

**THE APPLICABILITY OF THE
CONTINGENT VALUATION METHOD
FOR DETERMINING THE
NON-MARKET VALUES OF THE
HIGH COUNTRY LANDSCAPE**

Presented in partial fulfilment
of the requirements for the Degree
of Master of Science
in the
UNIVERSITY OF CANTERBURY

by
S.K.F. Ericksen

Centre for Resource Management
University of Canterbury and Lincoln College
1987

ABSTRACT

The landscape of the high country and the changes that are occurring to it are discussed. These changes may be viewed as either negative or positive. One agent of change is the self-spread of exotic conifers, and this is a focus of the study. This is because many of the possible changes occurring to the high country landscape are, or can be, a consequence to the possible responses to this spread. Benefit-cost analysis is considered as a tool for assisting in making decisions. Because the landscape is a classic public good it has a non-market value that is not readily apparent. If rational decisions and responses are to be made about the changes occurring in the high country, the non-market values need to be quantified and considered. Various methods of non-market valuation are briefly assessed. The contingent valuation method is considered most appropriate for assessing the non-market values of the high country landscape. However assessing the landscape is considered to be a personal and subjective experience. There is a lack of familiarity of viewing the landscape as a commodity within a context of tradeoffs. There is a likelihood of "contamination" of any value derived by ideological or non-economic values. Problems with willingness-to-pay measures not reflecting the "true" compensation that would be required because of the phenomenon of loss aversion are also considered. Consequently it is considered that given the present state of the arts that any measurement using contingent valuation would be subject to serious distortion. However, it is noted that even order of magnitude estimates can be of value in the decision making process.

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ACKNOWLEDGEMENTS

There are a number of people who have helped in making this study possible and whom I would like to take this opportunity to thank.

I would especially like to thank my two supervisors over the period of this study, Rienhard Pauls and Basil Sharp, for their help, encouragement and perseverance.

The numerous people I have had discussions with, which have helped in the formulation of the ideas contained within this dissertation.

The University of Canterbury Librarians for their ever helpful assistance in tracking down or obtaining references.

My classmates and flatmates who have unceasingly encouraged and cajoled me on.

CHAPTER ONE: INTRODUCTION

The high country of the South Island of New Zealand forms an extensive and distinctive landscape. While it has a semi-wilderness appearance, it is a human-induced landscape, first through the burning of forests by the Maori, and then through grazing of sheep (Ashdown and Lucas, 1987). As with all landscapes it is in a continual process of change, both from natural and human-induced sources. These changes may vary from beneficial to detrimental, manageable to impossible to manage (White and Bratton, 1980). Changes that are occurring in the high country range from successional processes, either natural or induced, through to developments such as plantations, bulldozed tracks or "shiny sheds". Because of the volume of change that has occurred in recent decades there is concern in some quarters that the landscape quality of the high country is in decline (Rackman et al., 1983). Some changes, such as the reduction of grazing pressure, results in other changes, such as the establishment of self-seeded or "wilding" trees. Because of the ecology of exotic conifers, they have a considerable potential to colonise much of the high country. This would have, not unexpectedly, a considerable impact on the landscape. However, whether people would view this as a positive or a negative change is a matter of much conjecture. Options suggested in response to the spread of conifers range from "do nothing", manage for wood products, through to control. Associated with all these options however are various costs and benefits and to arrive at an economically efficient solution these need to be known.

Because the landscape is a classic public good (that is: the enjoyment or utility derived by one person does not diminish that available to others) (Price, 1978) it has a non-market value that is not readily apparent. If rational decisions and responses are to be made about the changes occurring in the high country, the non-market values need to be quantified and considered. However before these non-market values can be quantified, the various methods available need to be assessed as to their applicability or appropriateness for this particular

situation. With a focus on the contingent valuation method it is this specific problem that this project attempts to address.

This topic of the appropriateness of non-market valuation to the high country landscape is important for a number of reasons. As with any tool the limitations on its use needs to be understood, otherwise spurious information may be produced. If maximising the overall social welfare of the people of New Zealand is considered a worthy objective, then it needs to be known what the various costs and benefits of available options are, in order to arrive at an economically efficient solution. However if the assumptions from which non-market values are derived are faulty, or the degree of reliability not appreciated, it is not possible to make sound decisions. The resultant unsound decisions are likely to result in economic efficiency not being attained. Along with producing bad (or non-optimal) decisions, if non-market valuation is used in inappropriate contexts, it would bring into ill repute techniques that are useful and valid in other, more amenable contexts.

To assess the applicability of contingent valuation for valuing the high country landscape the project has been structured in the following manner:

Chapter 2 reviews what (and where) the high country landscape is; what the changes occurring to it are (with particular emphasis on the spread of wilding conifers); options available to respond to this change; and the rationale for protecting a portion of this landscape.

Chapter 3 reviews benefit-cost analysis and the concepts of social welfare, utility and efficiency; the requirement to have non-market values; the concepts that make up non-market values; and the various non-market valuation methods available.

Chapter 4 considers the process of evaluation of landscapes; reviews the contingent valuation method, its biases, and the conditions under which it should be used; assesses its appropriateness to the valuation of the high country landscape; and comments on the degree of accuracy needed.

This assessment however must be viewed in the light that non-market valuation is a relatively young field of endeavour, and that techniques and methods are evolving at a rapid rate. Conclusions reached today may not be valid tomorrow in the light of new knowledge.

The contribution to be made in making this assessment of the contingent valuation method are twofold. One, it will clarify whether or not it is a useful technique, or what the limitations of its use are, to potential users such as government agencies like the Department of Conservation and the Ministry for the Environment, that have an interest in the management of the high country. As a consequence, if it is appropriate for their needs, they may be able to use the techniques to be better able to achieve their goals or seek more appropriate levels of funding. Two, it draws attention to an apparent gap in our knowledge as to what an economically efficient or desirable level of protected landscapes we as a nation want (or can afford). While Ashdown and Lucas (1987) have drawn attention to the need to preserve tussock grassland landscapes, and Taylor (1986) reviews financial incentives for the conservation of landscape, the question that remains is "How much?" Kelly and Park (1986) appear to accept the limitation of "available finance" without asking if it is at an appropriate level. Only Murray (1986), who investigates the attitudes and opinions of high country farmers to exotic forestry, recognises that "trade-offs" between various landuse options can only be accounted for by subjective valuation.

CHAPTER TWO: THE HIGH COUNTRY

Tussock grasslands are a predominant landscape in the high country. It is however an induced landscape that is undergoing continual change. Some of these changes are described, but the focus of this chapter is on the self-spread of exotic conifers, and possible responses to this change. The chapter finishes with a summary of some of the reasons presented for protecting a portion of the landscape. The question posed though is "How much?" in order to be economically efficient.

Landscapes in which tussock grasslands are prominent are widespread in New Zealand. These grasslands give rise to a range of distinctive landscapes. Most of these grasslands occur east of the main divide in the South Island. Much of this grassland is under pastoral lease or pastoral occupation licence (2.6 m ha out of a total of 2.75 m ha)(Ashdown and Lucas, 1987). "Short tussock grasslands are, in the main, induced vegetation. As such they are part of our cultural heritage requiring grazing to maintain their present physiognomy." (Swaffield and O'Connor, 1986). They have been created by the

"... clearance of forest and scrub by fire [for the role of fire, especially in early Polynesian times, see Molloy et al., 1963] and maintained as such by subsequent management [and although] farming practices have often induced rather artificial environments, these farmed grasslands are still an impressive visual resource [and] in many areas a sense of spacious wilderness still dominates" (Ashdown and Lucas, 1987).

Lucas (1987) considers that it is

"... the vegetation which visually sets the high country apart from other regions in New Zealand. This vegetation results in a semi-wild character, which is possible because people do not appear to dominate -- there is a lack of dominating developments or formal human-created patterns."

Consequently, the high country is considered to have certain landscape values that are

ascribed to it, based on ecological, cultural, visual, and economic values (Ashdown and Lucas, 1987).

"While regularly referred to as 'natural' landscape in reality the High Country is the result of both natural and human activities. It has never been static and is today in a state of constant change" (Rackman et al., 1983) and as a consequence the values attached to landscape are subject to change from a number of different areas. It is in the nature of landscapes to change as it is a dynamic and inevitable process. The factors that alter these values may be natural or induced ecological changes, such as natural successional processes or the invasion of exotics; changes in management strategies such as oversowing and topdressing or planting shelterbelts and plantations; or developments such as bulldozed tracks, power pylons or a "shiny shed". Rackman et al. (1983) note that

"The sheer volume of cultural change witnessed in the last few decades has inevitably led to concerns that the landscape quality is in decline - the dramatic 'natural' spacious panoramas of the inland basins will be lost forever unless something is done now."

This, however may not be true.

Different people, at different times, places or contexts, may consider these changes either beneficial or detrimental, positive or negative, with regards to the value that they derive from that landscape. Indeed, as Price (1978) notes, "The individual himself also changes in his reaction to the landscape. In various states of mind he may like or dislike landscape of different types, or may inconsistently prefer one feature or element over another" The aesthetic preferences of individuals according to Price (1978) are affected by the cultural norms, people being responsive to whatever conforms to the cultural tradition of the time and place, and what he refers to in a narrow sense as quality, which is conformity with all known and unknown principles of aesthetics. Consequently, for example, while "afforestation is damaging to the aesthetic tradition of the British uplands . . . new generations build their

associations elsewhere . . . [and] the consumer [of landscape] is replaced by others for whom the new condition of landscape is familiar" (ibid.). Hayward and O'Connor allude to this when they comment that "Holiday makers travelling from Geraldine to Fairlie are more likely to remark 'Haven't the trees grown' than lament the loss of grasslands, scrublands and forests of past landscapes" (Hayward and O'Connor, 1981).

One view of change in the high country (Lucas, 1987) notes

"The open character of the high country landscape makes it highly vulnerable to the impact of obvious insensitive developments which come in many forms: a zig-zag track over a smoothly curving ridge; a shiny shed in a dull setting; a bright square of lucerne sitting on a prominent fan; windbreaks, woodlots and wilding trees in open grassland. But the greater threats to our high country landscapes are the slow, subtle changes, changes which many closely associated with the land do not notice because they are so close to it. Over time tussocks are replaced with other pasture species in a process traditionally referred to as "improvement" of tussock grasslands. The improvement that involves the gradual loss of the tussock component sees the tawny hills changed with a new, simple landcover that has no semi-wild or remote quality. High country thus developed will have a landscape character little different from much hill country and lowlands in New Zealand. Similarly, high country afforestation proposals seriously threaten the distinctive character of these landscapes. Even when carefully sited at the base of mountain slopes, they often disrupt the visual relationship between the slopes and the terraces, basin or valley floor below. This often separates the landscape into developed flats with the mountains merely a remote backdrop. It is the continuity of the landscapes that suffers because of these pressures".

Fairgray (1983) however takes a different point of view. He considers that there is an

"... increasing awareness of the impact that different land uses can have on the landscape values of an area. Indeed the visual scene is primarily dependent upon land uses and the patterns created by superposing these uses upon, or relating them to, the natural pattern of the landscape. Yet forestry tends to be associated with continuous areas of single species plantation which are said to be aesthetically monotonous. This view has been influenced by the forests established in the central North Island during the depression years. However, by proper management techniques forests can add considerably to the diversity of the rural landscape" (Fairgray 1983).

As Rooney (1987) notes

"... conifers are important trees ... but one of their undersirable characteristics is that conifers have the ability to dominate visually any landscape in which they are placed. Their successful use therefore demands a certain sensitivity to landscape value".

However, while forestry may be able to add diversity to a high country landscape, it may well be that it is simplicity that is desired by some.

However it is just as well to have regard to O'Connor's admonition with regards to high country afforestation, but which is applicable to other changes to the high country landscape.

"Attitude and opinions concerning forestry in the high country landscapes would seem to be perhaps as varied as the landscapes themselves. Opinions range from strong aversion to the presence of alien conifers in what is thought to be a natural tussock grassland to the strong preference for grand scale tree planting as a positive forestry landuse. Clearly there are no universally valid prescriptions, and where and how trees are planted and managed may be much more important than whether to tolerate them at all" (O'Connor, 1986).

This study will focus on the conflicts that are generated by the spread of wilding conifers, as many of the possible changes to the HCLS mentioned above are, or can be, a consequence of the possible responses to this spread.

Many introduced conifers are well adapted to a wide range of NZ conditions as evidenced by the widespread establishment of selfsown seedlings or wildings. Smith (1903, cited in Hunter and Douglas, 1984) first noted this selfspread occurring before the turn of the century. However it has been since the 1940's that wildling establishment has been noted as dramatically increasing in unimproved rangelands (Hunter and Douglas, 1984). This spread has caused concern about the uncontrolled establishment of exotic forests reducing pastoral productivity, and conflicting with scientific and nature conservation, landscape, and amenity values. (O'Connor, 1982). O'Connor has also noted that "As well as the planted forests there are the beginnings of extensive forests in the high country as the consequence of voluntary spread of seedlings from existing plantations" (O'Connor, 1986).

The species found to spread in the high country include most conifers that have been widely planted there. Chavasse (1979) has outlined the occurrence of the following species: *Pinus contorta*, *P. pinaster*, *P. nigra*, *P. radiata*, *P. ponderosa*, *P. banksia*, *Larix decidua* and *Pseudotsuga menziesii*. European larch and Corsican pine are considered to cause some of the most widespread problems in the inland areas of the South Island, where they were extensively planted earlier this century. While *Pinus contorta* has spread on many sites in the North Island it is not considered to be such a major problem in the South Island in terms of the area occupied at present. However, as Hunter and Douglas (1984) note, many plantings of this species are comparatively recent and the situation may change in the future. Indeed, Gibson (1988), who studied pine spread in North Canterbury, comments that the most notable feature of the *P. contorta* spread was the size of its contribution that has arisen, considering the small seed source.

Exotic plants have been present in the high country since last century, but high stocking rates helped control the spread of many plants. However with the reduction of sheep numbers the spread of many plants has sped up considerably and Benecke (1967) relates the increased spread of conifers since the 1940's and 50's to this reduction in grazing pressure. Prior to this reduction in grazing the rangeland had suffered severe overstocking and depletion (O'Connor , 1982). Many other woody weeds such as Sweet Brier (*Rosa rubigosa*) also increased dramatically at this time. In addition over this period rabbit numbers were at a low following the "killer policy" of 1947 (Hunter and Douglas, 1984). Hunter and Douglas (1984) also note that restrictions on burning of grasslands reducing conifer control by fire and/or an increase in the number of mature trees producing viable seed may also have contributed to this increase in spread in the 1950's.

Of the accounts that have been written describing introduced conifer spread in grassland areas, only Benecke (1967) and Wethey (1986) provide quantitative information on the relationships between establishment rate, ground cover and grazing intensity. The major question that has arisen from their research is what levels of stocking or pasture improvement are necessary to suppress wilding regeneration. As Gibson (1988) notes, the difficulties in answering this question are many.

A number of factors of ecology and environment contribute to the reason why conifers are successful in establishing themselves in the high country, with spread having been recorded in rainfall areas as low as 375mm (Douglas, 1970), and at altitudes up to 1220m (Ledgard, 1980). Climate is an important aspect, as it influences conifer flowering, seed set, development, dispersal and germination of seed, and plant establishment. The more extensive areas of conifer spread in NZ have occurred where there are frequent periods of extreme wind, and it is not uncommon for seed dispersal to take place over several kilometres (Hunter and Douglas, 1984). The hot dry norwest winds common to the high country provide perfect conditions for cone opening and seed dispersal.

All introduced conifers, but to a lesser extent Douglas fir, are "colonisers" establishing most readily in conditions of low competition for light and water (Hunter and Douglas, 1984). Indeed, tussocks in unimproved grassland areas appear to assist germination of conifer seeds by providing a low competition environment with shelter from desiccation while competition from introduced grasses and clovers on improved grassland is sufficient on its own to prevent seedling establishment (Benecke, 1967). Chavasse (1979) notes that most records of introduced conifers is into tussock grasslands.

Options that can be considered in response to this propensity to spread includes control, erosion control, management for wood products, deliberate plantings with desirable or non-spreading species, agroforestry, or "do nothing". Many of these responses, by their very nature, overlap. There are, however, problems inherent in many of these strategies.

While there are other methods of control such as fire, felling, and chemical spraying (see Wethey, 1986), Murray (1986) notes that "the most cost effective control method found to date appears to be grazing with sheep". Conifers are generally most vulnerable as seedlings to grazing by sheep or goats, whereas cattle have a lower level of grazing control compared to that exerted by sheep (Gibson, 1988). However where stock rates are less than one sheep to 1.6 ha Benecke (1967) considers that establishment of conifers is a strong possibility given a suitable seed source. However, in extensively grazed rangelands dispersed grazing tends to be selective with a great variation in grazing intensity occurring, and this may not coincide with areas prone to conifer establishment (O'Connor, 1978, in Hunter and Douglas, 1984). O'Connor (1981) has also noted that the level of grazing pressure needed to completely control establishment of conifers may not be sustainable in many unimproved areas of tussock grasslands. Also to be considered is that land is moving out of agricultural production as noted by Taylor (1987a,b)(see below).

The success of conifers in establishing themselves in the high country

"... demonstrates that most of the tussock grassland area below the upper subalpine zone is endowed with a climate suited to forest growth [and] it is this [feature of climate] which demands that we examine possible roles for forestry in the high country in the future" (O'Connor, 1986).

These roles include the management of either planted or wilding forests for timber, pulp, or possibly as a biomass source for liquid fuel production. Agroforestry is another possible strategy, while the "do nothing" option has been suggested also.

Ledgard and Belton (1985b) have shown that there is a considerable potential for forestry development in the high country. For areas that are "at risk" from wilding spread it has been suggested that these areas can be planted (and managed) with species not likely to spread. However Jamieson's (1974) assessment of *P. contorta* wildings from Kariori forest (in the central North Island) concluded that

"silvicultural treatment of regenerated contorta pine stands at fairly high altitudes is feasible and not costly, that response in terms of increased diameter growth is good and that stands can be brought into a uniform condition approaching plantations of the same mean height" (Jamieson, 1974).

For prospective uses of high country production forestry see: Nordmeyer (1979), Ledgard and Belton (1985a, 1985b), and Ledgard and Baker (1982).

"Another area of interest is in the production of liquid fuel" (Ledgard and Baker, 1982). As Hayward and O'Connor (1981) note

"In the absence of positive management [to control the spread of conifers], we should expect that within the next 100 years many tussock grasslands will become open or even dense coniferous forests, as has already occurred on the Waiouru plateau. As these forests may have a significant role in future production of liquid fuels, such change may have real economic advantages".

The "do nothing" option which has been suggested, is to leave the development of wilding forests, through natural succession, to return to natural bush. It is not considered applicable other than in areas where suitable indigenous seed source is present and it is desired to allow the land to return to bush (Gibson, 1988). "If disused pine or oak forests give way to beech in a thousand years, it will be some thousand years before beech would arrive on its own" (O'Connor, 1986). Burrows (pers. comm.) disputes this, noting that the ecology of pines would lead to self-perpetuation through periodic wildfire. It is also a very long term approach. However Hunter and Douglas (1984) consider that wilding stands which do not bear the "harsh outline and uniformity of planted stands" could "enhance landscape and recreation values". A related strategy is the use of introduced conifers, in particular *P. contorta*, for erosion control (Hunter and Douglas, 1984). However there is a dubious connection between afforestation and erosion rates (McSaveney and Whitehouse 1986).

O'Connor (1986) reviews forestry and its possible roles with agriculture in the SI high country, and agroforestry options appear to have an important future agricultural role (Gibson, 1988). Of considerable significance is the build up in phosphorus levels under conifer stands (Ledgard and Belton, 1985, O'Connor, 1986). Advantages of agro-forestry include: short term cash return, better nutrient utilisation, longer rotation trees crops and utilisation of land with low feed production (Gibson, 1988).

Gibson (1988) proposes a control strategy to prevent further spread that

"... consists essentially of delimiting a containment zone, destruction of trees beyond this limit, and regular checks and destruction of establishing trees. Further improvement on the basic strategy is possible by grazing management and land improvement beyond the containment zone. There is good potential for agro-forestry options within the containment zone. Re-establishing pastoralism

in afforested areas would require destruction and removal of the trees. The consequent land disturbance would provide ideal conditions for trees to re-establish. A follow up programme of top dressing and oversowing would be necessary, and preferably sheep and/or goat only management to prevent conifers re-establishing" (Gibson, 1988).

However with most of these options the tussock grassland landscape values would be lost. O'Connor (1986) recognises "... that nature conservation of tussock in potentially forested country, demands improved pasture management as buffer zones to control wilding spread." Swaffield and O'Connor (1986) comment that

"Clearly there are prospects that positive integration between different land uses and conservation may be [desired] in some of the lower altitude terrains. Short tussock grasslands are, in the main, induced vegetation. As such they are part of our cultural heritage, requiring grazing to maintain their present physiognomy. There are other areas which, as wetlands or tall tussock grasslands, require protection against intensive grazing use or development of any kind if they are to be maintained in those formations. There is increasing concern that tussock grasslands may be occupied by exotic conifers. While this is a real threat, it is believed by some that "natural" tussock grasslands, themselves induced from forest by fire, should be protected universally from the planting or ingress of conifers and from pasture improvement. What is not understood by such people is that sufficient conifers already exist in the tussock grasslands to take them over by natural spread, if the unimproved grasslands are not protected by zones of intensive grazing management, feasible only on developed grasslands. As pointed out by O'Connor (1983, 1986) the interdependence of each use is a design imperative".

While the interdependence of unimproved grasslands and developed grassland may be a design imperative, it is an expensive undertaking to "improve" grassland. As Taylor (1987a, 1987b) notes with a surplus of world agricultural production along with improved efficiencies ". . . fewer hectares will be needed to provide the food and fibre for the world's needs. Thus land currently in agricultural production may move out to other uses, e.g. amenity, tourism, recreation or simply 'set aside'." As a consequence the financial incentives to develop buffer zones in marginal areas are reduced, along with a concomitant decline in grazing pressure, thus resulting in more exotics establishing themselves and a continuing reduction in 'natural' tussock grasslands. So the question is "How much do we as a nation want to (or can afford to) conserve or preserve"? It is because of this that we need to know what the values placed on the tussock grasslands are, if we are to make effective and efficient decisions about the landscape, using the limited resources that we have available to us. As Kelly and Park (1986) note that the Protected Natural Areas Programme is based on

" . . . a process of systematic assessment and ranking, determining which are the best, or most representative, examples. There is widespread fear in conservation circles that selection or "ranking" procedures tend to focus on the few best natural areas, and cast aside the rest as unimportant. We believe this fear to be a real one however, the pressure of market forces require a selection to be made. The fact does remain that at times one place only **must** be chosen, for reason of available finance, or time ultimately society requires a final judgement to be made as to which alternative is 'best'."

The question that remains though is "How much finance should we make available?", as we can not 'preserve' all of it. So should we allocate more or less resources and by how much (to be economically efficient), and indeed, is intervention warranted? Alternatively, the question could be asked as to how much of the high country do we want to see afforested. However it is considered more appropriate to deal with changes to the status quo, hence the question of "How much do we want to preserve?"

Reasons for wanting to conserve and preserve a representative portion of the high country landscape include links with our past, the limited representation in present reserves, and the related requirements of the Reserves and Conservation Acts.

Lucas (1987) has commented that

"Change has always been a feature of tussock grassland areas. When in tussock grasslands, we can marvel at the processes that created the landforms, and often the immense change from forest and shrubland caused by the earliest inhabitants. The grasslands will, because of their ecology or our intervention, continue to change. We need to ensure that they can do this without losing their meaning for our past."

Indeed Kelly and Park (1986) note, "... widespread oversowing or cultivation is transforming these tussocklands into anonymous hill country". Lucas (1987) also asserts that "The high country is special to us all, not just in terms of production or recreation. Somehow we all recognise it as a significant part of our natural heritage, even ... [to] many of those not fortunate to live or work in, or visit it". In addition Kelly and Park (1986) note that "New Zealand relies heavily on the distinctive quality of its landscape and natural environment for its tourist industry. Native vegetation, flora, and fauna establish the character of much of the sought-after landscape".

Kelly and Park (1986) consider that "... many important classes of land are poorly represented in protected areas. In many parts of the country, with their own particular character, there are simply no protected areas". For example, up until 1980 only nine hectares of short tussock grassland in Otago was protected in scenic reserves (McSweeney and Molloy, 1984). [See also O'Connor (1983)]. Compounded with this, Kelly and Park (1986) consider that "The rate of change in the lowlands and some montane country of is now so rapid that areas not identified for protection now will probably have disappeared in ten years", which is a sentiment echoed from Molloy et al. (1980).

Related to this are the requirements of the Reserves Act 1977 and the Conservation Act 1987 with regards] to the landscape. Section 3(b) of the Reserves Act 1977 requires

"Ensuring, as far as possible, the survival of all indigenous species of flora and fauna, both rare and commonplace, in their natural communities and habitats, and preservation of representative samples of all classes of ecosystems and **landscapes** which in the aggregate originally gave New Zealand its own recognisable character:",

while the Conservation Act 1987 is "An Act to promote the conservation of New Zealand's natural and historic resources" which includes landscape and landform.

The primary concern of the Reserves Act is with "natural ecosystems and landscapes". Kelly and Park (1986) however note that

"In practice, most sites have been modified to a greater or lesser degree. It is however most important to note that fire-induced and secondary communities may still be completely natural, in terms of their species composition and ecosystem processes. Natural does not mean static. From a visual landscape point of view, naturalness essentially means the original form and contour of the land are unbroken. We cannot escape the fact that some of the most appealing landscapes in the country are a mosaic of the indigenous and the transformed, on an undisturbed contour. Intermontane Canterbury and Otago . . . Banks Peninsula . . . provide numerous examples"

With 'insensitive' developments it is the continuity of the landscapes that suffers (Lucas, 1987). "We need overall harmony - but that does not mean no development. Often development can be carefully contained within a tussock landscape, depending on how it is sited, designed and managed" (ibid.). Hayward and O'Connor (1981) stressed to ". . . landscape architects that they were not in a preserving role so much as a protecting,

discriminating and directing role, because of the changing nature of 'natural landscapes'" (Swaffield and O'Connor, 1986). Indeed O'Connor (1986) has confidence "... that creative forestry has a genuine future in economic, aesthetic and responsible cultural landscape" However as noted by Rooney (1987) "Their successful use therefore demands a certain sensitivity to landscape value".

However the range of values, and the threats to the values of tussock grasslands, according to Lucas (1987), have seldom been acknowledged in planning, development or management strategies. Ashdown and Lucas (1987) stress the need to recognize not just the "special" landscapes, but also the "typical" as essential in the overall distinctive regional character. "This factor needs to be considered when assessing each and every development proposal or land management intensification which may have an immediate or eventual impact on a tussock grassland landscape" (ibid.). However with regard to wilding spread

"In the absence of positive management, we should expect that within the next 100 years many tussock grasslands will become open or even dense coniferous forests The challenge, however, is to recognise that the process of such change has already been set in train and therefore to develop positive management strategies where we believe that landscapes would be degraded by afforestation" (Hayward and O'Connor, 1981).

Conflicts and compromises are inevitable in making decisions; to make better decisions information on the various aspects of what is affected is needed. Landscape values are but just one (often overlooked) aspect of what needs to be considered when making a decision. However people may prefer these changes, such as tree planting or spread, over-sown and top-dressed pasture, etc. For example Hunter and Douglas (1984) consider that wilding stands which do not bear the "harsh outline and uniformity of planted stands" could "enhance landscape and recreation values". As O'Connor (1986) has noted

"Attitude and opinions concerning forestry in the high country landscapes would

seem to be perhaps as varied as the landscapes themselves. Opinions range from strong aversion to the presence of alien conifers in what is thought to be a natural tussock grassland to the strong preference for grand scale tree planting as a positive forestry landuse."

It is however important to keep in mind Price's (1978) comments that

"Absolute protection, with management specifically for landscape purposes, could and should be given to a selection of elite landscapes of all types. It is preferable that they should be enclaves within areas where protection of some stringency is also applied, so that detrimental effects along the boundary are reduced. In this way the best of both natural features and man-made landscape should be retained, at least until such time as it is demonstrably not valuable enough to justify its costs."

Other values in addition to landscape values, such as scientific/ecological, agricultural, water and soil values, along with agricultural and financial considerations, also have to be weighed also in the decision making process and subsequent management strategies. If managers are to allocate resources optimally between these different values, they must be aware, not only of the use levels of the different user groups, but also have some idea of the relative value that each competing use has to the nation. When one is in conflict with another it is not sufficient for decision makers to decide that one use will be regarded as more important than any other. If allocation of resources is to be optimal decision makers should seek to trade off uses according to their relative values to society.

"The introduction of forestry [or any other major change] into the high country will involve the consideration of non-market costs and benefits, particularly in such areas as landscape, ecological and social impacts. These can only be accounted for by seeking the subjective valuation of their relative worth from the local and regional communities in deciding trade-offs between various land use options" (Murray, 1986).

As a consequence we need to consider the applicability of the various non-market valuation techniques for ascertaining these values, so as to help in answering some of the questions that have been posed above.

CHAPTER 3: A RATIONALE

"Landscape as a commodity is publicly viewed from outside the boundaries of the physical landscape. Its value is substantially affected by private and public action. To reach rational decisions about whether actions should be undertaken or permitted, it is desirable that this externality should be considered and quantified. [However] No intuitive appreciation of the desirability of one course of action can properly reflect the wishes of the public. The decision-maker must become analytical if he wishes to make good decisions, and he needs a system of evaluation to help him. Either some trade-off has to be made between landscape and other values, or beauty has to be treated as truly sacred, and all detriment to landscape prohibited." (Price, 1978).

A rational method for assessing what the social welfare consequences (ie. social costs and benefits) of actions in determining how trade-offs are to be made is Benefit Cost Analysis (BCA). BCA uses market and assigned prices as a basis for deriving measures of social welfare. However, public goods, by their very nature are unpriced by market activities and as noted by Price (1978) "Landscape is a classic public good: it is difficult for its owners to exclude the public from consumption of it; and the product is not used up in the process of consumption."

To estimate values of unpriced goods and services for BCA (either formally or informally) non-market valuation techniques are used which thereby allow decisions to be made (hopefully) in a total valualational context. There are a number of techniques for estimating non-market values and these are reviewed below. However, before this is done the concepts of social welfare and BCA will be briefly reviewed.

BCA is a technique which attempts to set out and evaluate the social costs and benefits of

actions or activities. The aim is to identify and measure the losses and gains in social welfare which are incurred by society as a whole if a particular action occurs (Bannock et al., 1972). Social Welfare is considered as the wellbeing of the community considered as a whole and is an aggregation of the preferences of individuals within society (ibid.). Social Welfare is a utilitarian concept and is based on an economic model of Egoistic Man, where the definition of economic value is derived from a preference structure called indifference. This is where an individual is indifferent between amounts and assortments of things that provide equal satisfaction or utility (Edwards, 1987). Utility is defined as ". . . the satisfaction of a human want or desire (and) this is virtually synonymous with a capacity to make a favourable difference to someone's life" (Sinden and Worrell, 1979).

"(If economic man's income increases, so will personal utility, since more money is available to increase the amounts of things that provide personal satisfaction. [However] if something changes to reduce the availability, amount, or quality of something that provides instrumental value, what is the maximum that the person is willing to pay to prevent the change? Notice that the change . . . would lower utility for economic man, and that maximum willingness - to - pay is the reduction in income that prevents the change. That is, maximum willingness-to-pay is the change in income that holds personal utility constant" (Edwards, 1987).

Consequently as Edwards (1987) notes

". . . the cold truth is that there is nothing unique about an apple, a day of fishing, a scenic vista, a blue whale, or a bequest of clean ground water to future generations. Economic man trades these off at the margin to identify positions of equal personal satisfaction."

Price (1978) also notes that: "The cost-benefit analyst strives to encompass such disparate additions [of apples and elephants] by summing, not the things themselves, but their power to impart welfare, or benefit, or satisfaction, or utility."

The main objective of natural resource management policy in NZ is efficiency in resource use so as to maximise net social benefits according to Piddington (1987). As Freeman (1979) comments

"... if the objective of environmental management is to maximise the efficiency of the use of resources then benefit-cost analysis becomes, in effect, a set of rules for optimum environmental management and a set of definitions and procedures for measuring benefits and costs".

Merkhoffer (1987) considers BCA "... in essence a pragmatic methodology for determining whether a proposed change in the use of resources will improve efficiency."

The efficiency criterion underlying benefit cost theory is also known as a criterion of "potential Pareto optimality", and this means that "... a decision is an improvement if those who are better off could potentially share some of their gains with those who are worse off. It does not, however, require that such compensation actually be made" (Merkhofer, 1987). It is this concept that underlies the social welfare criterion for ranking and/or assessing the consequences of social actions in BCA (Cummings et al., 1986).

"The compensation test in turn forms the theoretical foundation for cost-benefit analysis the benefits of a proposed policy or project are defined in theory as the maximum amount that gainers would be willing to pay in compensation to losers. Theoretically, costs are the minimum amount required to compensate all losers fully." (Bishop, 1985).

In order to make decisions about resource use that will increase efficiency and improve social welfare (or at least do not diminish it) requires information on how market and non-market values would be affected by the alternative options. To do this the various types of benefits (and costs) have to be in a common unit of account so as to allow aggregation, and it must be possible to compare benefits with costs in a meaningful way (Sharp, 1987). According to Fisher et al. (1987) "BCA is the only technique that attempts to compare in commensurate

terms the positive outcomes (benefits) with the negative outcomes (costs) of regulation." A commensurate measure of value is the dollar. Indeed, due to the nature of BCA it is the only suitable metric available, as noted by Sinden and Worrell (1979):

"The only clear case in which a monetary value is necessary is when both benefits and costs can vary and the decision criterion must be to maximise net benefits. Because different kinds of benefits and costs cannot be added or compared directly, it is necessary to measure all in a common unit."

As Edwards (1987) notes:

"Dollars, or more accurately changes in income, are convenient and legitimate proxies for the change in commodities that leave economic man indifferent between initial and final conditions."

Edwards further notes that

". . . if man's preferences are selfish and structured by indifference, then economic value is well-defined and measured appropriately in monetary terms. This simple abstraction of man is powerful in the sense that it yields testable hypotheses about willingness-to-pay."

In its simplest format BCA directly uses existing prices to impute values. However

"for many . . . decisions . . . actions . . . produce substantial changes in the market, and these impacts must be taken into account when using market prices [which require] a more complex analysis involving concepts of consumers and producers surplus" (Merkhofer, 1987).

To do this the demand curve is needed to be known. Once this has been derived the consumer surplus can be determined and this is the summed differences between the willingness-to-pay and the price paid for that good. From this the total benefit derived from that good/service is obtained.

"Implicitly, market prices are appropriate measures of the 'benefits' (social welfare) of concern in BCA . . . [and] it is . . . assumed that market prices for

outputs and inputs serve, at least as a first approximation, as proper measures of socially relevant benefits and costs" (Cummings et al., 1986).

However

". . . markets and prices are not necessary conditions for economic value. Rather, markets and prices emerge from collective economic behavior when people can be excluded from the use and benefits of things unless they pay [or exchange something else] for them. Property rights protect owners' claims to things while prices facilitate an allocation of their claims. Without exclusivity on the supply side and a sufficient interest or demand on the part of others to pay for something, markets and prices would not emerge. Contrast things that are exchanged in markets with scenic vistas, clean ground water, national forests, and blue whales. Although the latter are usually are not priced in traditional single-commodity markets, economic man still gets personal satisfaction from their existence." (Edwards, 1987).

"Many problems are complicated by the presence of things that have not been bought and sold in markets and are therefore unpriced. [However decisions that need to be made] are still basically economic, because they arise from competing demands for scarce resources" (Sinden and Worrell, 1979). Consequently, "In the absence of a market price, values must necessarily be imputed to the flows of benefits" (Sharp, 1987) if a comparison with alternative uses is to be made. With regards to the high country landscape the task is ". . . to assign a monetary equivalent to the change in aesthetic values consequent on a given change in the physical composition of a given landscape" (Price, 1978), and "Since the compensation test [which forms the theoretical foundation for BCA] emphasises society as a whole, the goal must be to measure all the values held by all members of society" (Bishop, 1985).

Before the various facets or concepts that non-market value is composed of are described,

two aspects of the word "value" need to be defined in order to reduce confusion. What are values, and also, where do they reside? One aspect of the word value relates to "the moral principles and beliefs or accepted standards of a person or social group" (Hanks, 1979). Rokeach suggests that "A value is an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end-state of existence (Rokeach, 1973, quoted in Stewart, 1983). Another aspect of the word "value" relates to ". . . the desirability of a thing, often in respect of some property such as usefulness or exchangeability: worth, merit, importance" (Hanks, 1979), or "The total utility which is yielded by the object in question [while] utility [is] the satisfaction, pleasure or need-fulfilment derived from consuming some quantity of good" (Bannock et al., 1972). As such the value of a thing (be it private or public good, real or metaphysical) is a property of, and resides with the consumer, observer or believer. As such intrinsic values (ie. a value an object has [to its self] independent of any observers) are not considered in this schema except in as much that this provides utility to those who believe in its existence. This concept of value is synonymous with the idea of utility and it is this aspect of value that this study will be considering.

The utility derived from something is a combination of both market and non-market values. Market values can be observed directly. With regards to the high country there is a market value of the land which is related to its (perceived) productivity from animals, trees or tourists. Because the market is not "perfect" not all the utility derived from consuming a good or service is directly expressed in dollar values. As Price (1978) notes:

"Unfortunately, because landscape is a public good, consumers seldom exhibit directly a willingness to pay for it." The portion of the social value of a good that is not expressed in market values as dollars is known, not unsurprisingly, as non-market value, and is comprised of Instrumental, Option, Quasi-option and Existence values. These are:

Instrumental Value: "This is the value of present and expected use of a resource"

(Kerr, 1986). An example is the utility derived from viewing mountain scenery. The value of a good can sometimes be indicated where there is say an entrance fee to a scenic area. However no indication of consumer surplus or the total utility derived is given.

Option Value: "... is the value of an option that keeps available the possible future use of a resource, apart from the value of using the resource" (Talhelm, 1983). Where uncertainty exists with regard to the use of a resource, there is a risk that future use options will be foreclosed. Option value is a measure of the utility derived from insuring that future options remain open.

Quasi-option Value: This is the utility that may be obtained sometime in the future through improved knowledge about a resource, but could be foreclosed by irreversible changes through using the good/resource now. However, "since we do not know these future outcomes now, quasi-option value cannot be estimated" (Kerr, 1986).

Existence Value: This is the utility that is derived from the the knowledge that something exists, without any direct or intended use of it.

"The unifying characteristic of these values and their definitions in the economics literature is that their assignment is based solely on personal utility and indifference." (Edwards, 1987). However "... it is usually unnecessary to isolate value components in economic analyses of environmental policies which require only information on total value (i.e., option price)" (ibid.).

There are a number of various methods available to determine non-market values. Methods that are discussed are: Travel Cost, Implicit or Hedonic Price, Indifference Curve Mapping, and Contingent.

Travel Cost Method

The travel cost method was originally developed for valuing outdoor recreation (Sinden and Worrell, 1979) and its central theme is that the amount of use a site receives is dependent on the associated costs of using that site. For free access public recreation sites this cost is usually equated to costs of travel (Kerr, 1986). Because costs of travel influence the number of visits (Sinden and Worrell, 1979) the value of the site can be derived. While it is a relatively easily applied means of assessing site values (Kerr, 1987), it assumes that all benefits are derived from visits (Sinden and Worrell, 1979). Also, the value derived is only attributable to the resource in its present state (Kerr, 1986). According to Sinden and Worrell (1979) because of assumptions in the method, it is limited to estimating minimum values and comparative values of similar things. Consequently it is not considered suitable for estimating the value of the high country landscape. In addition, the high country landscape is not so much a destination site, but a part of the journey.

Implicit or Hedonic Price Method

The hedonic price method is a market based valuational approach (Kerr, 1986; Fisher, 1987). Goods exchanged in markets have a price which is a reflection of the sum of various attributes or characteristics which make that good up. By holding all factors and attributes constant except one it is possible to estimate the marginal value of that (environmental) attribute. To use this method a "well-behaved market for the good containing the relevant environmental attribute" is required along with an informed public (Kerr, 1986). Fisher (1987) however considers that the assumption/requirement of full information would be unrealistic in many cases. High transaction costs and indivisibility of some attributes may also invalidate the former requirement (Kerr, 1986). Another limitation is that it does or can not incorporate values held by people towards an (environmental) attribute who do not

participate in the market for the good that contains that attribute. While this method can be useful in determining values for environmental attributes through the property market, because many/most people who hold values about the high country landscape do not participate in the market for high country properties it is considered that this is an inappropriate method. In addition this market is probably too small, and landscape only a minor factor for those who do participate, for statistically valid conclusions to be drawn.

Indifference Curve Mapping

This method attempts to map indifference curves of individuals - that is: the combinations of goods and services that have equal utility or satisfaction. Demand curves can then be derived and thence consumer surplus (Kerr, 1986), from which total benefit is determined. While this approach is intuitively appealing (Bennet, 1987) there are a number of problems with implementing the method, along with concerns over certain assumptions such as additivity of utility (ibid). The method is expensive to use (ibid; Kerr, 1986), long (taking up to two hours per interview), and complicated (as the concept of probability needs to be understood). Because "these practical difficulties negate the methods usefulness for most situations" (Kerr, 1986), this approach is also considered inappropriate for valuing the high country landscape.

Contingent Valuation Method

The contingent valuation method is based on setting up a hypothetical market for an unpriced good and individuals are asked directly either how much they would be willing to pay, or accept as compensation for proposed changes to that good (or service). Approaches that may be taken are: open-ended questions, dichotomous choice, iterative bidding, payment card formats, and contingent ranking techniques (Bishop and Heberlein, 1987). Analysis of

results ranges from fairly straight forward, through to the application of difficult econometrics techniques (ibid). The method has limitations (such as the willingness and ability of respondents to value the good or service (ibid) and is criticised because of a number of potential biases (ibid; Kerr, 1986). Because "All other methods of valuing publicly provided goods and services . . . require some rather direct link to actual market transactions . . . [and] no such link . . . is required for contingent valuation [and] most environmental assets lie outside the market system" (Bishop and Heberlein, 1987) it is considered that the contingent valuation method could be appropriate for determining the non-market values of the high country landscape.

In this chapter the concepts involved in, or with, BCA such as social welfare, utility , and economic efficiency have been reviewed. If these are accepted then consequently is a need to know non-market values which are in commensurate terms with market values. Various methods that value non-market goods in dollar terms were considered. The contingent valuation method was adjudged to be the most appropriate. It will be assessed in further detail in the following chapter where its applicability for determining the non-market values of the high country landscape will be considered.

CHAPTER FOUR: ASSESSMENT

The task: "... to assign a monetary equivalent to the change in aesthetic values consequent on a given change in the physical composition of a given landscape" (Price, 1978).

"There is, of course, a barrier of unfamiliarity about judgements on the cash value of landscape. Yet they are not really different from, nor more difficult than, judgements on the worth of marketable goods. Anyone who can answer the question, 'What would I pay for a jam doughnut?' can be trained to answer the question, 'What would I pay for an attractive view?' The case of the jam doughnut is initially simpler because the answer can be discovered by trial and error, the decision-maker having been confronted by the priced article on numerous occasions. But the same process can be applied in an hypothetical way to landscape. When 'a halfpenny' and 'a million pounds' have been eliminated as possible answers, it is merely a matter of narrowing the choice down. Where, as normal, evaluation is required of landscape in different states, the decision may be likened to a choice between jam doughnuts and cream doughnuts, to which different prices are attached. If the change is represented as from jam to the (say) higher state of cream, willingness to pay for the change is technically appropriate; if from cream to jam, the required compensation for giving up the cream. Of course, some people prefer jam doughnuts to cream; so it is with the two states of a landscape" (Price, 1978).

Before the contingent valuation method (CVM) is reviewed in this chapter, the nature of assessing landscapes is considered. The biases that are posited to occur, and various other problems that have been raised about the method are then reviewed and in the light of these the CVM will be assessed as to whether it is applicable for placing values on the high country landscape.

The evaluation of landscapes is largely a subjective process, as aesthetic preferences are determined by individual tastes (Fairgray, 1983; Murray, 1986; Kelly and Park, 1986;

Ulrich, 1986; Jackman, 1986). "It is emotional, subjective, and the result of conditioning" according to Fairgray (1986). As Kelly and Park (1986) comment, the assessment of the visual attributes of a landscape

"... is inherently difficult, since the character or quality of the landscape recognised or valued in any area is essentially an individual perception, and may embrace indigenous, modified, rural, or even urban lands, as well as water, landform features, and places devoid of vegetation. Sometimes it is the juxtaposition or mingling of two or more quite different features which characterise 'the landscape' for the viewer."

Because the opinions that make up the values attached to the landscape are diverse (Piddington et al., 1985) it is not surprising to find controversy over what makes up a 'good' landscape. "That which is an outrage to one person may be perfectly acceptable to another" (Fairgray, 1983). As O'Connor (1986) notes,

"Attitude and opinions concerning forestry in the high country landscapes would seem to be perhaps as varied as the landscapes themselves. Opinions range from strong aversion to the presence of alien conifers in what is thought to be a natural tussock grassland to the strong preference for grand scale tree planting as a positive forestry landuse."

With regards to the attitudes attached to the high country landscape by visitors there is little information about the attitudes about tree planting. There is however a small unpublished survey of winter visitors to the Mackenzie that was done by Pauline Gibbons (O'Connor, 1986). Although openness and grand scale were frequently identified as attractive features of the Mackenzie, the apparent barrenness was sometimes considered as unattractive. However most visitors considered that tree planting and irrigated land development would enhance the scene. This finding is in concordance with the observations of Ulrich (1986) who notes that

"Findings from several studies indicate that high-preference views can frequently

be described as park-like or savanna-like in appearance. Hence, preferred unspectacular landscapes are comparatively ordered, 'civilised' assemblages of natural elements; most are not wild in terms of conveying a sense that human influences are absent. There is little question that urban parks characterised by smooth ground covers, scattered trees, and depth or openness, are visual approximates of a general class of natural landscapes that are highly preferred relative to many, if not most, other natural scenes."

While attitudes and opinions may be varied, Fairgray (1983) considers that there is

"... common agreement on many aspects of what is visually acceptable and what is not. An understanding and identification of these areas of common agreement provides a means by which the ... landscape may be managed to preserve the quality of the visual environment as it is assessed by the majority of the people."

An aspect of the visual environment in natural settings is the presence of man-made features and Ulrich (1986) notes that some investigations have found that these can have strong negative effects on liking.

"However . . . there is no simple general relationship between aesthetic responses and the presence of built features in natural settings . . . [and] liking is less influenced by the number or extent of man-made features than by the degree of 'fittingness' or compatibility between the elements and their surroundings. Fittingness refers to the perceived harmony or integration between a feature and its natural background. Low fittingness, or obtrusiveness, is produced by properties such as large element size, low congruity of shape, and high color contrast" (Ulrich, 1986).

Exotic plantations in the high country (especially on slopes) could exhibit most if not all of these characteristics if not carefully planned. However as O'Connor (1986) has commented:

"Clearly there are no universally valid prescriptions, and where and how trees are planted and managed may be much more important than whether to tolerate them at all." As Fairgray (1983) has noted, "... by proper management techniques forests can add considerably to the diversity of the rural landscape." Nevertheless there is no consistent approach to tackling the question of assessing the visual attributes of natural areas to yet emerge in New Zealand (Kelly and Park, 1986). According to O'Connor

"This question of land perception and discernment and valuing of 'quality' warrants careful research." However, whatever the type and range of attitudes existing about the landscape, there should be, as Price (1978) notes, "Absolute protection, with management specifically for landscape purposes ... given to a selection of elite landscapes of all types. It is preferable that they should be enclaves within areas where protection of some stringency is also applied, so that detrimental effects along the boundary are reduced. In this way the best of both natural features and man-made landscape should be retained, at least until such time as it is demonstrably not valuable enough to justify its costs."

The question though is "How much should we preserve to be efficient in the allocation of our limited resources?" and "Can CVM help us in answering this?"

Having reviewed briefly the problems of defining what the landscape is, the CVM will be reviewed before assessing its applicability for valuing the high country landscape.

"Contingent valuation devices involve asking individuals, in survey or experimental settings, to reveal their personal valuations of increments (or decrements) in unpriced goods by using contingent markets. These markets define the good or amenity of interest, the status quo level of provision and the offered increment or decrement therein, the institutional structure under which the good is to be provided, the method of payment, and (implicitly or explicitly) the decision rule which determines whether to implement the offered program. Contingent markets are highly structured, to confront respondents with a

well-defined situation and to elicit a circumstantial choice contingent upon the occurrence of the posited situation. Contingent markets elicit contingent choices" (Randall et al., 1983).

Cummings et al. (1986) consider ". . . that the iterative bidding process must be used in contingent valuation method (CVM) applications if meaningful measures of subjects' *maximum* willingness to pay are to be derived." With regard to landscapes Price (1978) considers that the relevant population is all those who *might* be aware of the sites existence, so therefore there is the need to sample whole country.

Evidence of several kinds from a number of studies support the validity of CVMs according to Randell et al. (1983). They consider that

". . . CV bids are not random numbers. Many empirical studies show that individual or household bids are significantly related to income, availability of substitute and complementary goods and demographic characteristics. Basic data are disaggregate . . . cross-sectional in nature, and typically generated from small samples. Considering the nature of this data, the proportion of total variation in bid usually explained compares with that in similar cross-sectional data sets. CV results are not only systematic, but are consistent with various types of actual behavior. At the most elementary level, individuals are willing to pay positive amounts in contingent markets for amenities that (their behavior shows) they prefer" (Randall et al., 1983).

They also note a considerable number of comparisons that have been undertaken that have resulted in consistent valuations with alternative methods. According to Rahmatian (1986) the comparabilty of the contingent valuation technique with other, more traditional, techniques has given substantial credibility to the survey techniques. The credibility of the CV approach is based upon the stability of bids offered for a non-market good. Stability depends on the extent to which the respondents are induced to research their preferences. The depth of respondents's research into his/her preferences depends on two critical factors:

(1) how well the non-market good is specified; and (2) the quality of the survey design. However because the CVM technique is based on personal valuations of goods that are inherently difficult to subject to interpersonal validation, there are suspicions that misstated valuations may be prevalent. However alternative methods are themselves subject to limitations. This realisation is essential to a balanced evaluation of CVM, as comparisons are between techniques which are all imperfect, but in different ways. (Randall, 1983; Seller et al., 1985).

Sources of potential error in CVM include hypothetical, strategic, instrument, information, and starting point biases (Kerr, 1986; Brookshire, Ives and Schulze, 1976; Rowe, d'Arge, and Brookshire, 1980; Thayer, 1981).

Hypothetical bias is raised as a problem as respondents could casually bid any amount without weighing the opportunity costs implicit in their bids (Bishop and Heberlein, 1979), because of the hypothetical nature of the payment. Experimental findings supports the notion that some kinds of questions result in 'truer' responses than others. Of the various 'attitudinal' questioning approaches, contingent choice questions appear to work best (Randall, 1983). According to Cummings et al. (1986)

"...at worst, evidence from research to date provides equivocal results concerning the hypothetical payment issue; at best, for public goods which satisfy the ROC's, evidence from comparative and experimental studies suggests that minimal biases in CVM measures may result from hypothetical payment."

Significantly, Cummings et al. (1986) consider the most prominent source of bias arises

"... where the CVM commodity, within a contingent exchange setting, is largely unfamiliar to the subject - the subject has no experience in viewing the commodity within the context of tradeoffs." The implications of this are discussed in further detail below.

Strategic bias occurs when individuals attempt to maximise their own welfare by misrepresenting their real preference so as to influence the mean bid. Smith (1980, cited in Randall et al., 1983) "...found that as incentives for strategic behavior became stronger and subjects became more familiar with the experimental format, the incidence of strategic behavior increased somewhat."

Instrument or Vehicle Bias is where the method for collecting or paying for the bid influences the bid (Kerr, 1986). However it has been suggested that

"...the social arrangements by which payments are made - the payment vehicle - is an integral part of the CVM commodity per se, i.e., one cannot separate the value of the commodity from the procedures by which the commodity is provided and payment is made. These arguments have . . . important implications for the design and interpretation of results from CVM reflecting the *fact* that our commodity is not a market commodity, but a commodity which can only result from social action (government intervention)" (Cummings et al., 1986).

Information Bias occurs where the amount of information provided about the implications of the proposed changes affects the bid (Kerr, 1986). "[A]n integral part of pre-tests of questionnaires must be the effort to balance the subject's need for information with his/her general capacity to absorb - process - the information" (Cummings et al., 1986).

Starting point bias is said to occur where the starting bid in iterative applications affects the final outcome. According to Cummings et al. (1986) the

"... use of a payment card does not eliminate the problem inasmuch as value ranges on the bidding card provide the potential for 'entering biases' (indications of 'reasonable' responses). [They however] conclude that starting point biases

should be amenable to control through care in the design of the CVM payment card."

Another source of error is Social Desirability Bias (SDB). The underlying notion of SDB is that the respondent wants to present her/himself in a favourable way, and consequently questions are answered in ways that will make the respondent look good (or avoid looking bad). "Social desirability is generally considered to be a major source of response bias in survey research." (DeMaio, 1984). A definition of social desirability bias that she quotes is:

". . . answers which reflect an attempt to enhance some socially desirable characteristics or minimize the presence of some socially undesirable characteristics. Source of the expectations or values influencing answers can be the person [her]/himself (ego threatening), the perception of the interviewer, or society as a whole."

While the sources of these biases may be controlled or accounted for, it is still a matter of conjecture as to how 'true' these revealed valuations are in relation to 'market values'.

Cummings et al. (1986) have suggested Reference Operating Conditions (ROC) relevant for the CVM so that 'reference accurate' measures are obtained. ROCs refer to the limits on the relevant circumstances under which the measurement is taken, so that errors do not exceed 'reference accuracy', which is a summing up of demonstrated possible sources of error as a percentage of estimated values. The ROCs suggested by Cummings et al. (1986) are:

- #1. Subjects must understand, be familiar with, the commodity to be valued.
- #2. Subjects must have had (or be allowed to obtain) prior valuation and choice experience with respect to consumption levels of the commodity.
- #3. There must be little uncertainty.
- #4. WTP, not WTA, measures are elicited.

The rationale for these ROCs are noted by Cummings et al. (1986). For ROCs 1 and 2 the derivation is "... directly from the market institution (which provides high quality information at low cost)". In addition ROC 1 is also derived from "... results from psychological research [which] point to distortions in decision processes (framing biases, etc.) that arise when individuals are unfamiliar with decision contexts ROC 2 . . . results from experimental economics emphasiz[ing] the importance of iterative trials [not questions] which serve to provide subjects with valuation and choice experience - subjects must 'learn' maximising strategies. . . . ROC 3 derives directly from research in psychology and experimental economics: under conditions of uncertainty, valuation decisions may be subject to distortions resulting from the use of a wide range of heuristic [learning] devices. [ROC 4] . . . WTA measures are generally found to be highly distorted vis-à-vis 'true' valuations as a possible result, psychologists would argue, of cognitive dissonance." Cummings et al. (1986) comment that

"The relevance of the above-described ROC's lies in our expectation that, if the CVM institution satisfies them, we would expect the resulting measure of value to approximate market-analogous values within a range of error defined by 'background' sources of error, suggested at the present time to be no less than ± 50 percent. If ROC's are not satisfied, the range of reference accuracy increases, reflecting the errors associated with the excluded ROC."

The simulation of the market institutions as a framework for applying the CVM is motivated by wanting to emulate the incentives for preference revelation that economic theories lead us to expect from a market context.

"In the market context, individuals must introspectively balance the utilities foregone as a result of paying for a good with the utilities gained from acquiring the good; to this end, he/she must, however 'completely', search his/her preferences for the good in question vis-à-vis *all other* possible goods and their prices (relative to his/her income). Thus . . . the importance for

assessments of the CVM of such themes as the subject's familiarity with a commodity (for the preference 'search', or research process) and the credibility of payment and payment modes (for *meaningful* subjective assessments of implied opportunity costs)" (Cummings et al., 1986).

Measurement problems in surveys are most likely to occur when questions asked are vague and which are remote from the everyday concerns of respondents (Turner & Martin, 1984). As noted above Cummings et al. (1986) consider that the most prominent source of bias within the rubric of 'hypothetical bias' in CVM, occurs when the subject is unfamiliar with the commodity within a contingent exchange setting; that is that the subject has no experience in viewing the commodity within the context of tradeoffs. As Price (1978) notes: "The evidence indicates that it is not hard to confuse respondents" Familiarity and experience are considered to be a prerequisite for CVM commodities by Cummings et al. (1986). They are

" . . . compelled to conclude that results from the received literature offered little that would support the notion that subjects, during the relatively brief period of the CVM interview, could define their preferences for a new, unfamiliar commodity in any meaningful way - thus our use of ROC's 1 and 2 [The ROC 1 and 2] conditions then loosely require that . . . the consumption bundles (including the CVM commodity) that the subject is hypothetically evaluating are within the neighborhoods of consumption bundles with which he/she has had experience."

As a consumer moves from an 'existence value' to a hamburger, Cummings et al. (1986)

" . . . expect individuals to be increasingly familiar with the 'commodity' and to have had greater market-related experiences; along this continuum, uncertainties as to outcomes of transactions and potential for problems related to cognition are reduced."

Consequently they consider that the ROC's preclude " . . . the derivation of value estimates

for unfamiliar and uncertain commodities such as those related to option, preservation and bequeathment values" (ibid.). The high country landscape which many people have experienced and are familiar with, is not a commodity that people have familiarity or experience within the context of tradeoffs. It is not a familiar commodity like the jam doughnut. Evidence of this unfamiliarity of the landscape as a commodity is the ". . . persistent belief that landscape is not measurable in money terms" (Price, 1978).

Related to the need for familiarity and experience Kahneman (1986) considers that the use of CVM should be restricted to user values, rather than what he calls ideological values. He notes that

". . . there is a class of problems in which people's answers to preference questions seem quite insensitive to the numbers that are mentioned in these questions. [This] willingness to choose among inadequately specified options suggests that the possibility of tradeoffs is neglected. Preferences of this kind appear to reflect a hierarchy of ideological values."

Edwards (1987) considers that it seems reasonable to assume that the CVM, which is offered as a substitute for the market, is not intended to measure ideological values - but it may nonetheless be contaminated by such values. For example

". . . ethical views that argue for the intrinsic value or rights of other humans, wildlife, and future generations could be personified by a genuine altruist with unselfish commitments to the well-being of others. The question thus arises: does such a stereotype of altruistic man- the antithesis of economic man - have implications for interpreting expressions of willingness - to - pay."

This commitment to others as exhibited by the altruist does, according to Sen (1977, quoted in Edwards, 1987),

". . . involve, in a very real sense, counterpreferential choice, destroying the crucial assumption that a chosen alternative must be better than (or at least as good as) the others for the person choosing it, and this would certainly require

that models be formulated in an essentially different way Commitment is, of course, closely related to one's morals it drives a wedge between personal choice and personal welfare, and much of traditional economic theory relies on the identity of the two."

While Kahneman (1986) considers that ". . . users of CVM often deal with people who simply do not have the kind of coherent preference order that the theory assumes - especially in domains for which they lack market experience", the reason for this lack of coherent preference order may be due to the pluralistic system of preferences within individuals and throughout society that Kellert (1984) has investigated. Consequently, according to Edwards (1987), "Ethicists challenge economists for presuming, a priori, that people attempt to think and behave like economic man, and that the 'total' value of the natural environment can be measured in economic terms". An example of this 'incoherent' preference ordering has been noted by Kahneman (1986) where the results to questions on willingness to pay an extra tax to maintain fishing in some regions of Ontario

". . . indicate that people seem to be willing to pay almost as much to clean up one region or any other, and almost as much for any one region as for all Ontario together. [The] responses do not reflect expectations of personal enjoyment from the clean up, since Toronto residents are willing to pay substantial amounts to clean up the lakes of British Columbia! People seem to answer such questions as if they had been asked "What do you want to do about keeping fish in our lakes?" and "How important is the issue to you?" The dollar number merely expresses the strength of the feeling that is aroused by these questions. Because the questions all elicit symbolic expressions of the same attitude, there is not much difference between the numbers that are attached to a single region and to all of Ontario. [Kahneman] call[s] this 'symbolic demand' because it is true of symbols that quantity is sometimes irrelevant."

Because the evaluation of landscape is a subjective, and to many people, an emotional

process, it is highly likely the contingent valuation of the high country landscape would be subject to 'contamination' by ideological values.

Along with restricting CVM to 'user values', Kahneman (1986) also considers that CVM should only be used for problems that have a 'purchase structure'. He distinguishes two structures of transaction: purchases and compensation. In a purchase payment is either made for things that will increase utility, or to prevent a normal and expected deterioration. It has what is called a 'purchase structure'. In what Kahneman (1986) calls a 'compensation structure',

"... we start with someone who has an endowment - for example a nice view, or clean air - which is threatened by some deliberate and optional action of other people. Giving up this part of the endowment will make the individual worse off than before. The individual is requested, and sometimes coerced, to see part of his or her endowment diminished in order to benefit someone else or society at large",

and for which compensation may or may not be given.

The use of CVM only in the 'purchase structure' is justified by Kahneman (1986) by the phenomena of what he calls 'loss aversion.' This is where individuals value losses disproportionately higher than identical gains. Thus, one would expect a subject's valuation of a gain (WTP) to be substantively different from his/her valuation of a loss of identical magnitude (WTA). An example of the buying-selling discrepancy is the 3:1 ratio of estimates of WTA and WTP for hunting permits, which Kahneman comments appears to be very solidly documented [see Bishop, 1987]. Kahneman (1986) states that

"If loss aversion is accepted as a fact of valuation, it follows that WTP is an acceptable method only for purchase transactions. In particular, WTP should not be used as a measure of value for people who are made to lose their clear air or trees because of the intervention of some other agent. The fairest way to

represent such cases is by recognizing that the experience is a genuine loss, and that the compensation should reflect this fact."

Kahneman (1986) does not recommend using the WTA method to estimate this value, because this method is likely to produce useless results, but "... the use of WTP is likely to yield serious underestimates of the value of a good in a compensation structure." Where exchanges are recurrent and reversible the individual becomes familiar with the experience of getting a thing and giving it up.

"What is given up is eventually perceived as an opportunity cost rather than a loss, and loss aversion is then not a factor. When a loss is imposed on an individual on a unique occasion, however, there is no reason to expect the evaluation of gains and losses to be so balanced. [B]y restricting the scope of CVM to measures of willingness-to-pay in problems that have a purchase structure, we may have restricted the applications of the method quite substantially. There are surely many cases of compensation structure in which we would like to measure value, but the measure of WTA is suspect and WTP is not an acceptable substitute" (Kahneman, 1986).

[For further discussion on the discrepancy between WTP and WTA or compensation demanded see Gregory (1986)]. A question that Kahneman (1986) poses is then "How do we evaluate trees that are taken out to permit mining, but were doomed anyway by a pest?" In a similar fashion how do we evaluate a landscape that is going to be planted in trees, but was 'doomed' by wilding pine spread? However, as with Price's (1978) jam and cream doughnuts, attitudes and opinions about high country landscapes are varied and what is acceptable to one is anathema to another. This is in contrast to applications of CVM where one alternative is readily identifiable as 'bad' and the other 'good' (eg. air pollution and clean air). As with pine planting there are many other changes occurring in the high country, such as grassland 'improvement' or developments such as skifields, that may have a 'compensation structure', and are thus not amenable to CVM. In addition changes that are amenable because they may have a 'purchase structure', such as wilding pine spread, but are

closely interlinked with things such as pine planting, which may have a 'compensation structure', could cause 'identification problems' or confusion by the respondent as to what s/he is responding about.

While the CVM can be a valuable and useful tool, Cummings et al. (1986) consider that

"... given the present state of the arts, a limited number of environmental 'commodities' are amenable to CVM applications, where the ROCs are satisfied. For such applications, where the ROCs are not satisfied, the present state of the arts does not allow us to conclude that accurate or inaccurate measures will result. [However] available evidence suggests that such measures may be seriously distorted."

From the evidence available to us at present, it points towards the landscape (be it high country or not) being 'not amenable' to having CVM applied to it without the risk of serious distortions to the derived values being present given our present understanding. This results both from failure to meet various ROCs and from objections raised by Kahneman (1986). However, as Cummings et al. (1986) comment

"... our colleagues in medical and engineering sciences consider, as a matter of course, estimates producing errors on the order of one to ten (one order of magnitude) *to be normal*; therefore, it is not clear that we should be disturbed if our value estimates are thought to be within $\pm 50\%$ of true values, or $\pm 100\%$. Ranges of error of 3:1 or 5:1 may pale in significance when compared to those reflecting technical ignorance in most environmental fields."

Indeed, as Kerr (1986) has noted, "In many instances an order of magnitude estimate of value will be sufficient for decision-making." Therefore, depending on the proposed application for the values derived, the contingent valuation method may or may not be an appropriate technique to ascertain the non-market values of the high country landscape.

SUMMARY

- 1 There are changes that are occurring in the high country that warrant investigation as to their effects on the overall welfare of people.
- 2 The rationale for doing benefit/cost assessments was investigated and a basis for undertaking CBA was found.
- 3 Various non-market methods of value determination were reviewed and CVM was considered to be the most appropriate for further assessment.
- 4 Attitudes and opinions about landscape were reviewed and found to individualistic and subjective.
- 5 CVM and the various biases that can affect it were then reviewed. Relevant operating conditions for the use of CVM were considered. These are:
 - #1. Subjects must understand, be familiar with, the commodity to be valued.
 - #2. Subjects must have had (or be allowed to obtain) prior valuation and choice experience with respect to consumption levels of the commodity.
 - #3. There must be little uncertainty.
 - #4. WTP, not WTA, measures are elicited.
- 6 In addition the concepts of 'user values' and 'purchase structures' investigated. The findings of the review were:
 - That there would be lack of experience and familiarity about the landscape as a commodity;
 - That the risk of contamination by 'ideological' values is high; and
 - That there would be problems with 'purchase/compensation' structures.
- 7 As a consequence the CVM was considered 'not amenable' to assessing the non-market values of the high country landscape, because of the risk of serious distortions to the derived values being present given our present understanding of

- the approach, if values within 50% of market analogous values are required.
- 8 However, in many instances even an estimate of value within an order of magnitude can be sufficient for decision-making.
- 9 Therefore, depending on the proposed application for the values derived, the contingent valuation method may or may not be an appropriate technique to ascertain the non-market values of the high country landscape that would be of interest to government agencies such as the Department of Conservation or the Ministry for the Environment.
- 10 Areas that further research are needed include that of landscape perception and the specification and measurement of Reference Accuracy for CVM measures. There is the need to further define relevant ROCs
- ". . . and for calibrating errors with deviations from ROCs. Thus, we must ask questions exemplified by: What is 'familiarity' or 'experience' vis-à-vis a CVM commodity; what is 'uncertainty' and what constitutes 'ideological content'; what variables may perform best as measures of cognition and/or affection and how are attitudinal variables calibrated with measures of attitude-behavior correspondence; how can we better structure value questions so as to enhance *a priori* our expectations that preferences are obtained which are at least consonant with incentive-compatible revelations in market context?" (Cummings et al. 1986)

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