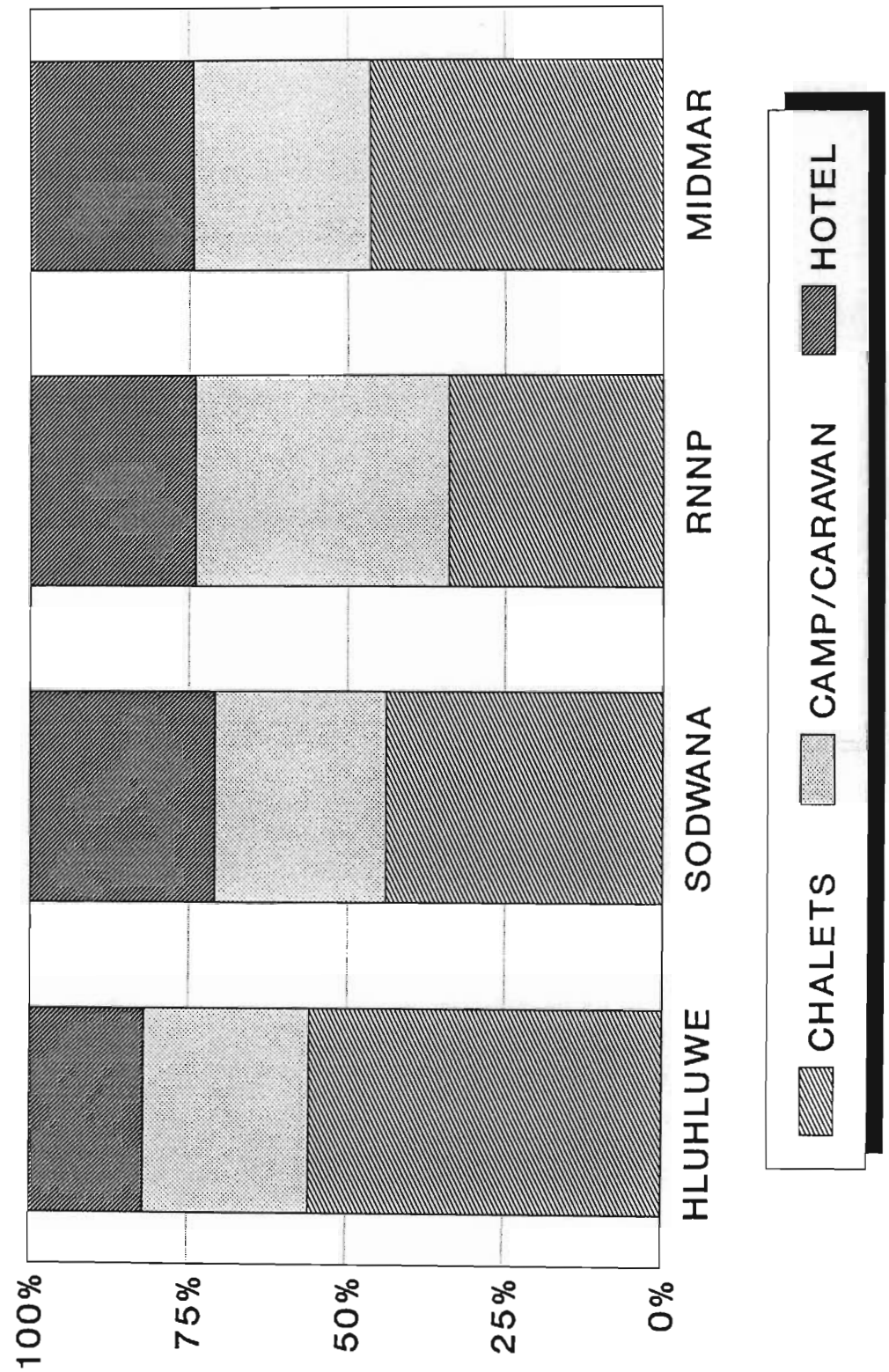


Figure 5 ACTIVITY ATTRIBUTE PREFERENCES

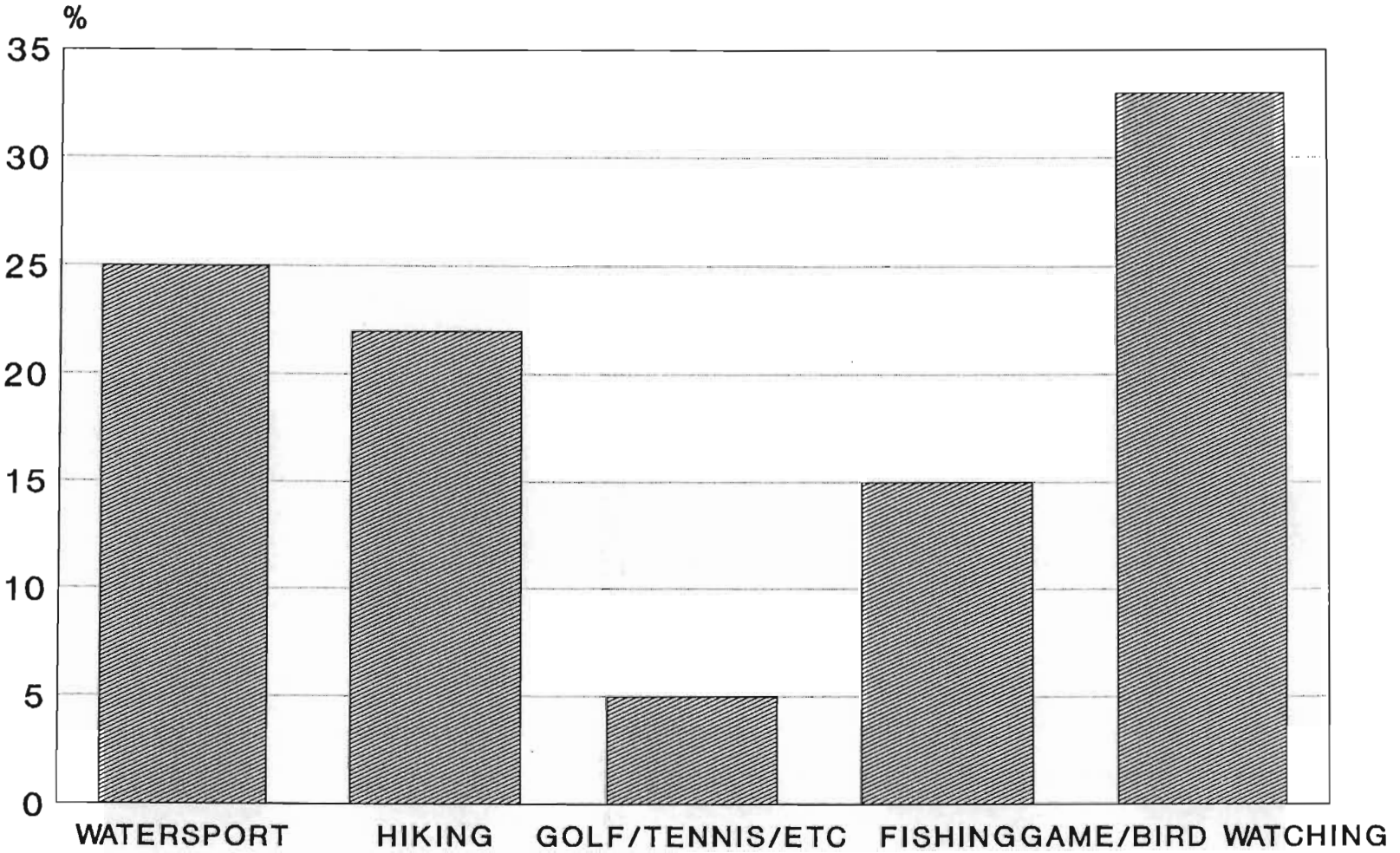


Figure 6 ACTIVITY PREFERENCE LEVEL

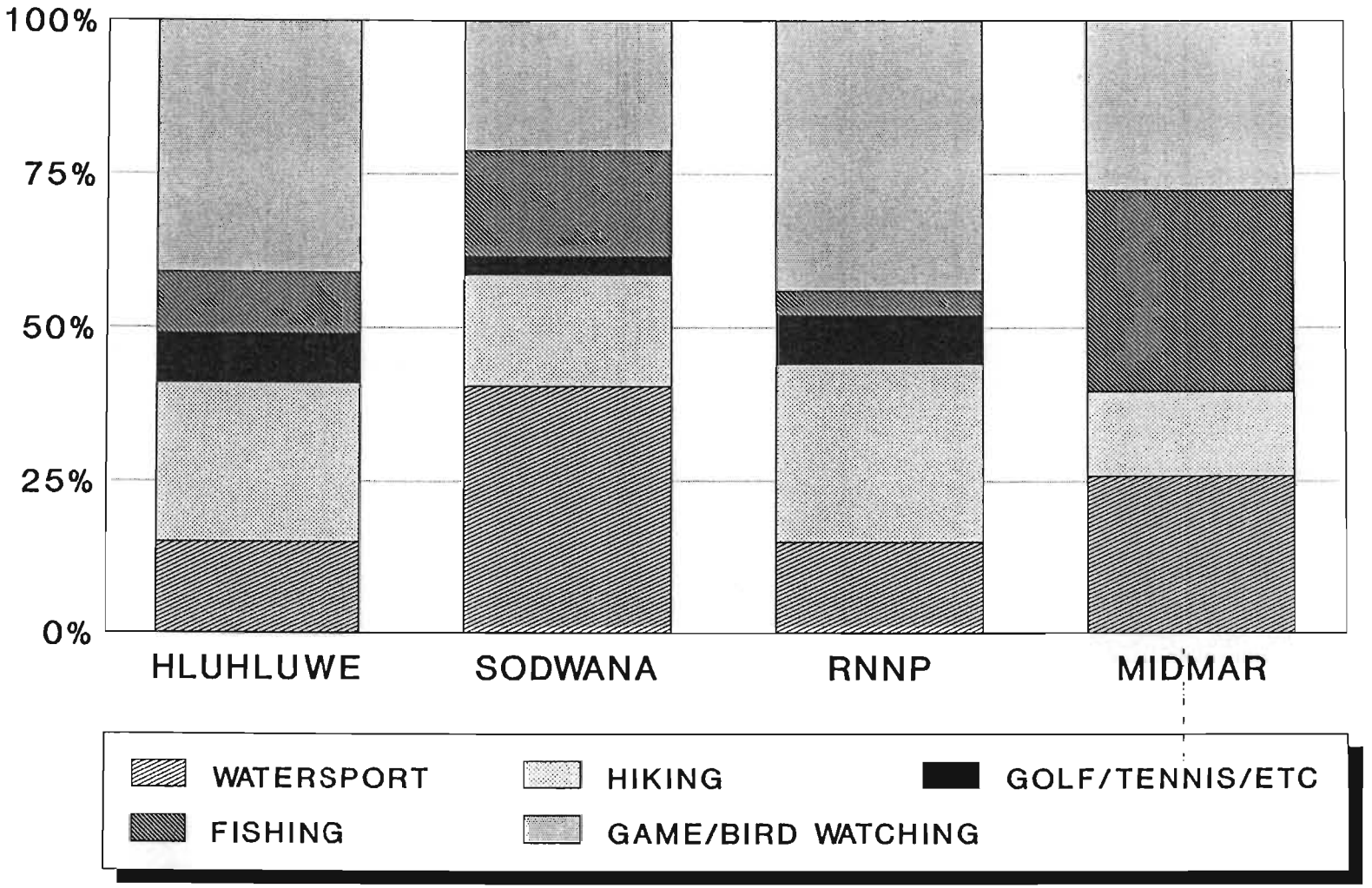


Figure 7 FACILITIES PREFERENCE LEVELS

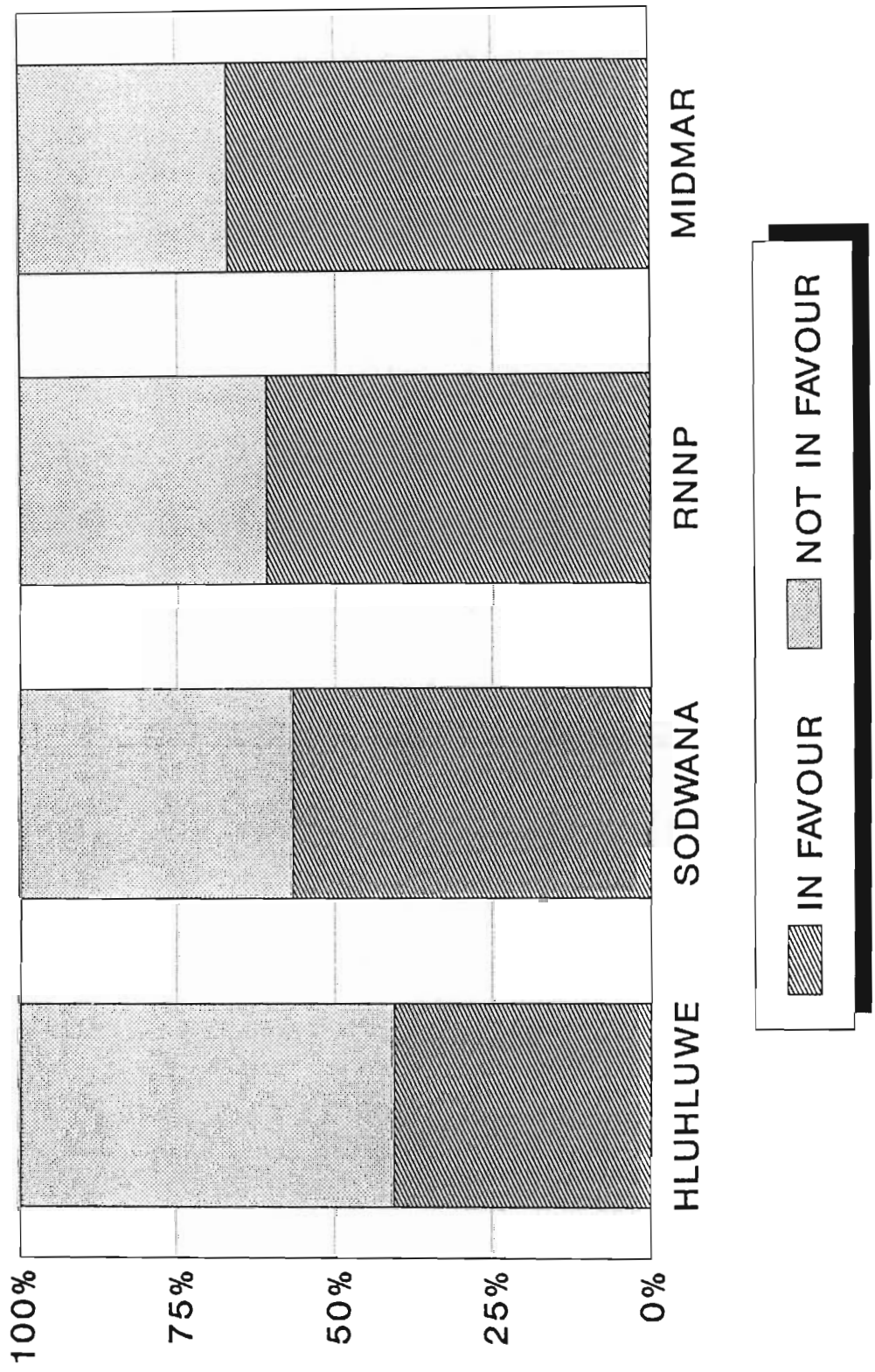
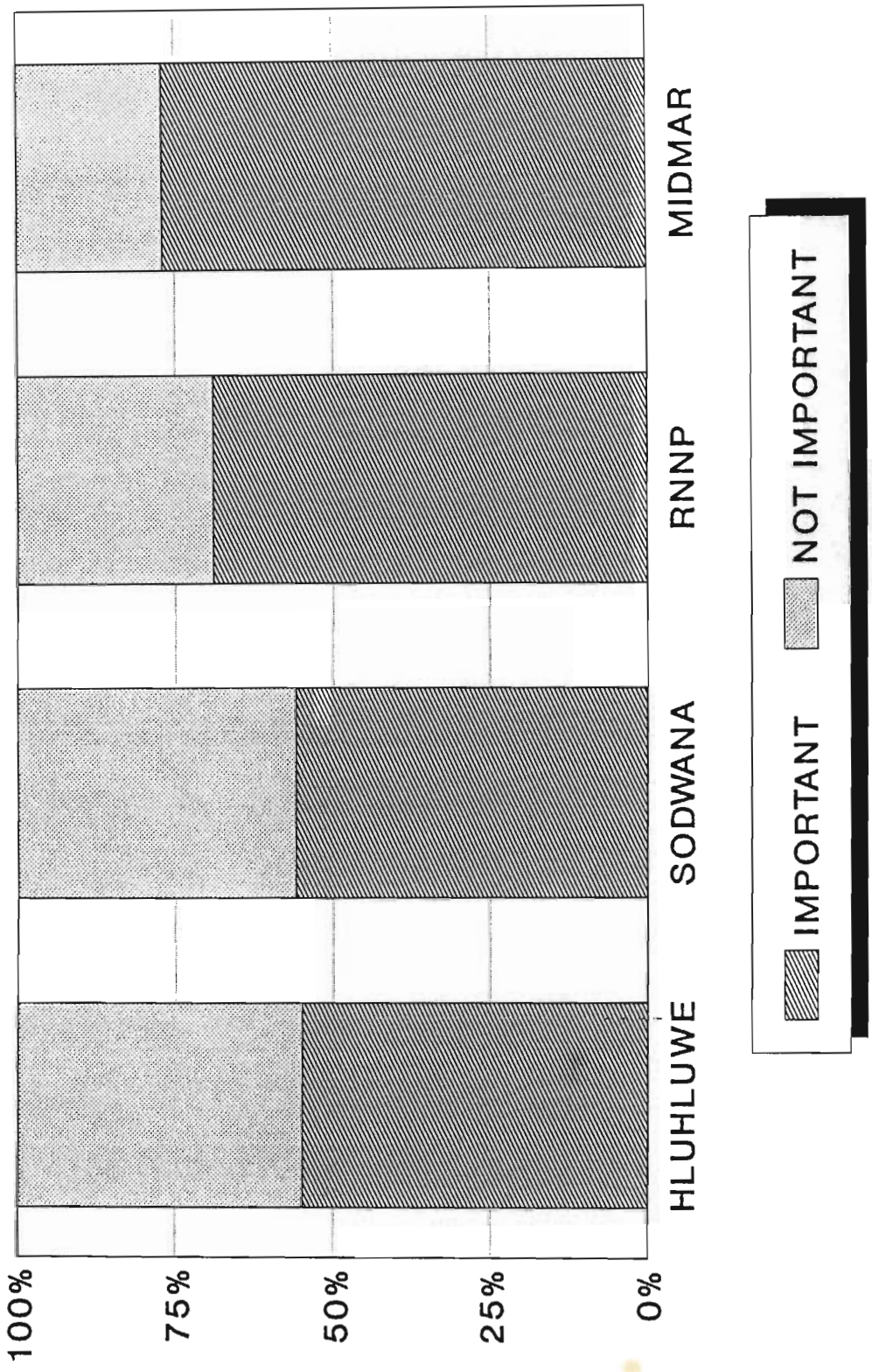


Figure 8 INDIGENOUS HABITATION LEVELS



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