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Correcting for multiple destination trips in recreational use values using a mean-value approach

An application to Bellenden Ker National Park, Australia.

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Abstract

This paper focuses on an empirical application of the travel cost method, to estimate the recreational use value of Bellenden Ker National Park, part of the Wet tropics World Heritage Area Queensland, Australia. Walking appears to be one of the main activities associated with recreational experiences in the region. Substantial socio-economic as well as environmental benefits are expected to be gained if the areas was to be developed further, with regard to walking tracks, provided that this would be done in an environmentally sustainable way.

Two overnight tracks within the park have been selected to obtain information about visitors' experiences with the tracks in the past, to address specific needs for possible future developments.

A standard assumption for interpreting travel costs as a valid proxy for the price of a trip is that the travel cost be incurred exclusively to visit that particular site. However, this assumption often proves to be invalid as people tend to combine destinations. We propose a method commonly used in multi-criteria decision-making to correct for multiple trip bias.

A value of $AUS 15.2 mln has been estimated as the net present value of recreational use in 2001 values at about six percent real rate of interest in perpetuity. This value appears to be rather small compared to other TCM studies undertaken in the area, for national parks that were similar in size and visitor numbers.

Key words: multi-criteria analysis, multiple trip bias, travel cost method, Wet Tropics World Heritage Area

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1. Introduction

Part of the Wet Tropics of Queensland World Heritage Area (WTWHA) Australia form the focus of the present study. The WTWHA extends along the upper Northeast coast of Australia and measures about 894,000 ha and is highly important for the conservation of Australia's biological diversity. In the past, large parts of the rainforest were cleared for logging purposes and to make way for the sugar cane plantations that spread along the entire northern coast. However, while the economy of the region thus used to be nearly entirely dependent on primary production, the focus has now shifted to tourism. A study undertaken by Driml (1996) for example showed that benefits derived from tourism in the WTWHA exceeded benefits previously generated by logging by at least a factor of 10.

In 1990, the Wet Tropics Management Authority (WTMA) was established, which would be responsible for managing the Wet Tropics according to Australia's commitments under the World Heritage Convention. Central to these commitments is the responsibility of the WTMA to preserve, protect and present the values of WTWHA to locals and visitors alike (WTMA, 2000).

Tourism and recreation are means of accomplishing the *presentation* element of the goal of the WTMA. Walking is one of the primary activities associated with tourism and recreation in the WTWHA, which, provided that it is properly managed, is compatible with conservation and protection of World Heritage Values (WTMA, 2001).

The Bellenden Ker National Park includes, amongst several short tracks, two overnight walking tracks, i.e. the Goldfield track and Mt Bartle Frere track. The park is situated approximately 60 kilometres from Cairns, which is the nearest city.

The park is an area of mostly undeveloped tropical rainforest. The walk to the summit of Mt Bartle Frere takes about 10-12 hours return, which could be done in one day by experienced hikers, however a lot of people make it an overnight trip using the camping area near the summit. With its peak at 1622 metres it is the highest mountain in Queensland (WTMA, 1999).

The Goldfield track is a 19 kilometer trail, situated between the Goldsborough Valley State Forest Park and Babinda Boulders Wildland Park. Both tracks are now under management of the WTMA.

Presently, there is little comprehensive statistical data available to measure demand for walking in the Wet Tropics, or to assess a need for particular types of walks. However, trends in other areas of Australia and local anecdotal evidence suggest that there is an increasing demand for a variety of walks (TQ, 2000; WTMA, 2001). Also, some existing tracks are currently being over-used, resulting in adverse environmental impacts, which increases the need to investigate options for the development of future tracks. Furthermore, despite the fact that the area has had some capital funding, with rising high demands on resources, and a poor history of 'user pays' to obtain contributions towards management costs, there is an increasing need for more stability in funding arrangements (WTMA, 2000). The overall objective of this study is an attempt to provide information on walking, in the WTWHA, which can assist both public and private sector managers in their planning for, and development of, tourism and recreational use in the WTWHA in a sustainable way.

Specific objectives are threefold: First, to develop an understanding of the patterns of existing tourism use of walking tracks. This will enable monitoring systems to be

established and maintained, and models can be developed to describe likely future patterns of visitation. Furthermore, any possible consequences of changes to management strategies or actions can be assessed. To fulfil this objective, a visitor's survey has been conducted seeking visitor's experiences with the region in the past, and opinions about future development proposals of the site. Second, to estimate consumer's demand for walking tracks within the WTWHA. By applying the Travel Cost Method (TCM), current visitor's demand will be assessed. In a second stage, demand will be predicted at various hypothetical entrance fees. This will provide an assessment of the benefits that are experienced by the visitors. The explicit analysis of the benefits can be used to reveal what the site is "worth" to the public, and provide an economic justification for conservation, further development and management practices. Alternatively, the results of this part of the study could, if desired by the relevant authorities, serve as a guideline for the introduction of entrance fees or overnight charges.

The Travel Cost method (TCM) is a commonly applied tool when valuing nature parks. However, while the method has been used in numerous applications world-wide, there are still a considerable number of issues subject to debate and hence, have not yet been solved satisfactorily. One of these issues has been addressed in the present study, and concerned the problem of multi-destination or multi-purpose trips. The third objective of the study can therefore be described as an attempt to contribute to an improved usage of the travel cost method, by applying a technique, commonly used in multi-criteria decision-making, to correct for multi-destination or multi–purpose trips.

The remaining part of the paper is outlined as follows: The next section discusses the travel cost method and problems associated with the method, which have all but been

solved. Section 3 is devoted to the design of the questionnaire and the construction of the variables. The fourth section demonstrates some basic statistics to test the validity of the data. Section 5 reports the results. Section 6 provides a discussion, with recommendations for future research, and presents the conclusions.

2. Valuing Wet Tropics World Heritage Areas with the Travel Cost Method

The basic premise of the TCM is that the number of trips to a recreation site will decrease with increases in distance travelled. Exploiting the empirical relationship between increased travel distances and associated declining visitors' rates should permit one to estimate a true demand relationship. If estimated empirically, this demand schedule could be used to compute the total benefits produced to park visitors, which equal any entry fees paid plus the remaining unpriced benefits, referred to as consumer surplus.

2.1. Issues concerned with TCM

Ever since the earliest applications of the TCM, researchers have been dealing with the question whether, and if so, how, certain possibly important determinants of demand should be included in the demand function.

When applying a travel cost model, one can either choose to apply the individual travel cost model (ITCM) based on individual visitors, where the dependent variable, quantity consumed, is the number of trips taken per period by individuals or households, or apply a zonal travel cost model (ZTCM), where the dependent variable is either the probability of participation, or rate of participation per capita.

Two conditions need to be satisfied to use an individual travel cost model (ITCM) i.e. visitor survey data are needed, and most visitors should take more than one trip a year.

While the first condition is satisfied, in the study of walking tracks in Bellenden Ker National Park, the second one is not. Information obtained from Queensland Park and Wildlife Service (QPWS) showed that only four respondents had applied more than once for a camping permit to the park. This small data set for ITCM left no other option than to aggregate individuals into zonal data. Zones in this study have been defined by statistical division within each state (ABS 1992). Each identified statistical division has initially been used to represent one single zone. Population numbers for each statistical division for persons over fifteen years old were used to represent its zonal population. Eighteen zones have been identified. The use of the zonal method brought along the problem of 'zero-visitation rates'. The more distant zones tend to exhibit zero-visitation rates. Some studies have dropped zones with none visitation, others have combined these zones with adjacent zones that have positive visitation rates. Theoretically, zero zones should be included in the analysis, since one wants to get an idea of the number of visitors from the whole of Australia. Moreover, Hellerstein (1992) notes that excluding these zones will truncate the data set, which will bias the coefficient estimate, and will result in a more inelastic demand curve. Zero zones were thus combined with positive zones that were similar in both distance and character (i.e. urban zero zones were combined with other urban positive zones, and rural zero zones with other rural positive zones). A list of the identified zones has been included as Annex A.

2.2. Multi-purpose trips

When people visit more than one destination on one particular trip, travel cost should not be assigned only to the site in question. However, allocating costs among multiple sites has proven to be very difficult. There are two alternatives. First, one can either use a

quantifiable variable in terms of 'nights spent' at the different sites, as a proxy for its relative importance. However, this method is somewhat troublesome because costs are allocated among so many sites, that the basic premises underlying the TCM are violated. Stoeckl (1993) for example found that demand for visitors from Tasmania was higher than demand from visitors living much closer, hence demand did not fall with increasing costs.

Second, one can use visitor's preferences to allocate the cost. Theoretically, this would be the preferred method. Applying this to our case, one would then presume people base their trip decision on the possibility of visiting those sites that are of most interest to them. For the purpose of the present study, preferences need not only be identified, but also ranked, as we want to determine the relative importance of each destination. In a recent paper, Hajkowicz *et al*., (2000) evaluated five weighting methods that enables one to rank criteria used for multi-criteria decision making in natural resource management. The five methods include fixed point scoring, rating, ordinal ranking, geographical weighting, and paired comparisons. Their evaluation was based on ease of use, and how much they helped clarify the problem. They found that ordinal ranking was most preferred by the decision-makers. The results showed that decision-makers felt uncomfortable when applying fixed point scoring as is occasionally used within TCM (see for example Willis and Garrod, 1991; Hanley and Ruffell, 1992). Ordinal ranking appeared to be the most preferred method. Ordinal ranking implies that decision-makers have to rank the criteria according to their relative importance. Hajkowicz *et al*., (2000) conclude that the most important advantage of this method is that the weights accurately reflect the subjective insights of visitors. Ordinal weights can then be converted into

cardinal values using the 'expected value' approach (Nijkamp *et al*., 1990). The application of the 'expected value approach' requires the derivation of a set of weights, given a ranking of, in our case, destinations. The expected value method works in such a way that differences in quantitative weights for objectives highest in ordinal ranking (i.e. those that are more important) are greater than differences between those at the bottom of the ranking (i.e. those that are less important) (Hajkowicz *et al*., 2000). A more formal explanation of this method is given in Annex B.

Achieving a complete ranking is difficult when a large number of criteria have to be ranked. Nijkamp *et al*. (1990) found nine criteria to be the maximum number that can be ranked at once. Voogd (1983) suggested that in a case where the number of criteria exceeds nine, a stepwise approach might be useful, where the set of criteria is divided into subsets. However, in our application as visitors could theoretically have visited many different sites, it would result in too fragmented travel cost. Therefore, respondents were asked to state five other destinations at most.

2.3. Travel time

Since there is no consistent method of how to value travel and on-site time, any adjustment made by the researcher is necessarily arbitrary. Moreover, travellers might gain utility from the actual experience of travel, which would reduce travel cost.

2.4. Travel cost components

Travel cost have been based on average running vehicle costs per km, calculated by the National Road and Motorists' Association (NRMA) for the year 2001. Calculations have

been carried out for a range of different types of cars, up to ten-year ownership period, based on an annual distance traveled of 15000 kilometers per annum. [2]

Types of cars that were not on the list have been matched with their closest substitutes. Accommodation during the travel has not been taken into account, since there was no information on whether or not visitors did travel directly from their home to the park. Weighted average travel cost, with the weight based on the frequency of the different types of vehicles within the sample, have been calculated per km, assuming the type of vehicle a person owned did not depend on the zone of origin, and per km costs would thus be the same across all zones. A weighted average running cost of $AUS 0.53 per km was obtained.[3]

3. Questionnaire design and administration

Primarily due to time and cost constraints, it was decided to a postal survey rather than personal interviews.[4] Camping permits are being issued by Queensland Parks and Wildlife Service (QPWS) for those visitors that stay overnight. Unfortunately not all applicants had included a full postal address and so in order to get a large enough sample it was necessary to include permits issued since 1995. The annual number of permits issued is displayed in Table 1. Since information regarding the total number of permits issued in 2001 was not available, this year was assigned the rounded average of the

2 Theoretically, the portion of the travel cost associated with the distance travelled should be based on measures of the marginal cost of operating a car. However, information about average cost appeared to be the only data available, hence we used average running costs calculated by NRMA (2001) for different types of cars, which included apart form petrol cost, also depreciation, interest, vehicle registration, insurance, and NRMA Membership.

3 This value however has been based on 2001 prices. We thus assumed that average running cost would have been the same for previous years.

4 The questionnaire was pilot-tested doing personal interviews during one week. However, we encountered only 15 travelers then. Considering the fact that we wanted to have at least 100 usable interviews, it virtually ruled out the option to proceed with personal interviews.

previous years. Bellenden Ker National Park is of international significance, with a substantial number of foreign visitors. These visitors however were not included in the database as we can safely assume that probably no single overseas visitor would fly all the way to Australia just to visit Bellenden Ker National Park. These visitors are likely to undertake a myriad of other activities, hence their travel costs do not bear any relationship with their value for the park. Inclusion would probably have lead to a huge overestimation of the total estimated value of the park. The most common thing to do is to just leave them out or estimate a separate value based on contingent valuation like questions, i.e. their willingness to pay for the park (see for example Driml, 1996).

Insert Table 1

Thus, Australian visitors who camped in the park during the period 1995 to 2001 inclusive were chosen as the relevant population. There were a total of 482 names and addresses could be used, and the equivalent number of questionnaires was posted in the first week of October 2001. QPWS agreed to send out the questionnaires on behalf of the University of Queensland to ensure confidentiality with respect to respondent's personal details. During the design phase, the questionnaire was pilot-tested. Valued suggestions were made on design, wording and sequencing of the questions. A copy of the introductory letter and the final questionnaire has been included as Annex C1 and C2 respectively.

A second mail-out of postcards were sent to each address, to both act as an incentive for those that had not responded yet, and to thank those that had, for their time and effort. Of the total of 482 questionnaires posted, a total of 96 were returned unopened. A total of 142 responses were received, representing a high response rate of 36.8 percent.

4. Data

To get a total visitation number for each zone, the number of visitors had to be multiplied by a ratio to correct for the fact that only those people who responded have been counted, which is likely only a fraction of total population visiting the site. As 1135 permits that had been issued during the seven years the ratio is 1135/142 which equals 8.05. Table 2 reports visitation numbers corrected by this figure. Figures have been based on the average group size of three persons.

Insert Table 2

With these figures visitation rates, defined as the number of visits for a given period per thousand zonal population, could be computed using the following:

$$VI_i = \frac{V_i * 1000}{P_i} \quad (1)$$

where:

$VI_i =$ Proportion of visits over the years 1995-2001 per zone i
$V_i =$ Number of visits over the years 1995-2001 per zone i
$P_i =$ Population per zone i

4.1. Travel cost

Visitors were asked to state their modes of transportation from their home to the starting point of the walking track. Travel distances have been computed between Bellenden Ker and the largest city within each statistical division, representing the point of origin for that specific zone, using the Royal Automobile Club of Queensland (RACQ) route planner.

In the case of single destination visitors total travel costs were the appropriate costs to include. However, for those who had combined trips, i.e. the multi-purpose-or-destination visitors, a proportion of the total travel costs was assigned according to the relative importance of the site in question, in relation to the other sites visited.

The proportion of travel costs attributable to Bellenden Ker National Park were calculated using the aforementioned 'expected value approach'.

A question has been asked to elicit more information on visitors' attitudes to the travel part of their visit. However this question was very poorly answered, which might indicate that its purpose was not clear enough. It was therefore decided that the personal benefits of travel equal the opportunity costs of time.

Apart from the travel cost variable, it was decided to include socio-economic variables since it could be expected that demand for visits to a national park would be influenced by any of these variables. All the variables have briefly been discussed below, in terms of their expectant influence, followed by an explanation of how values for these variables have been computed.

Age

Intuitively, age would be an important determinant of demand for outdoor recreation. Furthermore, we would expect this relationship to be negative. Especially overnight walking tracks are likely to attract relatively young people who are assumed to be fit and able to cope more easily with relatively primitive circumstances than older people. For example, results from a national survey in the U.S. among 300 adults by the Heritage Conservation and Recreation Service 1977 reported by Walsh (1986), showed that more youth participate in physically strenuous activities. To include age, the respondents were

asked to state their year of birth. Since the survey ranged over a period of seven years altogether, the median year 1998 has been used to calculate a weighted average age.

Education

Generally, education tends to be positively correlated with visits to a national park. Results from the study reported by Walsh (1986) as above, showed that education is positively related to recreational activities in general and physically strenuous activities in particular. Also, Stoeckl (1994) for example found that 70 percent of respondents in her study claimed to have either a degree or diploma, whereas only 28 percent of the Australian population at that time held these qualifications.

Income

Income also tends to exhibit a positive relationship with outdoor activities. Ward and Beal (2000) however note that this relationship is often not very strong. Walsh (1986) also found this. His results showed that the correlation between income and participation is usually positive, albeit it is often not statistically significant. Furthermore, it is noted that a negative relationship is often found between hiking and income, which indicates that hiking apparently, is considered an 'inferior good'.

The final question of the survey was about the visitor's annual household income before taxes. Eight answer categories were given, with income brackets being relatively large, also to increase the likelihood that people would actually answer the question.

The problem encountered here however was that incomes were stated for the year 2001, whereas the trip might have been in 1995. Current income levels are likely not to be representative of those in 1995 and hence, income is presumably overstated. We corrected the household income with real income growth as explained in Annex D.

4.2. Test Statistics

Variables were included on the logic of the underlying economic theory. First, variables were tested for correlation. According to Anderson *et* al., (1990), an absolute value of 0.7 indicates that there may be a problem of multicollinearity. The correlation matrix displayed in Table 3 shows no correlation any higher than 0.46, which indicates that multicollinearity is not a problem within our data set. All variables could thus initially be included in the analysis.

Insert Table 3

Eviews 4.0 has been used to perform ordinary least squares regression analysis to estimate the first stage demand curve for the recreation experience, that is, per capita visitation as a function of travel costs, that are expected to increase as the distance between the zonal origin and destination increases.

The second step obtains a 'true' demand curve for the site. This is done by using hypothetical increases in entry fees and determining the corresponding visit rate demanded per zone. For each hypothetical entry fee the visit rate is aggregated across all zones. This process assumes that visitors would respond to an increase in entrance fees in the same way as increases in travel costs (Haspel and Johnson, 1982; Loomis and Walsh, 1997). Finally, the consumer surplus has been calculated by integrating the area underneath the second stage demand curve.

A general form of the relation between travel costs and visitation rates was estimated, specified as follows with α as intercept, β_i as regression parameters and error term ε_i:

$$VI_i = \alpha + \beta_1 TC_i + \beta_2 A_i + \beta_3 E_i + \beta_4 I_i + \varepsilon_i \quad (2)$$

where:

VI = visitation rate for the years 1995-2001 per zone i
TC = weighted travel cost per zone i
A = weighted average age per zone i
I = weighted average household income adjusted for real income changes per zone i
E = weighted average education level per zone I

Six different functional forms have been tested, initially with all variables included. However, all socio-economic variables appeared to be highly insignificant. Therefore, a redundant variable test was performed to test whether all socio-economic variables all have zero coefficients, and might thus be deleted from the analysis. Specifically, the following hypothesis was tested:

$$H_0 : \beta_2 = \beta_3 = \beta_4 = 0 \tag{3}$$

The p-value was found to be 0.569, hence the F statistic is not significantly different from zero at the five percent level, and the null hypothesis cannot be rejected. It can therefore be concluded that those predictor variables do not seem to explain the variation of VI about its mean. As socio-economic variables generally do have some significance in travel cost models, our case might indicate that the sample size was too small to reveal this.

Thus, it was decided to proceed with a model that only includes 'travel cost' as an independent variable resulting in the following model:

$$VI = \alpha + \beta_1 TC_i + \varepsilon_i \tag{4}$$

Test statistics for six different functional forms including the linear, and five transformed models have been displayed in Table 4.

Insert Table 4

Notwithstanding the ease with which other travel cost studies seem to apply this method (e.g. Stoeckl 1994; Beal 1995b; Driml 1996 and Xue *et al*., 2000), comparing different

functional forms based on the single criterion of the adjusted R^2 is generally inappropriate on statistical grounds, as all models involve different dependent variables (Garrod and Willis, 1999). The log likelihood function is a well-known approach to compare the goodness of fit of the different models.

Table 4 shows that the model that had all variables in linear form, except for the travel cost, which were inverted, clearly outperformed the other ones in terms of measuring the probability of the observed results (Log likelihood), explanatory power (Adjusted R^2), significant variables (t-values) and overall significance (F-value).

Based on these results the model that has travel costs inverted is the one that has been chosen to proceed with. Next, the model was tested for heteroscedasticity. When heteroscedastsicy is present, estimates of variances of each of the estimated parameters will be biased, leading to incorrect statistical tests. The White test has been applied, testing the following hypothesis:

$$H_0 : \sigma_1^2 = \sigma_2^2 = \sigma_3^2 = \sigma_N^2 \tag{5}$$

where σ^2 represents the variance and N is the number of observations.

To perform this test, regression residuals are used to run the following regression:

$$\hat{\varepsilon}_i^2 = \gamma + \delta X_i + \tau X_i^2 + \nu_i \tag{6}$$

with $\hat{\varepsilon}_i^2$ are the squared residuals of the regression, δ and τ the regression parameters, X_i the reciprocal of the travel costs, and v_i the error term. The White test is based on the fact that when there is homoscedasticity (Pindyck and Rubinfeld, 1998):

$$NR^2 \quad \sim \quad \chi^2 \tag{7}$$

where:
N = number of observations
R^2 = the R-square associated with the regression of the residuals

with degrees of freedom equal to the number of independent variables. The value for NR^2 in this case was 6.85. The critical value of the chi-square with 2 degrees of freedom at a 99% confidence level (α=0.01) is 9.21. Thus, the null hypothesis of homoscedasticity cannot be rejected and we do not have to control for heteroscedasticity.

5. Results

5.1 Survey responses

The first question asked in the survey was, which of the walks in Bellenden Ker National Park had been completed during the trip, for which the respondents had applied for a camping permit. Results for the first question are summarized in Table 5.

Insert Table 5

It appeared that 106 people completed the journey to Mt Bartle Frere, 23 people completed both walks within the same trip, and 7 did only the Goldfield trail. Six respondents did not reply to this question. Two respondents claimed they had not walked either of the tracks but only applied for a permit for Graham Range and the Tableland Areas. One respondent wrote they did not remember details of the trip as they had been only passing through to Cairns. Similarly, one respondent reported they had just spent time coming from the Kennedy highway, and visited areas surrounding Cairns, Atherton etc. Another two respondents just answered 'neither' and 'none at these sites' respectively.

Congestion, Question 13 in the survey, did not appear to be apparent on either of the tracks, as 83.1 percent of the respondents stated that their enjoyment had not been reduced at all. 9.6 percent claimed their enjoyment had been slightly reduced by the

number of other hikers, 5.2 percent experienced a moderate reduction, while 2.2 percent thought their enjoyment had been greatly reduced by the number of other people.

This is consistent with the results from a later question where respondents were asked to state possible detracting features they had come across during the hike(s). Only one respondent mentioned the high number of day-trippers as a feature of distraction, because this had presumably caused degradation of the track.

The follow-up question sought for possible detracting features. It was designed as an 'open-ended' question for the following reasons: first, since permits applications from the previous seven years have been used, there may be quite some differences in what people perceived as being detractive features then and now, due to the long time span. Issues that might not have been at stake five years ago could have become a major aspect these days because visitor numbers have increased. Conversely, features that might have been detracting at that time may well have been controlled by now. Second, this type of question allows people to comment on the way they perceive the park is to be managed. Obviously though, an open-ended type question brings along the problem of variation among all given answers. For recording and analysis, and in order to limit variation between answers, sixteen categories have been designed. The categories are discussed below.

'None' refers to no detracting features experienced during the visit. Rain, humidity and mist have all been included in 'Weather'; lack of signage and comments like "It was easy to head off to a false trail" and "Different information regarding the tracks from QPWS and the tourist info" were placed into the category 'Poor information'; All comments that included the observation of rubbish, or mess on the track and campsites, have been

included in ‘Litter’; ‘Inadequate management’ here refers to management decisions and lack of facilities apart from the camp site. Responses like "There is no link with a long distance track", "There should be a camping limit", but also "Lack of toilet facilities" have been placed in this category; Burn-off by sugar cane farmers in vicinity of the park causes haze in the air, thereby restricting views. Comments explicitly stating that views were restricted by burn-off and not bad weather conditions were included in ‘Restricted views’; "Not enough camp sites", "Poor management of the camping areas", and "Poor location of the camp sites" were recorded under ‘Inadequate camping facilities’; ‘Noise pollution’ includes noise from intensive agriculture, and from motorbikes on the road next to the Mulgrave River; ‘Feral pigs’ were assigned a separate category; and lastly a category ‘Other’ was designed, which included two responses: One respondent claimed that camping fees were not rounded to the nearest dollar or fifty cents, which made it difficult to find change, and one respondent was annoyed by the fact that large areas had been sacrificed for agriculture and housing.

Insert Table 6

Overall, campers were reasonably satisfied with the present conditions of the tracks as is shown in Table 6.

In more than 35 percent of the cases, respondents stated that they had not experienced any detracting features during the visit, and except for bad weather conditions and leeches that accounted for 16.7 and 9.3 percent of the responses respectively, all other detracting features were mentioned in less than 10 percent of the responses.

By comparison, the study undertaken by Driml (1996) who examined benefits of sustainable tourism to the Wet Tropics World Heritage Area included the same question. Results are discussed below as far as they are comparable.

'Nothing detracted' was the most popular response here as well, reported by 48.4 percent of the respondents. The most reported aspect detracting from satisfaction was tourism impact and crowding, mentioned in 15.0 percent of the cases. Combining 'erosion/degradation of the track', 'litter' and 'restricted views' together under 'tourism impacts' gives a proportion of 14.2 percent, similar to Driml's findings. Altogether, 14.6 percent of Driml's responses found the natural environment disappointing; including an inability to see wildlife, the presence of biting insects and bad weather conditions. In the present study, no single response was recorded that included an inability to see wildlife, however when summing the categories 'leeches' and 'weather' into a single one, this feature was nominated in 25.9 percent of the responses, nearly twice as high as Driml's results.

'Poor facilities' were reported in 5.9 percent of the cases for Driml's study compared to 4.9 percent for the present study. However, it should be noted that 'poor facilities' is a more general term applied to all tourism aspects of the Wet Tropics than our 'inadequate camping facilities' which clearly only takes facilities in camping areas into account. 'Poor information' was mentioned by 4.4 percent of respondents for Driml's study, similar to the 4.9 percent found in the present study. 'Poor management' accounted for 4.1 percent and 1.85 percent in Driml's and the present study respectively.

Finally, development on private land was reported by 4.1 percent in Driml's study and was only mentioned once, or in 0.62 percent of the cases for the present study. This

finding might indicate that the extent to which development on private land is taking place within the Wet Tropics varies distinctively between locations.

Respondents were asked to state their motivation for the trip. Five possible choices were given, as shown in Table 7. Multiple answers were allowed.

Insert Table 7

A majority of respondents undertook the trip as part of a weekend. This might be due to the fact that more than 75 percent of all respondents were residents of Queensland, hence the distance to the park was likely to be small. Furthermore, both walks do not need to include more than one overnight stop, which may be an additional attractive feature to undertake the trip as part of a weekend. Another 35.9 percent of the respondents claimed their trip to the park had been part of a vacation. Another 14.1 percent were placed under 'Other' with responses varying from scout outing and navy cadet training, to scientific research and field trips from bushwalking clubs. A further 8.3 percent had undertaken the trip as part of a visit to relatives and friends, and a final 3.9 percent accounted for business trips.

The survey was only conducted among those visitors that were registered as having an Australian address for reasons discussed earlier. Table 8 reports the distribution among visitors according to their residential state of origin.

Insert Table 8

The distribution in the study does not follow state population sizes. More than 75 percent of the visitors were residents of Queensland, while the state only accounts for 18.5 percent of the total Australian population. This might be due to the fact that the Wet

Tropics are located in Queensland, though on the contrary, the study undertaken by Driml (1996) shows figures that are almost equal to state distribution, indicating that distance apparently did not act as a constraint for people to get to the Wet Tropics. A reason might be that while Driml's study concentrated on the entire Wet Tropics, including the most popular features that attract visitors from all across the world, the present study focuses solely on a specific activity, namely walking, in a specific relatively remote area, i.e. Bellenden Ker National Park. Our sample is thus selected from a different population than the general public.

The survey also sought for opinions of future developments of currently existing tracks. In order to ascertain how people would feel about these plans, suggestions and ideas that have been proposed by the WTMA were used (Question 20 of the survey). The idea of WTMA was favoured by the majority of visitors: 83.7 percent of the respondents thought they would walk a long distance trail as has been described in the proposal, the remaining 16.3 percent stated they would not. One respondent did not answer the question. Some of those that answered 'no' thought that idea was great though, however, due to reasons varying from not being fit enough anymore, having small children and living too far away from the Wet Tropics, they would not consider doing any of the proposed hikes themselves. The survey undertaken by TQ (2000) incorporated a similar question. Respondents were asked to state their interest in doing a long distance walk in the area on the basis of a five point scale ranging from 'very interested through to 'not at all interested'. 37 percent reported they would be very interested, 25 percent would be quite interested, 11 percent claimed to be indifferent, 16 percent would not be very interested, and a final 11 percent did not express any interest at all in doing a long distance walk.

Interestingly, the question asked in the TQ survey is assumed to be easier to answer than the one asked in the present study, which explicitly asks if people think they would actually do a walk like that. Nevertheless, the proportion of respondents indicating they would favor the idea of a long distance track was only about 60 percent for the TQ survey, compared to over 85 percent for the present study. However, this might be due to the fact that the present study only surveyed those people who had done at least one overnight bushwalk previously, i.e. Mt Bartle Frere or the Goldfield track, hence it can be expected that they are likely to be more interested in an activity of a similar kind than the general public.[5]

In addition, the study by TQ included a separate question, designed to reveal reasons of disinterest in a long distance walk. Reasons as stated above for the present study were also found for the TQ survey. Finding it 'too hard/too long' was the most popular response here, nominated by 35 percent of those who would not be interested in doing a long distance walk.

The closed response question was followed by an open-ended one to try to ascertain more closely what people would drive to do a long distance track. The various aspects people mentioned have been placed in to six categories, displayed in Table 9. Multiple answers were allowed.

Insert Table 9

A substantial proportion of respondents, 24.6 percent, would primarily be attracted by a variety of views, wildlife and vegetation on a longer walk. The camping on the track

[5] Moreover, 82.7 percent of respondents had done overnight tracks other than Mt Bartle Frere or the Goldfield track. It would therefore be expected that most of them would answer 'yes' to the question about whether they had any interest in doing another one.

would attract 23.9 percent. Another 23.1 percent considered getting away from civilisation, out into the wilderness, the most attractive feature of a long distance track as opposed to a shorter walk. This was followed by an additional 15.7 percent that would find the challenge to undertake strenuous exercise especially appealing. A small number of responses, 9.0 percent, nominated the longer break from usual routine as the most attractive aspect. A final 3.7 percent reported exploring new places would be the most attractive feature for them.

Visitors who had not included any destinations other than Mt Bartle Frere and the Goldfield track on that particular trip were asked to state their level of enjoyment derived from doing the walk. This was reported on a Likert type scale from 1-5 with 1 indicating a high, and 5 a low level of enjoyment. The results are shown in Table 10.

Insert Table 10

Overall, slightly more than 50 percent and 45 percent respectively, of all visitors that had specifically come for hiking Mt Bartle Frere and/or the Goldfield trail were not very satisfied with the walk. For Mt Bartle Frere, more than 70 percent regarded the walk as being not very enjoyable, summing responses from level 1 and 2, approximately 4 percent was neutral in their opinion, and 25 percent reported a high level of enjoyment, summing level 4 and 5.

For the Goldfield trail, 60 percent stated they had derived a low level of enjoyment from doing the walk, 10 percent were neutral and 30 percent claimed a high level of enjoyment derived.

Interestingly, these results are conflicting with those from one of the previous questions where people could state any possible detractions, and over 40 percent reported they had not experienced any detracting features.

Despite the fact that it was decided that the whole issue of time would be omitted from the analysis after all, a question was asked as to ascertain whether or not travel time was considered a cost, i.e. whether or not people would have wanted to avoid travel time. One option to assess visitor's opinions about this issue could have been accomplished by just asking respondents whether they liked travelling to the site. However, this was considered a leading question. Furthermore, respondents would not have been forced to make a trade-off between spending time on the travel itself and doing something else instead if this type of question was asked. Therefore, though obviously more difficult, the present study adapted a hypothetical question used by (Beal, 1995a). This was expressed as: "If you could have reduced the time to travel to the Mt Bartle Frere and/or the Goldfield track substantially by some means that could take you to the site in only a few seconds, at exactly the same cash cost you have incurred in the trip you actually took, would you have taken this option?" Three options were given; 'Yes both ways', 'Yes one way' and 'No'.

This type of question was expected to be more difficult since it is does not describe any real situation, i.e. there exist no means of transport (yet) that could have taken visitors to the site in only a few seconds.

The majority, 63.6 percent of respondents, answered they would not have taken the option. Another 10.9 percent claimed they would have taken the option for one way only, and a final 25.6 percent of respondents reported they would have taken the option

instead for both ways. This appeared to be mostly local residents who undertook the trip in a weekend, assuming that they are familiar with the area and do not consider travelling through an area that is known to them, as particularly exciting.

These results indicate that travel time in more than half of the cases is considered enjoyable. It should be noted though that the high number of respondents answering 'no' to this question might also be due to the fact that the wording of it appeared to be unclear. Drawing on comments by respondents, it was apparently not obvious to people whether the proposed alternative means of transport would include substitution for the actual walks themselves, or that it would only replace the travelling to the site. Unfortunately, this was not discovered until after some first responses had come in who raised the issue. This type of error could have been avoided by explicitly stating that the alternative mode of transport would substitute the travel up to the starting point of the track.

The issue of substitutes has been addressed by asking what people would have done instead if they were informed one day beforehand that both tracks would been closed. About 23 percent stated they would have stayed home. For those who reported they would have stayed home otherwise, there seemed to be no substitute sites. However, all but one respondent were local residents of North Queensland, which is likely to imply that though they decided not to go and visit another site at the time, they probably would have the possibility to do so any time they like. Since the issue of substitutes within TCM is addressed to assess how exclusive this specific site and its features really are, it can be hypothesized that if the site was lost for any reason those respondents would have come up with a substitute site after all. On the other hand however, if people maintain they

would have 'stayed home' it may be because there is really nothing else that would substitute for the features that specific site exhibits.

5.2. Estimates of recreation demand and consumer surplus

The first regression estimated a relationship between travel costs and visitation rates as:

$$VI = -.699 + \frac{599.89}{TC} \quad (8)$$

This initial first stage equation has been used to estimate the second stage demand function.

In order to simulate price increases one needs to increase all travel costs by a given amount, which is equal to the price rise and then recalculate the aggregate level of visitation at that higher entry price.

Entrance fees of $5, $10, $15, $20 $25 $35 $50 $75 $100 $150 $200 $300 $400 $500 $600 and $750 (this is where the total number of visits drops to zero) have sequentially been added to the average travel cost for each zone. Visitation rates have been estimated from each zone under these entrance fees, and the total number of visitors at each entry price calculated. While it is highly questionable people would actually still come and visit the park at entrance prices of $ 750, Xue *et al.*, (2000) note that it is important to keep increasing fees until visitation drops to zero, since summation of the visitation quantity data would otherwise become truncated. This could then result in an inaccurate estimation of the demand function and hence consumer surplus. Figure 1 shows the demand curve for visits to Bellenden Ker National Park:

Since current entrance fees are zero, consumer surplus represents the whole area under the demand curve. For each increment consumer surplus has been calculated by joining the points of total visitation at the various increments by straight lines, and sum all the

discrete areas underneath this demand curve. The consumer surplus resulting from this demand curve has been estimated at $ AUS 6771060 for the period 1995-2001. However one wants to obtain an annual value measure to calculate the net present value of the park in the long run. The discounted annual average consumer surplus is then calculated as follows:

$$a = \frac{CS}{\sum_{t=1}^{7}(1+q)^{t-1}} \tag{9}$$

where:
CS = Total consumer surplus for the period 1995-2001
a = Average annual discounted consumer surplus
q = Discount rate
t = Year

Applying this formula to the total consumer surplus obtained above, generates an average discounted figure of $ AUS 915770 per year. The rate of return on long-term government bonds is commonly used as the appropriate discounte rate. For Australia, it appeared to be 6.01 percent (Reserve Bank of Australia, 2002). Based on this percentage, the net present value of the park in perpetuity then is $ AUS 15232176.

6. Discussion and Conclusions

6.1 Discussion

Questionnaire

Overall, conducting the survey seems to have been successful, as response rates were relatively high, and comparing the outcomes of the present study to previous studies undertaken in the area demonstrated that many results appeared to be similar to findings from Driml (1996) and TQ (2000). Furthermore, a considerable number of respondents

provided additional positive comments on both the design of the questionnaire and the fact that they were given the opportunity to express their opnions about the park..

Poor results were generated from the question that tried to define a limited set of possible substitute sites or activities. First, the list of reported substitutes appeared to be infinite, and second, many respondents did not provide any serious answer. Future applications could probably shorten the question, that is, exclude the constraint of knowing only a day beforehand that an alternative should be sought, and try to group sites and activities instead, to restrict the amount of possible substitutes.

The question designed to account for multiple destination-or-purpose trips seems to have worked well, despite the fact that respondents had to jump questions. Earlier studies note that jumping questions often leads to confusion and irritation. None of this however was mentioned by any of our respondents, indicating that it apperently was no real problem to them.

The travel cost model

The second part of the study has been concerned with an empirical application of the travel cost model to estimate a recreational use value of the park. Based on a real interest rate of 6.01 percent in 2001, the net present value of the park in perpetuity, in 2001 values, has been estimated at $ AUS 15.2 mln. Anticipating on predicted trends, with further development and improvement of the tracks this value is likely to increase.

However, a few points are worth noting here. First, no allowance has been made for any additional accommodation expenses that might have been made during the trip. This would lead to an underestimate of the travel cost and therefore an overestimate of consumer surplus. Second, prices for possible substitutes have not been included in the

model, hence, we implicitly assumed that there are no substitutes for this particular site. The underlying reason was that finding prices for all possible substitutes would have been a job too tedious and time-consuming to serve the purpose of this particular study. However, not including any prices for substitutes has likely led to an overestimation of consumer's surplus. Third, overseas visitors have not been incorporated in the analysis Thus, the estimated value is likely to understate consumer's surplus. Fourth, the usage of current prices for all possible means of transport has presumably led to an overestimation of travel costs for those respondents that undertook the trip in the years before 2001. Fifth, sampling only those people that have actually visited the site thereby excluding those who wished not to do so, probably also has led to an overestimation of consumer's surplus.

Considering these points, the results should be interpreted with some caution. On the other hand however, while the total size of the bias remains unknown, the fact that the problem of correcting for multiple-destination-or-purpose trips has been addressed within the present study at least reduces the number of possible biases that needs to be taken into account when applying the travel cost method in comparison to other studies. By having different destinations ranked in an ordinal way, we adopted a 'new' approach to correct for multiple trip bias.

6.2 Conclusions

Concluding, the present study has assessed visitors' demands and preferences for walking, and calculated an economic value regarding recreational use of Bellenden Ker National Park.

The survey responses enabled us to compare visitors' past experiences with respect to specific features within the area, with those identified by the WTMA. Furthermore, the information obtained regarding possible future developments of the area is believed to be fairly detailed, and will become useful in fulfilling the WTMA's objective of meeting visitors' need with respect to walking tracks.

The generated 'user value' of the park provides a guideline for the possible introduction of entrance fees and makes a strong argument for sustaining the area, as it has been demonstrated that economic benefits derived are large. In addition, the estimated value may also help promoting to sustain other natural areas, which may have not been protected yetand are thus presumably even more dependent on fair decision-making within the policy arena.[6]

Lastly, the method applied to correct for multiple trip -or- purpose bias has proved to be workable and appeared to be relatively easy to implement. Furthermore, the adopted approach goes beyond previous attempts to account for this problem, in that it is based on solid economic theory, (i.e. consumer's preferences govern choices that need to be made) and may thus provide a practical alternative to other methods applied in travel cost modelling.

Thus, despite the fact the travel cost method is still subject to a substantial number of problems, the present study seems to have resolved some of the uncertainty surrounding its results. Provided that we will proceed in this way, the travel cost method has the

[6] In the likely event that these unprotected areas are intended to be used for other more commercial purposes (e.g. housing) estimating the total user value of such a site may very well lead to the conclusion that sustaining the araea would, in the end, be more beneficial than exploiting the area for commercial activities.

potential to become an even more promising tool in future policy-making for natural areas.

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Table 1
Number of permits issued 1995-2001

Year	Number of permits issued
1995	149
1996	207
1997	190
1998	143
1999	123
2000	161
2001	162
Total	1135

Source: QPWS, personal communication, 2001.

Table 2
Adjusted number of visitors per zone

Zone	Number of respondents	Total number of visitors
Brisbane	48	386
Moreton	6	48
Fitzroy	15	121
Northern	87	700
Cairns A	111	894
Cairns B	54	435
Canberra	21	169
Sydney	18	145
Hobart	15	121
Adelaide	6	48
Perth	6	48
South West	6	48
South Eastern	6	48
Melbourne	12	97
Loddon	3	24
Mallee	3	24
Gippsland	3	24
Richmond-Tweed	3	24
Total	423	3404

Source: Fieldwork, 2001.

Table 3
Correlation matrix of variables

Variable	Visit rate **VI**	Travel cost **TC**	Age **AGE**	Education **EDU**	Income **INCOME**
VI	1.000000	-0.386267	-0.103712	-0.342766	-0.046958
TC	-0.386267	1.000000	-0.133537	0.100542	-0.331179
AGE	-0.103712	-0.133537	1.000000	0.460297	0.358580
EDU	-0.342766	0.100542	0.460297	1.000000	0.386157
INCOME	-0.046958	-0.331179	0.358580	0.386157	1.000000

Source: Fieldwork, 2001.

Table 4
Test statistics for six functional forms

Functional form	**Log-Likelihood**	**t-value b_0**	**t-value b_1**	**t-value b_2**	**F-value**	**Adjusted R^2**
Linear	-40.63	2.628	-1.675		2.81	0.096
Quadratic	-38.11	3.587	-2.638	2.199	4.16	0.270
Linear-log	-36.06	4.266	-3.903		15.24	0.456
Log-linear	-34.46	-1.56	-1.11		0.28	0.013
Double log	-33.09	1.399	-2.017		4.07	0.153
Reciprocal (1/travel cost)	-25.57	-2.153	9.175		84.18	0.830

Source: Fieldwork, 2001.

Table 5
Percentage of respondents walking each track

Track	**Percentage of respondents** (N=136)
Mt Bartle Frere Track	77.9
Goldfield Track	5.1
Both	16.9
Total	100

Source: Fieldwork 2001

Table 6
Detracting features of the trip undertaken

Feature	**Percentage of responses** (N=162)
None	35.8
Leeches	16.7
Weather	9.3
Erosion/degradation of the track	6.8
Poor information	4.9
Inadequate camping facilities	4.9
Strenuous walk	4.3
Litter	4.3
Restricted views	3.1
Other	1.9
Lack of drinking water	1.9
Inadequate management	1.9
Presence of rats	1.2
Noise pollution	1.2
Damage by feral pigs	1.2

Note: Multiple answers were allowed
Source: Fieldwork, 2001.

Table 7
Motivation for the trip

Motivation	**Percentage of respondents** (N=156)
Weekend	37.8
Vacation	35.9
Other	14.1
Visit to relatives/friends	8.3
Business trip	3.9

Note: Multiple answers were allowed
Source: Fieldwork, 2001.

Table 8
State of origin of visitors

State of origin	Percentage of respondents (N=140)	Percentage distribution of Australian population*
Queensland	75.7	18.5
Victoria	5.0	24.9
New South Wales	5.0	33.8
Australian Capital Territory	5.0	1.6
Western Australia	4.3	9.8
Tasmania	3.6	2.5
South Australia	1.4	7.9
Northern Territory	0.0	1.0
Total	100	100

**Source*: Estimated resident population by age and sex (ABS, 2001a).

Table 9
Attractive features from a long distance track

Feature	Percentage of responses (N=134)
Variety of views/wildlife/vegetation	24.6
To experience the camping on the track	23.9
Getting away from people/isolation/wilderness experience	23.1
To undertake strenuous exercise/challenge	15.7
To have a (longer) break from usual routine	9.0
To explore new places	3.7

Note: Multiple answers were allowed
Source: Fieldwork 2001

Table 10
Satisfaction with the walk

Level of satisfaction		Mt Bartle Frere (%) (N=71)	Goldfield track (%) (N=20)
High	1	52.11	45
	2	18.31	15
	3	4.23	10
	4	7.04	20
Low	5	18.31	10

Source: Fieldwork 2001

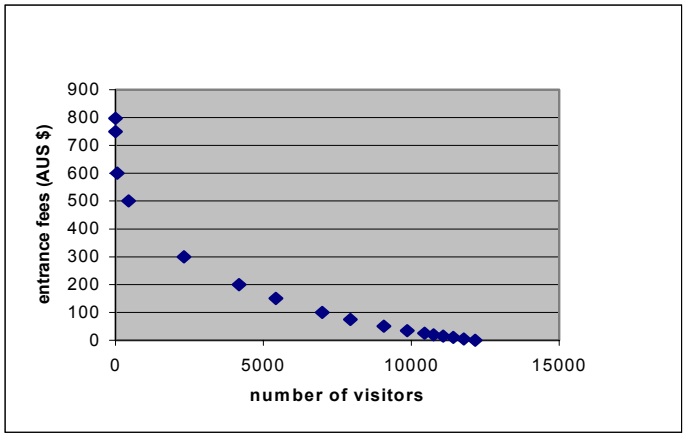

Figure 1: Second stage demand curve for visits to Bellenden Ker National Park

Annex A Zonal distribution across states and their corresponding population

Table A1
Zones distributed across states and corresponding population figures per zone

State	Zone	Population
New South Wales	Sydney	4183175
New South Wales	Richmond-Tweed	604264
Victoria	Melbourne	3002259
Victoria	Loddon	234885
Victoria	Mallee	108427
Victoria	Gippsland	398512
Queensland	Brisbane	1451331
Queensland	Moreton	239031
Queensland	Fitzroy	265015
Queensland	Northern	181778
Queensland	Cairns A	91242
Queensland	Cairns B	83096
South Australia	Adelaide	1531870
Western Australia	Perth	1104902
Western Australia	South West	199058
Western Australia	South Eastern	181925
Tasmania	Hobart	371596
Australian Capital Territory	Canberra	504039

Note: Figures include ' zero zones' and have been based upon the latest population census and excludes individuals younger than 15 years of age.
Source: Authors' calculations based on data from ABS, 2001a.

Annex B The expected value approach to ranked criteria adopted from Nijkamp *et al*. (1990)

We assume that J criteria need to be ranked in increasing order importance. Furthermore, the assumption is made that weights are non-negative and add up to 1. The set of feasible weights is then:

$$S = \left\{(\gamma_1,...,\gamma_j)\middle|\ 0 \le \gamma_1 \le \gamma_2 \le ... \le \gamma_J ; \sum_j \gamma_j = 1\right\} \tag{A1}$$

It is assumed that the probability density function of the weights is equal for all values in S. Thus, a uniform distribution of the weights in S is derived:

$$g(\gamma_1,...,\gamma_{J-1}) = \begin{cases} c & \text{if: } 0 \le \gamma_1 \le \dfrac{1}{J} \\ & \gamma_1 \le \gamma_2 \le \dfrac{1}{(J-1)} - \dfrac{\gamma_1}{(J-1)} \\ & \vdots \\ & \gamma_{J-2} \le \gamma_{J-1} \le \dfrac{1}{2} - \dfrac{\gamma_1}{2} - ... - \dfrac{\gamma_{J-2}}{2} \\ 0 & \text{elsewhere} \end{cases} \tag{A2}$$

In Rietveld (1989) it is shown that $c = (J-1)!J!$. Once the values $\gamma_1,...,\gamma_{J-1}$ are known, the value of γ_J can be found as:

$$1 - \gamma_1 - ... - \gamma_{J-1}$$

The expected values of $\gamma_1,...,\gamma_{J-1}$ as cardinalised values of rank numbers of $1,...,J$. The expected value of an arbitrary γ_j is:

$$E(\gamma_j) = \int_0^{1/J} \int_{\gamma_1}^{q_1} ... \int_{\gamma_{J-2}}^{q_{J-2}} (J-1)!J!\gamma_j d_{\gamma_{J-1}} ... d_{\gamma_1} \tag{A3}$$

Where:

$$q_k = \frac{1}{(J-K)} - \frac{\gamma_1}{(J-K)} - ... - \frac{\gamma_k}{(J-K)} \qquad (k = 1,...,J-2) \tag{A4}$$

After integrating out $\gamma_{J-1}, \gamma_{J-2},..., \gamma_{j+1}$ in (3), one arrives at:

$$E(\gamma_j) = \int_0^{1/J} ... \int_{\gamma j-1}^{qj-1} \frac{(J-1)!J!}{(J-j-1)!(J-j)!} (J-j+1)^{J-j-1\gamma_j} \tag{A5}$$

$$(q_{j-1-\gamma_j})^{J-j-1} d_{\gamma j} \ldots d_{\gamma 1}$$

For integrating out γj in (A5) one can make use of the fact that the primitive function of $x(a-x)^n$ equals

$$\frac{-1}{n+1}(a-x)^{n+1}x - \frac{1}{(n+1)(n+2)}(a-x)^{n+2}$$

The following results can be obtained after the appropriate integrations (see Rietveld, 1989):

$$E(\gamma_1) = \frac{1}{J^2}$$

$$E(\gamma_2) = \frac{1}{J^2} + \frac{1}{J(J-1)}$$

$$\vdots$$

$$E(\gamma_{J-1}) = \frac{1}{J^2} + \frac{1}{J(J-1)} + \ldots + \frac{1}{J*2}$$

$$E(\gamma_J) = \frac{1}{J^2} + \frac{1}{J(J-1)} + \ldots + \frac{1}{J*2} + \frac{1}{J*1} \qquad \text{(A6)}$$

Consider for example a respondent who visited next to Bellenden Ker National Park four other destinations. Thus, a total of five destinations would then need to be ranked. Assume that Bellenden Ker National Park ranked third. The appropriate weight would then be:

$E(\gamma_3)$ = 1/25 +1/20+1/15 = 0.16

Within the present study, respondents were requested to rank seven destinations at most. The calculated expected values for those destinations have been presented in Table B1.

Table B1
Expected values of destination weights

Number of destinations	$E(\gamma_1)$	$E(\gamma_2)$	$E(\gamma_3)$	$E(\gamma_4)$	$E(\gamma_5)$	$E(\gamma_6)$	$E(\gamma_7)$
2	0.25	0.75	-	-	-	-	-
3	0.11	0.28	0.61	-	-	-	-
4	0.06	0.15	0.27	0.52	-	-	-
5	0.04	0.09	0.16	0.26	0.46	-	-
6	0.03	0.06	0.10	0.16	0.26	0.41	-
7	0.02	0.04	0.07	0.11	0.16	0.23	0.37

Source: Adopted from Nijkamp *et al*., (1990)

Annex C1 Introductory letter to the questionnaire

Dear «Dear_1» «Dear_2»,

I am writing to you as you have walked and camped in the Wet Tropics of Queensland. Walking is becoming increasingly popular in Queensland. Research into walking in natural areas will help protected area managers better meet the needs of walkers and ensure walking is environmentally sustainable.

Research is currently being conducted into visitor demand, satisfaction and environmental impact by the University of Queensland. Enclosed is a questionnaire seeking details of your views and experiences of walking and camping at Mount Bartle Frere or the Gold Field track in the Bellenden Ker section of Wooroonooran National Park.

Participants in this survey were chosen from visitors to the Bellenden Ker section of Wooroonooran National Park. You provided your details to the Queensland Parks and Wildlife Service (QPWS) when applying for a camping permit between 1995 and 2001. To enable this important research to proceed while protecting your personal details QPWS has agreed to send out the enclosed questionnaire on behalf of the University of Queensland. Your personal details have not been supplied to a third party. Any information which you choose to provide will be treated as confidential.

Once you have completed the questionnaire it can be returned by simply sealing it in the reply paid envelope provided and posting it.

If you have any questions about this project, please do not hesitate to contact either Mrs Averil Cook or Ms Lonneke Nillesen, at the School of Economics, University of Queensland on 3365 6604 or at a.cook@economics.uq.edu.au. If you have any questions regarding the involvement on QPWS in this project please contact Cate Melzer on (07) 3006 4624 or at cate.melzer@env.qld.au.

Your information is greatly appreciated and will be put to good use. Thank you for your participation.

Yours sincerely

David Briggs
Acting Manager Conservation Planning

Annex C2 Questionnaire

THE UNIVERSITY OF QUEENSLAND

Questionnaire **Confidential**

The following questions refer to your visit in recent years to Mt Bartle Frere and/or the Goldfield track where you have been issued a camping permit.

Q1 Could you indicate which of these hikes you have completed during this visit?

- ☐ Mt Bartle Frere
- ☐ the Goldfield track
- ☐ both

Q2 Are you:

- ☐ an Australian resident
- ☐ a Temporary resident
- ☐ a Visitor on holiday

Q3 How many days did you spend in North Queensland (i.e. Townsville and further North) during that particular trip where you visited Mt Bartle Frere and/or the Goldfield track?

☐

Q4 How many people were in your group? ☐

Q5 Was this trip to Mt Bartle Frere and/or the Goldfield track undertaken as part of: *(more than one box may be ticked)*

- ☐ a vacation
- ☐ a business trip
- ☐ a visit to relatives or friends
- ☐ a weekend
- ☐ Other *(please specify)*

.....

Q6 How many days away from home did you spend on the trip that included walking Mt Bartle Frere and/or the Goldfield track? ☐

Q7 Were there any other destinations in North Queensland included on that trip? *(Please tick one box)*

☐ Yes **Go to Q8** ☐ No **Go to Q12**

Q8 Which of ***all*** destinations included in this trip, did you decide to visit, prior to the actual start of your trip from home? Please list the ones you first decided upon, not more than five.

i) .....

ii) .....

iii).....

iv).....

v) .....

Q9 How many nights did you stay at each of the destinations mentioned in Q8?

i) ☐
ii) ☐
iii) ☐
iv) ☐
v) ☐

If you listed Mt Bartle Frere and/or the Goldfield Track in your response to Q8, go to Q10, if not, go to Q11

Q10 How did these destinations score in terms of enjoyment? Please rank the destinations you listed in Q8 in descending order of importance.

1) .....
2) .....
3) .....
4) .....
5) .....

Go to Q13

Q11 How did walking Mt Bartle Frere and/or the Goldfield track score in terms of enjoyment, compared to the other destinations you listed in Q8? Please list these destinations again, in order of enjoyment (highest level first) now including Mt Bartle Frere and/or the Goldfield track.

1) .....
2) .....
3) .....
4) .....
5) .....
6) .....
7) .....

Go to Q13

Q12 How did walking Mt Bartle Frere and/or the Goldfield track score in terms of enjoyment? *(Please circle, where 1 indicates a high level, and 5 a low level of enjoyment)*

Mt Bartle Frere	1	2	3	4	5
The Goldfield track	1	2	3	4	5

Q13 Has your enjoyment from hiking Mt Bartle Frere and or the Goldfield track been adversely affected by the number of other hikers on the track? *(Please tick one box)*

☐ Yes, greatly reduced
☐ Yes, slightly reduced
☐ Yes, moderately reduced
☐ No, not reduced at all

Q14 What features did you find of interest on this/ these walk(s)? *(More than one box may be ticked)*

☐ Wildlife
☐ Geology
☐ Views
☐ Outdoor exercise
☐ Vegetation
☐ Other.....

Q15 What, if any, attributes or aspects of this/ these walk(s) did you dislike?

.....
.....
.....

Q16 What mode(s) of transport did you use from your address in Australia, to the starting point of the track? *(Please list all types and start and end points)*

Mode	From	To

Q17 If you stated a private car in Q16, please write down the make and model.

.....

The following questions are hypothetical in nature.

Q18 If you could have reduced the time to travel to the Mt Bartle Frere and/or the Goldfield track substantially by some means that could take you to the site in only a few seconds, at exactly the same cash cost you have incurred in the trip you actually took, would you have taken this option? *(Please tick one box)*

□ Yes, both ways
□ Yes, one way
□ No

Q19 If you'd found out, the day before your intended start to Mt Bartle Frere, and/or the Goldfield track, that both tracks would be closed, how would you have spent your time?

.....

.....

The next questions seek your opinions with regard to the proposal described below.

Recently, the Wet Tropics Management Authority has proposed to develop long distance walking tracks, by linking walks that are already available. Options for this specific area include:

1. Linking Bartle Frere East and West, and the Russell River Circuit;
2. Linking the Atherton Tablelands through to the Goldsborough Valley, to the Goldfield track.

These options would probably involve two or three overnight stops.

TURN OVER PLEASE

Q20 Do you think you would walk a long distance track as has been described above in the near future? *(Please tick one box)*

□ Yes **Go to Q21** □ No **Go to Q22**

Q21 What specific features of a long distance track, compared to short walks, would be of most interest or value to you?

.....

.....

.....

Q22 Have you ever undertaken any other overnight walks in Australia? *(Please tick one box)*

□ Yes **Go to Q23** □ No **Go to Q24**

Q23 Where were these other walks?

.....

The final questions refer to demographic information

Q24 Gender *(Please tick one box)*

□ Female □ Male

Q25 Year of birth ☐

Q26 What is your home address?

City/Town .....
Postcode .....
Nearest large city .....

Q27 What is the highest level of education you have completed so far? *(Please tick one box)*

□ Primary
□ Secondary
□ Technical/apprenticeship/TAFE
□ Bachelors degree
□ Postgraduate University degree (Masters, PhD)

Q28 What is your current work status? *(Please tick one box)*

□ Employed full-time
□ Employed part-time
□ Unemployed/looking for work
□ Home duties
□ Retired
□ Full-time student

Q29 Would you please indicate in which category your household income before tax lies? *(Please tick one box)*

□ < $ 20000
□ $ 20001-$ 30000
□ $ 30001-$ 40000
□ $ 40001-$ 50000
□ $ 50001- $ 60000
□ $ 60001- $ 70000
□ $ 70001- $ 80000
□ > $ 80000

Annex D Income adjustment

To correct incomes that have been stated for the year 2001, information obtained from the Australian Bureau of Statistics was used. Gross household income per head of mean was used to calculate changes in real income over the years 1995-2001. Table D-1 displays the data adopted from the ABS.

Table D-1 Gross Household Income per head of mean household ($AUS)

States	1995	1996	1997	1998	1999	2000	2001
NSW	24263	25807	27015	27744	29149	30674	32658
Vic	23670	25041	25622	26589	28024	29534	31347
Qld	21083	21971	23136	23479	24886	25657	27243
SA	21390	23040	23385	24124	24499	25362	26859
WA	23372	24787	25298	26066	27283	29023	30335
Tas	19689	20738	21232	21557	22518	22963	24278
Act	32327	33373	33064	34114	36553	37793	40316

Source: ABS (2001b)

Consumer price indexes have been used to correct for inflation. Since consumer price indexes were only available per state capital, the same figure applies to all zones within one state. For the years 1995 and 1996 only the weighted average of the eight capital cities was available, thus the same figure has been applied across all states. Furthermore, the indexes were given per quarter, which we transformed into an average annual inflation figure. The base year for which the indexes were given was 1989/1990. We thus needed to rebase those figures to obtain the desired indexes for incomes from 2001. Adjusted consumer price indexes have been displayed in Table D2.

Table D-2 Adjusted consumer price indexes

States	1995	1996	1997	1998	1999	2000	2001
NSW	0.875	0.889	0.888	0.899	0.914	0.955	1.0
Vic	0.888	0.902	0.898	0.902	0.916	0.959	1.0
Qld	0.883	0.897	0.905	0.912	0.920	0.959	1.0
SA	0.876	0.889	0.896	0.907	0.919	0.960	1.0
WA	0.903	0.916	0.896	0.908	0.924	0.961	1.0
Tas	0.891	0.904	0.911	0.919	0.924	0.966	1.0
ACT	0.888	0.902	0.898	0.908	0.916	0.960	1.0

Note: base year 2001
Source: Authors' calculations based on data from ABS, 2002.

The adjusted price indexes have been multiplied with the gross household income per head of mean to calculate the real income for the years 1995-2000. Results have been displayed in Table D3.

Table D-3 Real incomes for the period 1995-2001 ($AUS)

States	1995	1996	1997	1998	1999	2000	2001
NSW	21230.13	22942.42	23989.32	24941.86	26642.19	29293.67	32658.00
Vic	21018.96	22586.98	23008.56	23983.28	25669.98	28323.11	31347.00
Qld	18616.29	19707.99	20938.08	21412.85	22895.12	24605.06	27243.00
SA	18737.64	20482.56	20952.96	21880.47	22514.58	24347.52	26859.00
WA	21104.92	22704.89	22667.01	23667.93	25209.49	27891.1	30335.00
Tas	17542.90	18747.15	19342.35	19810.88	20806.63	22182.26	24278.00

ACT	28706.38	30102.45	29691.47	30975.51	33482.55	36281.28	40316.00

Source: Authors'calculations based on data from ABS, 2001b; ABS, 2002.

From these figures the increase in real income could be computed. Per state, annual average increases in real income have been calculated, which appeared to be 7 percent for NSW, Vic, and Qld respectively, and 6 percent for SA, WA, Tas, and ACT respectively.

These figures then gave us the opportunity to calculate what incomes stated for the year 2001, would have been in 1995, corrected for inflation. The following example may help to explain the calculation that has been performed:

Consider a zonal income of $AUS 47000.3 for Sydney in the year 2001. An annual income $AUS 47000.3 in 2001 would have been worth $47000.3/1.07^6$ = $AUS 31318.28 in 1995. For the year 1996 it would have been $47000.3/1.07^5$ = $AUS 33510.5643. For each subsequent year the income has been calculated in that manner.

Results are shown in Table D4.

Table D-4 Real zonal incomes for the period 1995-2001 ($AUS)

Zones	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Sydney	31318.28	33510.56	35856.3	38366.25	41051.88	43925.51	47000.30
Richmond-Tweed	53307.38	57038.89	61031.62	65303.83	69875.10	74766.36	80000.00
Melbourne	46644.12	49909.21	53402.86	57141.06	61140.93	65420.79	70000.25
Loddon	53307.38	57038.89	61031.62	65303.83	69875.10	74766.36	80000.00
Mallee	36649.16	39214.60	41959.62	44896.79	48039.57	51402.34	55000.50
Gippsland	36649.16	39214.60	41959.62	44896.79	48039.57	51402.34	55000.50
Brisbane	37093.29	39689.82	42468.11	45440.88	48621.74	52025.26	55667.03
Moreton	48309.98	51691.68	55310.09	59181.80	63324.53	67757.24	72500.25
Fitzroy	29985.73	32084.73	34330.67	36733.81	39305.18	42056.54	45000.50
Northern	45454.41	48636.22	52040.76	55683.61	59581.47	63752.17	68214.82
Cairns A	35260.86	37729.12	40370.16	43196.07	46219.79	49455.18	52917.04
Cairns B	32946.68	35252.95	37720.65	40361.10	43186.38	46209.42	49444.08
Adelaide	37010.60	39231.24	41585.12	44080.22	46725.04	49528.54	52500.25
Perth	22911.39	24286.08	25743.24	27287.84	28925.11	30660.61	32500.25
South West	29961.00	31758.66	33664.18	35684.03	37825.07	40094.58	42500.25
South Eastern	24673.97	26154.41	27723.67	29387.09	31150.32	33019.34	35000.50
Hobart	39477.93	41846.61	44357.4	47018.85	49839.98	52830.38	56000.20
Canberra	44312.11	46970.83	49789.08	52776.43	55943.01	59299.59	62857.57

Source: Authors' calculations based on fieldwork 2001

However, we also needed to account for the fact that responses were not equally distributed among the years. As we did not know the exact distribution of responses, we assumed that this would follow the distribution of permits across the years. The relative share of the permits was then used as a weight to obtain a weighted average zonal income. Thus, for example, of a total of 1135 permits, 149 permits had been issued in 1995. The appropriate weight would then be 149/1135.

Another example may clarify the steps taken:

Consider 'Sydney' again. The 1995 income was $AUS 31318.28. This figure has then been multiplied by 149/1135 to represent the 1995 share of responses. For 1996, the real income of $AUS 33510.56 has been multiplied by 207/1135 to represent the 1996 share of responses. This process has been repeated for all the subsequent years, and all 'shares' eventually sum up to the required weighted average zonal income.