BENEFIT ASSESSMENT OF RECREATIONAL LAND: THE WHAKAPAPA AREA, TONGARIRO NATIONAL PARK

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FOREWORD

Increasing real incomes, more leisure time, greater mobility and other socio-economic factors all have led to a greater demand for outdoor recreation resources. With the amount of such resources being limited, greater pressure has been placed on those managing these resources to allocate them in such a way as to maximise the benefits to society. Optimal management requires information about attitudes, uses and values. This study attempt to do this for a particular set of resources: the Whakapapa skifield and Village within Tongariro National Park.

In 1985 the then Department of Lands and Survey contracted the Department of Agricultural Economics and Business at Massey University to undertake research into current recreational use of the Whakapapa area, which would provide information of use in preparation of a management plan for the area. The principal part of this research was a questionnaire survey of visitors to the area in both the winter season and the summer season. This Discussion Paper reports on the conduct and results of these surveys.

The aim of the research was to provide information which would provide an estimate of the economic value of the Whakapapa skifield, both to its region and to the nation as a whole. This entails the use of applied economic techniques which, although well established overseas, have been used relatively infrequently in New Zealand. These techniques are principally:

(i) an estimation of direct expenditures by visitors to the skifield with a view to deriving regional income and employment multipliers;

(ii) an estimation of the economic value of the skifield by use of the travel cost method of non-market valuation.

In addition, the survey was to be used to investigate further aspects of interest to park management which could be accomplished without prejudicing the main aim of the survey. In practice this involved principally the gathering of profile information about visitors, their stay in the area, and their attitudes to developments and facilities in the area.

This Discussion Paper, although reporting on the results, concentrates on the following:

1. a thorough explanation of the theory underlying the techniques used,
2. a detailed description of how the researchers went about their task and the problems encountered, and
3. a discussion of the meaning of the results and their possible use in decision making.

Full results of the surveys are held by the Department of Conservation and are available on request.

The two researchees are, respectively, Research Economist with the N.Z.

Institute of Economic Research (while doing the research Mr Clough was Research Officer with the Centre for Agricultural Policy Studies) and, Reader in Natural Resource and Environmental Economics in the Department of Agricultural Economics and Business.

On behalf of the authors I would like to extend appreciation to all those whose help and co-operation made this research possible. In particular thanks are due to:

The Department of Conservation (formerly Lands and Survey) for funding and providing contacts and support, and the National Park Board staff at Tongariro National Park who put in a tremendous amount of effort to get the survey off the ground and completed.

Prof. A. N. Rae
Head, Department of Agricultural Economics and Business
Director, Centre for Agricultural Policy Studies.

CHAPTER I

INTRODUCTION

1.1 The Economic Dimension in Recreation Decisions

In recent years New Zealand has witnessed a rapid expansion of participation in outdoor recreation, particularly those forms based on satisfying 'inner-directed' needs for activity, adventure and appreciation of the natural environment (Henshall 1984). The reason for this expansion is usually attributed to a combination of inter-related factors including: increasing real incomes; increasing leisure time and adoption of the 'holiday' habit; increasing personal mobility through widespread car ownership and improvements to the roading network; higher attainment levels in education resulting in new awareness of the environment and its potential for recreation; and, some would argue, an increase in stress, necessitating more 'escapism' into a less complex outdoor environment. Other causative factors have also been suggested, but whether or not they are, and continue to be, influential, one thing remains certain: the resources available for supply of recreation facilities are limited, as are the time and money available to individuals to use them. Consequently all decisions on the provision and use of recreation resources implicitly contain an economic dimension.

This has long been recognised with respect to the supply of recreation facilities, which must compete with other activities for the use of the land, labour and capital required to provide them. In the market system which governs most economic activity, such productive factors would be used in recreation provision if the marginal returns they generated were higher than those they could earn in any alternative use. However, for much outdoor recreation in New Zealand there is no market mechanism, making it difficult to assess the returns from such factors, and the cost-effectiveness of their use.

The reasons for this are partly intrinsic to the nature of outdoor recreation, and partly historic. In certain respects, outdoor recreation displays the characteristics of market failure, and has therefore been regarded as a public good. It is practically impossible to exclude non-payers from the benefits of access to an area like a national park. Moreover, given this inability to enforce a system of charges, the scale of operation of recreational land management would be excessive for any private operator to contemplate. So in New Zealand, as in other countries, a two-tier system of recreation management has developed, with the public sector controlling large areas of extensively used land, while the private sector operates more intensively used facilities. This system is epitomised by the division of interests between the National Park authorities and the concessionaires operating facilities in the

Whakapapa area.

The historical reason for the absence of a market mechanism is that recreation has long been regarded as a 'merit good', a good thing in itself which no member of the public should be excluded from by virtue of being unable to afford it. Consequently entrance or use charges levied by public authorities have tended to be nominal or non-existent. However, quite apart from the difficulty of assessing whether recreation is such a socially beneficial activity as is sometimes claimed, the argument that recreation is good in aggregate does not preclude the need to evaluate individual recreation sites or facilities, both in terms of economic and other criteria.

It is not uncommon to hear the argument (particularly among recreational practitioners themselves) that recreation decisions lie outside the scope of economics, and that the benefits individuals obtain from it are intangible or otherwise incommensurable (as e.g. health, emotional well-being etc.). The implication behind this argument is that recreation is somehow different from other goods and services in the market place, but many of these other goods and services also convey intangible benefits which, moreover, are reflected in the different prices attached to superficially similar goods. Although outdoor recreation does not have an explicit price per unit of consumption, it does exhibit characteristics similar to those of other economic goods. From the viewpoint of the individual participant, it involves a sacrifice of time, effort and money to enjoy its benefits. Decisions involve the individual 'trading off' the benefits from recreation against those of other demands on his time and money, so there is an implicit opportunity cost in every decision. Moreover, recreation has scarcity, in the sense that most individuals would like to have more of it; and it displays a diminishing marginal utility, in the sense that individuals have some satiety point for recreation and that, the more they have, the less they apparently value additional units of recreation. So there are implicit economic choices in recreation decisions which, although rarely manifested through a market mechanism, are nevertheless revealed through individuals' behaviour.

1.2 Approaches to Economic Analysis

Agencies and individuals involved in the provision of outdoor recreation need periodically assess the use of the resources under their control. Among the questions they may want to ask about their existing arrangements (or about proposed future arrangements) are:

(i) are they effective in providing the sort of service intended;

(ii) are they equitable in application, and not unduly disadvantaging one group over others;

(iii) are they cost effective, in the sense that benefits outweigh costs;
(iv) are they efficient, providing benefits comparable to or greater than those obtainable by deploying the resources elsewhere?

Economic analysis is concerned principally with the third and fourth questions, and may also provide information pertinent to the second. These issues are addressed through the concepts of welfare economics in which benefits and costs of activities are compared. Such an approach attempts to estimate the total benefits generated by a recreation facility, deduct from them the total cost of providing that facility, and so obtain the net benefits from the facility. Total benefits, in turn, are a function of the use people make of the good or services, or the amount demanded.

'Demand', in its strict economic sense, is the relationship between the quantity of a good or service consumed and its price. The demand schedule, which can be expressed graphically as a demand curve, states the amount of a good or service which would be purchased in a given time period at specified price levels. But economic theory indicates that the primary benefits of a service or facility, those accruing directly to its users or consumers, can be estimated by calculating the area beneath its demand curve. There are also certain secondary benefits, accruing mostly to the factors used in providing the facility, but these are essentially different from the primary benefits to consumers.

The problem with respect to recreation facilities, in the absence of a market mechanism, is how to estimate the demand schedule as a basis for estimating benefits? Under the traditional economic view, in which outdoor recreation resulted from market failure and had zero cost to the participant, demand for recreation was taken as infinite with zero price (i.e. with a horizontal demand curve), so variations in the consumption of outdoor recreation were determined entirely by variations in supply (Figure 1). This economic explanation provided a justification for paternalist allocation of recreation facilities: if a public authority desired more recreation for its constituents, it had only to alter the supply of facilities to achieve the desired effect (Burton 1971). However, notwithstanding the fact that some recreation consumption is generated by the supply of facilities, in the post-war period the traditional view has been recognised as too simplistic, and economists have sought ways of measuring surrogate prices for recreation.

Two broad categories of benefits from a recreation site can be distinguished — commercial and non-commercial. The commercial benefits are more apparent, because they result from commercial transactions within the locality or region of a particular recreation facility. They act as a stimulus for further spending in the region, generating employment and income for its inhabitants. The result of successive 'rounds' of spending in the region by the recipients of money circulating from the initial injection produces a multiplier effect, the size of which depends on the degree of self sufficiency of the region, the local population's propensity to save or 'import' goods from outside the region, and the amount of other leakages from the local economy. These form the basis of economic impact analysis.

The second category is that of non-commercial or non-market benefits, of which there are four distinct types. These benefits accrue to the consumers rather than the producers of the recreation facility, although in this case the term 'consumer' is not synonymous with 'user' of the facility. Current users of the facility obtain at least as much benefit from the use of the facility as it costs them to use it — otherwise they would not come. So for them benefits can be derived from two types of cost: the cost of using facilities, accommodation, meals and so on, over and above what they would have spent had they stayed at home; plus the travel costs associated with reaching the facility (Clawson & Knetsch 1974). In addition, there may be some people, not current users of the facility but who expect to use it in future, who would be prepared to pay to maintain the option of using it at some future date. They hold an 'option value' in the facility similar to an insurance or 'risk-avoidance' premium. Moreover, there may be some individuals who have no intention of ever using the facility, but who are nevertheless willing to pay to see its existence continue. The estimation of the value of non-market benefits is therefore dependent on being able to survey individuals' willingness to pay for certain aspects of the facility in question: its use value (as derived from additional expenditures and travel costs), option values for future use, and existence values.

Whereas it is most practical to measure commercial benefits at the local level, non-market values by their very nature tend to reflect values held beyond the immediate vicinity of the recreation site. Option values and existence values may be expressed by those who never go near the site, while a resource such as a national park may also draw current users from far afield. Moreover, commercial measures do not reflect the total value to consumers of the goods they are purchasing. At almost every price level at which goods change hands, there will be some consumers who would be willing to pay more, and who therefore capture a 'consumer surplus' by paying, what is to them, a bargain price. The aggregate consumer surplus is measured by the area under the demand curve, but is excluded from the total of commercial transactions (price times quantity). So there are fundamental differences between commercial values and non-market values in the scope and significance of what they include (Figure 2).

In the political arena difficulty is sometimes exhibited in distinguishing between the non-market valuation of a resource and its economic impact, as measured by commercial transactions. By analogy, the decision to bring land into agriculture is primarily determined by its agricultural productive potential, and the farmers' spending power in the local community is a secondary consideration — if, in fact, it is considered at all. Yet with recreation and tourism enterprises, the reverse emphasis seems to be the case: economic impact seems to be accorded greater significance than economic value, particularly at the local level. Problems of comprehension of the concepts involved are compounded by the political differences between local and national interests.

There are several reasons why commercial expenditures should not be taken as indicators of the value of a recreation resource. First, many such expenditures, such as those on accommodation and meals, are not spent on the resource itself, but rather on identifiable market-priced goods and services, located at, but ancillary to, the non-market resource. If a given resource or national park ceased to exist, it is quite likely that the expenditures made within it would be transferred to other facilities elsewhere. However, the non-market benefits to consumers would be wiped out, because of the loss of opportunity to use the park.

Secondly, many commercial expenditures are not related to a specific site or a specific visit. Items such as fishing rods, camper vans and skis are essentially fixed costs, which should be accounted for over a number of years' use. Both the number of times they are used, and the locations in which they are used, are indeterminate. Such expenditures may be indicative of the strength of interest in a particular activity such as skiing or camping, but they cannot be allocated between individual recreation resources.

Thirdly, if expenditures were the main determinant of land use policy, many minimal impact recreation activities would apparently undervalue the resource they use. The back-country hiker, for instance, may carry his own accommodation and food from his own town, so his expenditures in his chosen holiday area would be small. The fact that he has made sacrifices of time and money to reach his chosen destination is irrelevant to the economic impact approach to land use policy.

But the main reason for not relying on economic impact for policy decisions lies in economic theory. Marshall developed the concept of consumers' surplus which has played a central role in the subsequent development of welfare economics. At the heart of consumers' surplus is the idea that things are valued above the price actually paid for them, i.e. there are people willing to pay more than they are currently doing so to obtain access to a particular resource. Estimating this surplus is the central problem in non-market valuation.

1.3 Methods of Recreation Valuation

Economic estimates of the value of recreation have been directed mostly at the valuation of individual sites or resources, principally in an attempt to assess the cost-effectiveness of recreation provision at these sites. There may be other types of recreation valuation of interest for specific purposes — for instance, the estimation of individual utility functions to determine how leisure time is valued against non-leisure time — but most economic analysis of recreation has concentrated on resource allocation, and this is the approach adopted here.

Since recreation is provided at zero cost, a major problem in valuation is how to identify and measure an appropriate proxy for a market price. Several methods encountered in the literature are unsuitable. The value of sport fisheries, for instance, has been equated with the market value of the fish they produce, but such a method implies that the only value anglers receive is from the fish themselves, whereas anglers may enjoy fishing even when they catch nothing. Another method sometimes used is to estimate the gross expenditures on a certain site or activity. However, this suffers from all the limitations outlined above for relying on commercial transactions: the difficulty of distinguishing between fixed and variable costs, and of allocating them to particular sites. Some studies have suggested that recreation benefits equal the cost of facility provision, which clearly justifies any level of expenditure and provides no measure of the cost-effectiveness of provision. Another method is to value public sector facilities on the basis of comparison with private sector facilities, but unfortunately no true comparisons can be made: the fact that private facilities can charge indicates that the service they offer must be different in some way from that of the free public facilities.

Three methods are currently in use which yield valid estimates of individuals' willingness to pay for a recreational resource. Each approaches the problem from a different perspective, and each has its particular advantages and problems in application.

One method which still uses 'real' market information from transactions records is hedonic pricing. Land agents have long recognised that amenity factors have an influence on residential land values, and this method attempts to estimate the capitalised value of proximity to recreation facilities as evidenced through prices in the housing market. The difficulty with this approach is trying to isolate the effect of recreation facilities from those of all the other influences on residential house prices, and in practice very large data series are required. This method is only applicable to urban recreation facilities, and is clearly inappropriate to rural facilities where a high proportion of users are non-residents.

The second method is known as contingent valuation, and consists of surveying individuals' willingness to pay for a certain resource. This is the most comprehensive of the three methods, since it encompasses use values, option values and existence values, but unfortunately it has a number of practical drawbacks. Chiefly these result from the fact that a hypothetical question (how much would you be willing to pay for this resource which has hitherto been free?) may produce a hypothetical answer, and there is evidence that some respondents will undervalue or overvalue their replies depending on the effect they want to give to the survey sponsors. Other practical difficulties include the choice of an appropriate vehicle for the question: ratepayers may be able to articulate willingness to pay more easily through an increment on rates, rather than trying to imagine a gate fee or lump sum payment for use of a currently free resource. A further practical problem is the survey method itself, since interest in a particular resource is likely to be dissipated through the community, requiring a large sample to generate sufficient replies for analysis.

The third method starts on the premise that, even in the absence of any entry fee, recreation is not a free good: there are variable costs associated with each recreational trip, the principal category being travel costs. The travel cost method surveys the users of a particular site or activity, examining their total costs in using the resource: accommodation expenses, food and meal expenses over and above what they would have spent at home, travel costs and so on. The information so gathered can then be used to derive a relationship between costs (or price) and quantity of recreation 'consumed' across the various distance zones from which people come, and hence a demand curve for the recreation resource. A number of variables can be built into this method to take account of individuals' valuation of time, different socio-economic characteristics, depreciation on vehicles and so on.

All three methods yield estimates of the consumer surplus associated with a particular site or resource. They differ greatly in method and intent from the measurement of economic impact through expenditures. This difference is illustrated in this study, which presents a travel cost valuation and an economic impact study of the Whakapapa area in Tongariro National Park.

1.4 Limits to Analysis

Any method which imputes values in the absence of explicit market values will have limitations which qualify its usefulness. Some of the limitations of the travel cost method are specifically described in the detailed exposition of the methodology, but some general reservations need consideration from the outset.

First is the question of who is counted? The travel cost model is based on a survey of current users only, so non-use values such as option values and existence values are excluded. Furthermore, the value placed on a resource by future generations (which may be very different from those of today) is totally ignored. Both existence values and future needs have a bearing on public policy towards recreation and land use.

Second is the question of what is counted? This is particularly important in a resource with multiple aims, like the joint objectives of conservation and recreation in a national park. The travel cost technique records principally the recreational use values, whereas contingent valuation would be more appropriate to estimate the existence value which current generations attach to nature conservation. It has often been noted that recreation and conservation tend to be somewhat in conflict, but the travel cost method provides little assistance in resolving such conflict. It is sufficient for providing a single estimate of value, but inadequate for estimating separable demand curves for recreation and conservation.

A third question relates to the weighting of results in the final decision-making process. Economic analysis centres primarily on the criterion of efficiency, which broadly reflects the ratio between benefits and costs of a particular project. However, recreation planners may have other criteria for assessing their facilities: for instance, they may have an objective for providing across a 'recreational opportunity spectrum' (Stankey 1979). Depending as it does on costs incurred by current users, the demand curve derived from the travel cost model reflects the current income distributions in society, which public policy towards recreation may seek to redress. As Flegg (1976) has pointed out, the choice of economic efficiency as the dominant criterion is just as much a value judgement as the choice of any social goal, and the economic analysis is not necessarily any more 'objective' than analyses based on other criteria.

In short, economic analysis is only one part of a complex decision process, serving a variety of objectives, and should not be regarded as a prescriptive tool for decisions regarding resource allocation. The aim of economic valuation of non-market resources is not to make decisions easier, but rather to make them better informed. The travel cost method will provide an order of magnitude estimate of the value of the recreation area to the nation, but it is not the total value. The pursuit of other objectives implies other values over and above those recorded by the travel cost method, but at least the estimation of the current use values focuses attention on how large the non-use values are likely to be.

1.5 Outline of Study

Section Two examines in depth the travel cost methodology, and develops a model for applying the methodology to survey data of recreational users of the Whakapapa area collected in Winter 1985 and Summer 1985/6. Section Three does the same for economic impact analysis and its relationship to regional income and employment multipliers. Section Four presents results of a survey of the Whakapapa area in Tongariro National Park with estimates of both national value (from the travel cost method) and local value (from the impact analysis). In conclusion, Section Five draws together some of the implications of these results for management policy, regional development and areas to be addressed in further research.

CHAPTER 2

THE TRAVEL COST METHOD OF RECREATION ANALYSIS

2.1 Introduction

'Just as modern marketing is turning to a study of what the consumer wants, expects and is willing to pay for, so must modern recreation administration turn to a study of its consumers' (Clawson and Knetsch 1974, p.45). This statement indicates that recreation is basically a consumption good and that its primary benefits are those accruing to users. It also underscores the economic concepts of value which make it theoretically justifiable to estimate consumer surplus as a measure of a recreation site's value.

The value an individual places on something reflects a preference for that thing, based on some form of utility derived from it. In the market economy, value is usually revealed by willingness to pay, via the exchange medium of money. Each individual's consumption of a good varies with the price at which that good is offered, and each individual has a theoretical demand schedule, explaining the relationship between quantity purchased at different price levels. Individual's willingness to pay for a certain good or service can be aggregated to give an indication of total value to society. Similarly, individual demand curves can be summed horizontally to give an overall market demand curve. The question remains, what is the true value to society of a given good or commodity?

One suggestion is that revenues earned are an indication of value. These are given by the product of price times quantity of actual sales (area OHGF in Figure 2). The largest such rectangle under the demand curve of a good is the maximum revenue that a non-discriminating monopolist could earn (i.e. one offering the same price to all buyers). However, this is a measure of producer value rather than consumer benefits and, as Marshall noted, 'the satisfaction which [the consumer] gets from [a good's] purchase generally exceeds that which he gives up in paying away its price, and thus he derives from the purchase a surplus of satisfaction.' The demand curve indicates that there are consumers willing to pay above the current price of a good to secure access to it. If the good's supplier was a perfectly discriminating monopolist (i.e. could extract from each consumer their full willingness to pay for the good) the supplier's revenue would be equal to the area under the demand curve for the quantity which is actually consumed. However, since no supplier is a perfectly discriminating monopolist, the difference between this maximum revenue (OCGH in Figure 2) and actual revenues (OFGH) constitutes a consumers' surplus (FCG) of satisfaction above price paid.

In the case of recreation the consumers are the recreation participants, whose consumption levels are determined by their own time and money constraints and their diminishing marginal utility from recreation. Assuming individuals behave rationally, they will optimise their utility by consuming recreation to the point where the marginal costs incurred are equal to the marginal benefits obtained from each recreational visit. In the absence of a market price for much outdoor recreation, variable travel and on-site costs will determine the number of trips at which an individual's utility is optimised. So data on these costs permit the calculation of a demand schedule from which consumers' surplus can be estimated.

There are problems associated with using the consumers' surplus as a measure of social value. Where the commodity in question is a major part of a consumer's total expenditure, a change in its price will produce an income effect which shifts the entire demand curve and makes consumers' surplus calculation impossible. However, Hicks developed compensated and equilibrated demand curves, whose positions remain fixed relative to real incomes, to overcome this problem. In any case this problem is not significant in estimating the value of a single recreation site, expenditures on which are unlikely to use a large part of an individual's total income.

There are two measures of consumers' surplus which can be empirically estimated. One is willingness to pay, which is the maximum amount consumers are prepared to pay to obtain the benefit of a good or service. The other is willingness to sell, which is the minimum amount which individuals would be prepared to accept in compensation for loss of access to the good in question. The distinction is important, because the two measures are not the same. As long as the Marshallian triangle of consumer surplus is small relative to consumers' income, willingness to pay, willingness to sell and the consumer surplus will be all approximately equal. But if this condition is not met, willingness to sell is likely to be greater than willingness to pay, because it is not bounded by individuals' income levels (Bishop 1974).

There are some policy issues which require measurement of willingness to sell, but in general willingness to pay is the appropriate measure of consumers' surplus in recreation analysis. This is the measure which the travel cost method attempts to estimate.

2.2.1 The Basic Travel Cost Model

The basic problem in evaluating a public outdoor recreation resource is that the usual yardstick of value, a consumer price, is partially or totally lacking for such resources. However, outdoor recreation has a distinctive characteristic in that people travel to specific locations to consume it *in situ*, in contrast to most other goods or services which are distributed to consumers in their place of residence. So the expenditure of time and money needed to reach a particular recreation site is a major influence on the frequency with which an individual can use it.

The essence of the travel cost technique was expounded by the American economist Hotelling in 1947:

> 'Let concentric zones be defined around each park so that the cost of travel to the park from all points in one of these zones is approximately constant. The persons entering the park in a year, or a suitably chosen sample of them, are to be listed according to the zone from which they come. The fact that they come means that the service of the park is at least worth the cost, and this cost can presumably be estimated with fair accuracy. If we assume that the benefits are the same no matter the distance, we have, for all those living near the park, a consumers' surplus consisting of the differences in transportation costs.'

This approach was developed into a travel cost model by Clawson, both alone and later in conjunction with Knetsch. The principal changes that they introduced were first, to redefine visitor numbers as a visit rate per thousand population from each zone; and second, to introduce a two stage approach to the derivation of the demand curve. The first stage was to plot visitation rates from each zone against costs of travel from that zone to the site in question, and fit a statistical function to the plot. This is the initial demand curve for the recreational experience associated with the visit, incorporating the stages of anticipation, travel to site, activity on site, return travel and recollection. The second stage was to use the functional relationship between visitation rates and travel costs to predict numbers of visits from each zone at different levels of travel cost. This second stage would produce a final demand curve for the recreation site itself, from which consumers' surplus could be estimated.

The Clawson method has since been widely applied, particularly in North America, and a considerable body of literature has emerged concerning its theoretical grounding and its application in practice. However, it is by no means the only travel cost method to have been devised. Bouma (1976) reversed the site-specific nature of Clawson's method to envisage a model with a central population area with surrounding distance zones containing separate parks, the use level and value of which was some function of travel costs and congestion at each individual park. Cesario (1975) proposed another two-stage statistical analysis of observed travel patterns to account for differences in 'emissiveness' and 'attractiveness' of population centres and parks respectively. Other writers such as Sinden (1974) have argued that the travel cost method should be abandoned altogether in recreation analysis, in favour of a more direct approach to estimating willingness to pay — in other words, some form of contingent valuation.

Despite this, the Clawson travel cost method (and its numerous modifications) remains the most widely accepted and frequently used approach to the economic analysis of outdoor recreation provision. It has two principal advantages over the other methods so far devised: it is relatively easy to apply, with well known data requirements; and it is based on actual expenditures and real behaviour, in contrast to the hypothetical approach of contingent valuation. The travel cost methodology applied to the Whakapapa study follows the Clawson approach, and the terms 'travel cost model' and 'Clawson method' are used interchangeably from here on.

The basic assumption on which the Clawson method is built is that individuals' utility can be inferred from the level of their current variable expenditures. These expenditures, which constitute a 'price' for recreation, include transport costs, entrance fees (if any) food and lodging costs in excess of what would have been spent at home. In the case of a skifield they would also include costs of using the field such as lift passes and equipment hire. Other key assumptions are:

(i) that the average of one large group of recreational users (zone) will react to costs in the same way as the average of another large group of users;
(ii) that users are indifferent between (react in the same way to) changes in travel costs and changes in entrance fees;
(iii) there is sufficient variation in travel costs to map out a demand relationship (restricting the method's usefulness for local facilities);
(iv) current users have socio-economic characteristics typical for their origin zones (so that their current activities will predict future visitation);
(v) time on site is the same for all visitors;
(vi) no substitute sites for activities are available;
(vii) the unit of measure is visits, rather than visitors, irrespective of whether increasing visits are due to new visitors or current users re-visiting.

The travel cost method can be expressed algebraically as follows (adapted from Bishop, 1979). The initial premise is:

$$V_{ij} = f(C_{ij}, P_i)$$

where V_{ij} = visits from zone i to site j
C_{ij} = round trip travel costs from zone i to site j
P_i = population of zone i.

Adding more explanatory variables and converting visits to a visitation rate results in a function of the following form:

$$R^o_{ij} = V^o_{ij} / P_i = f(C_{ij}, T_{ij}, A_i, S_i, Y_i \ldots)$$

where R^o_{ij} = the visitation rate per 1000 population at current costs

T_{ij} = round trip travel time (or distance) from zone i to site j

A_i = some measure of tastes for recreation in zone i

S_i = some measure of substitute sites available to zone i

Y_i = income levels in zone i.

The function fitted to the scatter plot of observations might take the following form:

$$R^o_{ij} = a + b_1C_{ij} + b_2T_{ij} + b_3A_i + b_4S_i + b_5Y_i + \ldots e_i$$

The regression analysis will reveal which of the variables is significant in explaining the observed scatter, and the fitted line given by this equation is the initial demand curve for the recreational experience as a whole.

Travel cost analysis then proceeds to use differences in travel cost as a proxy for an entry fee to the site, in order to predict visits at notional entrance fees. Total visits at the initial zero entrance fee are given by

$$V^o_j = \sum_{i=1}^{n} P_i R^o_{ij} \text{ for site j with n origin zones.}$$

If the cost of visiting the site were increased by an amount equivalent to an entrance fee x, the visitation rate would be explained by

$$R^x_i = f(C_{ij} + x, T_{ij}, A_i, S_i, Y_i \ldots)$$

Similarly, total visits at 'price' x would be given by

$$V^x = \sum_{i=1}^{n} P_i R^x_i$$

So, repeating this process for various price levels would result in a series of points which define the final demand curve for the site, plotting quantity (visits) at different prices (x values). This demand function will have the general form $V_x = f(x)$.

If the initial regression revealed travel costs to be the only significant explanatory variable, the other variables could be removed to leave a simple linear regression equation, which can be used to predict visitation rates for each zone at successive price changes.

$$R_i^x = a + b_1 (C_i + x)$$

where a $=$ Y intercept
b_1 $=$ regression coefficient of travel costs.

By holding a and b constant but altering the value of $(C_i + x)$ the R_i for successive values of x can be found. If the expectation of distance decay is valid, the coefficient b_1 will be negative. This means that visitation rates will be driven to zero at the point where $b_1(C_i + x) = a$. This will be the uppermost point on the final demand curve, and the lowest point $(x = o)$ will be the current observed visitor level.

The consumer surplus is given by the area below the demand curve and above the current price line. If the demand function is a linear one, the consumer surplus will be a triangle and the per capita consumer surplus per origin zone is given by:

$$(V_{ij} / P_i) \text{ x } (OZ\text{-}C_{ij}) \times 0.5$$

where OZ is the price at which V_{ij} is driven to zero. So total consumer surplus for zone i will be

$$P_i[(V_{ij} / P_i) \times (OZ\text{-}C_{ij}) \times 0.5] \text{ or } [V_{ij}(OZ\text{-}C_{ij}) \times 0.5].$$

Therefore total consumer surplus across n origin zones is

$$\sum_{i=1}^{n} [V_{ij}(OZ\text{-}C_{ij}) \times 0.5].$$

In other words, if the current entry fee is zero, the consumer surplus will be the total area under the demand curve.

Alternatively, the consumer surplus can be estimated directly off the initial demand function. Total visits to site j,

$$V_j = \sum_{i=1}^{n} (V_{ij} / P_i) \text{ x } P_i = \sum_{i=1}^{n} P_i (a+b_iC_{ij})$$

So at an additional entrance fee of x,

$$V_j = \sum_{i=1}^{n} P_i \, [a + b_1(C_{ij} + x)]$$

Calculating V_j for each increment of x over the feasible range of costs $b_i(C_{ij} + x)^o$ to 'a' and summing the result of $V_j^x(C_{ij} + x)$ across all increments gives the area under the demand curve.

If the fitted function is not linear, the area under the curve can be found by integration on the function concerned. For zone i, consumer surplus will be

$$CS = P_i \int_{C_{ij} + x^o}^{C_{ij} + OZ} f(C_{ij} + x)dx$$

$$\text{So total surplus} = \sum_{i=1}^{n} P_i \int_{C_i + x^o}^{C_{ij} + OZ} f(C_{ij} + x)dx$$

Where the site has a zero entry fee (as in most New Zealand outdoor recreation contexts), $x^o = O$.

In practice there is some flexibility as to the choice of functional form, and the variables to be specified within it. A number of existing studies adjust the functional form and variable transformations on the data, selecting only the best fit functions or the most reliable estimators for final analysis.

It should be noted that the travel cost method was initially developed for what Clawson termed 'intermediate recreation areas', i.e. those which are primarily used for single-destination day or week-end trips. Applying the method to other types of site without suitable modification would make a number of the basic assumptions untenable. The issues requiring such treatment are considered in the rest of Section 2.2 under the headings of:

Variable specification
Joint consumption benefits
Data preparation
Functional form
Limitations
Applications

2.2.2 Variable Specification in the Travel Cost Model

A number of issues are raised by the questions: 'What variables are to be included in the regression equation,' and 'How should the variables be measured'? In particular a measure of 'tastes' in a particular zone has proved elusive, and is usually treated by inclusion of a number of socio-economic variables of the population of the origin zones including age structure, racial composition, income, education levels, car ownership, and rural or urban location. However, the greatest uncertainty in variable definition concerns an appropriate handling of the valuation of users' time. Even if two users from different zones faced the same travel cost to a site, their visitation rates are unlikely to be equal because of differences in travel times.

If individuals valued their leisure time at the same rate as their work time, the income forgone in making a recreation trip may well be far larger than actual expenditures, suggesting the time element cannot be ignored (Keith and Workman 1975). The failure to explicitly incorporate the value placed on users' travel time results in a demand curve which is biased downwards and a conservative estimate of consumers' surplus. Unfortunately, the costs of time and distance cannot be derived empirically because they are so highly correlated their effects are indistinguishable. This also means that a simple time variable cannot be included alongside the travel cost variable in a regression equation because of the problem of multicollinearity.

This problem can be avoided if a cost of travel time is used, but this raises the further question of what is the appropriate opportunity cost of travel time? Dissatisfied with the practice of using a crude average wage rate as a measure of travel time, Cesario (1976) examined a number of ways in which individuals' trade-offs between time saved and money spent could be observed to infer an average value of time saved. Noting a number of studies suggesting commuting time is valued between a quarter and a half the average wage rate, Cesario adopted a time variable of a third of the zonal average wage rate to examine the effects on consumer surplus estimates. While the opportunity cost of recreational travel time need not be the same as that of commuting time, Cesario suggested it should be less than the average wage rate to account for non-earners amongst the visitors (spouse, children), benefits derived from the travel itself, and the lower marginal wage rates of second jobs forgone.

A number of other studies have followed this approach, but a recent paper has suggested that Cesario's proposal is not unambiguously superior to using a crude average wage rate (Smith et al. 1983). No one approach to valuing travel time is likely to be suited to all situations, and testing a number of travel time variables may be appropriate for further studies.

Another question concerning time valuation concerns whether the time chosen is simply the travel time, or travel time plus time on site. McConnell

(1975) argued that the cost of consuming a unit of recreation (trip) is the sum of travel costs and earnings forgone over the entire trip. Even where a user forgoes zero earnings, time still has an opportunity cost or scarcity value, since it could have been used for some other leisure activity. A modified function of the form:

$$\text{Visits} = f\,(\text{travel costs} + \text{trip time, distance, income} \ldots \text{etc.})$$

avoids the problem of multicollinearity between costs and time (distance), because it transforms the costs into a variable which is not dependent on the distance travelled.

McConnell argues further that the visit rate should be measured as visits (or trips) rather than visitor days (or visitor hours) since the latter is not causally dependent on the level of travel costs. A number of studies, however, continue to measure visitation as visitor days.

Another variable which has received some attention is that of site quality, usually equated with congestion. Participants in outdoor recreation have some expectation of the maximum number of people likely to be at a given site, so that if the numbers encountered exceed this expected use level, some loss of satisfaction and user benefit will occur. If an individual's willingness to pay for the right to use a site when fewer people are there can be obtained, a value can be placed on congestion.

However, measuring congestion at a 'site' is particularly problematic for benefit evaluation where there are interdependent facilities, because the relief of congestion on one facility may simply transfer it to another (Cesario 1980). For instance, an additional ski tow may relieve congestion on the skifield, but increase pressure on associated car parks, shelters and cafeteria facilities. Price (1981) questions the dogmatic assertion that extra capacity is self-defeating, generating extra demand which annihilates its benefits. He shows that if the management's aim is to increase user satisfaction, new facilities invariably achieve this, providing price and access are manipulated to regulate numbers entering the area. The arguments against facility expansion are not those in terms of user satisfaction, but rather those of aesthetic cost and irreversibility of the proposed expansion.

Congestion has yet to be successfully incorporated into travel cost analysis, except as some simple dummy variable based on users' perceptions of the site's use level. Walsh et al. (1983) applied contingent valuation to congestion of a skifield, in which —

$$WTP = W - b_1L - b_2A$$

where W = Willingness to pay in the absence of congestion
L = Congestion measured as queue length (minutes)
A = Congestion measured as skiers per unit area.

However, they recognised that congestion would be felt by skiers in more respects than simply the length of lift queues and the numbers in the area. The paper suggested a method of estimating optimal economic capacity, but recognised that this would neither satisfy management's aim of serving the most people, nor provide the highest quality of experience to users. Another study incorporating congestion into a travel cost framework was conducted in Australia (Collins & Hodge 1981), but this produced no firm conclusions about the influence of congestion, other than that it appears to affect different types of user in different ways.

The question of measuring congestion may be of no consequence to travel cost analysis. Shelby (1980) notes that congestion is a fluid concept, depending on an individual's expectations rather than actual experiences, and on the context of those experiences. A densely peopled beach or skifield may not be 'crowded' if social contact is a desired part of the experience. Shelby suggests that satisfaction in terms of reaction to crowding is not a useful measure because:

(a) recreational behaviour is voluntary and self-selective, so that crowd-tolerant users will tend to use 'crowded' areas;
(b) those bothered by heavy use will be displaced from crowded sites by crowd-tolerant users, leading to a change in user composition;
(c) increasing density of use changes the experience of the site, leading to a 'product shift' and a higher expected level of use.

In other words, crowding changes the composition of site users, but need not detract from the level of aggregate satisfaction. Indeed, it is possible for congestion to increase the level of aggregate user benefits from the site because of increased numbers of users, contrary to the implicit assumption behind Cesario's treatment of congestion. For a site's management there are important issues of user benefit distribution resulting from congestion, but these are not significant in the estimation of aggregate site benefits from travel cost analysis.

2.2.3 Site Substitution and Joint Consumption Benefits

The existence of alternative sites to the one under study raises two issues for inclusion in travel cost analysis. One is that the visitation rate from any origin zone will be influenced by the availability of substitute sites to the population of that zone. The other is that some sites may be accompanied by visits to others in the same general area. If the site under study happens to be one of a multiple-site visit, the question arises of how to allocate the joint consumption benefits implied by travel costs to the various sites visited on the journey.

Early applications of the travel cost model neglected substitute sites, and assumed a direction of bias in the result. 'While the existence of substitute goods would shift a demand curve to the left, a positive change in the price of substitute goods would shift the curve to the right' (Gum & Martin 1975). However, Caulkins et al. (1985) have suggested there is no automatic directional bias, since the direction of bias depends upon whether the sites are alternatives or complements, and upon whether the travel costs to the sites in question are negatively or positively correlated. They illustrate this by means of a cross roads map, with lakes 'i' and 'j' at either end of one of the roads (Fig.3) For those living along the road NS, travel costs to the lakes are negatively correlated, since as C_i increases, C_j decreases. But for those living along the WE road, C_i and C_j are positively correlated. If the two lakes are competitive, the effect of omitting substitutes is that the observed consumer surplus will be less than the true consumer surplus for individuals living along the NS road, but above true surplus for those in the EW road. If the lakes are complementary, the observed surplus will exceed the true surplus for those on the NS road, but be less than the true surplus for those along the EW road. Thus the omission of substitute sites does not necessarily over-or under-estimate the site value: the sign of the bias depends on the economic relationship between sites and the sign and correlation of travel costs to each site.

This finding, although interesting in itself, serves only to confirm that the treatment of alternative sites in the travel cost method is very complex. If the origin zones are large or distant, there may be innumerable alternative sites available at lower travel cost than the subject site. Moreover, defining what constitutes an alternative is not easy, particularly where a number of different activities are engaged in at the same site. The substitutes for the Whakapapa skifield are clearly defined; the substitutes for Whakapapa are less clearly so; whereas the substitutes for sightseers at Whakapapa village may be scattered throughout the country.

The availability of substitutes has been included as a dummy variable in some models, with varying degrees of significance. Substitutes have also been treated as sites in their own right in household based surveys of recreation patterns in a small area (Moncur 1975). For single site-oriented studies, however, there does not appear to be any generally accepted method of dealing with substitutes in the different population origin zones.

The problem of joint consumption benefits stems from the basic tenet of the travel cost method that the site is the only source of utility, and that the journey is a cost. Joint consumption benefits may arise if more than one site is visited on a trip, or if travellers positively enjoy the time spent travelling, as an end in itself, rather than as a means to site-oriented recreation.

In a study of one recreational site, Cheshire and Stabler (1976) identified three different types of site visitor:

(a) pure visitors, for whom the site was the main destination and the journey was a cost;
(b) meanderers, deriving utility from the journey itself and visiting many sites;
(c) transit visitors, whose stop was incidental to a journey for some other purpose.

They surmised that a decrease in time costs to a site is unlikely to have much impact on meanderers, and less of an impact on transit than on pure visitors. They were also concerned at over-estimating the time cost incurred by transit visitors, suggesting that only the detour to the site should be used, rather than the total journey. As a result, consumer surplus estimations are likely to be exaggerated by not being limited to pure visitors.

One method of apportioning the travel costs of meanderers between the various sites they visit would be to divide them according to the time spent at each location (Beardsley 1971).

$$\frac{\text{Time at Site i}}{\text{Time at all Sites}} = \frac{\text{Time at Site}}{\text{Total trip time - Travelling time}}$$

The underlying assumption that visitors allocate their expenditures and time according to the benefits they receive has been widely criticised, particularly in view of recreational users' stated preferences. However, actual time allocation may be as valid an indication of revealed preferences as any subjective assessment by users, and it is implicit in the whole rationale for the travel cost technique.

Recognising that the attractiveness of a given destination is often related to the possibility of visiting other destinations in the same trip, whose travel costs are shared jointly and inseparably, Haspel and Johnson (1982) applied a model to three adjacent national parks which might be viewed as a single destination by distant visitors. Travel costs to the central park were adjusted according to the number of major destinations on the trip, the percentage of visitors who visited the adjoining park, the length of stay at the subject park and the total trip length. A similar method has been applied to Mount Cook National Park with satisfactory results, although it was suggested that total benefits may be understated because only the return trip distance to

Mount Cook was used, instead of the total distance of each visitor's itinerary (Kerr et al. 1986).

The treatment of joint consumption benefits required careful consideration for the Whakapapa Study, not least because the composition of winter and summer visitors appeared so different. The winter survey, with around 90 per cent of respondents arriving for skiing, could be handled in a single site model without introducing much bias. However, two thirds of summer survey respondents listed Whakapapa as one stop on a multiple-stop vacation, indicating that not all of their costs should be allocated to Whakapapa.

2.2.4 Data Preparation

There are several issues relating to the preparation and choice of data for use in the travel cost methodology. Some appear quite trivial, others more profound, but all may have significant impact on the size of the resulting consumer surplus estimates.

Discussion still surrounds the choice of actual or perceived costs for the estimation of travel costs. The case for using perceived costs is that they are the costs that influence an individual's actions — at one level. The case for using actual costs are that they, at another level, determine the individual's actions, in conjunction with his income. The majority of opinion now appears to favour using actual costs as an indication of revealed preferences, since they are both more readily collected and applied, and more consistent with other cost and income figures used in analysis (Common 1973). However, a number of studies have tested the travel cost method using different types of cost, and some have obtained better results when using figures other than those of actual costs (Smith 1970; Everitt 1983).

Another issue concerns the aggregation of observations used in the analysis. Early applications of the travel cost model relied on zonal averages of variables such as travel costs, travel times, income and education levels and so on. Smith (1970) noted that increasing the number of origin zones reduced the variation in consumer surplus estimates under varying assumptions of travel cost. Brown and Nawas (1973) suggested that the use of less aggregated data would alleviate the problem of multicollinearity among several explanatory variables. Both these papers noted that the use of disaggregated data led to a lower R^2 value, but the reliability of estimated parameters was improved. Since the aggregation problem arises because, firstly, data are unlikely to be efficiently grouped for two variables simultaneously, and secondly, because of intercorrelation between variables in grouped data, using less aggregated data appears a simple remedy.

This approach was developed by Gum and Martin (1975), who used observations on individual recreationists rather than average observations within distance zones. In this way distance travelled can be introduced as a surrogate for travel time without introducing multicollinearity with variable costs. They also noted the distinction between the true aggregate demand curve, the sum of all individual demand curves, and the expanded 'average' demand curve. The expanded average curve is always to the left of the true demand curve, so surplus estimates based on the average curve understate the benefit.

Travel cost analyses based on individual observations are now readily applied using modern computing methods. However, Brown et al. (1983) identified two further sources of bias from using disaggregated data. First, the scope for measurement error and biased parameter estimates is increased. Secondly, bias may ensue if the fitted travel cost function fails to account for a lower percentage of the district's population coming from distant districts. Their recommended solution is to express the dependent variable V_i , on a per capita basis, i.e. each observation should be divided by the proportion of visitors in the population of its locality. The adjustment required is

$$V_{kj}\, p_i/P_i = f\,(C_{kj} + x)$$

where P_i the population of zone i of which individual k is a member
p_i is the number of site users sampled from zone i.

Where the proportions from each zone are equal, such an adjustment is unnecessary.

The grouping of visitors into zones of varying sizes may produce heteroscedasticity (unequal error variance) in the estimates obtained by ordinary least squares regression. This is because ordinary least squares procedure implies weighting sample observations from each zone equally, but this is only so if the variances from each zone are equal. Since for each zone the variance

$$\mathrm{Var}(V_i) = \sigma^2/P_i = \text{, where } P_i = \text{ zonal population,}$$

as P_i increases, $\mathrm{Var}(V_i)$ gets smaller, producing heteroscedasticity between zones.

One suggested solution to this problem is to weight trips per capita and travel costs for each origin by the square root of the zonal population (Bowes and Loomis 1980). The weighted observations,

$V_i\sqrt{P_i}$ result in equal variances $Var(V_i\sqrt{P_i}) = P_i \, Var(V_i) = \sigma^2$.

The weighted least squares procedure approximates to a generalised least squares regression, and results in a significant difference in estimated benefits compared with that produced using ordinary least squares.

However, such weighting may not be necessary or desirable, since the hypothesis that the error variance is inversely proportional to zone population, P_i, has been questioned (Vaughan et al. 1982). An alternative procedure which removes heteroscedasticity is to perform a transformation on the dependent variable, V_i (Strong 1983). A natural logarithmic transformation of the dependent variable seems to move the error variance towards homogeneity, so a semi-logarithmic functional form does not appear to require the use of the weighted least squares procedure.

2.2.5 Functional Form

Most of the applications of the travel cost method have included some experimentation in the choice of functional form. A common approach has been to select a regression equation to fit to the data (usually linear), then repeat the exercise using various transformations of the original function. The form chosen for Stage II of the travel cost procedure, the estimation of the final site demand curve, is the one offering the best predictive ability in explaining the observed data.

Opinion appears divided as to whether one functional form should *a priori* be more suitable than another. Types of function which have been used include linear, log linear, semi-log, quadratic, multiplicative, exponential and reciprocal. The linear form does not result in a demand curve which might be theoretically expected, and should be discarded because of an upward bias in the consumer surplus estimate (Ziemer et al. 1980). However, the semi-log, quadratic and some of the other functions produce plots with a striking resemblance to the classical demand curve, complete with diminishing marginal utility of the commodity in question, so the final choice of functional form depends upon the particular characteristics of each data set.

A problem encountered with some of these forms is that they produce asymptotic curves, so that their estimates are unbounded. The derivation of the derived demand curve requires that there should be some 'price level' at which visits no longer occur, but this requirement is not met by, for instance, an exponential curve. One solution to this, employed in some of the early travel cost applications, was to change the dependent variable from (V/P) to (V/P + 1), but this manipulation of the variable to fit the function is theoretically groundless (Common 1973). A practical solution which does not meet this criticism is to set some arbitrary limit to the travel costs, determined by the maximum feasible distance travelled in a day, which can then be used as a cut-off point beyond which visitation is treated as zero.

The choice of functional form can have a significant effect on consumer surplus values derived from recreation demand functions. The consumer surplus estimated from a linear form was about three times that of the quadratic and semi-log functions fitted to the same data (Ziemer et al. 1980). Clearly the form chosen is critical to the results obtained.

Another issue relating to the choice of function is the so-called 'identification problem'. Whereas demand and supply functions each imply a schedule of alternative price-quantity relationships, current observed use refers to a single point on those schedules. It is possible to observe apparent changes in demand which actually result from real changes in the supply of recreation opportunities (Kalter & Grosse 1970). An example might be when the use of one site is increased by the closure of a substitute site in a distant origin zone. There is no simple solution to this problem, but regional alternative sites could be used as a 'shifter' variable to stabilise the influence of demand.

Neither the theory nor practice of travel cost analysis give much guidance in the specification of a demand function. Although a number of studies have found advantages in a semi-log function (among them McConnell 1975, Strong 1983, Ziemer et al. 1980), there has also been suggestion that the process of transformation itself introduces bias, and that such functions no longer measure what they purport to measure (Stynes et al. 1986). The implication is that results obtained from such transformed functions should be interpreted with care.

Examples of some functional forms used (simplified to two independent variables) are given below.

$R_{ij} = a + b_1C_{ij} + b_2D_{ij} \ldots + e_i$	Linear
$R_{ij} = a + b_2C_{ij} + b_2C_{ij}^2 + b_2D_{ij} \ldots + e_i$	Quadratic
$\ln R_{ij} = a + b_1C_{ij} + b_2D_{ij} \ldots + e_i$	Semi-log
$\ln R_{ij} = a + b_1\log C_{ij} + b_2\log D_{ij} \ldots + e_i$	Log-log
$V_{ij} = aC_{ij}bP_ic(\exp(e_i))$	Multiplicative
$V_{ij} = \exp(a + bC_{ij} + cP_i + e_i)$	Exponential
$R_{ij} = a + b/C_{ij} \ldots + e_i$	Reciprocal

where R_{ij} = visitation rate (per thousand population from zone i to site j)

V_{ij} = number of visits from zone i to site j

C_{ij} = travel costs from zone i to site j

D_{ij} = travel time from zone i to site j

a,b,c = estimated parameters relating to site j

e_i = error terms

2.2.6 Limitations of the Travel Cost Approach

The foregoing sections have indicated a number of specific issues in the application of travel cost analysis for which the literature provides no definitive solutions. There are also, however, a number of more generalised limitations to its usefulness.

The fact that some problems have no satisfactory solution has resulted in *ad hoc* experimentation to circumvent them. Such an approach to recreation valuation is only applicable if the results obtained are subject to thorough sensitivity analysis (Common 1973). A more general criticism is that recreation analysis has concentrated almost exclusively on the question of estimation of user benefits per unit time. However, there is another dimension to recreation analysis, namely projecting future benefits, which has received relatively little attention (Bouma 1976). This can itself be subdivided into two problem areas: the estimation of changes in future use levels and resulting benefits, and the choice of an appropriate discount rate to apply to them.

Economic analysis is only as reliable as the assumptions on which it is based, but a number of studies have raised doubts about the validity of the assumptions behind the travel cost method. For instance Smith (1975) questions several of the assumptions set out in Section 2.2.1 with respect to their applicability to wilderness areas, whose users are small in number, dispersed among origin zones, and are quite distinctively different from the zonal norm with respect to a number of socio-economic characteristics. Statistical testing of the results of a travel cost analysis of a wilderness area led him to conclude that they were all inappropriate to the valuation of that particular resource.

The basic assumption that visitors react in the same way to changes in entry fee as to changes in travel cost has met frequent criticism, and in some cases there is empirical evidence to suggest it is untenable (Harrison & Stabler 1981). Moreover, on a site with a high proportion of first time visitors with no previous experience of the site, the utility of their first visit is attached to the knowledge of what the site has to offer, rather than to the site itself, suggesting that traditional travel cost analysis may overstate the benefits derived for such visitors.

As origin zones become more remote from the subject site, the assumption that each trip is solely, or even primarily, for recreational purposes at a single site becomes less tenable. It is also likely that long distance visitors spend longer on site than those from nearby and may even use different modes of travel, so that studies which ignore the relationship between distance and on-site behaviour will over-simplify the factors influencing demand (Smith & Kopp 1980).

Where a site is both a local and regional resource there is a problem in ensuring sufficient observations from each distance zone to accurately reflect costs and use preferences (Harrison & Stabler 1981). A site which is remote with few visitors may appear more valuable than a site close to population centres, by virtue of the aggregate expenditures made to reach it. This valuation is based solely on economic efficiency criteria, and distributional issues may dictate diverting resources to parks closer to urban centres which are more accessible to low income users (Cesario & Knetsch 1975).

Seckler goes further in expressing concern that 'economics may seem to imply policy prescriptions which are not an integral part of that theory nor necessarily in the public interest' (Seckler 1966 p485). He suggests that a compensation test is required if prescriptive policy analysis is to be made, since much of the rationing function of a pricing system falls inequitably on lower income groups. Flegg (1976) also raised distributional issues in suggesting that the use of the willingness to pay criterion in evaluation is based on two implicit value judgements: first, that individual preferences count; and secondly, that those preferences should be weighted by market power. The latter is controversial and counter to democratic ideals, so there is no reason why the results of economic analyses should be considered any more 'objective', or be accorded greater emphasis, than those of analyses based on quite different criteria.

A further area of uncertainty relates to the comparability of valuations obtained through travel cost analysis with those from other valuation techniques. The value of recreational land use, for instance, is not directly comparable to the market value of products of other land use which do not include any consumers' surplus (Norton 1970). Beardsley (1971) notes that the consumers' surplus measured in travel cost analysis includes surplus not only from the recreational portion of the 'recreation experience' but also from consumption of other goods and services on the trip, which has prompted other writers to advocate distinguishing between exogenous (unavoidable) costs and endogenous (chosen extra) costs in the estimation of travel costs (Norton

1970, Ward 1984).

While these criticisms contain valid points, some are rather extreme in their negativity. The drawbacks of the travel cost method are at least well documented, and it behoves the researcher to conduct analysis with them in mind and to thoroughly test the outcomes, before presenting results with qualifications made explicit.

2.2.7 Applications of Travel Cost Analysis

Variants of the travel cost method have now been widely applied, particularly in North America where they are frequently used to estimate public recreational values associated with national parks, forest parks, and water supply reservoirs in cost benefit analyses. While its general acceptance has made its application almost routine, further refinements to the technique are constantly sought, and a number of the issues raised in the foregoing sections were the result of observations made in the method's application.

Travel cost analysis has also been applied to a number of locations in Britain, including parks, reservoirs and canals, but its acceptance there has been more restrained than it has in North America. Mansfield (1971) found a wide discrepancy between consumers' surplus estimates from the traditional travel cost model and one incorporating diversion from other areas, and concluded that the Clawson method was inappropriate in a compact country like Britain, where intervening opportunities and the relief of congestion are significant influences on recreational travel patterns. A number of other British studies have severely qualified their conclusions in view of data deficiencies or other difficulties encountered in application, and the method does not appear to receive much emphasis in current literature (see Norton 1970, Flegg 1976, Cheshire and Stabler 1976, Harrison & Stabler 1981).

In New Zealand, travel cost analysis has been limited to a few studies over the past 10 years. Woodfield and Cowie (1977) used the Clawson method to estimate the value of the Milford Track to two types of users: the guided track walkers and the so-called 'freedom walkers'. The results suggested (rather against expectation), that there was little difference between the two groups, and little advantage in trying to price discriminate between them. Theirs was a rather pioneering study, with a number of far-fetched assumptions, such as the exclusive allocation of travel time from home to the track; average wage rates as a measure of opportunity cost of time; and zero utility obtained from travelling. More information was required than was obtained from the questionnaire, and the authors admitted their study had too many drawbacks to be useful in policy making.

An illustration of a policy-oriented application of travel cost analysis addressing a specific problem, is provided in a study of Lake Tutira in Hawkes Bay (Harris & Meister 1981). This lake had been suffering eutrophication from infiltration of nutrients from neighbouring farmland, so the question raised was, would the recreational benefits justify the cost of cleaning up the lake? A visitor survey was conducted at the site, the current users being divided into 13 origin zones, based on major population centres in the North Island. Initial analysis showed most variables had little influence on the result, so the final demand equation fitted was a bivariate reciprocal function. The results suggested the benefits of the lake did justify the clean-up expenditures. The authors conclude, however, that the information gathered from current users, and the choice of functional form, were critical to the result. A larger number of zones in the immediate vicinity of the lake would also have been useful in distinguishing between travel costs of visitors in nearby localities.

A similar reciprocal function was fitted to survey data on hunters in the Kaimanawa and Kaweka Forest Parks, but was found in that case to suffer from heteroscedasticity (Sandrey 1983). An exponential function was fitted instead, which yielded demand elasticity estimates not dissimilar to those of the Tutira study. The omission of data on substitute sites, multiple-site visits, length of stay and quality index make the results of this study tentative. It yielded an estimate of per capita consumer surplus of $27 per visit, considerably higher than the estimates for Lake Tutira of $8 per visit.

A rather less complex version of the travel cost analysis was applied to the Kauaeranga Valley in Coromandel State Forest (Everitt 1983). This study considered distance the only independent variable, but ran separate estimates for high and low travel cost assumptions, with and without travel time included (valued at one third of the average wage rate). The simplicity of the model was justified by the aim of obtaining a minimum, rather than a 'precise', value for recreational benefits. Joint consumption benefits were not explicitly treated, but they were minimised by restricting the distance variables to where individuals set out on the day of their visit, rather than from their home areas.

The most comprehensive application of travel cost techniques in New Zealand so far is a study of Mount Cook National Park (Kerr et al. 1986). This study considered two separate analyses: one of New Zealanders only, the other of all visitors (including overseas visitors). The New Zealand only study identified 14 origin zones, and assumed all arrived by car. No data were collected to account for substitute sites in the origin zone, but an adjustment was made to the travel cost variable to account for multiple-destination trips, namely $C_{ij}^* = C_{ij}/STOPS_i$

where $STOPS_i$ = mean number of major destinations for visitors from zone i.

Travel time was valued at 25 percent of the average wage. Six variants of the basic function were run, both with and without the adjustment to travel costs. The adjusted-cost final demand curves were all more elastic than those from unadjusted cost data, hence consumer surplus estimates were smaller.

The preferred result was from an adjusted-cost curve, yielding consumers' surplus of $44 per visitor. This cannot be validated, but is likely to understate the surplus, because only distance from home to Mount Cook was used, rather than the distance of each visitor's total tour itinerary.

The worldwide visitor analysis failed to produce any credible result, because the models used were found to be heteroscedastic and to have poor predictive ability. Contributing factors are thought to include:

(i) variable response rates between visitors of different nationalities;
(ii) variable tastes and socio-economic factors in overseas countries, which could not be effectively incorporated into the models;
(iii) uncertainty as to transport costs, due to a multiplicity of air routes and fare schedules.

A conclusion to be drawn is that the travel cost method in its current form is only successful for intra-country values. This had implications for the Whakapapa study, since the number of overseas visitors was significantly higher in the summer survey than in the winter survey.

CHAPTER THREE

ANALYSIS OF EXPENDITURES

3.1 Introduction

The benefits of a recreational resource measured by the travel cost method accrue principally to the consumers of that resource — in other words its users — and they are spread throughout the nation. Because of this and the prevalence of consumer welfare in economic theory, these national benefits are known as primary benefits, and they represent the value to the nation of the opportunity of using the resource for recreational purposes.

There is another category of benefits associated with a recreational resource which accrues principally to the factors of production of goods and services used in enjoying the resource. These benefits are most apparent in expenditures made on identifiable goods and services located at the resource. Because these benefits are regional and apply to factors of production — businesses, wage earners and so on — rather than consumers, they are known as secondary benefits.

Whether secondary benefits are considered in policy decision making or not depends on the objectives held for a particular policy. From the view point of a national cost benefit analysis, for instance, whether a particular hotel is located close to the recreational resource or some distance away is of little consequence, since this makes no difference on the effect on employment and income at the national level. However, if regional objectives are held to be important, the measurement of secondary benefits can be of considerable significance to policy decisions.

Expenditure analysis is aimed at estimating secondary benefits and can take a number of forms. At its simplest it attempts to quantify how much was spent, by whom, on what and where such expenditures were made. Such information may be of use to resource managers in such functions as infrastructure planning; deciding on the effectiveness of facility provision; and deciding on the desirable level of future provision. For example, a park authority may require guidance on whether to expand accommodation in its park and, if so, of what sort. Even in cases where the risks of such developments are borne by concessionaires rather than by the park authority itself, if the decision concerns an irreversible land use change, or it impinges upon irreconcilable objectives, the authority requires some assessment of the commercial feasibility of the options available, which may be obtained from expenditure analysis.

An extension of expenditure analysis is economic impact analysis, which attempts to estimate the effect of expenditures on a target region. These effects are manifested through the level of economic activity in the region; the employment created in the region; and the income from that activity which is retained in the region. The impact of an injection of funds into a region — as from tourist expenditures — depends not only upon the size of the initial injection, but also on the subsequent rounds of spending that it generates, and the level of 'leakages' from the regional economy. Hotel receipts, for instance, will be distributed between the hotel proprietors, employees and suppliers of food and other services which the hotel uses. To the extent that these recipients make further expenditures within the region, the effect of the initial injection of funds will be multiplied through the local economy.

Such multiplier effects may be manifested as an increase in the level of turnover or output of local businesses, or as an increase in the income retained in the region after profits, rents and other expropriations from the region have been paid out of the enhanced turnover. And the multiplier may also be apparent in the employment levels within the region, resulting from the number of jobs created directly or indirectly from the initial injection and subsequent rounds of spending.

Multiplier coefficients may be calculated by a number of methods for each of these aspects of economic activity: output, income and employment. Output multiplier coefficients are invariably greater than those for income and employment, each of which is some function of the output multiplier. Calculation of all multipliers needs to take account of the different components of the multiplier, namely:

The initial (direct) effect: the initial dollar increase in output. Visitor expenditures may be viewed as an injection of funds, or as an increase in output of the tourist industry in the region.

The first round (indirect) effect: the first round of purchases by the sector receiving the initial stimulus of increased output.

The industrial support effect: the effect of second and subsequent rounds of output increases as successive purchases are made through the local economy. Induced increases in household consumption (final demand) are specifically excluded from this definition. The sum of the first round and industrial support effects is known as the **production induced effect.**

The consumption induced effect: the increase in output associated with increased demand from households whose income is enhanced by the initial and subsequent rounds of purchases.

Depending on the income:output and the employment:output ratios prevailing in a particular industry, corresponding effects may be identified as components of income and employment multipliers.

The multiplier effect is calculated as some ratio of direct and induced effects divided by the direct effects. Following the definitions of Butcher (1985), multipliers may be defined as:

Type IA = Initial + First Round Effects/Initial Effect
Type IB = Initial + Production Induced Effects/Initial Effect
Type II = Initial + Production & Consumption Induced Effects/Initial Effect

Thus a multiplier can be interpreted as indicating the cumulative impact on output, income and employment of a direct injection of funds into a region.

Before examining in more detail the derivation of the various types of multiplier some general points need to be made. The size of the multiplier depends on the extent of leakages from the local economy (i.e. how much of each dollar of initial expenditure is expropriated from the region in the form of payments to suppliers, shareholder profits, rentals to absentee proprietors and so on). The size of the multiplier is dependent on the size and definition of the region under investigation, since the smaller the region, the less self-sufficient it is likely to be and the greater the leakage of spending from it.

All multipliers implicitly contain a temporal dimension, dependent on the velocity of transactions within the local economy. Some of the receipts from an initial injection of funds will be spent on further purchases almost immediately, whilst others may be indefinitely withheld from circulation in the form of savings. There are lags between the time an initial injection is made and the time needed for all subsequent effects to work through the local economy. Consequently a distinction can be made between short term and long term multipliers, depending on the time frame within which the impacts are viewed.

Finally it should be noted that a high multiplier is not necessarily to be equated with better performance or advantages for a particular region. An industry with a small output multiplier may be preferable (in terms of regional income or employment) to one with a high output multiplier, if the latter has a much higher imported component in its supply structure. Similarly, a high employment multiplier may indicate an industry with high manning levels and relatively poor utilisation of capital. Interpretation of regional multipliers therefore needs to be made with comparisons to industries in other regions and with reference to the particular aims of regional development.

3.2 Types of Economic Multiplier

There are several procedures for analysing economic impacts which have been used to derive economic multipliers. Those which have received most attention in the literature and which have been empirically estimated most often are those derived from economic base theory, Keynesian regional economic models and input-output analysis.

3.2.1 Base theory multipliers

The economic base of a region consists of those industries which are primarily involved in exporting to other regions. The estimation of economic base multipliers requires the division of all industries in the region into either basic or non-basic sectors, the latter comprising those industries servicing primarily the local economy. It also requires the selection of two time periods for study, the initial period and the terminal period, and the calculation of economic activity in both sectors in both these periods. The economic base multiplier can then be calculated as the ratio of the change in total activity to basic activity over the study period i.e. $\delta T/\delta B$.

Implicit in this theory is the idea that the non-basic sector is dependent on the basic sector, and the the relationship between the two sectors is constant over the study period, so that changes in total economic activity may be explained by changes in the basic sector. Two further assumptions underlying this technique are that the relationship between the sectors is linear, and that there are unemployed resources available in the local economy available at zero opportunity cost, which can accommodate changes in economic activity brought about by changes in the economic base.

Base theory multipliers are relatively easy to obtain from secondary sources, but they have rarely been used in practice. The usefulness of the approach depends on the accuracy of the division of regional economic activity into the basic and non-basic sectors, but this division tends to be rather arbitrary, particularly with respect to a service based industry such as tourism. Depending on the characteristics used to divide the local industries into the two sectors, base theory multipliers may be estimated for output, income or employment. In practice employment multipliers have been estimated most often, largely determined by the availability of data.

While base theory multipliers are now generally regarded as having been superseded by multipliers from Keynesian and input-output models, they may have uses in providing crude comparisons between regions. An example of such use is given by Garrison (1972), who applied economic base multipliers to investigate the impact of new industry in small rural regions. This study's comparison of 5 counties in Kentucky confirmed that the larger the county, or greater its isolation, the smaller the leakages and the greater the multipliers were likely to be. The results further suggested that the effect of new industry on non-basic employment was smaller than the effect on non-basic income, since the industries tended to absorb unskilled labour from the surrounding areas rather than encourage population growth which would stimulate non-basic activities. Such results suggest that base multipliers may have uses in indicating where further analysis is required, but in themselves lack refinement on which to base decisions for policy purposes.

3.2.2 Keynesian multipliers

Underlying the estimation of multipliers from the Keynesian regional income model is the expectation that streams of income and employment will be generated in a diminishing geometrical progression from the initial injection. If extra tourism expenditures are δE, the extra income generated will be:

$$\delta E \times 1/(1\text{-}e)$$

where e = the propensity to spend within the region,
(1-e) = the proportion of leakages, and
1/(1-e) = (by definition), the multiplier.

A regional income multiplier can be derived from a regional income model of the form:

$$Y = C + I + (G - T) + (X - M)$$

where Y = regional income
C = regional consumption expenditure
I = regional investment expenditure
G = Government expenditure within the region
T = Government taxation extracted from the region
X = regional exports
M = regional imports

From such a model, a general multiplier can be derived as

$$k = 1/1\text{-}(c+m)$$

where c = marginal propensity to consume
m = marginal propensity to import

More elaborate versions have been developed, such as one by Archer (1976) incorporating the separable effects of direct and indirect taxation and government benefit payments on the regional economy.

Of more significance than this general formulation, however, is the scope offered by Keynesian multipliers for disaggregation of data on regional tourist expenditure. The direct and indirect component of income generated within a region by a unit of tourist expenditure can be expressed as

$$\sum_{j=1}^{N} \sum_{i=1}^{n} Q_j K_{ji} V_i$$

where j = each category of tourist, j=1 to N

i = each category of business, i=1 to n

Q_j = the proportion of total tourist expenditure spent by the jth type of person

K_{ji} = the proportion spent by the jth type of tourist on the ith type of business

V_i = the direct and indirect income generated per unit of turnover by the ith type of business receiving tourist spending

The additional income generated by successive rounds of spending within the region can be estimated by applying a multiplier expression to the formula above. This results in the tourist regional income multiplier of

$$k = 1 + \sum_{j=1}^{N} \sum_{k=1}^{n} Q_j K_{ji} V_i \times 1/ (1 - L \sum_{i=1}^{n} X_i Z_i V_i)$$

where L = propensity to consume

X_i = the proportion of total consumer spending by residents in business i

Z_i = the proportion of consumer spending by residents in the ith business within the region.

By a similar process Archer (1976) developed a tourist regional employment multiplier:

$$k_e = \alpha + \beta + \gamma$$

This consists of:

a) direct employment creation: $\alpha = \sum_{j=1}^{N} \sum_{i=1}^{n} Q_j K_{ji} Ed_i$

b) indirection employment generation: $\beta = \sum_{j=1}^{N} \sum_{i=1}^{n} Q_j K_{ji}(E_i - Ed_i)$

c) Induced employment generation: $\gamma = (a + b + c) \sum_{i=1}^{n} X_i E_i$

where a = direct regional income generated per unit of tourist spending
b = indirect regional income generated per unit of tourist spending
c = induced regional income generated per unit of tourist expenditure
Ed_i = employment generated per unit of turnover exclusively within the i-th business type receiving tourist expenditure
E_i = employment generated per unit of turnover by the i-th business type in the region

Using a Keynesian model, Archer and Owen (1971) estimated a regional tourist income multiplier of 1.25 for the Isle of Anglesey in Wales. This was broken down into separate multipliers for different types of tourist identified by accommodation type — hotel patrons, bed and breakfast visitors, camp site and caravan users — in recognition that their spending patterns would differ. (Camp site users, for instance, spend less on accommodation and more on groceries in the region than hotel patrons). Liu and Var (1983) used similar formulations in a study of the economic impact of tourism in metropolitan Victoria, British Columbia. Their results suggested that while overnight visitors had the highest direct income coefficients, day-trippers compensated for this by having a far higher coefficient for non-accommodation services. Moreover, the survey of tourist businesses showed that while non-locally owned establishments generated more revenue than locally owned ones, the latter had a higher direct income coefficient.

The array of detail given by a disaggregated Keynesian model may be useful in a range of commercial and policy-oriented applications. For instance, in the examples above, depending on whether the aim is to maximise regional income or employment, the separable multipliers give some indication as to the type of visit (day or overnight), accommodation type and business ownership which should be encouraged. On the other hand, the usefulness of such detail depends on the ability to act on it — for instance by diverting demand between the different types of accommodation — which may be relatively limited.

The derivation of Keynesian multipliers is less expensive and data dependent than the construction of a full input-output model, but it still requires an extensive survey, both of visitors and of businesses in which tourist expenditures are made. This latter information is often commercially sensitive and difficult to obtain. However, a limitation of the Keynesian multipliers is that they reveal little about the differing impacts of expenditures in the different sectors of the economy, for which reason multipliers derived from input-output models are now generally preferred.

3.2.3 Input-output models

In essence an input-output table is a simple device showing the generation of outputs in specific industries or sectors, and their distribution as inputs to other industries, as exports from the economy, or as consumption in final demand. The typical form of an input-output table has a list of producing industries or sectors down the vertical scale and purchasing or consuming sectors across the horizontal scale, with outputs totalled down the extreme right hand column and purchases totalled across the bottom row. A simplified version of a two sector model is illustrated in Figure 4.

The contents of cells in the table show the amount of output from sector i used as input in sector j. Input coefficients (a_{ij}) for the productive sectors are obtained by expressing each cell contents as a proportion of total input purchases. The table of these coefficients can be represented as a matrix, A. With vectors of sales to final demand, D, and of total sales, X, the table can be represented in matrix notation as:

$$AX + D = X$$
$$X - AX = D$$
$$X(I-A) = D$$

So $$X = (I-A)^{-1}D$$

This process of inverting the Leontiff matrix (I-A) results in a matrix in a matrix $(I-A)^{-1}$ whose elements show the direct and indirect output required from industries in response to a unit increase in final demand. A simple output multiplier of direct and indirect output can be obtained for each sector by summing the columns of $(I-A)^{-1}$.

If the elements of the inverted matrix are denoted by r_{ij}, the output multiplier for sector j = $\Sigma_i \, r_{ij}$. The direct effect on income from increases in output of a sector is the payments to households shown in the primary inputs quadrant, expressed as a proportion of total output.

$$w_j = H_j/X_j$$

where w_j = payments to households per unit of output in sector j
H_j = payments to households in sector j

Direct and indirect income generated from a unit increase in final demand for sector j, $I_j = \Sigma_i \, r_{ij} w_i$

where i = the appropriate element in the column vector of payments to households per unit of sector output

The Type I income multiplier is obtained by dividing I_j by the direct income effect w_j. Thus: $k1_j = \Sigma_i \, r_{ij} w_j / w_j$

To derive multipliers including the induced effect initiated by consumer spending, the household row and column must be brought into the transactions matrix, producing an enlarged matrix A*. If the elements of $(I-A^*)^{-1}$ are denoted by r_{ij}^*, the total output multiplier for sector j = $\Sigma_i \, r_{ij}$.

Income generated, $I^* = r_{hj}^*$

where r_{hj}^* = the appropriate element in the household row of $(I-A^*)^{-1}$

The Type II income multiplier for sector j is given by

$$k2_j = r_{hj}^*/w_j$$

Employment multipliers may be developed by calculating an employment coefficient for each industry, which is the number of people employed directly in an industry per unit of industry output.

$$e_j = P_j / X_j$$

where e_j = employment coefficient for industry j
P_j = number of people employed in industry j
X_j = gross output of industry j

Given this, the effect of direct and indirect employment will be,

$$\sum_{i=1}^{n} r_{ij} e_i$$

And the effect of direct, indirect and induced employment will be,

$$\sum_{i=1}^{n} r_{ij}^{*} e_i$$

So the Type I multiplier $$k_e 1_j = \left(\sum_{i=1}^{n} r_{ij} e_i\right) / e_j$$

And the Type II multiplier $$k_e 2_j = \left(\sum_{i=1}^{n} r_{ij}^{*} e_i\right) / e_j$$

The mathematical procedures for deriving multipliers from input-output tables are deceptively simple. In practice, the construction of input-output tables is a long and involved process, in which there is a seemingly inverse relationship between the size and detail of the table and its manageability. In many cases insufficient data for constructing regional tables is available, while the costs of conducting a business survey to remedy this deficiency are large. Because of this, much current interest is focused on the adaption of national input-output tables to be representative of the regions.

3.3 Empirical Estimation of Multipliers

The high labour component in the value added by tourism and recreational services results in generally less leakage of income outside the region than is the case for most manufacturing industries which have a higher component of materials input. For this and other reasons already discussed the crude multipliers obtained by dividing a local economy into its basic and non-basic sectors are likely to be unsatisfactory for analysing tourism impacts, which has led most empirical investigation of regional tourist multipliers to use Keynesian or input-output models.

The minimum information required to produce a Keynesian multiplier of the type developed by Archer is:

a) the number of each different type of tourist and their average length of stay in the region;
b) the average daily expenditure of each type of tourist and its breakdown by types of business, based on surveys of tourists;
c) information on the pattern in which businesses in the region distribute their tourist revenues to employees, proprietors and suppliers, both within and outside the region;
d) the employment created by businesses affected by tourism;
e) the pattern of expenditure of resident households, with some indication of expenditures outside the region.

Items a) and b) will generally be obtained from a survey of visitors to the region. Items c) and d) require a survey of a representative sample of businesses in the region, which may be hampered by business operators' fears about the commercial sensitivity of the information they divulge. Item e) is available from national household expenditure surveys, but rarely do these identify the precise location of expenditures, either inside or outside the target region.

The data requirements for input-output tables are even more formidable, since patterns of inputs, outputs, imports and exports of all sectors in the local economy need to be identified. Because the costs of such data collection are prohibitive, a number of studies have attempted to devise short-cut methods of adapting national input-output tables to represent the regions. Since a region is unlikely to have as wide a range of industry as the nation as a whole, and since individual regions are usually more closely integrated with their neighbours than are countries, a national input-output model should not be used without some modification.

One short-cut to estimates of regional input-output multipliers was proposed by Drake (1976), who decomposed the multiplier into three components:

a) an initial change component (unity)
b) a direct effects component $d_j = \Sigma_i a_{ij}$
c) an indirect effects component $b_j = [\Sigma_i r_{ij}] - [1 + \Sigma_i a_{ij}]$

These were used to estimate an 'interdependency coefficient', effectively a measure of the relative size and openness of the regional economy, which could be used to adjust the multiplier estimates from the national table. The results, however, were not entirely satisfactory, due to errors in estimating the direct effects component which were carried through into the indirect effects component. An alternative method of developing a regional table with reduced data requirements was developed by Craig Davis (1976), who concluded that the use of a national input-output table would be feasible for constructing local sectoral multipliers if the local sectors were formulated to closely correspond to sectors in the national transactions matrix.

In most instances, however, this will not be the case, and some other adjustment procedure is required. Recently attention has turned to a technique known as the GRIT method (Generating Regional Input-output Tables), first developed by Jensen et al. (1979) and subsequently adapted for other studies.

The central feature of the GRIT method is the adjustment of the coefficients of the national transactions matrix in accordance with the particular characteristics of the regional economy. Where a particular industry in the national matrix is not present in the region, the inputs it provides to other industries at the national level are treated as imports at the regional level, and its technical coefficients (a_{ij}) are set to 0. Where a particular industry is present in the region, the technical coefficient is adjusted by a location quotient (LQ) and the difference between the national and regional (adjusted) coefficients is added to the imports coefficient if LQ is less than 1, or subtracted if LQ is greater than 1.

The location quotient is calculated as the ratio of an industry's proportion of regional output to that industry's proportion of national output. That is:

$$LQ_{ij} = \frac{E_{ij}/\Sigma_i E_{ij}}{\Sigma_i E_i/\Sigma_i \Sigma_j E_{ij})}$$

where: E = output (or employment as a proxy for output) in industry i and region j;

so

LQ = the ratio of (output in industry i in region j/output of all industries in region j) and (output of industry i in all regions/ output of all industry in all regions).

Once the national table has been adjusted for LQ, further modifications may be made to the national table, for instance in view of 'superior knowledge' of transactions in particular regional industries, or combining some sectors to collapse the table into a smaller, more manageable form. When the regional transactions matrix is complete, the process of matrix inversion can be carried on as before and the regional sectoral multipliers obtained.

Regional input-output models derived from the GRIT procedure have now been applied in a number of studies in New Zealand. Hubbard and Brown used this method for examining the regional impact of irrigation projects (1979) and later to produce a series of regional input-output tables (1981). The regions defined in this study, however, were based on statistical divisions, and may be considered too large and aggregated to be of much use in regional planning. Butcher (1985) developed a range of output, income and employment multipliers for more narrowly defined regions, for estimating secondary benefits in agricultural cost benefit analysis. Most recently the GRIT method was used to develop multipliers for the McKenzie basin in a study of the economic benefits of Mount Cook National Park (Kerr et al. 1986).

Although the GRIT method is widely regarded as the most suitable non-survey technique for generating regional multipliers, it has some limitations in addition to those of general input-output methodology. It involves aggregation of industries, which may over-state the self-sufficiency of regions by obscuring inter-industry transactions. It also relies on the existing national input-output tables, which in the New Zealand context are now rather dated (1976-77 latest available).

3.4 Limitations to the Estimation and Use of Multipliers

The foregoing sections have outlined the three most commonly used methods for obtaining regional economic multipliers: economic base theory, Keynesian models and input-output analysis. The multipliers from the input-output models are the most comprehensive but also the most demanding of data. Economic base multipliers have the smallest data requirement but they are also the most aggregated estimates. Input-output multipliers derived from non-survey techniques are likely to be of most use for policy purposes, but they are subject to a number of limiting assumptions and problems, some of which are shared by the other forms of multiplier.

The most important assumptions underlying input-output modelling are as follows:

a) input-output relationships in each industry are linear, i.e. output changes in constant proportion to inputs and there are no economies of scale;
b) the output of each industry is homogeneous, i.e. the product mix remains the same at all levels of output;
c) the supply of inputs from all local industries is perfectly elastic;
d) technical coefficients change at the same rate in all industries. so that distortions from using old data are assumed away;
e) average production and consumption functions are equivalent to marginal production and consumption functions;
f) the only constraint on output is aggregate demand;
g) any increase in demand can be met by resource redeployment.

In addition to these general assumptions of input-output modelling, further assumptions are specific to the GRIT method of non-survey construction of regional tables. The main ones are:

h) intra-regional transactions have the same relative importance regionally as nationally;
i) an industry's input requirements for outputs of other industries are the same regionally as nationally;
j) regional imports are identical to imports nationally.

Notwithstanding the adjustments made to national coefficients in the GRIT procedure, these remain strong assumptions in the regional model. Moreover the assumptions behind input-output modelling generally can be criticised for presenting too static a picture of the economy, making no allowance for such things as input substitution, economies of scale, changing technologies in the different industries or changing patterns of inter- and intra-regional trade.

In practice it may not be safe to assume that increases in output required to service increases in final demand will be met by purchases from the input-supplying industries. If suppliers within the region are unable to service the increased demand, or the price of their output increases, their customers are likely to increase their imports into the region and thus reduce the value of the multiplier. Similar problems exist in dealing with the household sector, since as household incomes rise, the type and quantity of goods purchased is likely to change in contravention of the assumption of linear, homogeneous consumption functions which is usually made.

An implicit assumption behind the calculation of multipliers is that regional industries are operating at full capacity and thus require further resource deployment to meet enhanced demand for output. The existence of economies of scale in many industries with diminishing inputs at the margin contradicts this assumption. There is some empirical evidence of employment multipliers overstating the observed effect on employment, suggesting that service industries in particular operate at less than full capacity and can absorb increases in their output without employing additional staff (Butcher 1985).

Most multiplier estimates do not explicitly state the time lag over which the full effects of a multiplier will be felt. Different multiplier estimates will arise from different assumptions on the velocity of transactions through the local economy. Moreover, multiplier studies of regions or countries in isolation rarely contain a feedback mechanism to assess the effects on the subject region of additional demand for its products outside the region induced by extra economic activity within the region. Another omission from most models is the complex relationship between government transfers and the regional economy, as manifested by the interaction of regional income, taxation and transfer payments received.

Most input-output studies have implicitly assumed that output is destined for final demand, that the economy is driven exclusively by final demand, and that backward linkages within the economy are the most important linkages. However, some industries in any local economy provide very little output to final demand, so forward linkages may be significant. Multipliers taking account of forward linkages can be estimated by adjusting the technical coefficients of particular industries, as was done by Butcher (1985) for agriculture, horticulture and forestry, most of whose output is further processed by other sectors. For an industry such as tourism, however, which services final demand directly, multipliers based on backward linkages are appropriate.

One of the problems of constructing regional input-output tables is the aggregation bias which occurs when combining industries or sectors into a smaller, more manageable table. Lewis (1986) provides a mathematical exposition of the procedure to be used when collapsing tables. Hubbard and Brown (1981) suggest that aggregation bias in output multipliers is likely to be small, but such bias is more pronounced in income and employment multipliers.

A final general problem is that input-output analysis equates the average technical coefficients which appear in the transactions matrix with the marginal coefficients which economic theory suggests should determine the allocation of resources. The discrepancy between marginal and average values is likely to be greater at the regional than at the national level.

There is considerable scope for error in the construction of input-output tables which, combined with the underlying assumptions, implies that multipliers need to be interpreted with caution. Nevertheless, they can still be usefully applied to indicate the extent of impacts in a local economy generated by a particular project or industry. For some purposes the secondary benefits resulting from 'knock-on' or 'downstream' effects are important for policy decisions at the regional level, and multipliers provide an estimate of the likely magnitude of these effects.

What multipliers do not show are the costs of a particular industry or project; the precise effects nationally of a particular gain made locally; and the gains in one region resulting from secondary effects leaking into it from other regions. Furthermore, it should be remembered that the size of the multiplier is closely related to the size and openness of the regional economy to which it applies, making comparisons between unequal regions particularly hazardous. It is also important not to confuse the direction of causation in interpreting multipliers: output drives income and employment, and the creation of employment in one sector will not have a multiplied effect in other sectors unless there is a corresponding increase in sector output.

CHAPTER FOUR

CASE STUDY OF THE WHAKAPAPA AREA IN TONGARIRO NATIONAL PARK

4.1 Background to the Whakapapa Area Visitor Surveys

Situated in the centre of the North Island, Tongariro National Park is one of the most important outdoor recreational resources in New Zealand. It is approximately equidistant from the country's two largest cities, Auckland and Wellington, and approximately two thirds of the national population live within 5 hours' drive of the park.

The park is centred on three active volcanoes, Mounts Ruapehu, Ngauruhoe and Tongariro, and has a mixed terrain encompassing rock and snow slopes, tussock grasslands and indigenous forest. In the summer the park is the scene of a range of recreational activities, from general sightseeing, family camping and picnics, to more strenuous tramping and mountaineering. In the winter skiing and other winter sports are added to the list of activities undertaken in the park, since on Mount Ruapehu are found the only commercial skifields in the North Island.

There are three skifields in the park: Tukino, on the eastern side of Ruapehu; Turoa, on the southwestern side; and Whakapapa on the northwestern slopes. Tukino is a club skifield with limited facilities and public access. Turoa is a fully commercial field, developed by a single concessionaire since the 1970s. Whakapapa has been the scene of skiing activity since the 1920s, and has been developed since then by a combination of clubs and commercial operators into the largest skifield in the North Island.

Because of the time and nature of its development, the Whakapapa skifield has a number of distinctive characteristics. Around fifty private huts and ski-lodges are located on or around the skifield, in contrast to Turoa where all accommodation has been positioned outside the park boundaries. Below the skifield, further building has taken place in the Whakapapa village, which contains the park headquarters, the Chateau Tongariro hotel, a motel, motor camp and accommodation for local employees. The existence of around 1500 beds within the park on the skifield poses problems for park management, particularly with regard to the supply of water, sanitary arrangements, road clearance and parking facilities and the ability to evacuate the skifield in the case of emergencies such as avalanche and volcanic activity. These are in addition to the usual problems associated with skifield development within a national park, such as litter removal, visual intrusion of ski-tows and ancillary buildings and adverse impacts on the vegetation of the area.

Under the National Parks and Reserves Acts of 1953 and 1980, national parks in New Zealand have the joint objectives of preserving features of natural, historic or cultural importance to the nation while at the same time allowing public access for recreational purposes. To some degree all forms of recreational development, but particularly skiing, are in conflict with the conservation objective. In drawing up management proposals for a national park, it is useful to know what is the value of a particular area for recreation, at both the national and the regional level. This is information which can be provided by non-market valuation techniques, such as the travel cost model, and by economic impact analysis.

The following sections describe briefly the conduct and results of a survey of visitors to the Whakapapa skifield and village area carried out in the winter of 1985 and the summer of 1985/86. The survey was commissioned by the Department of Lands and Survey and intended to provide information to be used in the management planning process for the Whakapapa area. The aim of the survey was primarily to obtain sufficient information to undertake a travel cost evaluation and an impact analysis of the survey area, but in addition sought information on visitors' activities, attitudes to facilities and opinions on park management which may be of interest to those in the management planning process.

4.2 The Whakapapa Visitor Surveys

4.2.1 Conduct of the visitor surveys

The type of survey chosen was a self-completed questionnaire, distributed to a sample of visitors arriving at the Whakapapa skifield in winter, and at the Whakapapa village in summer. Very few summer visitors travel up to the skifield itself, since none of the facilities are operated outside the main skiing season, so the position of the survey point in the summer and winter surveys was different. The choice of a self-completed questionnaire was influenced by a number of factors: the staff required to distribute questionnaires, the number of contacts and sample size required, and, not least, the success of a survey run with similar procedures at the Turoa skifield in 1982.

Both surveys sought to distribute questionnaires to adult visitors identified as 'autonomous economic units'. In the case of family groups, the family was taken as being a single economic unit and given one questionnaire, but in the case of individuals travelling either singly or sharing a vehicle with others, each individual was treated as a separate economic unit. This distinction was necessary in order to allocate costs between visitors who were not from the same household, in recognition of the fact that travel costs to an individual could be substantially reduced by sharing transport.

In both surveys cars were selected at regular intervals from the traffic passing the roadside survey point. The winter survey was complicated by the existence of 'mountain goats', large four-wheel drive buses which travel up the mountain road between the Whakapapa village and the skifield. The goats get heavy use at times when weather conditions close the mountain road to vehicles other than those equipped with chains and four-wheel drive. Some visitors prefer to use the goats every time they go to the skifield, either because they are accommodated in the Whakapapa village on a package holiday deal and have no vehicle of their own, or because they are deterred by the state of the road from taking their vehicles all the way to the skifield. For the winter time survey, in addition to the roadside survey point, questionnaires were also distributed to visitors as they queued to board the mountain goats.

The choice of days for the winter survey was stratified according to month and transport type, using records of vehicle arrivals from 5 previous ski seasons. On the assumption that each car held on average 3.8 people and each bus contained 30, the expected use of the skifield through the season was estimated and 20 survey days were selected. For the summer survey, located below the position of the mountain road's permanent vehicle counter, no previous records of vehicle arrivals were available, so the selection of survey days was reliant on the judgement of park staff. For the duration of the summer survey, however, the vehicle counter was moved to a position below the survey point, so that there would be a record of total vehicle arrivals independent of the tally-sheets kept by those who distributed the questionnaires.

In the summer time, a number of visitors arrive by tour coach, stay at the Chateau Tongariro for one night and then depart the following day. An attempt was made to survey some of the patrons of the Chateau who arrived in this way but it was not successful, partly because there was no practicable way to control distribution to coach tourists who arrived at irregular intervals, and partly because the questionnaire proved ill-suited for use by those on package-type tours. So the summer survey was exclusively of those who arrived by self-driven vehicles. This omission was not critical to the travel cost analysis, since most coach tourists were from overseas visitors who were excluded from the analysis. However, it is more serious for the expenditure analysis and the survey of visitor profiles.

4.2.2 Results of Visitor Surveys

The 1985 survey of Whakapapa skifield was run as planned on 20 days over 11 weeks of the peak ski season, during which period 3,245 questionnaires were distributed, 2,539 to car occupants and 709 to goat passengers. After all responses had been returned, checked and in some cases discarded, the usable total of responses amounted to 924, equivalent to a response rate of 28.5 per cent. This was a low response rate but, unfortunately, once the initial contact with respondents was made, there was no way a follow-up survey or reminder notices could be sent to the contacts. The system of distributing questionnaires anonymously to respondents, and offering a prize draw as an incentive to return questionnaires, which had worked satisfactorily at Turoa in 1982, did not work so well in the case of the Whakapapa survey. Consequently there is the possibility of non-response bias in all of the results of the winter survey of Whakapapa skifield.

The summer survey of the Whakapapa area was run effectively on 17 full days and 2 half days (due to rain) over an 8 week period of the peak summer season (Christmas until late February). During the survey, 707 questionnaires were distributed and 481 were returned. For this survey contacts were requested to give their names and addresses, and they willingly complied in all but a handfull of cases. A follow-up survey of non-respondents conducted in April yielded a further 32 replies, resulting in an overall response rate for the summer survey of 72.5 per cent.

A number of conclusions on the survey procedure can be drawn from these results. The winter survey was run without any pre-test or pilot survey in the field which proved critical to the results, since the failings of the distribution system and a number of ambiguities in the interpretation of the questionnaire only became apparent once the full survey forms were being returned. The failure to run a pilot was caused partly by bad weather which caused the cancellation of the field pre-test, and partly by the intention of surveying through the whole ski-season. The aim of surveying though the whole season was to obtain a sample of sufficient size to be able to cross-tabulate and compare different subsets within the sample. This was not feasible given the results obtained. So the chance of running a pilot survey was precluded by an aim which was not achieved, partly because of the failure to run a pilot.

No pilot was run for the summer survey, also because of time constraints, but experience from the winter survey suggested modifications to the system which contributed to a better response. However, in both surveys there were ambiguities in the replies to some questions, particularly those pertaining to expenditures and other locations visited, which limit the usefulness of the results. So the importance of running a full pilot survey, covering questionnaire distribution, collection and coding can not be over-emphasised. Such pilot surveys require time, probably at least a month if changes are required to the questionnaire or the distribution system. When visitor surveys are conducted over fairly short periods of concentrated use (such as a ski season or peak summer period) this suggests that what is required is either a pilot run at the beginning of the season and a full survey run later in the season; or a pilot run in one season and a full survey across the whole season run the following year.

In retrospect the aims of the survey may have been too ambitious for the techniques employed. The questionnaire sought information for a number of distinct purposes: visitor profile data such as respondents' age, sex, income, home location, type of party; visitor behaviour data such as activites undertaken, previous visits to Whakapapa and reasons for coming; visitor attitudes towards specific facilities and management practices; travel cost data such as type of vehicle, size of motor and fuel used; and expenditure data. Although these information needs overlap to some extent, the resulting questionnaire was quite long — 21 questions, but requiring recall in some cases — and took around 10-15 minutes to complete. It was evident from the responses that some respondents simply gave up half way through answering the forms, suggesting that a less time-consuming form may have been more successful. For the questions on expenditures and alternative locations which were answered poorly, a smaller, controlled interview-type survey may have been more appropriate.

The size of the winter survey also posed problems for the logistics of running the survey. In both winter and summer, park staff were used to distribute most of the questionnaires, but whereas in summer there was a small group of staff who were fully conversant with the aims and requirements of the distribution method, for the winter survey many more people were used, some on a casual basis. Around 8 per cent of the questionnaires returned in the winter survey were discarded, either because they contained insufficient information or because they had been distributed to the wrong person (e.g. children within family groups). The risk of such loss of control over the survey increases as the size of the survey operation increases.

There were, however, some purely qualitative factors which affected the apparent difference in success of the two surveys. Weather conditions encountered in the winter survey, including rain, mist and near-blizzard, did not facilitate the stopping of vehicles. Mountain goat passengers, laden up with skis, poles and other paraphenalia had other things on their minds than what to do with the yellow questionnaire presented to them. Winter visitors as a whole were less relaxed than their summer counterparts, anxious to spend as long on the slopes as possible and in some cases mildly resentful of being asked to stop. In these circumstances, visitors may have been more responsive to questionnaires received when departing from the skifield, rather than when arriving.

The operation and results of the Whakapapa visitor surveys illustrate that such surveys need time and flexibility to be executed successfully. Experiences on other surveys at other locations are not necessarily a good guide to how to conduct a survey, and a pilot run is invaluable in tailoring the method adopted to the peculiarities of the particular survey location. The results of the Whakapapa surveys were sufficient to provide much information of use, but they also have deficiencies with respect to the representativeness of the winter time results, and the completeness of results for some categories of question, which to some extent limits the usefulness of further analyses of the data.

4.2.3 Some findings of the Whakapapa visitor surveys

The surveys provided a wealth of information about the visitors to the Whakapapa area in the two seasons, only a fraction of which is presented here. This covers visitor profiles, visitor behaviour, and opinions on facilities and management practices in the Whakapapa area. There were several significant differences between the winter and summer visitors, but also some points of similarity.

The most basic question concerning recreational use of any resource is 'how many people actually use it?' In both surveys, vehicle counters were located below the survey point for the duration of the survey period, for the purpose of weighting the results obtained. By adjusting the road counter figures for the proportion of non-recreational vehicles using the road (e.g. park staff vehicles, service or delivery vehicles) and comparing these adjusted totals against the tally sheets for the survey days, a weighting factor was obtained for inflating the number of responses up to the number of responses which would have been obtained if the survey had been a census of all arrivals over the survey period. A further weighting adjustment was made so that the proportion of week-end and week-day responses was the same as the proportion of week-end and week-day arrivals over the survey period as a whole. All of these adjustments assume that the survey sample can be taken as representative of the survey period population.

On this basis, over the 11 week period from 1st August to 14th October 1985 approximately 170,000 respondents arrived at the Whakapapa skifield. Counting the number of visitors recorded on each response (allowing for the difference between family groups and individual respondents) this implies that around 320,000 visitors arrived at the skifield over that period. By comparison, over the 8.5 weeks of the summer survey period, there were around 9,600 respondent arrivals, equivalent to total visitor arrivals of 22,000.

The quantum used here is 'visitor arrivals' rather than 'visitor days', which are rather more difficult to estimate. The number of visitor arrivals is likely to understate the number of visitor days, since a proportion of arriving visitors in both seasons is accommodated above the survey point, so that a single arrival generates more than one visitor day. (The weighting process precludes the calculation of visitor days by multiplying by days on site). On the other hand, the visitor arrivals figure also includes a proportion of very brief visits and may be expected to excedd the number of visitor days. Given these provisos, the visitor arrivals figure is the best estimate available of visitor numbers over the survey periods.

In both surveys families with children were the predominant party type, and there was a preponderance of respondents from the higher income groups who described their occupations as being in the professional, technical or managerial categories (around 35 per cent in each survey, compared with 10 per cent for the population as a whole in the 1981 census). The winter survey had a higher proportion of respondents in the 25 years and younger age groups, and a higher proportion of students, than the summer survey. Since these comparisons are of respondents rather than of visitors, a higher proportion of winter visitors appears to consist of young people travelling independent of their parents (i.e. acting as 'autonomous economic units').

The 'average' winter visitor arrived in a party of about four people, stayed on the skifield for around 4 days and was away from home for 5 nights. This average is, however, dragged upwards by a few very long stayers on the skifield, principally consisting of part-time workers on the field who work principally to be able to ski. Only 20 per cent of winter visitors were on their first visit to Whakapapa, and 87 per cent gave skiing as their main reason for their visit. All but 3 per cent of winter visitors were New Zealanders, and 40 per cent came from Auckland alone. The regions to the north of Whakapapa (including Hawkes Bay) were home to nearly two-thirds of respondents, and Wellington accounted for a further 14 per cent of respondents' homes.

The 'average' summer visitor arrived in a party of 2 or 3, stayed 2 days in the Whakapapa area on a trip away from home of around 19 nights. Around 30 per cent of visitors were on their first visit to the Whakapapa area, and no single activity (such as sightseeing, tramping or natural history study) predominated in the list of stated reasons for the visit. One third of summer respondents came from overseas — predominantly from Australia, but also a significant proportion from Western Europe — in which case they spent on average less than 2 days at Whakapapa on a tour averaging 39 nights away from home (compared with 2.5 days and 8 nights for New Zealanders). Auckland was the largest single source of visitors (22 per cent) followed by Australia (17 per cent) and Wellington (14 per cent).

A number of comparisons can be made between the winter and summer users of the Whakapapa area on the basis of these results. These include:

a) Visit characteristics differ considerably between the seasons. Summer visitors tend to be longer away from home and have a broader spread of purposes and activities in mind when visiting the Whakapapa area. They are also more likely to regard Whakapapa as only one of a mix of complementary sites in the region than are winter visitors.

b) Although many characteristics of summer and winter visitors are similar (e.g. income and occupation), others are quite different (e.g. ages, party type). While the winter and summer visitors are apparently drawn from similar subsets of the population at large, the individuals in the two sets appear to be largely different. Slightly under half the summer respondents had visited Whakapapa in the winter time, and of these only 45 per cent admitted to having skied there.

There were several significant differences between winter respondents who arrived on week days and those who arrived at week-ends. Week-end respondents spent less time on the field, spent less money each day they were in the area, were more likely to perceive the field as overcrowded, were more likely to regard Whakapapa as the sole destination of their trip, and more likely to live in Auckland. While these findings are not startling in themselves, in combination with the fact that about 60 per cent of visitors arrive on week-days, they illustrate some aspects of a classic dilemma for park management: whether to allocate resources to servicing peak (week-end) users, or whether to concentrate more on off-peak users. In the context of a park with a conservation objective, the ideal, minimum-impact solution is to try to spread use from peak to off-peak periods, but there is a limit to the extent to which this can be achieved.

Respondents in both surveys where asked to give their opinions on a range of facilities within the park, both using a 5-point attitude scale (1=Very Satisfied, 5=Very Dissatisfied) and in open ended questions. Responses were quite widely distributed, but the facilities drawing most unfavourable comment were the cafeterias in the village and skifield areas (both seasons), the road to the skifield and the toilets (winter only). Open questions from the winter survey drew a number of comments on congestion on the lower ski-tows, and on the requirement to purchase separate tickets for car parking and ski-lifts. Coincidently, since the winter survey was run, both these criticisms have been remedied by increasing the capacity of the lower lifts and unifying the parking and lift tickets, so the skifield operators could expect there to be some increase in user satisfaction from these changes.

In the summer survey, responses to attitude questions were mostly positive, although a number of open questions suggested there was too little low cost accommodation and too few tent sites in the Whakapapa village area. A recurring comment from overseas visitors was that there was insufficient publicity in distant locations about the park and what it has to offer. The park managers may take comfort that the summer nature programme of interpretative activities was very highly acclaimed by most of those who used it, but very few respondents took part in programme activities, possibly because of the short period over which they are offered.

More detailed results on visitor profiles, behaviour and opinions from the two surveys were submitted to the Department of Lands and Survey for use in their management planning exercise for the park. Clearly a visitor survey offers scope for obtaining feedback from park users on a range of aspects of interest to park management but, as indicated in the description of the survey operation, there is a limit to the amount of information which such surveys can usefully collect in practice.

4.3 Travel Cost Analysis of the Whakapapa Area

4.3.1 Variable Definition and Calculation

As indicated in Section II, the travel cost method of recreation analysis is a two-stage process designed to estimate the consumer surplus associated with current visit patterns to a recreational site. The first stage consists of fitting a statistical function to survey data relating number of visits to a site with the travel costs associated with those visits. The best fit equation from this stage is then used in the second stage to predict the number of visits which would be expected at successive increments of cost increase. This provides sufficient information to construct an economic demand curve, from which the consumer surplus can be calculated.

A separate analysis was applied to each of the winter and summer surveys of Whakapapa, in view of the differences between visitors apparent in the visitor survey results. Both analyses were based on aggregated data, which means that all variables refer to averages or percentages within specific distance zones into which the survey observations were sorted. The zones used were based on local territorial authority areas, either singly or in combination with neighbouring local authorities, from which accurate figures for total population were available from the 1986 census. The number of visitors from each home location was divided by the population of the corresponding zone to obtain a figure of visit rate per thousand population in each zone.

The principal variable in travel cost analysis is the travel cost itself, but there are several ways in which this can be formulated. A number of distinct travel cost variables were specified and tested to see which gave the most satisfactory results in the regression analysis. In some cases the best fit to the data was obtained from a variable which was not the most appropriate on theoretical grounds, so there was some element of trade off between obtaining statistical precision and a theoretically sound estimate of the demand equation.

Travel costs in an economic sense have three components:

the actual costs of travel e.g. vehicle running costs;
the extra expenditure associated with travel e.g. lodging;
the opportunity cost of time taken to reach the site.

How to incorporate these different components into a regression equation is not unanimously agreed in the literature on the travel cost method, so some experimentation with different formulations was applied to the travel cost data.

The travel cost finally accepted for the Whakapapa analyses was one which included all of the components above, averaged across visitors. It was obtained by first estimating travel cost per respondent which was either the respondent's recorded return fare on public transport; or some formulation of return distance from home times vehicle running costs. Running cost figures were taken from Ministry of Transport data and varied for three different sizes of engine for three types of fuel. The default was taken as being a petrol engine of 1600-2000cc capacity.

In the case of individual questionnaires (i.e. not family groups) the total travel cost was divided by the number of people sharing the vehicle, so as not to double count the vehicle costs. To each respondent's travel cost was then added their total expenditures made during the visit to Whakapapa, to produce a variable which was called 'journey cost'. Journey cost was then divided by the number of people represented by the respondent – in the case of individuals, 1, in the case of a family, the total of family members – to produce a variable 'individual journey cost' or 'ICOST'. Finally the time component (being a third of the average hourly wage rate times return journey time) was added to ICOST to produce the travel cost variable used in the analysis: 'TIMEIC'. Since the travel cost model was an aggregated one, the variable used was the mean of TIMEIC in each zone. The travel cost variable is therefore a composite of individual costs varying according to transport mode, engine size, fuel used and vehicle occupancy.

Various other travel cost variables were calculated along similar lines, including those adjusting travel cost by days in the area, by single or multiple visit trips and so on. These adjustments increased the variablilty in the observations and worsened the predictive ability of the equations obtained, so these adjusted variables were not selected for the second stage of the analysis. Attempts were also made to adjust the travel cost variable for multiple site visits along the lines envisaged by Beardsley (1971) or Haspel and Johnson

(1982), but the survey data contained insufficient information on visitors total trip itineraries to enable this to be done.
Other variables may be included into a multiple regression equation in the first stage of the travel cost analysis. No variable for substitute sites could be devised, so it was omitted. Neither was a variable for site quality specified, following the argument of Shelby (1980) about the irrelevance of individual perceptions of congestion to aggregate demand. Various socio-economic variables were tested in the equation as proxies for tastes, but the only one found to be significant was 'AGEPC', defined as the percentage of zone population aged 60 years or more.

4.3.2 Choice of an explanatory function

The aggregated data for both the winter and summer surveys were subjected to multiple linear regression analysis on a mainframe computer using the Statistical Package for the Social Sciences program, version 10 (SPSSX). A number of different specifications of the basic function were tried, in order to discover which variant had the best predictive ability.

An ordinary least squares regression procedure applied to aggregated data produces equations of the form:

$$VRATE = A + B1(TRAVEL\ COST) + B2X + \ldots BnK + E$$

where X . . . K are explanatory variables other than travel cost, A is a constant and E is the error term. In the case of the Whakapapa study the dependent variables were either the predicted visit rate (VRATE) or its natural log transformation (NLOG) or its square root transformation (VROOT). The independent variables included a variety of travel cost variables, age and income variables, or transformations of any or all of the independent variables.

Selection of the most suitable equations for the final stage of the travel cost procedure was based on a number of criteria. Initially equations were selected on the basis of their coefficient of determination (R squared), since this indicates the the proportion of variability in the dependent variable which is explained by the independent variables in the equation. However, direct comparison of the R squared of functions in which the dependent variable has been transformed can not be made with those of untransformed functions, since the denominator in the formula for R squared (the total sum of squares) is different in each case. To overcome this, the predicted values of the dependent variable in the transformed functions were transformed back to a predicted visit rate, then plotted against the observed visit rate. The resulting correlation and R squared statistics from these plots are directly comparable with those from untransformed equations, so they were used to rank the various equations for their predictive ability.

Other criteria used in the selection included the F statistic, the standard error of the estimate and the significance of the coefficients in the equation. A number of checks were also performed on the distribution of error terms including a histogram plot to check for normality in the distribution; a check for outliers on the error plot; and a scatterplot inspection to see if there was any observed pattern in the error variances. The untransformed summer equations displayed some heteroscedasticity and were rejected from further consideration. Moreover, when the time cost variable was included as a separate variable from ICOST, there was a high degree of correlation between them which was overcome by including them into a single variable.

In the summer time data, considerable difficulty was encountered in achieving any degree of predictive ability in the equations, although the procedures used were the same as those for the winter data. A high degree of variability in the data was associated with the high number of overseas visitors, so this was overcome by excluding overseas visitors from the analysis and by merging some of the distance zones. This move was not without precedent, since a number of other studies have discovered that the multiplicity of fare structures in travel costs from overseas and the difficulty of obtaining reliable socio-economic variables for overseas countries makes the inclusion of overseas visitors practically impossible. Moreover, since the travel cost method attempts to estimate the value of a site to the nation by analysing the costs incurred by nationals in their visits, there is no reason why non-nationals should be included.

The accompanying table (Table 1, Appendix) shows 6 equations for the summer analysis and 5 for the winter analysis which have the best predictive ability, based on the adjusted R squared of VRATE on PREDICTED V. For the winter data, semi-logarithmic forms appear to be most appropriate, whereas for the summer data a variety of untransformed, semi-log and log-log functions is represented. The preferred variable for use was TIMEIC, since this included transport costs, other expenses and time costs. For both summer and winter analyses, TIMEIC achieved a reasonable result in a semi-log transformation on the dependent variable.

In empirical studies of travel costs and visitations, an R squared value of 0.5 or above is quite acceptable (Walsh 1986). Some other studies have achieved apparently better predictive ability, but often these have been studies of sites with a smaller, more tightly defined catchment area of users. In some cases the coefficient of determination presented has been based on a transformed dependent variable before it has been converted to a prediction of visit rates which, as is shown in the table, results in a higher coefficient of determination in some cases.

4.3.3 The estimation of user benefits

The final stage of the travel cost method of recreation evaluation consists of using the selected equations to estimate the number of visits a site would receive at succesive increments of additional cost. This stage is similar to estimating the effect of imposing an entry fee on to the site, although this is not to imply that such fees should be applied in practice. For the Whakapapa study, this stage was adapted to a micro-computer spreadsheet program, as illustrated in the accompanying tables which show consumer surplus estimates for both winter and summer based on the variable TIMEIC.

The cells in the top block of the table (Tables 2 — 2d, Appendix) were used to estimate the cost of reaching Whakapapa from a particular zone at a particular level of cost increase. The cells in the bottom block of the table calculate the predictive equation on the contents of the corresponding cell in the top block, converting the results from natural logs into visit rates, then multiplying by the zone population to give the total number of visits from each zone at each level of cost. Summing these estimates down the columns resulted in a figure for the total number of visits at each level of cost.

This information on number of visits at successive cost (or price) levels forms the basis of an economic demand schedule, which can be graphically depicted as a demand curve. The total benefit to consumers, or consumers' surplus, was found by geometrically calculating the area beneath the demand curve between the x axis (visits at zero extra cost) and the point where the curve crosses the y axis (i.e. the cost at which visits are driven to zero). The surplus associated with each successive cost level was then summed to give the total consumer surplus, and finally converted to a mean consumer surplus per person visiting during each of the survey periods.

The estimated consumer surplus per head from the Whakapapa survey data was \$174 for winter visitors and \$147 for summer visitors. These estimates could be used to estimate the total benefits flowing from the Whakapapa area for the year as a whole by estimating total visitor arrivals in each season and multiplying these figures by the appropriate figure for consumer surplus per head. This calculation is not presented here, however, since there is no reliable estimate of visitor arrivals outside the survey periods.

These estimates appear high compared with those from some other recent studies employing the travel cost method in New Zealand. In 1985 dollar terms, consumer surplus per person was estimated as \$20 for Lake Tutira (Harris & Meister 1981), \$37 for the Kaimanawas (Sandrey and Simmons 1984) and \$53 Mount Cook National Park (Kerr et al. 1986). The difference with Lake

Tutira and the Kaimanawas may be partly explained by these resources' principally regional significance, in contrast to the Whakapapa area's role as a national resource. However, this distinction does not apply to Mount Cook National Park. The preferred estimate for the Mount Cook study was one based on a travel cost variable adjusted to allow for multiple-site trips, and estimates from unadjusted variables produced consumer surplus estimates of a similar order of magnitude to those obtained from Whakapapa. So the discrepancy appeared to be related to the treatment of multiple-site trips.

It proved impossible to account for multiple-stop trips at the stage of fitting the demand equation to the Whakapapa data, since the returned questionnaires did not yield sufficient information on visitors' total trip itineraries, but it was possible to adjust the consumer surplus. The unadjusted estimates effectively represent not the benefits received from the Whakapapa area alone, but rather the benefits received from the trips which included the visit to Whakapapa. Allocating all of these benefits to a single site would tend to overestimate the value attached to that site, but if some means of allocating total trip benefits between sites is used, a more plausible estimate for single site benefits can be made.

Given the extent and limitations of the Whakapapa survey data, the only feasible adjustment was to apply to each estimate the trip index (days at Whakapapa/nights away from home). This had a mean across zones of about 0.7 for winter visitors and 0.45 for summer visitors, a reflection of the differences in trip characteristics in each season. The effect of these adjustments was to reduce the summer estimate by more than the winter estimate, resulting in adjusted estimates of $124 per head in winter and $66 in summer.

The treatment of multiple destination trips requires more rigorous empirical testing before a definitive technique which is both practicable and intuitively plausible is found. In the Whakapapa study there were some undecided travellers who apparently did not know where they would stay after visiting Whakapapa, which suggests that a site-oriented questionnaire is inappropriate for techniques which rely on manipulating total trip itineraries. Similar uncertainty surrounds the treatment of time in the travel cost variable, which in the Whakapapa analyses accounted for slightly under 10 per cent of the final surplus estimates. However, the adjusted consumer surplus figures are of a plausible order of magnitude, and they indicate the relative differences in benefit derived from the Whakapapa area visitors in winter and in summer.

4.4 Expenditure Analysis of Whakapapa Visitors

4.4.1 Procedure adopted in the Whakapapa expenditure analysis

The analysis of expenditures from the Whakapapa survey was intended to give an indication of the level of economic impact in the Tongariro region associated with recreational visits to the Whakapapa area. Since this deals with the actual expenditures made for recognisable goods and services in the region, it would also illustrate the differences between such analysis and the travel cost analysis imputation of a value for intangible benefits derived from recreation.

The processing of data from the Whakapapa surveys encountered a number of problems. One question in each of the summer and winter questionnaires asked respondents to list their expenditures in the Whakapapa district, broken down by category of expenditure and specific location in which it was made. A high proportion of respondents appear not to have answered this question and of those who did, the inclusion of locations outside the Whakapapa district suggests that many did not understand the question. For the purposes of analysis it was assumed that all expenditures which were not specifically attributed to a location outside the local region could be attributed to it. However, it was by no means clear that all expenditures which should have been recorded were recorded, or that expenditures which should not have been included were omitted.

In view of this and the complexity of constructing a regional multiplier model (see Kerr et al. 1986) analysis of expenditures in the Whakapapa study was limited to the identification of local expenditures by visitors to the Whakapapa area. Multipliers developed by the Ministry of Agriculture and Fisheries for the Tongariro region (Butcher 1985) were applied to these identified expenditures to give an indication of the impact of visitor expenditures in the region as a whole.

For the purposes of the expenditure analysis, the Whakapapa region was defined as zones 1 and 3 of the location codes, broadly coinciding in areal extent with Taupo and Taumarunui counties. This local region was almost identical to the Tongariro region as defined by Butcher, for which multipliers were already available. The expenditure variables were grouped into two broad categories, according to the economic sector in which they fell. Most of the expenditures were grouped into a 'retail, wholesale, restaurants and hotels' (H & R) category, but expenditures on activities with a high personal service component were grouped into a 'personal service' category.

The expenditure variables used for this analysis differed from those included in the travel cost variable, since the latter included expenses incurred outside the immediate Tongariro region, whereas the expenditure analysis was limited to local expenditures. The expenditure analysis also included expenditures on items such as food and petrol, and spending by overseas visitors, all of which had been excluded from the travel cost analysis.

Type IB and Type II multipliers were applied directly to the expenditures recorded in each of the H & R and Service sectors to give an indication of the multiplied impact of those expenditures on the output of those sectors. With respect to the employment and income multipliers, it was necessary to convert the recorded expenditures into job equivalents and income retained estimates. The factors used for this conversion were the national indices given by Butcher (1985): in the H & R sector, 50.2 jobs and $232,000 income per million dollars direct injection; and in the service sector, 90.2 jobs and $431,000 per million dollars direct injection.

All of the indices and multipliers were based on an input-output table from 1976-77, so dollar values had clearly changed since they were calculated. In applying the output multiplier, it is not necessary to deflate expenditures back to 1977 values if the results are only to be reconverted into current values. For the income and expenditure multipliers, however, more serious distortions result from the age of the data used since, for instance, the effect of inflation is likely to have reduced the number of jobs created per million dollars of expenditure. However, deflating visitor expenditures back to 1977 values produced employment estimates which seemed exceptionally low. The real effect on employment is likely to lie between the deflated and undeflated estimates, but in the absence of better information on these ratios, greater precision is impossible. The application of income multipliers is also likely to have been distorted by the change in the real value of the dollar, although to a lesser extent than the employment estimates.

4.4.2 Results of expenditure analysis

Recorded expenditures in the Whakapapa region totalled $4.01 million over the 11 week period of the winter survey and $0.13 million over the 8 week period of the summer survey. The principal expenditure categories in winter were accommodation and meals (accounting for 33 per cent), skiing and other activities (31 per cent) and travel (19 per cent). In summer the principal categories were accommodation and meals (60 per cent), travel (22 per cent) and food (8 per cent).

The two accompanying tables (Tables 3 and 4, Appendix) show the winter and summer totals broken down by expenditure category, averaged across respondents (LEXP/CASE) and across visitors (LEXP/ALLV). Since the expenditure per visitor figures were averaged across the total of both those who did and did not record local expenditures, these averages could be applied to estimates of total visitor numbers to estimate expenditures over the season as a whole. In the right hand section of Table 4 the regional economic multipliers were applied to the total expenditure figures (LEXPEND), which were regarded as a direct inflow of funds into the local economy. Separate Type IB and Type II multipliers were applied to expenditures in each of the H & R and Services sectors, and the total impact in 1985 dollar terms was then calculated as the sum of the two sectoral impacts.

The results of this table show that, after taking into account the indirect and induced effects measured by the Type II multiplier, the $4 million dollars of expenditure by the winter visitors produced an additional $3.6 million of output and $1.6 million of income retained in the region. The number of jobs supported in the region lay in the range 113 (deflated) to 355 (undeflated). Similarly the $129,000 spent by summer visitors resulted in a further $105,000 of output and $44,000 retained income in the region. Extra employment supported by this injection lay in the range of 3 (deflated) to 9 (undeflated). The top level of the employment ranges are probably overstated, since the ration of employment to dollars of direct injection is likely to have changed since the time when the ratios were formulated.

Two further categories of expenditure associated with the Whakapapa area have an impact on the local economy. One of these is pre-paid bookings by recreational visitors which, given the ambiguities in the questionnaire replies, may have been recorded by some respondents. A detailed survey of tour operators would be required to ascertain how much they received in pre-paid bookings and how much they passed on to other establishments in the region. The other category is that of payments made by the national park administrators, such as ranger salaries and purchase of goods and services from local contractors. Such payments, if known, could be added to the expenditure figures and applied to multipliers to obtain revised estimates of impact. Since the visitor expenditure figures refer only to the periods of the survey, and extrapolations beyond these periods were unlikely to be reliable given the nature of the data base, no attempt was made to combine them with yearly park expenditures. So the impact figures above relate solely to the spending of visitors in the Whakapapa area over the periods surveyed.

CHAPTER FIVE

CONCLUSIONS ON RECREATIONAL LAND EVALUATION

Some recreational land uses, such as camping grounds and sports fields, have an economic value akin to that of other productive uses of land, determined by the stream of income flowing from that use over a period of years. But a problem arises with recreational land evaluation in an economic sense when dealing with more extensive tracts of public access land, which historically have been available for public use at zero or nominal charge to the users. This is caused by the absence of a market price for recreation which means that there is no 'quantum' to use in the valuation process.

This paper has outlined two methods which have been used in the evaluation of recreational developments on such land. The methods are not strictly comparable, since whereas travel cost analysis attempts to calculate a value for a non-market resource by estimating the consumer surplus from a demand curve derived from the behaviour of current users, impact analysis quantifies the value of that resource to the factors of production in the region in which it is located. So travel cost analysis results in an estimate of value to users throughout the nation, whereas impact analysis is limited to a value to producers for a particular region.

Either of these methods of analysis may be appropriate for particular policy purposes. They are not, however, interchangable. National policy makers may want a measure of the value of a resource used for recreation with which to compare its use for other purposes. The travel cost method, with certain reservations, is suitable for this purpose. Regional policy makers are more likely to want to know what effects a recreational or tourist activity will have in the region, in terms of service provision, levels of employment creation and income retained in the region. Multipliers obtained from expenditure analysis are suitable for this purpose, and those relating to tourism are directly comparable with those relating to other industries which may be competing for the same resource.

There has been some opposition to applying economic evaluation techniques to areas such as national parks and reserves, particularly from those who regard these techniques as debasing resources by attempting to assign dollar values to them. Such evaluation has been regarded in some quarters as morally offensive, even likened to the placing of a dollar value on the life of a relative. Distasteful as it may seem, society implicitly places values all the time on things as cherished as human life — for instance in determining the level of expenditure it is prepared to make on such things as public safety and health. Non-market valuation techniques do not attempt to create values where none existed before, but merely to identify the magnitude of such implicit valuations. Of these techniques, the travel cost method is the only one currently available which is both suitable for a resource used by non-locals, and which is based on observed human behaviour.

Much of the criticism of non-market valuation techniques is levelled not at the techniques themselves so much as at the way the results are used. The results of such evaluations are only one component in a decision making process based on many different criteria. Land under public ownership has a range of objectives set for it, of which provision for public recreation is only one. Decisions regarding the use or management of such land should therefore reflect more than simply its value for recreation.

There are limitations to the travel cost technique. Just what do the values obtained mean? First, they are limited in scope, being solely derived from values associated with current use of the resource. Such valuations say nothing about future levels of use, and hence nothing about future flows of benefits obtained from its use for recreation. Moreover, they explicitly exclude non-use values which may be associated with the resource. All economic valuation is anthropocentric in nature, equating value solely with some measure of human utility. There may be other intrinsic values, immeasurable in this way, which society nevertheless wishes to include in its policy decisions on land use.

Second, they are not marginal values, and hence do not provide a precise means with which to compare the returns from other land uses. The values obtained from the travel cost analysis of the Whakapapa area say nothing of the effect on its value of, for instance, a reduction by 10 per cent in the area of the skifield. It is not possible to relate these values to increments of land, and hence a comparison of the marginal values of various land uses can not be made. Moreover, these other land valuation techniques usually do not include the consumer surplus which is central to the travel cost valuation, which brings in another element of non-comparability.

Third, such values can not be used as a guide to economic demand in decisions concerning the imposition or increase of a gate fee to the recreational area. Even supposing such an entry fee were feasible over extensive tracts of land, there is empirical evidence that visitors react more adversely to a gate fee increase than they do to increases in 'hidden' transport costs, so such a fee would disturb the relationships on which the travel cost demand curve is based. Just as the elements of value are inseparable between the increments of the resource, they are also inseparable between the components of the recreational experience, such as travel costs and on-site costs.

Despite these reservations, values derived from the travel cost method do have use in providing a more comprehensive measure of demand for a resource than some commonly used alternatives (such as visitor days, participation rates). Placed within a cost benefit framework, although travel cost elements do not measure all the values associated with the resource, they do provide an indication of how big these other values must be to justify the resource's preservation in its current form. They thus remove some of the uncertainty and subjectivity surrounding the opportunity cost of retaining the resource in that use.

The values obtained from travel cost analysis are also useful in indicating the relative values of resources evaluated using comparable techniques. The value to the nation of the Whakapapa area in winter is approximately twenty times its value over a comparable period in the summer time. For a land management agency with a number of sites under its jurisdiction, and only limited resources to service them all, such relative values can be of use in determining where the priorities for resource allocation should lie. This is particularly so if the agency draws distinction between the recreational and other values which may be obtained from the site. For instance, a site with some value for nature conservation should not be precluded from being allocated resources for that purpose, simply because it has a low value for recreation. Recreational land evaluation has a contribution to make in improving the transparency with which decisions are made on land administered for multiple use.

The example of the Whakapapa study also shows that the value of the area to the nation far exceeds its value to the region, even after allowing for problems in data collection in the impact analysis. Regional figures from impact analysis do not include consumer surplus, but since consumer surplus is not captured by the region it is irrelevant to this kind of study. National values accrue to consumers, and represent the welfare loss which would accompany the loss of opportunity of using the area. Regional values accrue to the productive factors in the region, and the removal of tourist impacts in that region would not necessarily lead to a commensurate loss of economic impact in the nation as a whole.

The account of the Whakapapa area survey given in this paper illustrates some of the difficulties encountered in collecting data in practice. The estimates obtained in such circumstances should be regarded as indicative rather than precise. Such evaluation techniques require time for planning, testing and execution, and this requirement makes them inappropriate for use in some cases in the practical context of policy decision making.

On the other hand, such surveys also provide the opportunity for gathering other information which, although incidental to the economic evaluation, may also provide useful feedback on the success of current management practices. Such multi-function surveys enable the costs of data collection to be spread, providing the scale of the survey does not become so unmanageable that the response rate is adversely affected. Such questions as whether park programmes match the composition of existing users, or whether current facilities are being evenly used, can be addressed using a survey which also collects data for a travel cost analysis.

The Whakapapa survey, for instance, provided information on attitudes to management practices and facilities. Amongst other things it identified:

no clear balance of opinion in favour or against heliskiing;
a majority dissatisfied with the area's choice of eating places;
a perception of congestion on the lower skilifts and slopes;
dissatisfaction with separate car park and lift ticket purchase;
satisfaction with, but low use of, park interpretive facilties;
lack of awareness of the park's opportunities in distant areas.

These are all subjects which, either singly or in conjuction with other bodies such as skifield operators, tourist promoters and so on, the park authorities may wish to address in new policies. Such policies might be aimed at increasing visitors' satisfaction, evening out excessive peak use, increasing their length of stay in the area and, coincidently, increasing the economic impact of visitors.

The economic evaluation of recreational land is still in its infancy in New Zealand, with a number of unresolved questions about the appropriate definition and manipulation of variables used. Nevertheless, internationally there is an extensive body of literature on evaluative techniques, which ensures that such questions are at least well recognised. Removing such areas of uncertainty can only be achieved by further application and refinement of the techniques. While some might wish that economics were kept out of decisions on certain types of land use, the fundamental factors of irreversibility of land use change, scarcity of resources, and the need for accountability and transparency in policy decisions ensures that economic evaluations will continue to be required in the future.

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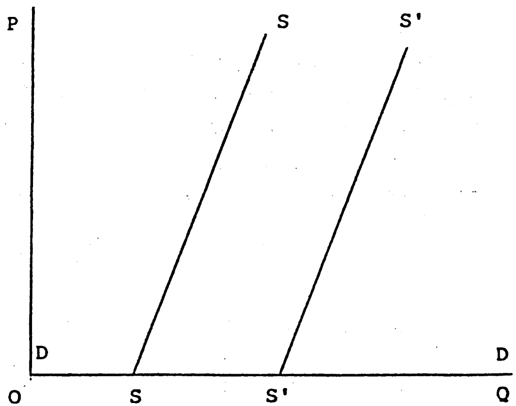
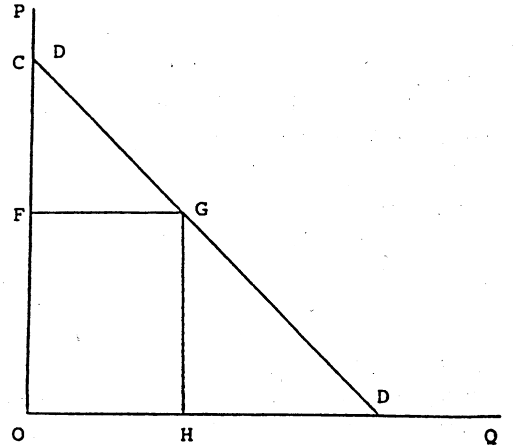
Figure 1



If rec has no cost, DD coincides with Q axis of supply curve. So variations in consumption are determined by shifts in the supply curve - S to S'.

Figure 2



Demand curve for a product/service is DD. If Price = F, Consumption quantity will be H, and the sum of commercial transactions will be OFGH. But there is also a consumer surplus at price F of FCG, which is the extra amount that some would have been prepared to pay. So total benefits from the product/service are given by area OCGH.

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Table 1: Equations Chosen for Travel Cost Analysis

WINTER

NLOG=	7.5967	- 0.0108	AVE PCOST	-0.1354	AGEPERCENT	|	0.7847	0.4352	0.6356	35.629
NLOG=	5.9301	- 0.01195	AVE PCOST			|	0.7368	0.2683	0.7028	54.1866
NLOG=	8.2126	- 0.0074	AVE ICOST	-0.1452	AGEPERCENT	|	0.5918	0.7486	0.6869	29.2811
NLOG=	7.668	- 0.0091	TIMEPC	-0.1366	AGEPERCENT	|	0.4345	0.7693	0.6579	32.6825
NLOG=	8.192	- 0.00657	TIMEIC	-0.1449	AGEPERCENT	|	0.7419	0.5812	0.6959	28.3012

SUMMER

VRATE=	18.86	- 0.794	AVE JCOST			|	0.5221	0.5221	4.21	12.016
NLOG =	6.39	- 0.998	lnAVEICOST			|	0.5467	0.5516	0.4594	15.476
NLOG =	6.502	- 0.9786	lnTIMEIC			|	0.5348	0.5402	0.4594	14.796
VROOT=	9.1166	- 1.3557	lnTIMEIC			|	0.5292	0.5418	0.6516	14.487
NLOG =	2.8998	- 0.00803	TIMEIC			|	0.5088	0.5489	0.4783	13.43
NLOG =	2.9142	- 0.010017	AVEIC			|	0.5167	0.5595	0.4744	13.831

Table 2: Calculations of Value from Travel Costs

(a) Summer - Time Cost

SUMMER TCM lnV = a + b1.TIMEIC +b2.AGEPC

STIMEIC ln V = 2.899825 -0.008031

	AGEPC	$0.00	$200.00	$400.00	$600.00	$800.00	$1000.00	$1200.00	$1250.00	$1260.00	$1270.00
TAUMARUNUI	9.70	43.58	$243.58	$443.58	$643.58	$843.58	$1043.58	$1243.58	$1293.58	$1303.58	$1313.58
TAUPO	9.70	49.25	$249.25	$449.25	$649.25	$849.25	$1049.25	$1249.25	$1299.25	$1309.25	$1319.25
WANGANUI	14.90	87.69	$287.69	$487.69	$687.69	$887.69	$1087.69	$1287.69	$1337.69	$1347.69	$1357.69
ROTORUA C	12.90	103.81	$303.81	$503.81	$703.81	$903.81	$1103.81	$1303.81	$1353.81	$1363.81	$1373.81
MANAWATU	13.70	114.15	$314.15	$514.15	$714.15	$914.15	$1114.15	$1314.15	$1364.15	$1374.15	$1384.15
HAMILTON	10.80	130.46	$330.46	$530.46	$730.46	$930.46	$1130.46	$1330.46	$1380.46	$1390.46	$1400.46
TARANAKI	14.30	195.64	$395.64	$595.64	$795.64	$995.64	$1195.64	$1395.64	$1445.64	$1455.64	$1465.64
NAPIER	13.90	139.35	$339.35	$539.35	$739.35	$939.35	$1139.35	$1339.35	$1389.35	$1399.35	$1409.35
TAURANGA	12.90	135.41	$335.41	$535.41	$735.41	$935.41	$1135.41	$1335.41	$1385.41	$1395.41	$1405.41
MASTERTON	15.20	172.71	$372.71	$572.71	$772.71	$972.71	$1172.71	$1372.71	$1422.71	$1432.71	$1442.71
WELLINGTON	12.00	179.17	$379.17	$579.17	$779.17	$979.17	$1179.17	$1379.17	$1429.17	$1439.17	$1449.17
AUCKLAND	13.80	178.73	$378.73	$578.73	$778.73	$978.73	$1178.73	$1378.73	$1428.73	$1438.73	$1448.73
WHANGEREI	13.20	205.74	$405.74	$605.74	$805.74	$1005.74	$1205.74	$1405.74	$1455.74	$1465.74	$1475.74

PREDICTED VISITS	EXP(NLOG)										
TAUMARUNUI	29.824	382	77	10	3	1	0	0	0	0	0
TAUPO	24.440	299	60	8	2	0	0	0	0	0	0
WANGANUI	59.689	536	108	13	4	1	0	0	0	0	0
ROTORUA	111.304	879	176	21	7	1	0	0	0	0	0
MANAWATU	169.092	1228	246	30	10	2	0	0	0	0	0
HAMILTON	188.639	1202	241	28	10	2	0	0	0	0	0
TARANAKI	103.879	392	79	9	3	1	0	0	0	0	0
NAPIER	193.372	1147	230	27	9	2	0	0	0	0	0
TAURANGA	113.534	695	140	16	6	1	0	0	0	0	0
MASTERTON	87.914	399	80	9	3	1	0	0	0	0	0
WELLINGTON	328.163	1414	284	32	11	2	0	0	0	0	0
AUCKLAND	860.349	3721	747	84	30	6	1	0	0	0	0
WHANGEREI	153.846	536	107	12	4	1	0	0	0	0	0
TOTAL		12832	2575	299	104	21	4	1	1	1	0
CONSUMER SURPLUS CALCULATION			1540659	287369	40265	12446	2497	501	119	104	96
TOTAL C.S.		1884055									
C.S./CAPUT		$146.83									
TRIP INDEX ADJUSTMENT (0.4474)			689291	128569	18014	5568	1117	224	53	46	43
ADJUSTED TOTAL C.S.		842926									
C.S./CAPUT		$65.69									

Table 2 - (b): Summer - Cost

SUMMER TCM lnV = a + b1.AVEIC +b2.AGEPC
SAVEIC2 ln V = 2.91424 -0.010017

	AGEPC	$0.00	$200.00	$400.00	$600.00	$800.00	$1000.00	$1010.00	$1020.00	$1030.00	$1040.00
TAUMARUNUI	9.70	37.47	$237.47	$437.47	$637.47	$837.47	$1037.47	$1047.47	$1057.47	$1067.47	$1077.47
TAUPO	9.70	38.74	$238.74	$438.74	$638.74	$838.74	$1038.74	$1048.74	$1058.74	$1068.74	$1078.74
WANGANUI	14.90	72.99	$272.99	$472.99	$672.99	$872.99	$1072.99	$1082.99	$1092.99	$1102.99	$1112.99
ROTORUA C	12.90	84.50	$284.50	$484.50	$684.50	$884.50	$1084.50	$1094.50	$1104.50	$1114.50	$1124.50
MANAWATU	13.70	91.52	$291.52	$491.52	$691.52	$891.52	$1091.52	$1101.52	$1111.52	$1121.52	$1131.52
HAMILTON	10.80	107.08	$307.08	$507.08	$707.08	$907.08	$1107.08	$1117.08	$1127.08	$1137.08	$1147.08
TARANAKI	14.30	170.22	$370.22	$570.22	$770.22	$970.22	$1170.22	$1180.22	$1190.22	$1200.22	$1210.22
NAPIER	13.90	113.50	$313.50	$513.50	$713.50	$913.50	$1113.50	$1123.50	$1133.50	$1143.50	$1153.50
TAURANGA	12.90	106.99	$306.99	$506.99	$706.99	$906.99	$1106.99	$1116.99	$1126.99	$1136.99	$1146.99
MASTERTON	15.20	138.39	$338.39	$538.39	$738.39	$938.39	$1138.39	$1148.39	$1158.39	$1168.39	$1178.39
WELLINGTON	12.00	143.56	$343.56	$543.56	$743.56	$943.56	$1143.56	$1153.56	$1163.56	$1173.56	$1183.56
AUCKLAND	13.80	141.73	$341.73	$541.73	$741.73	$941.73	$1141.73	$1151.73	$1161.73	$1171.73	$1181.73
WHANGEREI	13.20	218.73	$418.73	$618.73	$818.73	$1018.73	$1218.73	$1228.73	$1238.73	$1248.73	$1258.73

PREDICTED VISITS	EXP(NLOG)										
TAUMARUNUI	29.824	378	51	7	1	0	0	0	0	0	0
TAUPO	24.440	306	41	6	1	0	0	0	0	0	0
WANGANUI	59.689	530	71	10	1	0	0	0	0	0	0
ROTORUA	111.304	880	119	16	2	0	0	0	0	0	0
MANAWATU	169.092	1246	168	23	3	0	0	0	0	0	0
HAMILTON	188.639	1190	160	22	3	0	0	0	0	0	0
TARANAKI	103.879	348	47	6	1	0	0	0	0	0	0
NAPIER	193.372	1144	154	21	3	0	0	0	0	0	0
TAURANGA	113.534	717	97	13	2	0	0	0	0	0	0
MASTERTON	87.914	405	55	7	1	0	0	0	0	0	0
WELLINGTON	328.163	1436	194	26	4	0	0	0	0	0	0
AUCKLAND	860.349	3835	517	70	9	1	0	0	0	0	0
WHANGEREI	153.846	317	43	6	1	0	0	0	0	0	0
TOTAL		12731	1717	232	31	4	1	1	0	0	0
CONSUMER SURPLUS CALCULATION			1444774	194865	26283	3545	478	5			
	TOTAL C.S.	1669951									
	C.S./CAPUT	$131.18									
TRIP INDEX ADJUSTMENT (0.4474)			646392	87183	11759	1586	214	2	0	0	0
ADJUSTED	TOTAL C.S.	747136									
	C.S./CAPUT	$58.69									

Table 2 (c): Winter - Time Cost

WINTER TCM	lnV =	a +	b1.TIMEIC	+b2.AGEPC								
WTICAGE	ln V =	8.191876	-0.006569	-0.144886								
	AGEPC	b.AGEPC	$0.00	$200.00	$400.00	$600.00	$800.00	$1000.00	$1500.00	$1900.00	$1980.00	$1990.00
TAUMARUNUI	9.70	1.4053942	146.85	$346.85	$546.85	$746.85	$946.85	$1146.85	$1646.85	$2046.85	$2126.85	$2136.85
TAUPO	9.70	1.4053942	130.45	$330.45	$530.45	$730.45	$930.45	$1130.45	$1630.45	$2030.45	$2110.45	$2120.45
WANGANUI	14.90	2.1588014	185.52	$385.52	$585.52	$785.52	$985.52	$1185.52	$1685.52	$2085.52	$2165.52	$2175.52
ROTORUA C	12.90	1.8690294	186.57	$386.57	$586.57	$786.57	$986.57	$1186.57	$1686.57	$2086.57	$2166.57	$2176.57
TOKEROA	12.90	1.8690294	134.27	$334.27	$534.27	$734.27	$934.27	$1134.27	$1634.27	$2034.27	$2114.27	$2124.27
MANAWATU	13.70	1.9849382	203.07	$403.07	$603.07	$803.07	$1003.07	$1203.07	$1703.07	$2103.07	$2183.07	$2193.07
HAMILTON	10.80	1.5647688	192.42	$392.42	$592.42	$792.42	$992.42	$1192.42	$1692.42	$2092.42	$2172.42	$2182.42
WAIKATO	10.80	1.5647688	247.63	$447.63	$647.63	$847.63	$1047.63	$1247.63	$1747.63	$2147.63	$2227.63	$2237.63
TARANAKI	14.30	2.0718698	272.63	$472.63	$672.63	$872.63	$1072.63	$1272.63	$1772.63	$2172.63	$2252.63	$2262.63
HOROWHENUA	21.40	3.1005604	276.81	$476.81	$676.81	$876.81	$1076.81	$1276.81	$1776.81	$2176.81	$2256.81	$2266.81
NAPIER	13.90	2.0139154	243.92	$443.92	$643.92	$843.92	$1043.92	$1243.92	$1743.92	$2143.92	$2223.92	$2233.92
TAURANGA	12.90	1.8690294	273.28	$473.28	$673.28	$873.28	$1073.28	$1273.28	$1773.28	$2173.28	$2253.28	$2263.28
MASTERTON	15.20	2.2022672	171.45	$371.45	$571.45	$771.45	$971.45	$1171.45	$1671.45	$2071.45	$2151.45	$2161.45
WELLINGTON	12.00	1.738632	310.84	$510.84	$710.84	$910.84	$1110.84	$1310.84	$1810.84	$2210.84	$2290.84	$2300.84
AUCKLAND	13.80	1.9994268	305.85	$505.85	$705.85	$905.85	$1105.85	$1305.85	$1805.85	$2205.85	$2285.85	$2295.85
GISBORNE	12.90	1.8690294	462.78	$662.78	$862.78	$1062.78	$1262.78	$1462.78	$1962.78	$2362.78	$2442.78	$2452.78
WHANGEREI	13.20	1.9124952	454.49	$654.49	$854.49	$1054.49	$1254.49	$1454.49	$1954.49	$2354.49	$2434.49	$2444.49
PAIHIA	13.20	1.9124952	452.33	$652.33	$852.33	$1052.33	$1252.33	$1452.33	$1952.33	$2352.33	$2432.33	$2442.33
S ISLAND	15.50	2.245733	649.61	$849.61	$1049.61	$1249.61	$1449.61	$1649.61	$2149.61	$2549.61	$2629.61	$2639.61

PREDICTED VISITS	EXP(NLOG)										
TAUMARUNUI	29.824	10068	2706	727	196	53	14	1	0	0	0
TAUPO	24.440	9189	2470	664	178	48	13	0	0	0	0
WANGANUI	59.689	7358	1978	532	143	38	10	0	0	0	0
ROTORUA	62.930	10294	2767	744	200	54	14	1	0	0	0
TOKOROA	48.374	11157	2999	806	217	58	16	1	0	0	0
MANAWATU	115.500	15097	4058	1091	293	79	21	1	0	0	0
HAMILTON	119.276	25452	6841	1839	494	133	36	1	0	0	0
WAIKATO	69.363	10299	2768	744	200	54	14	1	0	0	0
TARANAKI	103.879	7882	2119	569	153	41	11	0	0	0	0
HOROWHENUA	53.592	1414	380	102	27	7	2	0	0	0	0
NAPIER	123.119	11954	3213	864	232	62	17	1	0	0	0
TAURANGA	113.534	10507	2824	759	204	55	15	1	0	0	0
MASTERTON	87.914	11381	3059	822	221	59	16	1	0	0	0
WELLINGTON	328.163	27034	7267	1953	525	141	38	1	0	0	0
AUCKLAND	860.349	56424	15167	4077	1096	295	79	3	0	0	0
GISBORNE	70.253	1872	503	135	36	10	3	0	0	0	0
WHANGEREI	95.898	2584	695	187	50	13	4	0	0	0	0
PAIHIA	57.948	1584	426	114	31	8	2	0	0	0	0
S ISLAND	369.483	1980	532	143	38	10	3	0	0	0	0
TOTAL		233530	62772	16873	4535	1219	328	12	1	1	0
CONSUMER SURPLUS CALCULATION			29630169	7964491	2140829	575448	154678	84991	2632	56	5

TOTAL C.S. 40553300
C.S./CAPUT $173.65

TRIP INDEX ADJUSTMENT (0.7137)		21147051	5684257	1527910	410697	110394	60658	1879	40	4

ADJUSTED TOTAL C.S. 28942890
C.S./CAPUT $123.94

Table 2 - (d): Winter Cost

WINTER TCM	lnV =	a +	b1.AVEIC	+b2.AGEPC								
WICAGE	ln V =	8.212612	-0.007445	-0.145223								
	AGEPC	b.AGEPC	$0.00	$200.00	$400.00	$600.00	$800.00	$1000.00	$1250.00	$1500.00	$1750.00	$1760.00
TAUMARUNUI	9.70	1.4086631	140.73	$340.73	$540.73	$740.73	$940.73	$1140.73	$1390.73	$1640.73	$1890.73	$1900.73
TAUPO	9.70	1.4086631	119.94	$319.94	$519.94	$719.94	$919.94	$1119.94	$1369.94	$1619.94	$1869.94	$1879.94
WANGANUI	14.90	2.1638227	170.83	$370.83	$570.83	$770.83	$970.83	$1170.83	$1420.83	$1670.83	$1920.83	$1930.83
ROTORUA C	12.90	1.8733767	167.26	$367.26	$567.26	$767.26	$967.26	$1167.26	$1417.26	$1667.26	$1917.26	$1927.26
TOKEROA	12.90	1.8733767	117.22	$317.22	$517.22	$717.22	$917.22	$1117.22	$1367.22	$1617.22	$1867.22	$1877.22
MANAWATU	13.70	1.9895551	180.44	$380.44	$580.44	$780.44	$980.44	$1180.44	$1430.44	$1680.44	$1930.44	$1940.44
HAMILTON	10.80	1.5684084	169.04	$369.04	$569.04	$769.04	$969.04	$1169.04	$1419.04	$1669.04	$1919.04	$1929.04
WAIKATO	10.80	1.5684084	222.96	$422.96	$622.96	$822.96	$1022.96	$1222.96	$1472.96	$1722.96	$1972.96	$1982.96
TARANAKI	14.30	2.0766889	246.70	$446.70	$646.70	$846.70	$1046.70	$1246.70	$1496.70	$1746.70	$1996.70	$2006.70
HOROWHENUA	21.40	3.1077722	250.54	$450.54	$650.54	$850.54	$1050.54	$1250.54	$1500.54	$1750.54	$2000.54	$2010.54
NAPIER	13.90	2.0185997	218.07	$418.07	$618.07	$818.07	$1018.07	$1218.07	$1468.07	$1718.07	$1968.07	$1978.07
TAURANGA	12.90	1.8733767	244.86	$444.86	$644.86	$844.86	$1044.86	$1244.86	$1494.86	$1744.86	$1994.86	$2004.86
MASTERTON	15.20	2.2073896	137.13	$337.13	$537.13	$737.13	$937.13	$1137.13	$1387.13	$1637.13	$1887.13	$1897.13
WELLINGTON	12.00	1.742676	275.23	$475.23	$675.23	$875.23	$1075.23	$1275.23	$1525.23	$1775.23	$2025.23	$2035.23
AUCKLAND	13.80	2.0040774	268.85	$468.85	$668.85	$868.85	$1068.85	$1268.85	$1518.85	$1768.85	$2018.85	$2028.85
GISBORNE	12.90	1.8733767	416.66	$616.66	$816.66	$1016.66	$1216.66	$1416.66	$1666.66	$1916.66	$2166.66	$2176.66
WHANGEREI	13.20	1.9169436	398.72	$598.72	$798.72	$998.72	$1198.72	$1398.72	$1648.72	$1898.72	$2148.72	$2158.72
PAIHIA	13.20	1.9169436	387.98	$587.98	$787.98	$987.98	$1187.98	$1387.98	$1637.98	$1887.98	$2137.98	$2147.98
S ISLAND	15.50	2.2509565	579.90	$779.90	$979.90	$1179.90	$1379.90	$1579.90	$1829.90	$2079.90	$2329.90	$2339.90

PREDICTED VISITS	EXP(NLOG)										
TAUMARUNUI	29.824	9429	2127	480	108	24	6	1	0	0	0
TAUPO	24.440	9020	2035	459	104	23	5	1	0	0	0
WANGANUI	59.689	7088	1599	361	81	18	4	1	0	0	0
ROTORUA	62.930	10260	2315	522	118	27	6	1	0	0	0
TOKOROA	48.374	11447	2582	583	131	30	7	1	0	0	0
MANAWATU	115.500	15198	3429	774	175	39	9	1	0	0	0
HAMILTON	119.276	26034	5873	1325	299	67	15	2	0	0	0
WAIKATO	69.363	10134	2286	516	116	26	6	1	0	0	0
TARANAKI	103.879	7650	1726	389	88	20	4	1	0	0	0
HOROWHENUA	53.592	1368	309	70	16	4	1	0	0	0	0
NAPIER	123.119	11892	2683	605	137	31	7	1	0	0	0
TAURANGA	113.534	10387	2343	529	119	27	6	1	0	0	0
MASTERTON	87.914	12844	2898	654	147	33	8	1	0	0	0
WELLINGTON	328.163	27292	6157	1389	313	71	16	2	0	0	0
AUCKLAND	860.349	57773	13034	2940	663	150	34	5	1	0	0
GISBORNE	70.253	1789	404	91	21	5	1	0	0	0	0
WHANGEREI	95.898	2672	603	136	31	7	2	0	0	0	0
PAIHIA	57.948	1749	395	89	20	5	1	0	0	0	0
S ISLAND	369.483	1913	432	97	22	5	1	0	0	0	0
TOTAL		235939	53227	12008	2709	611	138	21	3	1	0
CONSUMER SURPLUS CALCULATION			28916665	6523546	1471700	332013	74901	25735	4001	622	5
TRIP INDEX ADJUSTMENT (0.7137)			20637824	4655855	1050352	236957	53457	18367	2856	444	4

CONSUMER SURPLUS CALCULATION:
TOTAL C.S. 37349189
C.S./CAPUT $158.30

TRIP INDEX ADJUSTMENT (0.7137):
ADJUSTED TOTAL C.S. 26656116
C.S./CAPUT $112.98

Table 3: Breakdown of Total Expenditures and Mean Expenditures per Respondent (Case) at Whakapapa by Visitor Origin, Type of Party and Length of Stay

LOCAL EXPENDITURES	Winter	Survey	Summer	Survey
By Visitor Origin:	Total $	Mean/Case	Total $	Mean/Case
Local	243028	$43.99	0	$0.00
Other NZ	3586380	$75.51	108863	$121.87
Australia	184009	$96.37	18701	$113.57
U.S.A.			670	$27.00
British Is			577	$57.00
	4013417		128811	
By Type of Party:				
Individual	214178	$59.05	607	$60.00
Couple	430901	$78.18	28505	$126.43
Family	1929543	$103.54	57713	$117.06
2 Couples	120926	$45.05	3104	$62.50
2 Families	61968	$46.38	9818	$280.83
Org. Group	554222	$52.55	1377	$68.00
Informal G	658837	$57.77	27686	$106.72
Other	13333	$86.00		
	3983908		128810	
By Length of Stay:				
1 day only	447544	$58.16	98306	$183.91
2 day/W-E	926586	$73.27	6848	$72.28
3-7 days	1710949	$79.97	17656	$54.53
8-15 days	138802	$57.32	5830	$44.94
Over 15day	31919	$28.76	172	$17.00
Unspecific	742914	$75.67		
	3998714		128812	

Table 4: Economic Impact of Whakapapa Visitors in the Tongariro Region, and the Effect of Type IB and Type II Multipliers (1985 dollar terms)

WHAKAPAPA SUMMERTIME IMPACT

TOTAL			
VISITORS	22227		
Cases	9582		
MEAN V/C	2.3197		
LEXPEND $	128813		
by Cases	1093		
		LEXP/CASE	LEXP/ALLV
	128260	$117.35	$5.80
Accomm'n	77005	$70.45	$3.46
Travel	28066	$25.68	$1.26
Activities	3345	$3.06	$0.15
Food	10760	$9.84	$0.48
Purchases	4784	$4.38	$0.22
Misc. Exp.	4300	$3.93	$0.19
Total H&R	120615		
Total Serv	8198		

			Tongariro Regional Multipliers			
			Type IB		Type II	
	Injection		Multiplier	Impact	Multiplier	Impact
OUTPUT				$		$
H & R	120615		1.3	156800	1.8	217107
Services	8198		1.2	9838	2.1	17216
TOT IMPACT				166637		234323
EMPLOYMENT		Job Equiv.		Job no.		Job no.
H & R	120615	6.05	1.3	7.87	1.4	8.48
Services	8198	0.74	1.1	0.81	1.3	0.96
TOT IMPACT Undefl.				9		9
H & R	38449	1.93	1.3	2.51	1.4	2.70
Services	2613	0.24	1.1	0.26	1.3	0.31
TOT IMPACT Deflated				3		3
INCOME		Inc Retain		$		$
H & R	120615	27983	1.3	36377	1.4	39176
Services	8198	3533	1.1	3887	1.3	4593
TOT IMPACT				40264		43769

WHAKAPAPA WINTERTIME IMPACT — Tongariro Regional Multipliers

		LEXP/CASE	LEXP/ALLV
TOTAL			
VISITORS	327781		
Cases	174683		
MEAN V/C	1.8764		
LEXPEND $	4013418		
by Cases	54212		
	3978899	$73.40	$12.24
Accomm'n	1301497	$24.01	$3.97
Travel	772654	$14.25	$2.36
Activities	1245950	$22.98	$3.80
Food	261385	$4.82	$0.80
Purchases	125446	$2.31	$0.38
Misc. Exp.	271967	$5.02	$0.83
Total H&R	2460982		
Total Serv	1552436		

	Injection		Type IB Multiplier	Type IB Impact	Type II Multiplier	Type II Impact
OUTPUT				$		$
H & R	2460982		1.3	3199277	1.8	4429768
Services	1552436		1.2	1862923	2.1	3260116
TOT IMPACT				5062200		7689883
EMPLOYMENT		Job Equiv.		Job no.		Job no.
H & R	2460982	123.54	1.3	160.60	1.4	172.96
Services	1552436	140.03	1.1	154.03	1.3	182.04
TOT IMPACT Undefl.				315		355
H & R	784492	39.38	1.3	51.20	1.4	55.13
Services	494873	44.64	1.1	49.10	1.3	58.03
TOT IMPACT Deflated				100		113
INCOME		Inc Retain		$		$
H & R	2460982	570948	1.3	742232	1.4	799327
Services	1552436	669100	1.1	736010	1.3	869830
TOT IMPACT				1478242		1669157

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