

## **Investigation into the application of carrying capacity concept to Four New Zealand settings**

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Tourism carrying capacity has become a commonly applied consideration for sustainable development, the quest for which has encapsulated policy formation management and conceptualization over the past two decades ((Cooper, Fletcher et al. 1993; Watson and Kopachevsky 1996; Simon, Narangajavana et al. accepted 2003). However, based upon Malthusian principles for growth, tourism and the communities and destinations that house them are acknowledged to have a sensitive capacity ((Manning and Dougherty 1995; Doorne 2000) (Saveriades 2000; Chatterton 2002). Careful management is required to contain the significant impact tourism can have on economic, environment and social components on their destination.

In particular, the effect of host community perceptions on tourism is largely inescapable. Realisation of the importance of maintaining resident support has led to increased research attention ((Ap and Crompton 1998). A clear understanding of the factors influencing community perceptions and adaptations to tourism and its development at a local level is now required for effective tourism management. The goal for sustainable tourism has come to constitute not more tourism, but better tourism: Tourism that produces a more satisfying experience for tourists, whilst providing income and jobs for satisfied residents. Tourism marketing policies and initiatives in New Zealand imply that issues surrounding congestion, crowding and their relationship to visitor experience could pose significant problems if not managed sustainably ((Department of Tourism 1991; Ministry of Tourism 1992; Ap and Crompton 1998; Doorne 2000; Simon, Narangajavana et al. 2003). Similarly it has been well established that stress levels within a community establish a threshold level between acceptance and rejection of tourism (Doxey 1975)

This article proposes to explore the applicability of carrying capacity research to a tourism context utilising the results from a series of four case studies conducted by the Lincoln University Tourism, Recreation and Education Centre between 1998 and 2003 in New Zealand. Tourism forms an important component of the New Zealand economy, generating 9% of the G.D.P in the year ending 2003. In the year of 2003 over two million International visitors visited New Zealand destinations. The four case studies, which have been broken into five data sets for this project, were part of a

wider study investigating the effect host communities have upon tourism and in turn, how host communities are influenced and adapt to tourism in their area and the influence of a variety of characteristics on these perceptions.

The locations had a varying tourism density values<sup>1</sup> as seen in the table below.

	Akaroa	Kaikoura	Westland	Rotorua	Christchurch
Density	60	43	13	12	9.3

**Table One: Density of tourism in case study locations**

Triangulated research methods were utilised, enabling the collection of qualitative and quantitative data. One of a team of researchers based themselves in the community for approximately six months, canvassing general opinions and conducting interviews with key members of the community. Basing a researcher in the community enabled a more accurate understanding of the broad value perspectives and interpretations of the community to be gained, an insight often lost by external researchers (Cohen, 1979 in (Pearce, Moscardo et al. 1996). Secondly, three postgraduate students conducted a phone survey. This survey focused upon resident perceptions, encounters and interaction with the tourism industry. For further detail these reports are listed in the appendix. Tourism carrying capacity studies have been criticised for over-attention to socioeconomic data and a lack of focus on behaviour (Schreyer 1984). This study focused on a range of factors, such as displacement and coping mechanisms as well as the more widely researched data. However much of this data will have to be analysed at a later date due to a lack of raw data.

### **Carrying Capacity**

Developed in Environmental Management, the concept of carrying capacity initially centred around biological and biophysical aspects of carrying capacity (Stankey and McCool 1984). Adoption by recreational research led to significant exploration through which the social carrying capacity gained prominence (Stankey and McCool, 1984; (Kuss, Graefe et al. 1990); (Stewart and Cole 2001). The application of the concept was heralded as an exciting management integration (Devlin and O'Connor<sup>2</sup>) and a way to manage the negative effects of tourism and the cycles of popularity and decline.

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<sup>1</sup> Tourism density in this instance has been calculated by a ratio of tourist nights to community nights. Day visits have been taken into account.

<sup>2</sup> Kay Booth has the full reference for this paper. It was taken from her set readings for the recreation course.

The precise definition of carrying capacity, and the separation and interaction of its economic, physical, ecological and social sub groupings, hampers its application (Wall 1982). Social carrying capacity has been conceptualized into two forms, both of which are addressed in this paper. :

- The threshold at which host communities experience negative effects (Watson and Kopachevsky 1996) and
- The level at which the quality of the environment (in its broadest sense) as seen by tourists and locals begins to decline (Kuss, Graefe et al. 1990).

It is a dynamic value judgment- produced term that can be manipulated by management. Guests are looking for natural and cultural experiences and see the residents as providing the hospitality and atmosphere. This capacity relationship is mediated by economic, environmental and management factors and has led to a focus on management and policy of local authorities in New Zealand research. Although the concept has been designed to apply to both, carrying capacity has largely been applied to natural settings. Significant focus is given to the relationship of density and community perceptions. Carrying capacity looks at a destination's ability to absorb tourism without negative effects being perceived by local residents. Destinations vary in collective tolerance of tourism changes seasonally and spatially. Aspects of this include encounters, perceived benefits, and visitor behaviour (Glasson, Godfrey et al. 1995).

There have been a limited amount of studies relating to carrying capacity in a New Zealand context (Devlin and O'Connor) . Australasian research has demonstrated place effects on attitudes and perceptions of tourists (Ministry of Tourism 1992). A unique set of locality affects the reaction, density and dependency of a location on tourists. This article will further this research by synthesizing results from four case studies and seeking to study the applicability of the carrying capacity concepts as a management tool for New Zealand tourism environments.

An important tenet in the study of resident perception is that of the "last settler syndrome" championed by White (1971 in Nielsen et al.) and Nielsen et al. (1977). This theory held that the resident who last settles in an area wishes development to become static. Applying this principle, it follows that residents will become increasingly resistant to population increase and tourism development. As tourism density and dependence increases, residents would become more hesitant to embrace tourism and this resistance would be proportionate to the amount of time lived in the

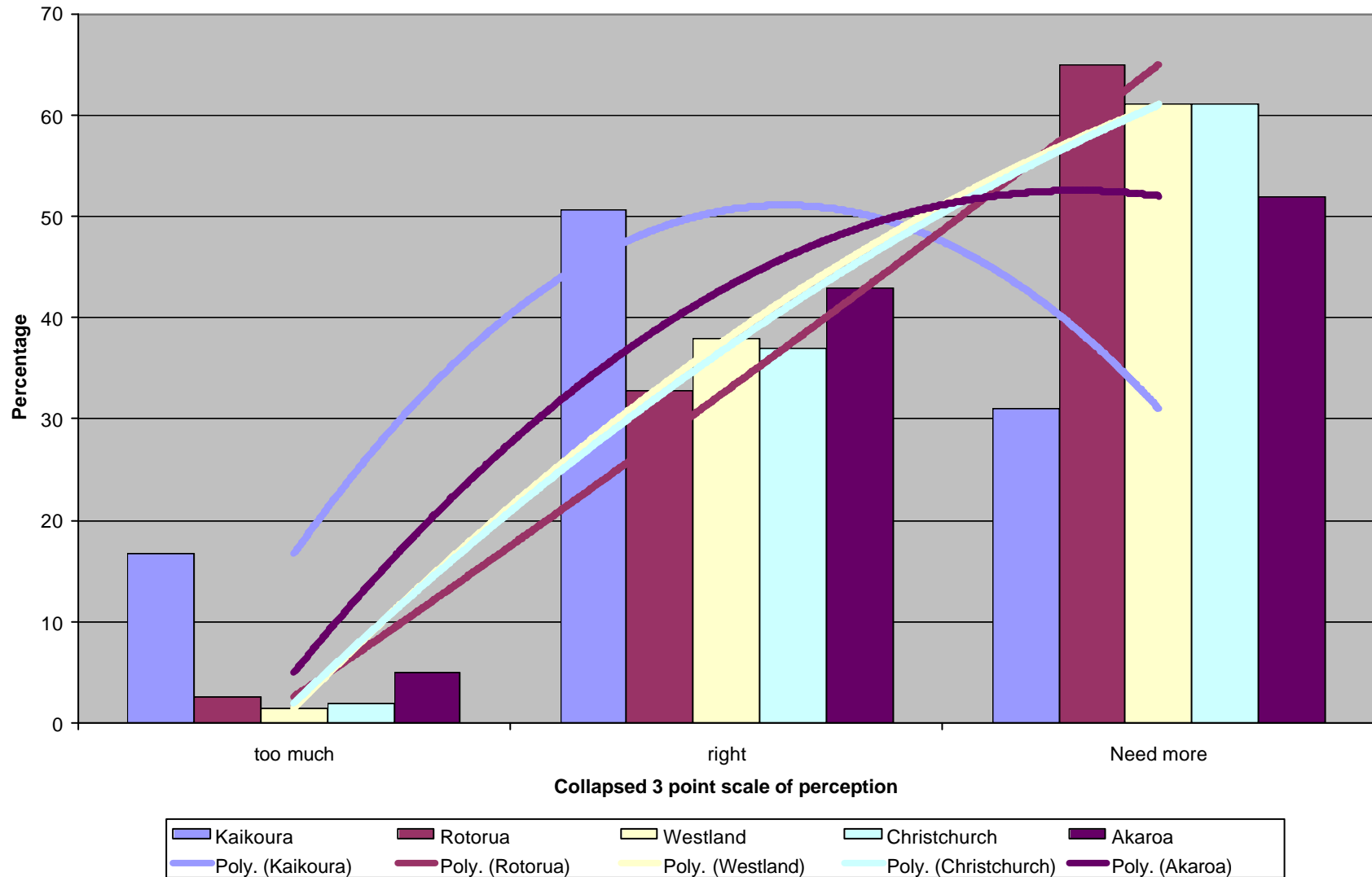
area. Each of the case studies included a question asking residents to categorise their perceptions of tourism. Results in the Figure one demonstrate largely positive views of tourism from all case studies.

Contrary to expectation, the majority of the perceptions, regardless of density, were positive. All localities demonstrated over 80% of resident respondents happy with the current development, or supportive of more development. When trend lines were introduced, a tapering off of satisfaction is suggested in Kaikoura and Akaroa. These two case studies also exhibited the highest densities of case studies suggesting perhaps there may be some suggestion of a carrying capacity. Graefe, Vaske and Kuss (Graefe, Vaske et al. 1984) are even less certain about a relationship however, stating after synthesizing twenty years of research that any relationship between crowding perceptions and use densities has since been mediated by a number of contextual, situational and subjective variables. Therefore the next section of this article seeks to explore other variables.

Linking figure one to the last settler syndrome, average length of residence varies across our studies: Kaikoura showed a very strong community attachment, with 68.3% stating they had lived in or been strongly associated with Kaikoura over the past 20 years. However Akaroa demonstrated a much lower average length of residence (17years) and Christchurch, with the longest average residence of 29.5 exhibited very positive perceptions of tourism development. This echoes McCool and Martin's (McCool and Martin 1994) study, which stated that although sense of belonging is important to resident quality of life, no significant difference is found between older residents and newcomers.

Although aspects such as length of residence have been purported to predict community perceptions, a crucial problem with the use of these measures is the failure to compensate for the "invisibility" of displaced residents. These residents have been so dissatisfied with the tourism that they have left the location. A "novice" or resident who has no preconceptions of desired levels of development, then replaces them and thus this increased tolerance therefore is not necessarily an accurate description. Other studies have also argued that the last settler syndrome can also operate in reverse (Brougham and Butler, 1981). The most recent settlers to an area can also be the most hesitant for increases to tourism. Older residents seeing the community proceed through a cycle of industry decline can cause them to consequently encourage the new industry of tourism.

Figure 1:  
Community Perceptions of tourism development



Many other factors are said to influence attitudes of host communities. Lankford and Howard (Bachleitner and Zins 1999) demonstrate that length of residence, birthplace, economic dependence on tourism, resident involvement in decision making and level of contact have impact on attitude. Results of our study agree more closely with that of Ryan, Scotland and Montgomery (Ryan, Scotland et al. 1998) who assert age is not significant overall in affecting perceptions.

Evans (Evans 1993) hypothesised as communities become increasingly dependent on tourism and the tourism seasonality increases, then there will be a higher proportion of resentful residents. Seasonality appears not to have a specific effect on perception. In Kaikoura, the most highly seasonal locality of studies, only 1.4% of respondents stated this as a major concern of tourism in their region. Westland featured higher with 5% of residents concerned with seasonality.

However it is not necessarily surprising that our results do not display such results. As Fisher indicates it is difficult to separate the network of forces and impacts and what is tourism. Residents can employ a number of strategies to cope with seasonality of tourism thus reducing the likelihood of negative effects. These are strategies such as taking a holiday in the off-season (Belisle and Hoy, 1980). The use of carrying capacity assumptions do not allow for the complexities of human behaviours and values. The impacts of tourism are influenced through a variety of site specific and seasonal variables. It is difficult to simplify this into a simple theoretical framework.

Economic dependence on tourism is also a debated factor in the formation of community perceptions. Economic restructuring and decline in industry has led to tourism forming a very important component of many New Zealand towns' economies. This can also relate to the social exchange theory where residents are involved in a trade off of the negative effects of tourism against the personal and community gains (Teye and Sonmez 2002). The table below demonstrates the proportions of tourism related employment.

	Akaroa	Kaikoura	Westland	Rotorua	Christchurch
% Employed	57	23.2	29.6	20.9	18

**Table two: Percentage of Employment in Case Study Locations**

Akaroa shows a very high proportion of employment in tourism related industry, however Kaikoura, showing our most obvious sign of reaching a “capacity” has relatively similar results as Westland and Rotorua.

Some proponents state that for capacity measurement to avoid “misguided simplicity” socio-political economic, subjective components and questions of desired conditions are asked and answered by all concerned parties. However a number of studies have also found no discernable link between socio-demographic characteristics of resident populations and variations in perceptions (Faulkner and Tideswell 1997).

A further investigation into the history of tourism development and the nature of the industry may aid in establishing the existence of a capacity. Rotorua, for instance, has been identified as an area that “failed’ to show the expected decline in resident satisfaction (Tourism 1992). This could be because of a historic development of tourism in Rotorua. Alternatively, the spatial arrangement of tourism could affect the perceptions of residents as it leads to an increased amount of encounters with tourists. The commodification of community resources and landscapes can resonate with local perceptions (Chang 1997). In this situation locals may be more adversely affected by encounters as the encounters may be seen to be less voluntary and encroaching on enjoyment. For example, the two communities in our case studies that showed the most declines in satisfaction also had the communities where tourism centred on the CBD of the town. However further questions indicate that residents found encounters with tourists enhanced their experience, although there were a number of concerns about infrastructure such as car parks. This suggests that management should focus on effective management of these factors, rather than attempting to separate tourists and residents.

The nature of encounters forms the principal component of crowding research. Of the host communities studied, Akaroa has the highest frequency of interactions, with 54% of residents saying they meet tourists frequently or very frequently. 50% of Akaroa residents say that they have this contact when doing their favourite recreation activity. Using crowding theories, we would expect this interaction to cause a decline in satisfaction, as these are involuntary encounters. However, critically 77% of residents say that these encounters enhanced their activity. When residents were asked to state where they did not enjoy seeing tourists, the majority of answers across all studies related to areas that posed a perceived safety risk (on the roads, places that give the city a bad name, unattractive areas). 5.1% of Rotorua residents disliked seeing local favourite places and tapu areas and 4.7% of Westlanders dislike seeing tourists in the backcountry. These results may relate to the strong Maori population in Rotorua and the relative isolation of Westland and, as explained in the

next section, illustrate that the values and desires of users such as those heading out for a ‘wilderness’ experience, will effect crowding perceptions. However overwhelmingly, residents seem to enjoy their encounters with tourists, despite density and high frequency.

Crowding is also thought to be culturally constructed. International visitors to communities can be more obvious than domestic visitors and thus can become the focus of negative resident perceptions. An example of this is a person of Asian descent, who will be more likely to be constructed as a tourist than an Australian visitor who because of their similar appearance, could be seen to be a “local”. The type of tourism engaged in by these visitors, such as organised bus tours compared with Free Independent Travellers increases prominence of some tourists in the perceptions of locals (Manning 1999). Although large proportions of respondents found it difficult to separate particular tourists that they “liked” or “disliked”, Asians and non English speaking nations featured highly on both lists, possibly due to their increased visibility.

### **Tourist carrying capacity**

A second use of carrying capacity is to investigate the capacity imposed by the perceptions of tourism themselves (O'Reilly 1986). Carrying capacity in this sense relates to a level after which the “attractiveness” of a destination declines (Watson and Kopachevsky 1996), or the experience quality is perceived to decline (Kuss, Graefe et al. 1990).

There are a number of approaches to researching feeling of capacity outlined by Stewart and Cole (Stewart and Cole 2001). Satisfaction is one of the most commonly used indicators of quality experience, especially its negative perception – crowding. However although studies generally show those who feel crowded generally report less satisfaction, clearly there are other factors (Stankey and McCool 1984; Manning 1999; Doorne 2000). Quality of experience and total satisfaction demonstrate a weak if existent relationship with crowding in a number of summary studies (Kuss, Graefe et al. 1990); (Manning 1999). Crowding models look at a wider range of factors mediating enjoyment. Kuss, Graefe et al. (Kuss, Graefe et al. 1990) found that density had more effect on crowding than experience however this was not significant. Other studies indicated a weak relationship between desired privacy, which declined as encounters but not against quality.

One problem identified by Stewart and Cole (Stewart and Cole 2001) was when creating satisfaction curves and encounter norms from hypothetical questions about satisfaction and encounters, you lead management options that are to restrict use. Many users may enjoy many encounters and free usage rather than restriction.

A popular representation of tourist satisfaction is the satisfaction curve. Total user satisfaction increases as total use increases, however past a certain point, or capacity, total use and satisfaction decreases. The number of encounters are also said to be correlated with user satisfaction and have been examined in this study.

A wide range of literature critiquing the use of average satisfaction exists. As the number of visitors to a location increases, the satisfaction concept, rather than becoming important, is hampered. As new users enter the system, norms regarding use levels rise, causing a “floating baseline”, and the displacement of dissatisfied users are lost in the aggregate increase of user satisfaction (Nielsen, Shelby et al. 1977). Similarly seeking to satisfy the average user we are neglecting two thirds of the population. This concept is in contrast to Nielsen et al.’s (1977) “last settler syndrome” where user dissatisfaction decreases as location becomes more crowded and satisfaction varies by time and nature of first novice experience. As early as 1972 evidence (Bolster, 1972) suggested that a value scale using values and behaviours would be more applicable to locations that didn’t have stable crowding norms. Increased research is called for on non-wilderness and high intensity settings as most previous research has concentrated on recreational settings.

Another significant factor analysed for tourism carrying capacity is crowding, which has become one of the most commonly researched themes in outdoor recreation (Manning 1999; Stewart and Cole 2001). Traditional crowding models involve studies of the effect of number of encounters listed and its effect on perceived crowding. There are a number of factors thought to affect crowding perceptions, most of which depend on the goals and values of the user (Shelby, Heberlein et al. 1984; Shelby, Vaske et al. 1989). Schreyer identified such issues, as a person who wanted solitude would be more concerned at encountering people, and a person who wished to ‘commune with nature’ would have their satisfaction affected by large facilities without which large numbers cannot be afforded (Shelby, Heberlein et al. 1984; Shelby, Vaske et al. 1989). Experience again causes a

“floating baseline” of satisfaction where novice users are less susceptible to crowding and are more likely to shift “venues” maintaining similar satisfaction (Schreyer 1976; Schreyer 1984).

### **Discussion and conclusion**

Therefore there are clearly documented issues with the use of tourism carrying capacity as a framework for measuring resident and tourist perceptions. Wagar (1964 in (Mathieson and Wall 1982) asserts carrying capacity represents a means to an end. Alterations from tourism can be seen as inevitable and carrying capacity seen as one method of indicating the degree and direction of change and as an *aid* in assessing the acceptability of such changes. (author’s emphasis) This statement may have some worth. The danger of applying the carrying capacity concept is the dominant drive for a numerical value after which increases in tourism development cannot be sustained. The assumption of homogenous communities and such a singular subjective focus on one factor of community perceptions creates an illusion of a direct relationship that denies consideration of the complex dynamic relationships within which human behaviour and perceptions operate. But as a general concept that reminds us of the finite nature of the sustainability of this resource, it has definite merit.

There have been a number of other methods touted as alternative focuses to the framework of capacity or to be utilized within such a framework. The measure of displacement and coping mechanisms utilized by communities is one such method of analysis (Manning 1999). This method was only utilised in the Akaroa and Christchurch case studies. Almost one quarter of Akaroa residents have altered their shopping times but much smaller numbers have changed recreational activities or have gone away to avoid tourists. However when considered with the residents’ enjoyment of interaction with tourists the importance of this declines. Further investigations could be undertaken into this concept.

Perhaps the most important focus in a study of influences on resident perceptions of tourism should be the concerns about tourism development held by residents. A high proportion of all responses were supply related. Resident concerns were largely related to the sustainability of the location for tourism, voicing concerns such as “Tourists wont come”, “Lose attractions”, “quality of tourist treatment”, and infrastructural concerns featured highly in each case study. The need to avoid commercialisation appeared in all studies with reference made to Queenstown as a centre viewed as being too commercialised. Smaller numbers of residents (approximately 3%) begin to be concerned

about factors we have focused upon under the carrying capacity framework, such as seasonality, crowding at natural resources, and rates. Other concerns relate specifically to local contexts, for example the high numbers of campervan tours in the West Coast have led to a concern relating to the management of waste and camping facilities for these tourists. By analysing such concerns, local authorities can ascertain areas in which to better manage the impact which tourism has on the local community.

A number of local resident concerns relate to the sustainable management of natural resources and attractions, such as the need to better manage campervan waste in Westland, the disruption of the whales and wildlife in Kaikoura, and access and crowding of natural attractions. This suggests that an aspect of the carrying capacity framework not focused upon in this study – environmental carrying capacity and the relationship of perceptions of this may play a more important part in resident – tourist relationship. This is an area of study that could be further explored. However although environmental capacities may be more finite and easier to establish, relationships to them may be as problematic as those in our community social carrying capacity perceptions.

Social Carrying capacity is a long developed and similarly long criticized framework in both recreational and tourism literature. As Schreyer (1976) and many other authors explain, the search for a singular number of carrying capacity becomes meaningless when the many social factors, which affect this value, are taken into account. Residents in the five case studies utilised display a high percentage of satisfaction with over eighty percent of residents desiring more or similar levels of tourism in the future. Although initially there appears to be a suggestion of a capacity being approached in two locations, upon further investigation this relationship is not strongly linked to density, economic dependence or encounters as the framework suggests. There are significant methodological issues with defining and measuring the factors included in the carrying capacity framework. These results and limitations suggest that social carrying capacity is an inadequate framework of analysis for community perceptions of tourism.

This is a work in progress and a number of further studies could be conducted provided further in-depth analysis of the raw data gathered in the TTREC case studies. The importance and effect of tourism on the host communities in New Zealand require further investigation into an adequate

method of analysing and managing the effect of tourists and their interaction with residents and their perceptions.

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