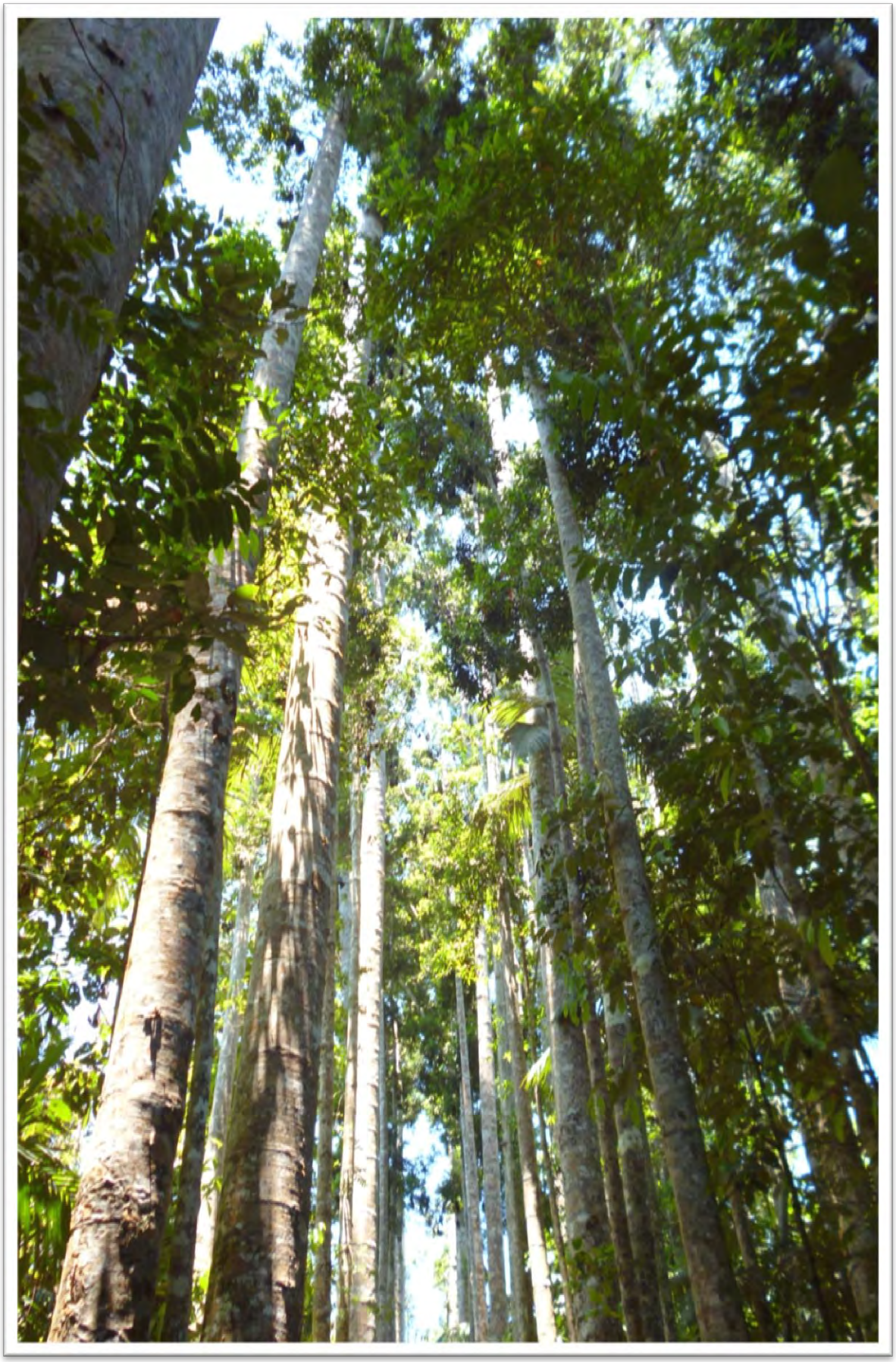


© Michelle Esparon

# 4 Sampling, response rates & overview of respondents

Mindful that different people are likely to 'value' the environment in different ways, we set out to include a broad variety of respondents to be able to highlight how 'different' and how 'similar' the values of different types of people are. Specific details about the data collection process are provided below.

## *4.1 Residential data collection activities*

We categorised our targeted residents according to Indigeneity, using different sampling and data collection strategies for each group.

First, our previous experience from working in Indigenous communities showed us that Indigenous people rarely complete mail-out surveys. Hence, we contracted RAPA to manage data collection in the Indigenous communities and to also advise us on how best to report-back results. We aimed to collect around 150 surveys. RAPA engaged 3 Indigenous researchers across the north (Robyn Bellafquih), centre (Sandra Levers) and south (Phil Rist).

Second, aiming for a geographically stratified random sample, we selected postcodes that lay adjacent to, partially or entirely within the WTWHA, using the Australian Bureau of Statistics (ABS) 2006 Census data by location. Thirty-three postcodes satisfied this criterion. We purchased a database with the names and addresses of more than 6.5 million people, of which 1.2 million records were for Queensland. The database is updated biannually, with a major update at the start of the year and a maintenance update mid year. The database was purchased after the mid year update in 2012. Households with addresses that were clearly outside the scope of our study were deleted. From these, the names and addresses of residents who had been sent surveys from two earlier research projects were deleted. This helped to reduce the risk of the same respondent being given several questionnaires (thus minimising respondent burden), giving the current project a good chance of achieving good response rates.

Two thousand households were randomly selected from that customised list – spread evenly across the 33 identified postcodes. Since there were 24 different versions of the survey, addresses were randomly allocated across each: versions 1-8 comprised 84 households each, while versions 9-24 included 83 households each. Distribution of the resident surveys followed Dillman's (2007) *Total Design Method* (TDM), with the first mail-out taking place in early August 2013. More precisely, residents were first sent a detailed information sheet, explaining what the project was about, its objectives and why their response was important. This information sheet was accompanied with a copy of the questionnaire and a prepaid pre-addressed envelope to return the completed questionnaire. The database was updated as completed surveys (and return-to sender envelopes) were received. Six weeks later, we sent a second follow-up letter with a replacement questionnaire – the aim being to remind those that had not yet completed the survey to do so. This was followed 6 weeks later with a third mail-out – this was the final chance for residents to be able to have their say.

Overall, we received 447 'return to senders'. Accordingly, from our initial 2000 surveys sent out, we estimate that 1553 reached our targeted households. We received 386 completed surveys from our mail-out, giving an estimated response rate of 24.8% (a relatively good response rate for mail-outs, particularly in northern Australia). We received an additional 160 completed surveys from Indigenous residents (through RAPA's data collection activities). Figure 17 illustrates the distribution of all responses received (Indigenous and mail-out), by postcodes.

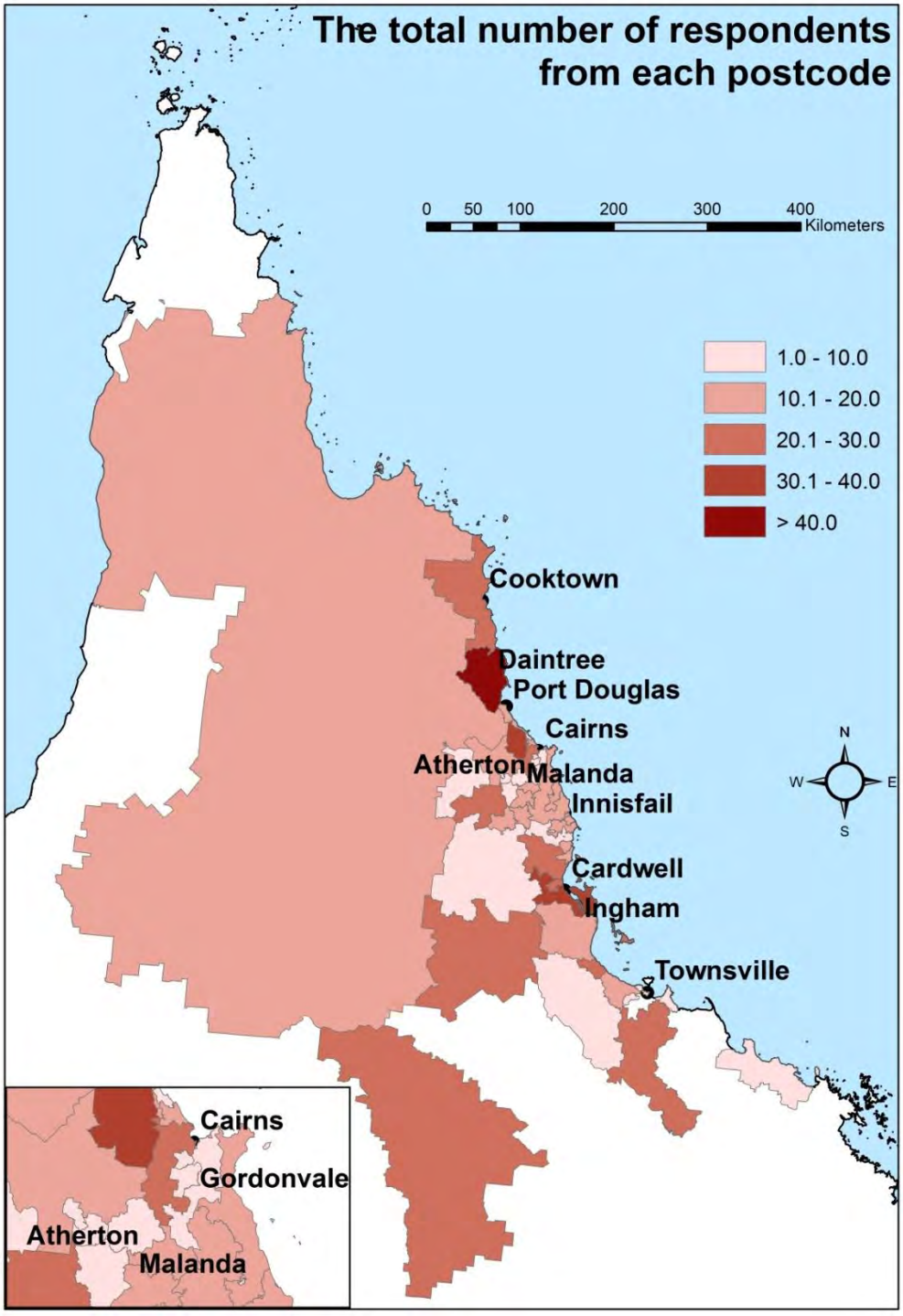



Figure 17: Number of resident responses to survey, by postcode.
Map produced by Diane Jarvis, JCU

Note the inland areas which lay well outside the WTWHA, but appear to have a large number of respondents. This is because postcodes in this part of Australia are geographically large. The database was 'filtered' by both location name and postcode, so only residents who lived closer to the WTWHA were sent questionnaires – the location in which respondents live within postcodes is thus closer to the WTWHA than appears from this map.

## 4.2 Tourist data collection activities

We identified 3 data-collection locations in Cairns (the lagoon and both the domestic and international airport terminals), obtaining permission to distribute questionnaires at each. They were selected as collection points because (a) the majority of visitors to the region depart by air and (b) the lagoon is a key attraction – even for those who travel to and from the region by car or bus. Moreover, the lagoon was found to be very successful during data collection for the GBRWHA-related study. Data collection began in August 2013 and continued until the end of June 2014, guaranteeing that the views of a broad range of tourists were captured across the different tourists' seasons. Two hours of data collection were allocated each month at each location. In total, we received 621 visitor surveys.

**NOTE:** The majority of visitors to this region come from China, Japan, the United Kingdom, the USA, New Zealand and Germany (in that order) (Tourism Research Australia, 2012, Stoeckl et al, 2013, Chandler et al, 2014). We lacked the resources to translate visitor surveys into Japanese and Chinese, hence missed the views of these two key visitor segments to the region (notably those with limited English). Our results thus encapsulate the views of only the English speaking visitors.

## 4.3 Residential and Tourist Responses summarised

Table 3 summarises responses across all survey respondents.

Table 3: Summary of responses

| | | Frequency | Estimated response rate | Percent of total sample |
|---|---|---|---|---|
| Residents | Non-Indigenous | 386 | 24.8% | 33.1 |
| | Indigenous | 160 | | 13.7 |
| Tourists | Lagoon | 208 | N/A | 17.8 |
| | Domestic terminal | 309 | N/A | 26.5 |
| | International terminal | 104 | N/A | 8.9 |
| Total | | **1167** | | 100 |

## 4.4 Overview of respondents

### 4.4.1 Demographic characteristics

Females made up the majority of respondents: 61% and 60% across Indigenous and non-Indigenous residents respectively, and 60% across the tourist samples.

The majority of tourists and Indigenous residents surveyed (62% and 50% respectively) were aged between 20-40 years old while 51% of non-Indigenous residents surveyed were aged between 40-60 years old.

The majority of tourists (61%) and non-Indigenous residents (33%) who answered the survey had completed a university degree. Most Aboriginal respondents had completed high school level, although 18% had completed a university degree (Figure 18).

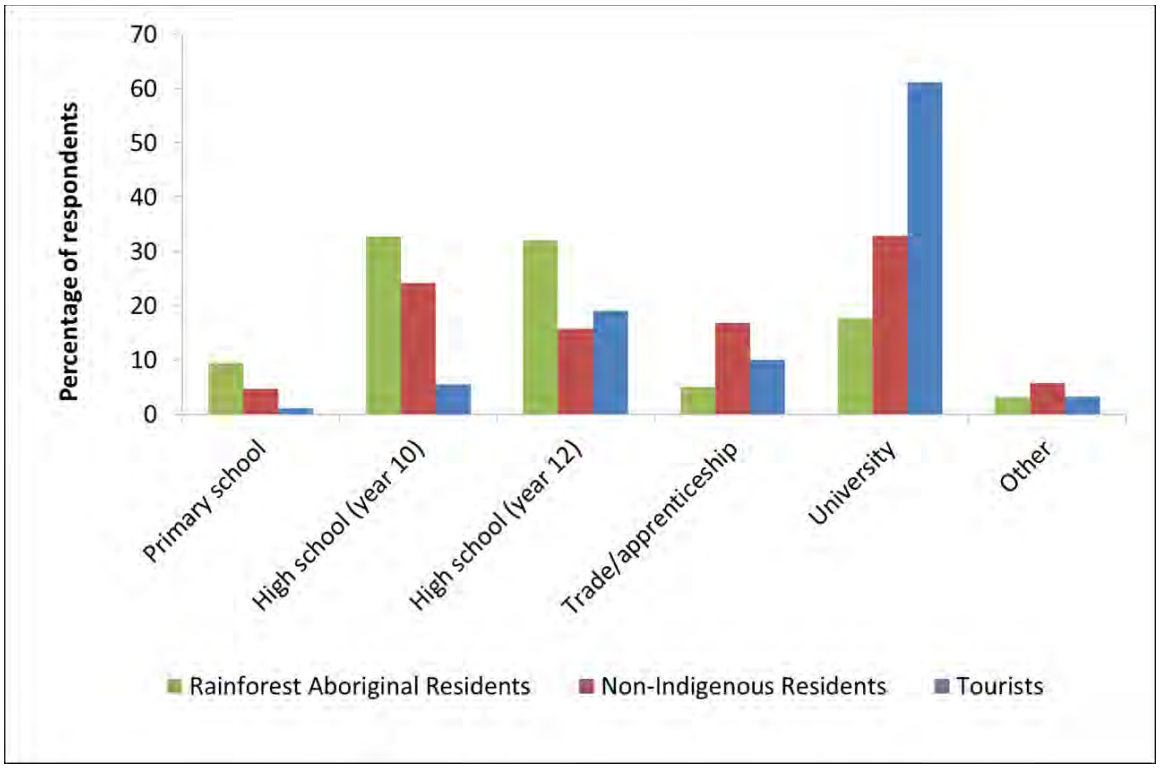



**Figure 18:** Highest level of education completed by type of respondent

Our combined Government-provided services sector, which also includes health and education, was the main source of income for over a quarter of our resident sample (47% and 31% of Indigenous and non-Indigenous residents, respectively) (Figure 19). Relatively few residential respondents were dependent on Tourism and Accommodation, cafes, and restaurants for their household income.

There was a clear difference between the incomes of Indigenous and non-Indigenous households, with the former being generally poorer than the latter (Figure 20). This result is not surprising with Indigenous households often being more dis-advantaged than their non-Indigenous counterparts (Stoeckl et al, 2011; Larson & Alexandridis, 2009; Carson et al, 2009). A slightly larger percentage of tourists were in the highest income bracket than were the non-Indigenous residents.

An overwhelming majority of respondents surveyed do not volunteer nor contribute financially to conservation organisations (notably tourists (81%). Of those who did participate in these activities, most did so on a national or local scale, except for the Indigenous residents (29%) who made contributions to or volunteered to local organisations (e.g. promoting/advancing their cultural values through the Rainforest Peoples Aboriginal organisation) (Figure 21).

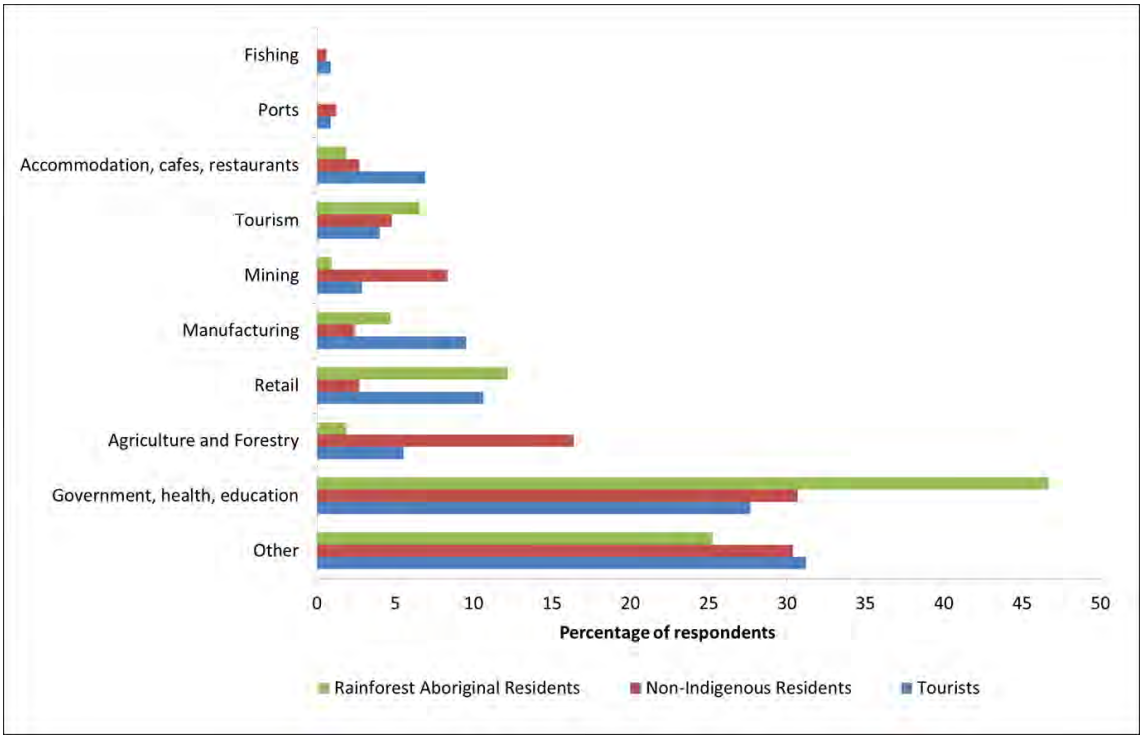



**Figure 19:** Main source of household income by type of respondent

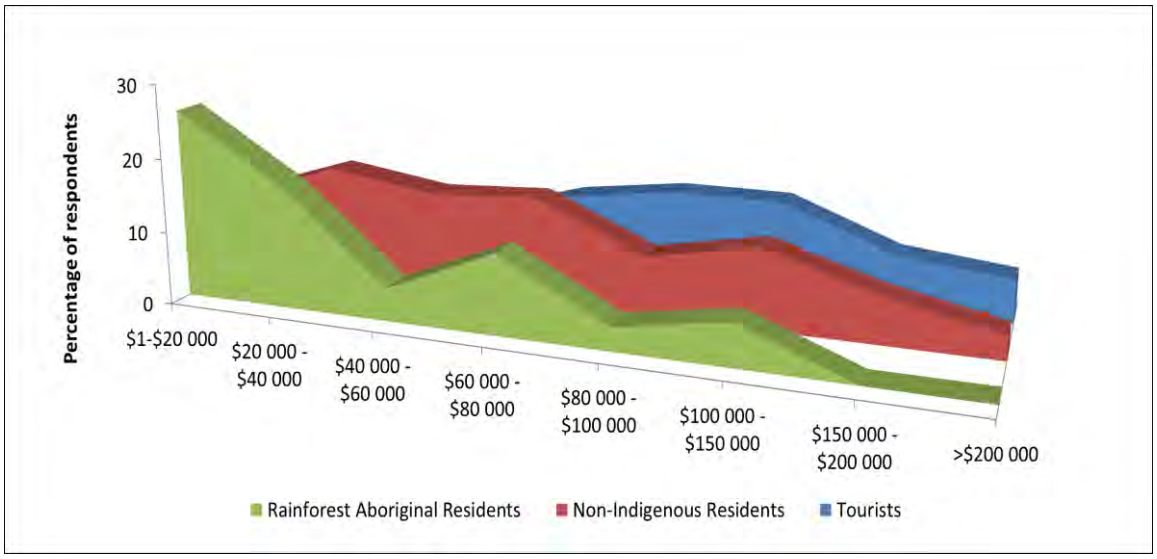



**Figure 20:** Pre-tax household income by type of respondent

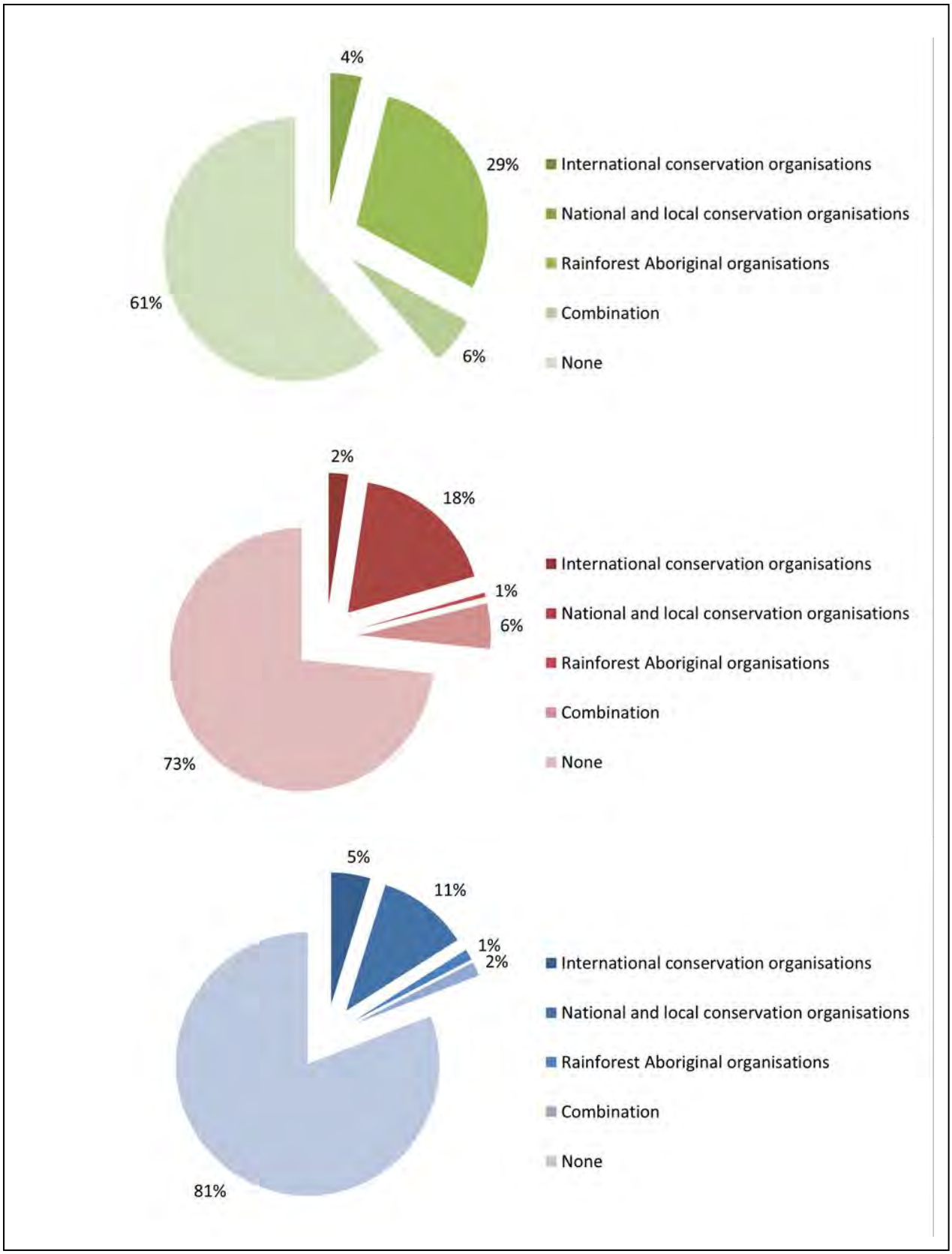



**Figure 21:** Volunteering and contributions to conservation organisations by type of respondent (Green: Rainforest Aboriginal residents; Red: non-Indigenous residents; and Blue: Tourists)

### 4.4.2 Activities undertaken in and around the WTWHA

We provided residents and tourists with a list of activities known to be undertaken in the WTWHA, and asked how often they participated in these activities. As anticipated, our sample of Rainforest Aboriginal residents engaged in learning about their culture and country daily (Figure 22). Enjoying the scenic beauty and peacefulness of the Area, and driving along the scenic routes were the next most common activities. These activities were most popular with our non-Indigenous resident and tourist samples (Figure 23 and Figure 24). All respondents also indicated that they spent time visiting waterfalls and swimming in the clear clean rivers/waterholes of the Area. Residents rarely paid to go on a tour.

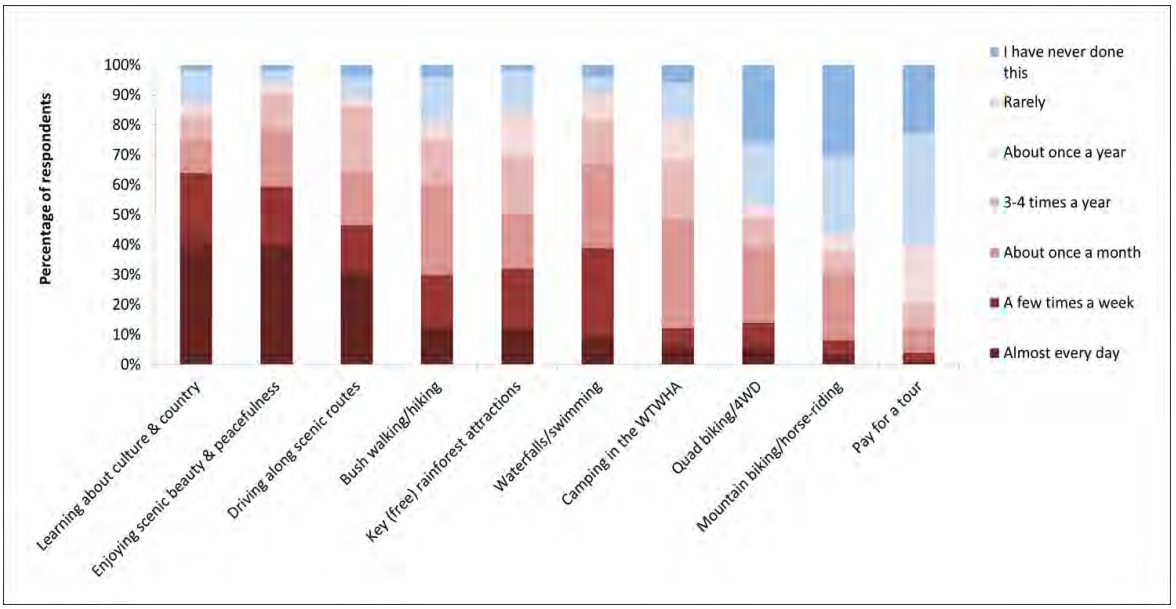



**Figure 22:** Frequency with which various WT-based activities are undertaken - Rainforest Aboriginal residents

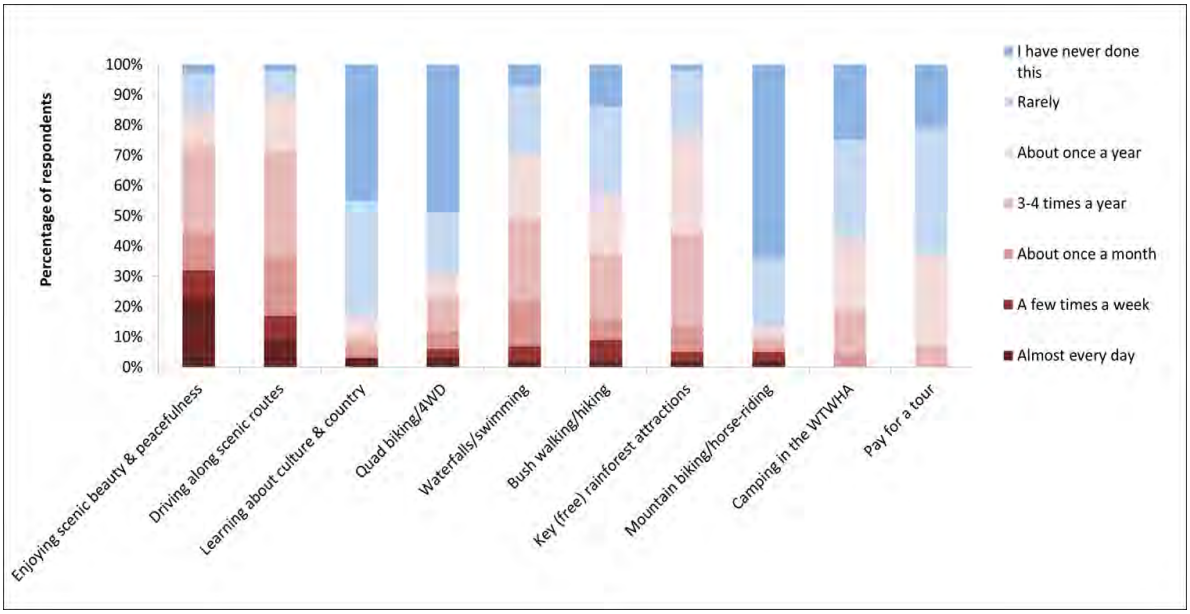



**Figure 23:** Frequency with which various WT-based activities are undertaken - Non-Indigenous residents

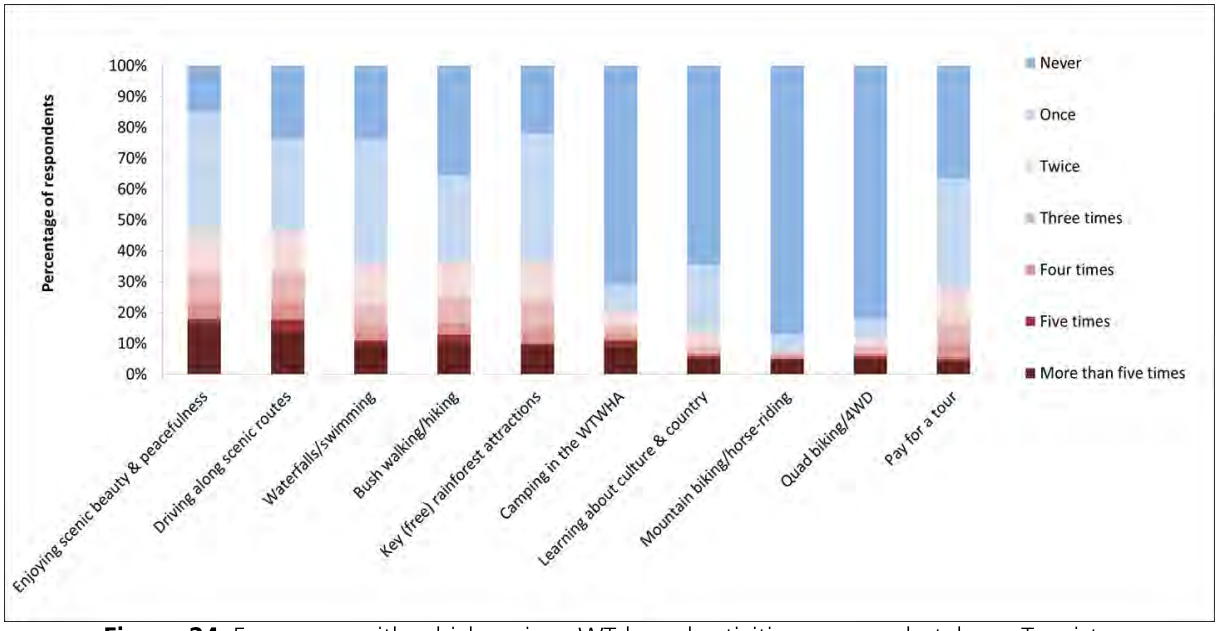



**Figure 24:** Frequency with which various WT-based activities were undertaken - Tourists

### *4.4.3 Resident specific questions*

More than half of our Indigenous respondents (63% of the 132 who answered this particular question) said they would not move away from the region even if it 'deteriorated'. Their non-Indigenous counterparts shared the same opinion: 59% were unwilling to relocate (n=338). These results highlight the locals'strong sense of place.

Overall, non-Indigenous residents were much more satisfied than the Indigenous residents (Figure 25).

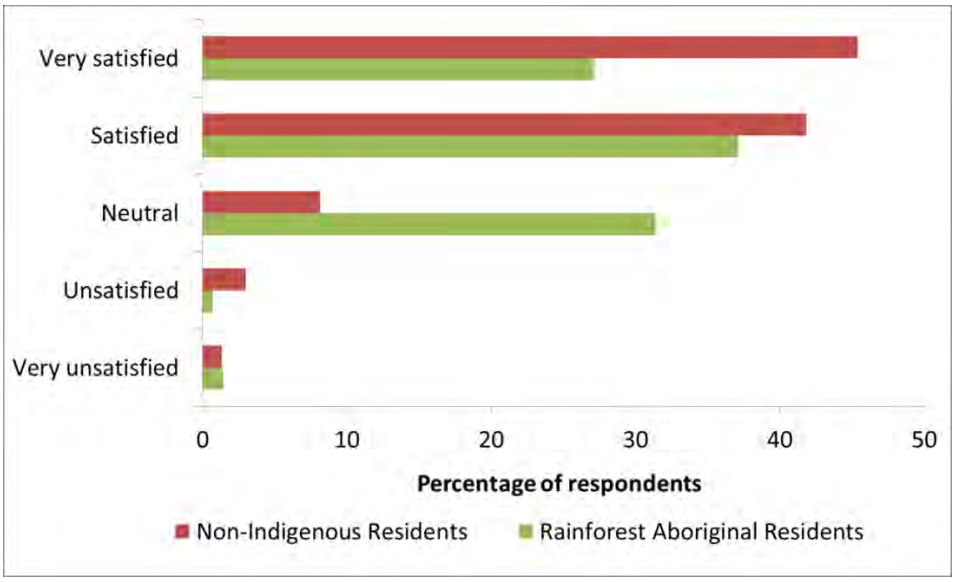



**Figure 25:** Resident satisfaction with life overall

As shown in Figure 26 and Figure 27, however, there is some variation in responses across postcode and Indigeneity. For example, in the Daintree, Rainforest Aboriginal respondents

were more satisfied with life than their non-Indigenous counterparts. The opposite is true in Ingham.

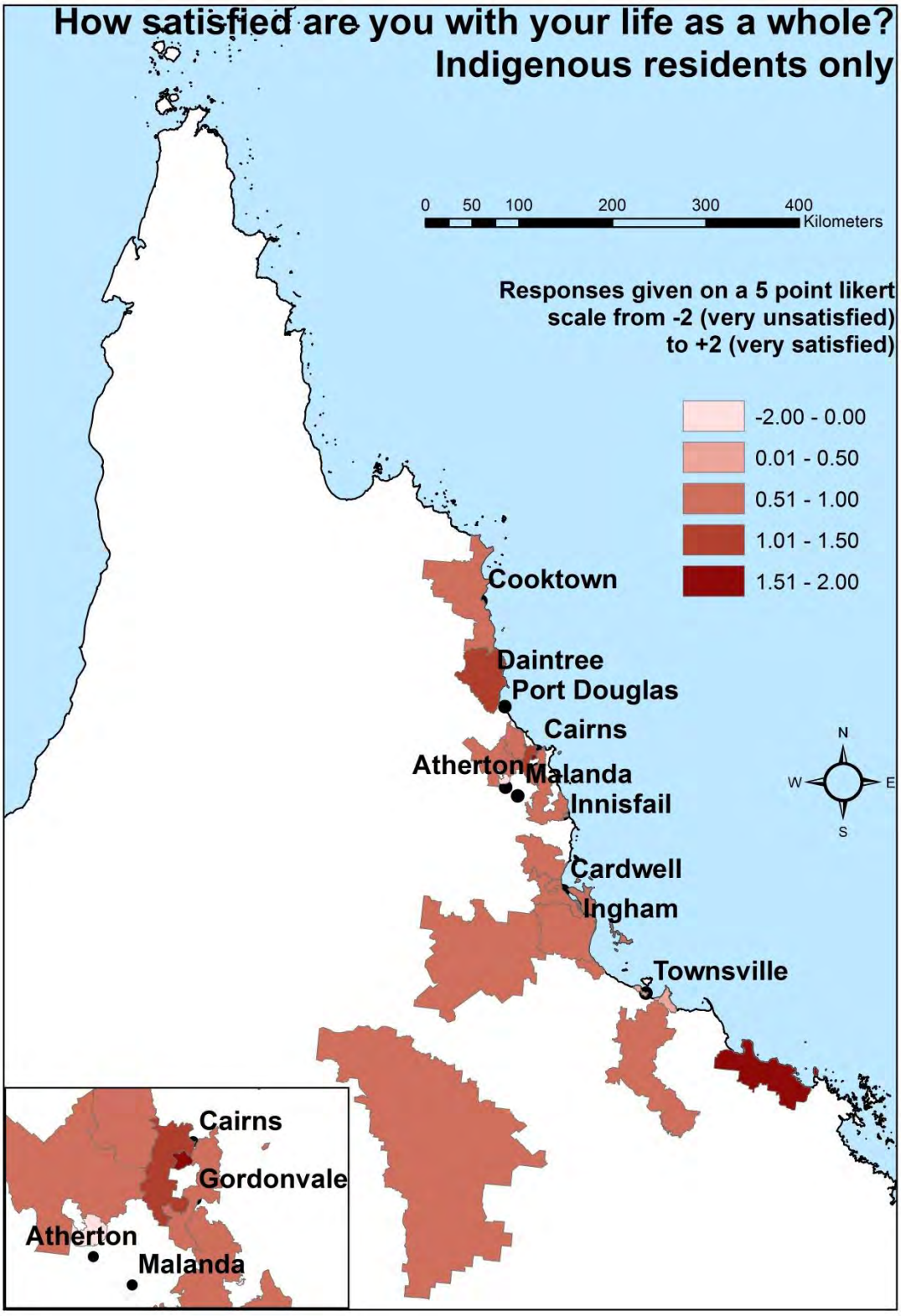



**Figure 26:** Rainforest Aboriginal residents' satisfaction with life overall - by postcode

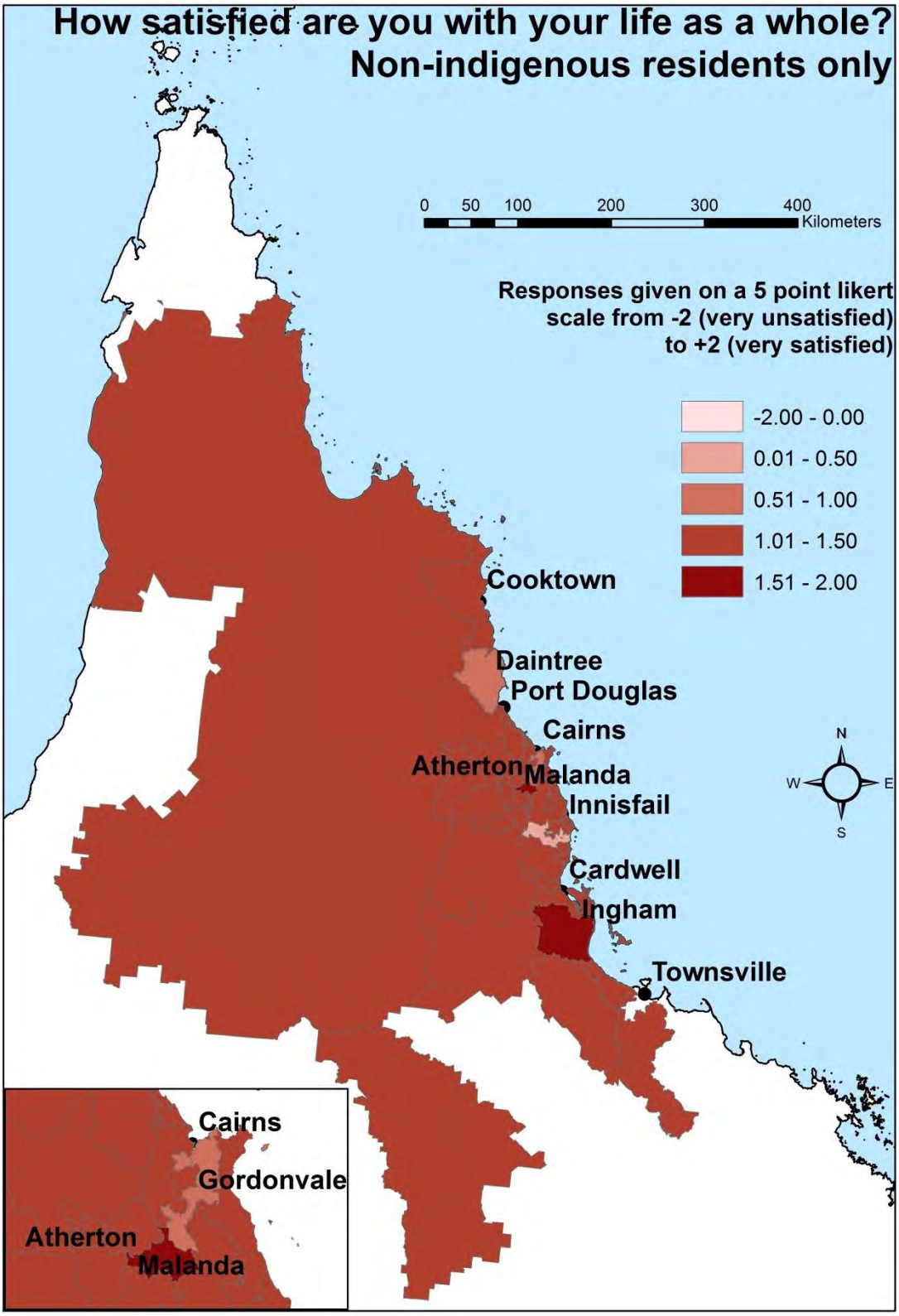



**Figure 27:** Non-Indigenous residents' satisfaction with life overall - by postcode

Note the inland areaswhich lay well outside the WTWHA, but appear to have a large number of respondents. This is because postcodes in this part of Australia are geographically large. The database was 'filtered' by both location name and postcode, so only residents who lived closer to the WTWHA were sent questionnaires – the location in which respondents live within postcodes is thus closer to the WTWHA than appears from this map.

### 4.4.4 Tourist specific questions

The majority of respondents were international (64%, n=385). Of the international visitors, most originated from Europe (44%). Of these, 18% were from the UK, followed by Germany (9%) (Figure 28).

Of the domestic tourists (n=220), 21% were from interstate, mainly New South Wales (10%), while the majority (79%) were from intrastate.

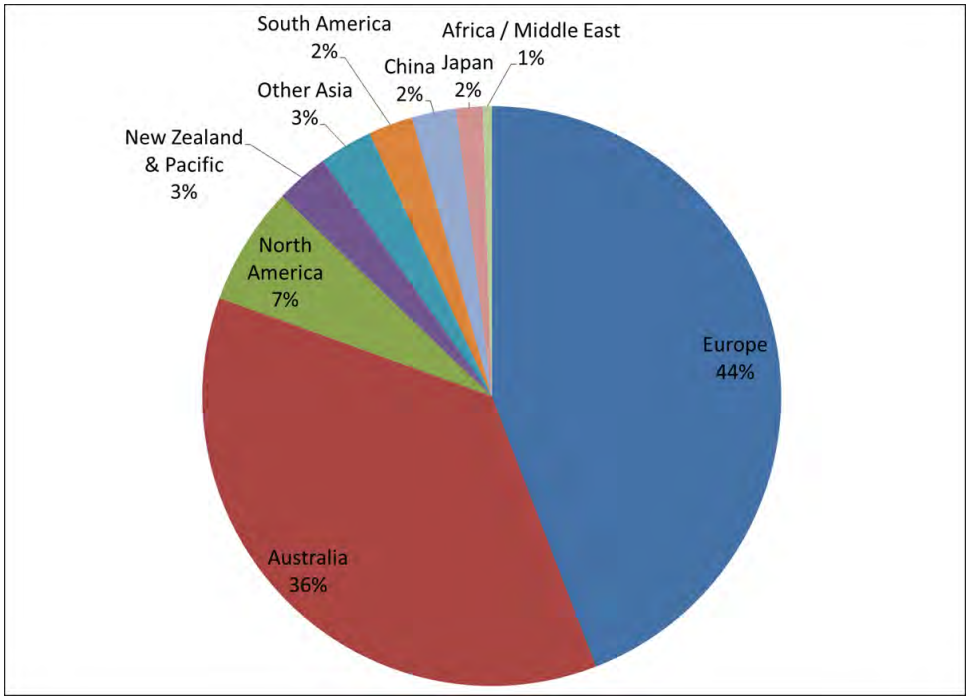



Figure 28: Country/region of origin

Couples made up 38% of the sample, while 22% were travelling with friends. Only 19% came here alone (Figure 29).

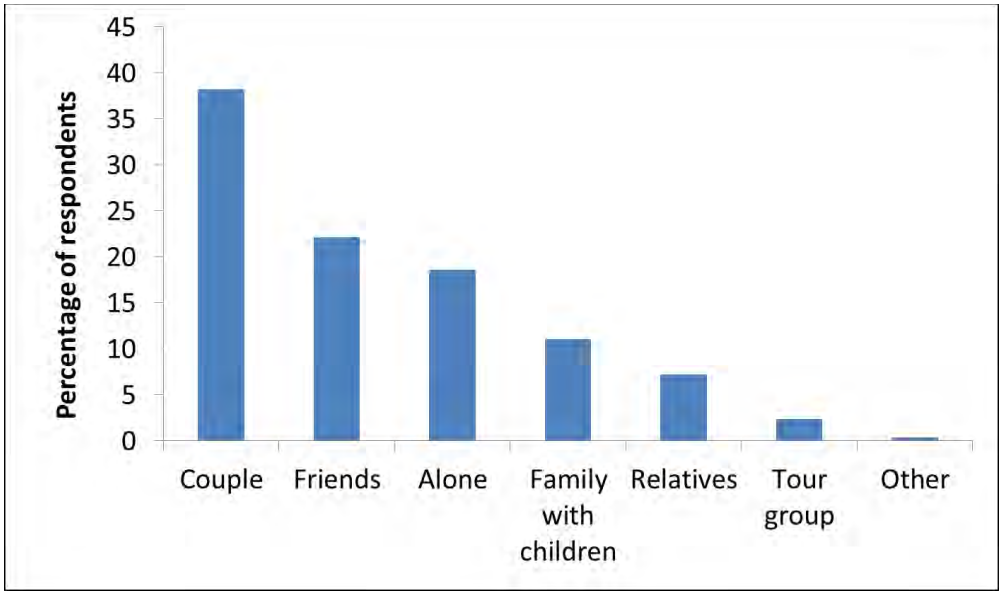



Figure 29: Travel party

More than one half of the tourists we approached at the airport terminals or lagoon (68%) had visited the WTWHA, and this did not vary substantially by origin of visitor (Figure 30).

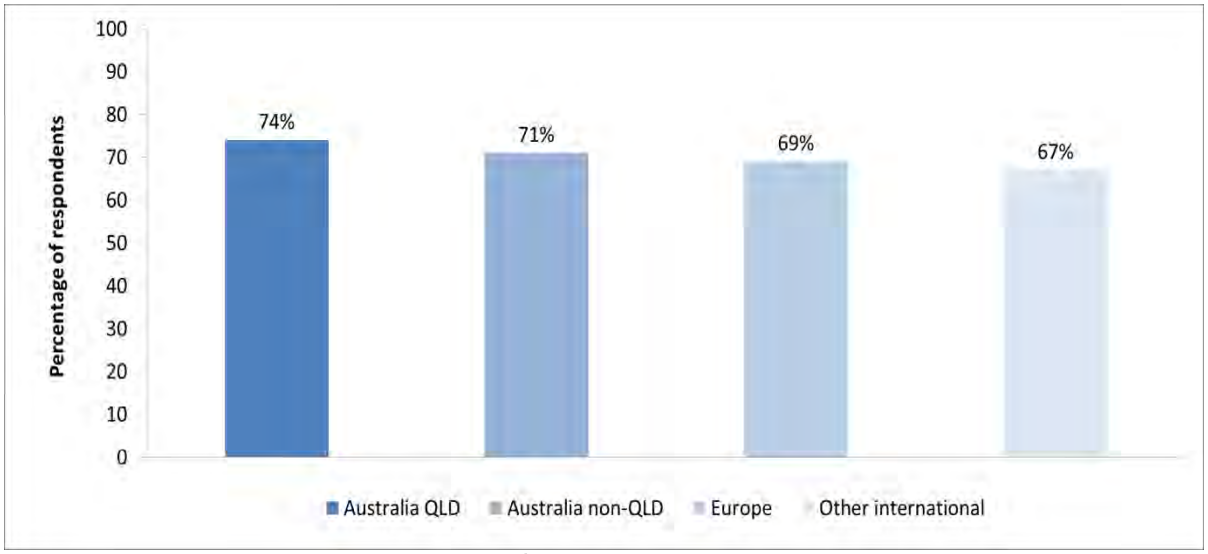



**Figure 30:** Percentage of tourists who had been to the WTWHA

Of the 68% who had been to the WTWHA, most visitors had spent 4 nights or more in or near the area (Figure 31).

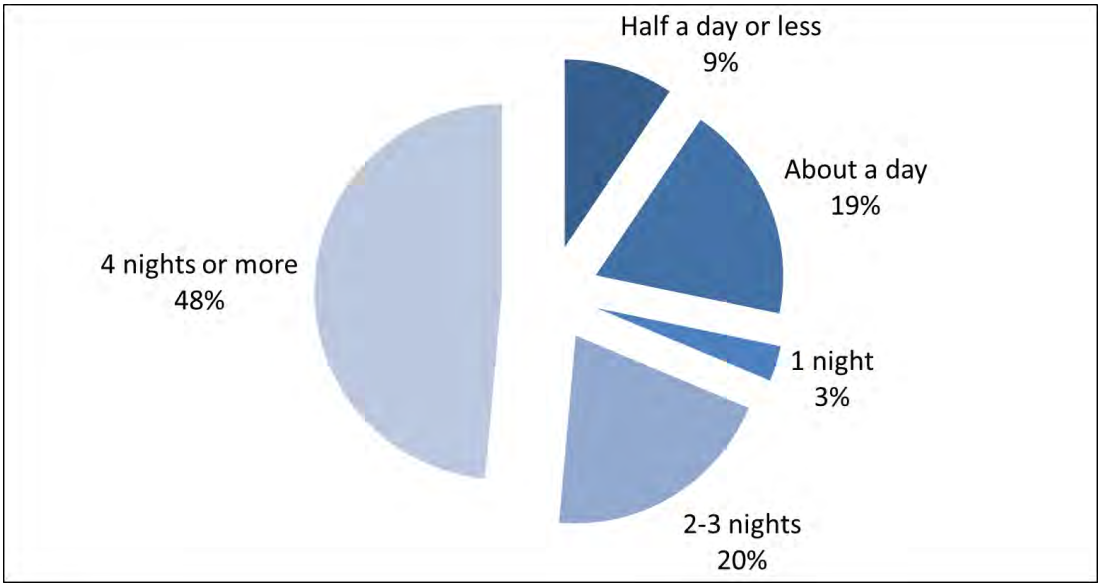



**Figure 31:** Length of time spent in or near the WTWHA (of the 68% who visited it)

An overwhelming majority of visitors surveyed (86%) expressed satisfaction with their experience as a whole (42% were very satisfied while 44% were satisfied). Similar levels of satisfaction were observed by visitors from different origins (Figure 32).

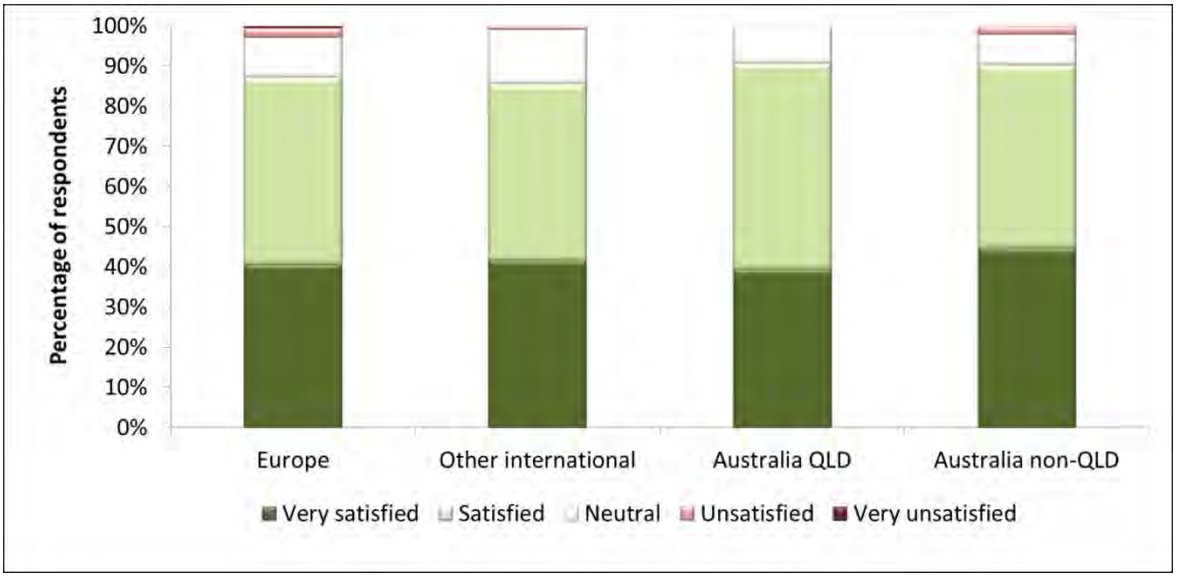



**Figure 32:** Tourist satisfaction with overall experience - by origin

For 85% of respondents, the trip was, overall, either above or well-above their expectations (54% and 31% respectively). A larger share of international visitors thought their trip was well above expecations than domestic visitors (Figure 33).

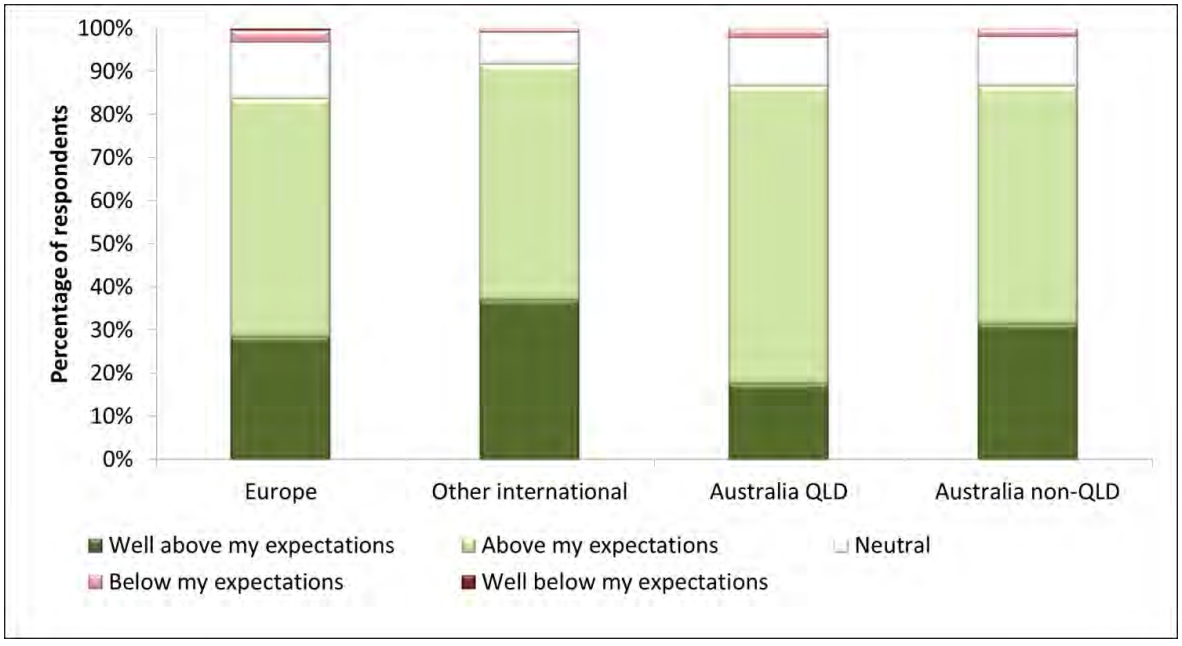



**Figure 33:** How well has this trip met your expectations? - by origin

More than one-half of all visitors (64%) said they were likely to return to the region in the future (37% of respondents indicated they would definitely return (Figure 34).

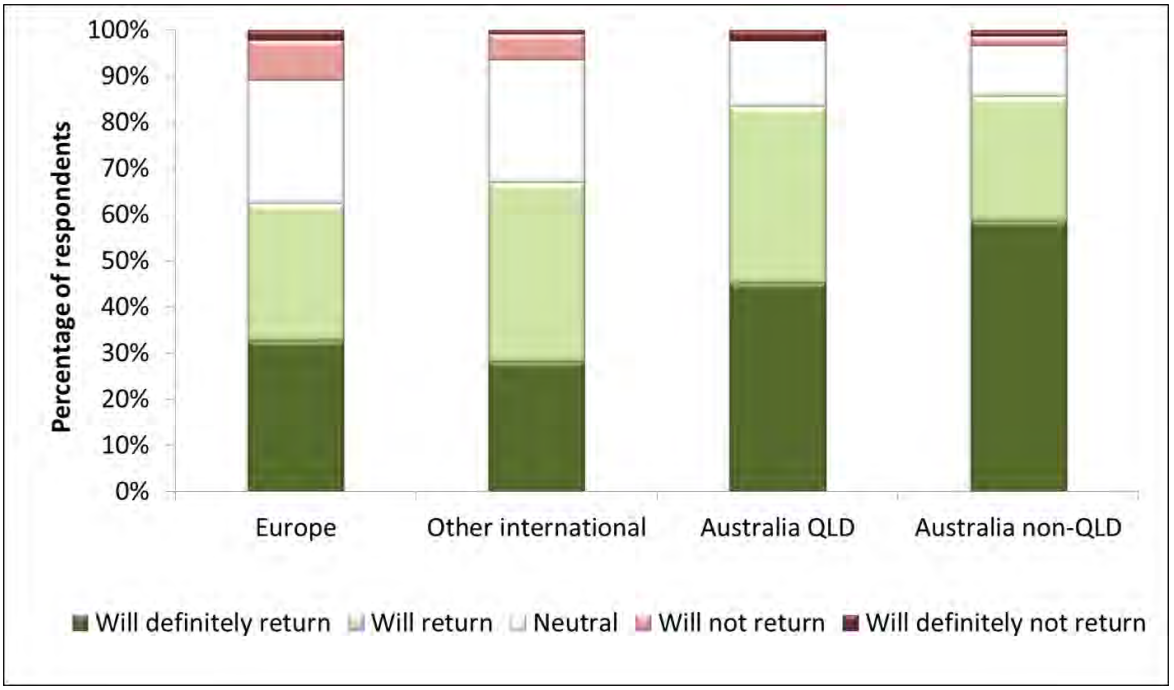



**Figure 34:** How likely is it that you will return to this region in the future? - by place of origin

Visitors from New Zealand and other Pacific Islands spent the most money per person per day, followed by those from America. The Germans and other Europeans spent the least amount of money per person daily (most probably the backpackers, given the lower spending on these three categories of expenditures (Figure 35).

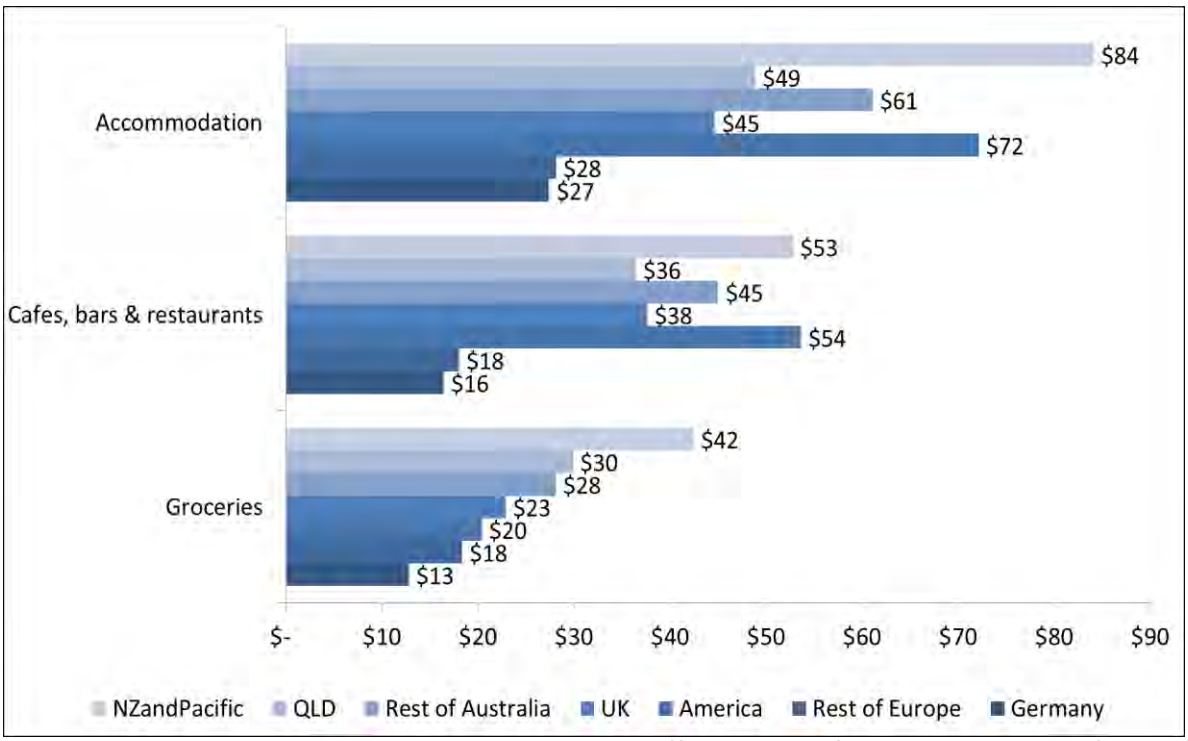



**Figure 35**: Average expenditure per person per day on different types of products - by origin of visitor

© WTMA/EPA

# 5 The relative 'value' of ecosystem services provided by the WTWHA

## 5.1 Some more methodological background

### 5.1.1 The 'importance' of various goods and services

Dollar denominated valuation techniques (such as willingness to pay - WTP) are commonly used for their ability to generate estimates of non-market 'values' which can be compared to other 'values'. As discussed in section 0, we chose to use a variant of the life satisfaction (LS) approach, which does not directly elicit values from respondents in dollar amounts. Instead, we asked residents to tell us how important various ecosystem services (ES) were to their overall quality of life, and we asked tourists how important those ES were to them when deciding to come to the region. The lists of values (

Figure **12** and Figure 13) did not include only ES provided by the WTWHA. We deliberately set out to assess both non-market values (ES and other things such as spending time with family and friends) and market values (such as the quality of accommodations, and the importance of earning income from various industries) using the same methodological approach. This ensures that it is possible to make comparisons, and to consider the value of different ES services *relative* to each other, and to other social and market goods.

Specifically, for each of the values listed in

Figure **12** and Figure 13, we asked residents and tourists, respectively:

- *How important are each of the following to your overall quality of life?*
- *How important were each of the following factors when you made your decision to come to this part of Australia on this trip?*

These items were presented in a different order on different questionnaires to ensure that we did not create a situation in which items presented at the top of the page were given a consistently higher (or lower) score than those at the bottom. All values were rated on a 5-point likert scale ranging from 2 being *Very important* to -2 being *Not very important at all*.

### 5.1.2 People's satisfaction with various goods and services

Having information about satisfaction provides one with a more comprehensive understanding of resident and visitor perspectives and experiences, enabling those tasked with the management and preservation of the Area to better understand and address the concerns of its users. It is particularly important to understand the perspectives of the local community given their deep sense of ownership and attachment (McIntyre-Tamwoy, 2004; Carmody & Prideaux, 2008). From a tourism perspective, information about satisfaction is necessary in formulating an appropriate strategy to attract more tourists. Satisfaction or dissatisfaction with one of the values will lead to satisfaction or dissatisfaction with the overall destination (Pizam et al. 1978). In the context of the WTWHA, as a protected area, satisfaction scores are an important component in assessing its success, or failure, to deliver a high quality visitor experience (Coghlan, 2012; Esparon et al, forthcoming). If travellers to the WTWHA are satisfied with the experience, then they are more likely to extend their stay, visit again or make recommendations to friends and family (Kozak, 2003, Vetitnev et al. 2013, Saltzer, 2002). In the case of the latter, Angelova and Zekiri (2011) note that endorsement of a product (or sharing of information about the experience) to others is in the order of five or six people for (satisfied customers). However, dissatisfied customers are more likely to tell another 10 people of their experience.

Hence, without visitors, without satisfied visitors in particular, tourism in the WTWHA may cease to exist.

For each value, we thus asked residents and tourists how satisfied they were with each. As with importance, values were rated on a 5-point likert scale ranging from 2 being *Very satisfied* to -2 being *Not very satisfied at all*. See page 2 of Appendix 4 and Appendix 5 respectively

### *5.1.3 Comparing importance and satisfaction*

Looking at importance and satisfaction separately does not allow one to answer questions such as: Is the marketing/management effort given to different values mirroring the importance attached to each? Are people satisfied with the things they feel are most important? By simultaneously looking at both importance and satisfaction, policy makers and tourism marketers can identify which values require the most attention and rectify them accordingly - the aim being to improve those values deemed highly important but with low satisfaction, while maintaining or enhancing values of high importance and high satisfaction (Esparon et al. 2014; Angelova & Zekiri, 2011).

Comparisons between importance and satisfaction were done by mimicking the popular importance-performance analysis (IPA) – a method originally developed in the marketing literature to identify areas of over-performance or under-performance so to guide the best use of limited resources. Results are normally analysed and presented on a two dimensional grid format (Figure 36).

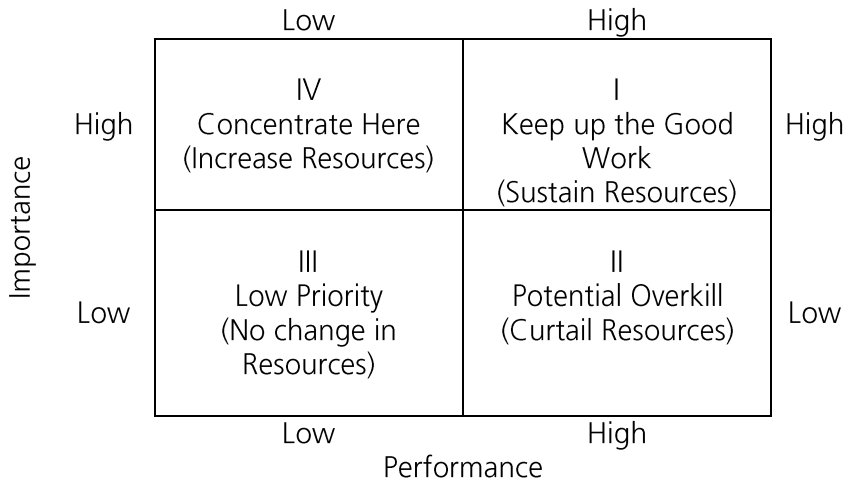



Figure 36: The original IPA framework
(Source: Adapted from Martilla and James, 1977)

Since its inception in marketing research in the late 1970s, the technique has become a prominent managerial tool largely applied to identify the strengths and limitations of brands, products and services in various domains such as: banking (Yeo, 2003); dentistry (Nitse & Bush, 1993); health care (Dolinsky & Caputo, 1991); information systems (Ainin & Hisham, 2008); organisational change (Graf et al. 1992); and education (O'Neill & Palmer, 2004). In tourism specifically, there have been numerous studies related to destination image (Edward & George, 2008); hotels (Chu & Choi, 2000); escorted tours (Duke & Persia, 1996); visitor centers (Mengak et al. 1986) tourist shopping villages (Murphy et al. 2011); national parks (Tonge & Moore, 2007), and certification scheme (Esparon et al. 2014) to name a few.

Yet, despite its popularity, the IPA continues to be surrounded by conceptual, methodological and measurement ambiguities. Oh (2001) provided a good overview of these inconsistencies, but what is of most interest to this research is the definitional ambiguity between performance and satisfaction which has resulted in them being used interchangeably (Tonge & Moore, 2007, Oliver, 1997). Baker and Crompton (2001) cogently distinguish the two, defining performance as a measure of provider output and satisfaction as a measure of visitor outcome. An importance-satisfaction approach, which is therefore outcome-based, is necessary in the context of the Wet Tropics and will provide better information to those tasked with the provision of desired outcomes for visitors (Tonge & Moore, 2007). Since respondents in this study were asked about satisfaction with the condition and health of the Rainforest (e.g. water clarity, healthy native plants and animals, etc.), then this information is equally beneficial to its protection and management. Identification of discrepancies between importance and satisfaction from the resident's point of view is equally important for the conservation and maintenance of the Area. To the best of our knowledge, no previous studies have considered the two simultaneously.

That said, given the number of concerns over the positioning of the gridlines in an IPA resulting in different managerial implications, we chose to present the results differently using a radar plot instead of the normal grid format. We also used the Wilcoxon signed-rank test to consider whether differences in perception between importance and satisfaction were statistically significant. This latter point not only addresses the lack of statistical analysis rigor limitation of the original IPA (Hammitt et al. 1996; Bacon, 2003), but importantly, provides researchers with confidence in prioritising values for improvement. For example, in the traditional IPA model, an attribute in the 'Concentrate Here' quadrant may be interpreted as requiring urgent attention, however, the use of statistical analysis validates whether this is really the case or not (i.e. if there is a significant difference between importance and satisfaction scores). This is especially important when there are limited resources (e.g. lack of funds) – instead, scarce resources can be diverted to where it is needed most.

### *5.1.4 Identifying overlapping values*

As noted earlier, ecosystems are intricate and multi-faceted systems, composed of non-linear, inter-dependent components (Koch et al. 2009). Most ES interact with one another in complex dynamic ways, thus separating each is challenging (Fu et al. 2011). Given the evidence of the connections amongst these services, still, little is known in regards to the significance and variability of such inter-connectedness. Bennet et al. 2009 argues that when relationships between ES are examined, researchers typically address only 2 services at a time. As a consequence, not much is known about how to minimise trade-offs or enhance synergies (Bennet et al. 2009). Importantly, there is limited information about how similar or different the beneficiaries of these services perceive them to be. Parallel research in the GBRWHA revealed that many of the values are inter-related or similar in importance (Larson et al. 2014, Stoeckl et al. 2014; Esparon et al. forthcoming). At a more practical level, researchers are cognisant of the fact that asking respondents to rate a large number of different ES will likely generate questionnaire fatigue, thus reducing the reliability of results. Having better information about which ES 'group' together, and which do not, can thus help inform the design of future studies which seek to assess either total or marginal values. We thus extended our analysis of importance in this study to see how well the values grouped.

Several data reduction techniques can be used, one being, *Principal Component Analysis* (PCA). Briefly, the goals of the PCA are to: (1) extract the most important information from the data table; (2) compress the size of the data set by keeping only this important information; (3) simplify the description of the data set; and (4) analyse the structure of the observations and the variables. In order to achieve these goals, PCA computes new variables called principal

components which are obtained as linear combinations of the original variables (Abdi & Williams, 2010).

Since our list of values used in this study was refined during the initial stages of the study, we did not need to use PCA for this purpose. Instead, we used the PCA to examine how similar in importance the values were perceived (i.e. how well the values grouped).

As an additional tool to exploring how the values grouped, we used *Leximancer*. Briefly, Leximancer is a text-mining (analytics) tool which uses word-association information to elicit key concepts and themes from the text and how they are related to each other (Figure 37). The relationships of these groups of concepts to each other are plotted on a *concept map*. Concepts that appear together frequently in the text or in similar circumstances will be close together on the map. The darker a concept label, the more frequently that concept appeared in the text. The size of the point (or shape) underlying the concept label defines the strength of the relationship between that concept and others (i.e. the bigger the point, the more related are the concepts). The grey network of pathways illustrates the most shared connections between concepts, although other direct inter-connections exist (Leximancer, 2011; Cretchley et al. 2010; Penn-Edwards, 2010; Smith & Humphreys, 2006).

To gain a better understanding of the significance of the WTWHA and the opportunities it presents to their quality of life (or trip experience), we thus used Leximancer to examine the open-ended questions about 'satisfaction'. To be more specific, we asked residents to think about their own life and personal circumstances, and how satisfied they were with their life as a whole (rated on a 5-point likert scale – as discussed earlier). They were then asked the reason they felt that way. Similarly, visitors were asked to rate their satisfaction with their experience as a whole (on a 5-point likert scale) and the reason they felt that way. Although not strictly about importance of values (instead about satisfaction), the ability of Leximancer to 'pick up' concepts/themes and displays the connectivity (i.e. how related they are to each other) proved useful in the context of this part of the analysis (i.e. inter-relationships about values).

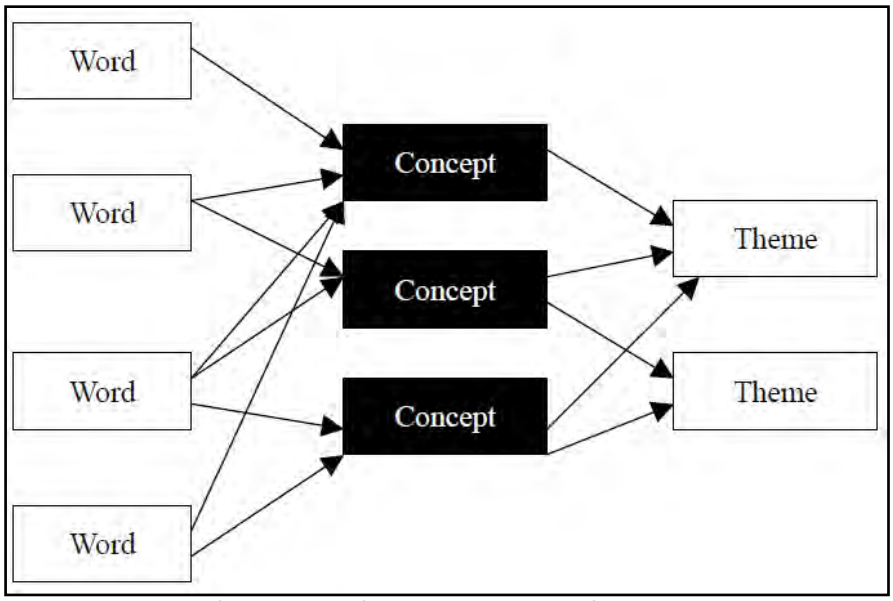



**Figure 37:** Simplified model of semantic pattern of extraction in Leximancer (Source: Crofts & Bisman, 2010)

### *5.1.5 Determining if different people 'value' different things*

Previous research has shown that different people 'value' and are motivated by different things (Bushell et al. 2007, Larson et al. 2014; Blocker & Eckberg 1997; Farr et al. 2014, Esparon et al.

forthcoming). Since different people have different priorities, knowledge of which values are important to whom will help tourism organisations design suitable marketing strategies, and managers/politicians prioritise regional activities. Thus, we looked at the way in which residents' and tourists' perceptions about the contribution that various ES make to well-being or trip decision relate to socio-demographics. We did this in two ways: (1) by looking for statistically significant relationships between various socio-economic and demographic characterisitcs and each factor score; and (2) by looking for statistically significant relationships between various socio-economic and demographic descriptors of people and the importance and satisfaction scores they assigned to each of the top 10 values.

In regards to the former, we regressed the scores of each of the 6 (residents) and 5 (tourists) factors identified by the PCA against variables measuring the socio-demographic characteristics of the respondents using stepwise ordinary least square (OLS) regression.

**Table 4:** Variables used in regression analyses – descriptors and abbreviations

| Variable of interest | Description | Abbreviations used in this report |
|---|---|---|
| Age | Respondent's age | Age |
| Gender | =1 if respondent is male, 0 otherwise | Male |
| Marital status | =1 if respondent is single, 0 otherwise | Single |
| Indigeneity | =1 if respondent i is Indigenous, 0 otherwise | Indigenous |
| Education | Respondent's highest level of education completed in five different levels ranging from primary school to higher education at university | Education |
| Household size | Number of people in respondent's household | HH size |
| Household Income | Respondent's household annual pre-tax income ranging from $6,500 to $285,500 | HH Income |
| Dependence on various sectors for household income | | |
| Tourism | =1 if the main source of respondent's household income is Retail, Accommodation, cafes & restaurants, and Tourism, 0 otherwise | Retail & Tourism |
| Commercial fishing | =1 if the main source of respondent's household income is Fishing, 0 otherwise | Fishing |
| Mining, manufacturing &/or ports | =1 if the main source of respondent's household income is Mining, Manufacturing and Ports, 0 otherwise | Mining & ports |
| Government, Health or Education | =1 if the main source of respondent's household income is Government, Health and Education, 0 otherwise | Government |
| Agriculture | =1 if the main source of respondent's household income is Agriculture and Forestry, 0 otherwise | Agriculture |
| Place of birth | =1 if resident born in QLD, 0 otherwise | QLD Born |
| Additional variables for tourists | | |
| Origin of visitors | | |
| QLD | =1 if visitor from QLD, 0 otherwise | QLD |
| Elsewhere in Australia | =1 if visitor from the rest of Australia, 0 otherwise | AUS (not QLD) |
| Asia | =1 if visitor from Asia, 0 otherwise | Asia |
| Germany | =1 of visitor from Germany, 0 otherwise | Germany |
| UK | =1 of visitor from UK, 0 otherwise | UK |
| Other European | =1 of visitor from other European country, 0 otherwise | Other European |
| North America | =1 if visitor from North America, 0 otherwise | North America |
| Type of travel party | | |
| Couple | =1 if travelling as a couple, 0 otherwise | Couple |
| Family with children | =1 if travelling as a family with children, 0 otherwise | Family with children |
| Friends | =1 if travelling with friends, 0 otherwise | Friends |
| Tour group | =1 if travelling with a tour group, 0 otherwise | Tour group |

As regards our analysis of importance and satisfaction scores, it is, strictly speaking, incorrect to use OLS regression since OLS assumes dependent variables are continuous and normally distributed, whereas both importance and satisfaction scores were elicited using a Likert scale (indicating that it would be more statistically appropriate to use ordinal regression instead). That said, many researchers have compared models using ordinal and continuous regression

techniques, the overwhelming conclusion being that choice of technique is more important in theory than in practice, since both approaches produce similar results (Ferrer-i-Carbonell & Frijters, 2004; Helliwell, 2003; MacKerron & Mourato, 2009). We therefore used stepwise OLS regression, since it is a particularly powerful way of simply highlighting statistically significant relationship.

Having identified 'core' socio-demographic variables that influence values, we then used (non stepwise) OLS regression to develop a consistent set of models (with the same variables) describing each value. Coefficients from those models were then used to compare (predicted values of the) 'average' importance scores which different groups of people ascribed to 4 key values, whilst controlling for other socio-demographic factors such as income and gender.

The different groups compared were:

- Indigenous and Non-Indigenous residents;
- Residents who were dependent upon different industries for their household incomes.

And the different values compared were:

- Having healthy native plants and animals;
- Having beautiful undeveloped scentery;
- Being able to visit waterfalls and/or swim in clear clean rivers;
- Protecting places that have aboriginal cultural values.

## 5.2 Results and discussion

### 5.2.1 How 'important' are the ES provided by the WTWHA?

Although it is not, strictly speaking, 'kosher' to summarise likert data using means, doing so makes it easy to compare responses visually. Tourists, Indigenous and non-Indigenous residents all indicated that safety is the most important factor, be it safety of family and friends (residents) or safety of self and that of travelling companions (tourists) (Figure 38,
Figure **39** and
Figure **40**). This was generally followed by time spent with the loved ones and the quality of infrastructure to support family and friends - such as schools, hospitals, roads, etc. Environmental values such as having healthy native plants and animals, undeveloped scenery and iconic species were also ranked highly – much more so than economic factors such as the jobs and incomes associated with mining, tourism and agriculture. Specific factors innate to our Indigenous sample such as the protection of places with Aboriginal cultural values and being able to learn about culture and country were, unsurprisingly, very important. It is widely acknowledged that Indigenous people have deep connections to 'country'. As per the quote below, such connection is rooted in caring for country, maintaining cultural life, identity, individual autonomy and Indigenous sovereignty (Garnett & Sithole, 2007, Ganesharajah, 2009).

> *"Country is multi-dimensional – it consists of people, animals, plants, dreamings; underground, earth, soils, minerals and waters, air… People talk about country in the same way that they would talk about a person: they speak to country, sing to country, visit country, worry about country, feel sorry for country, and long for country…Country knows, hears, smells, takes notice, takes care, is sorry or happy."* (Rose, 1996, p.7-8).

These cultural factors were ranked lower in importance by our non-Indigenous sample – instead, having some 'control' over what is happening in their lives was more vital. Good weather (sunshine) and going to the GBRWHA were essential components of visitors' trip.

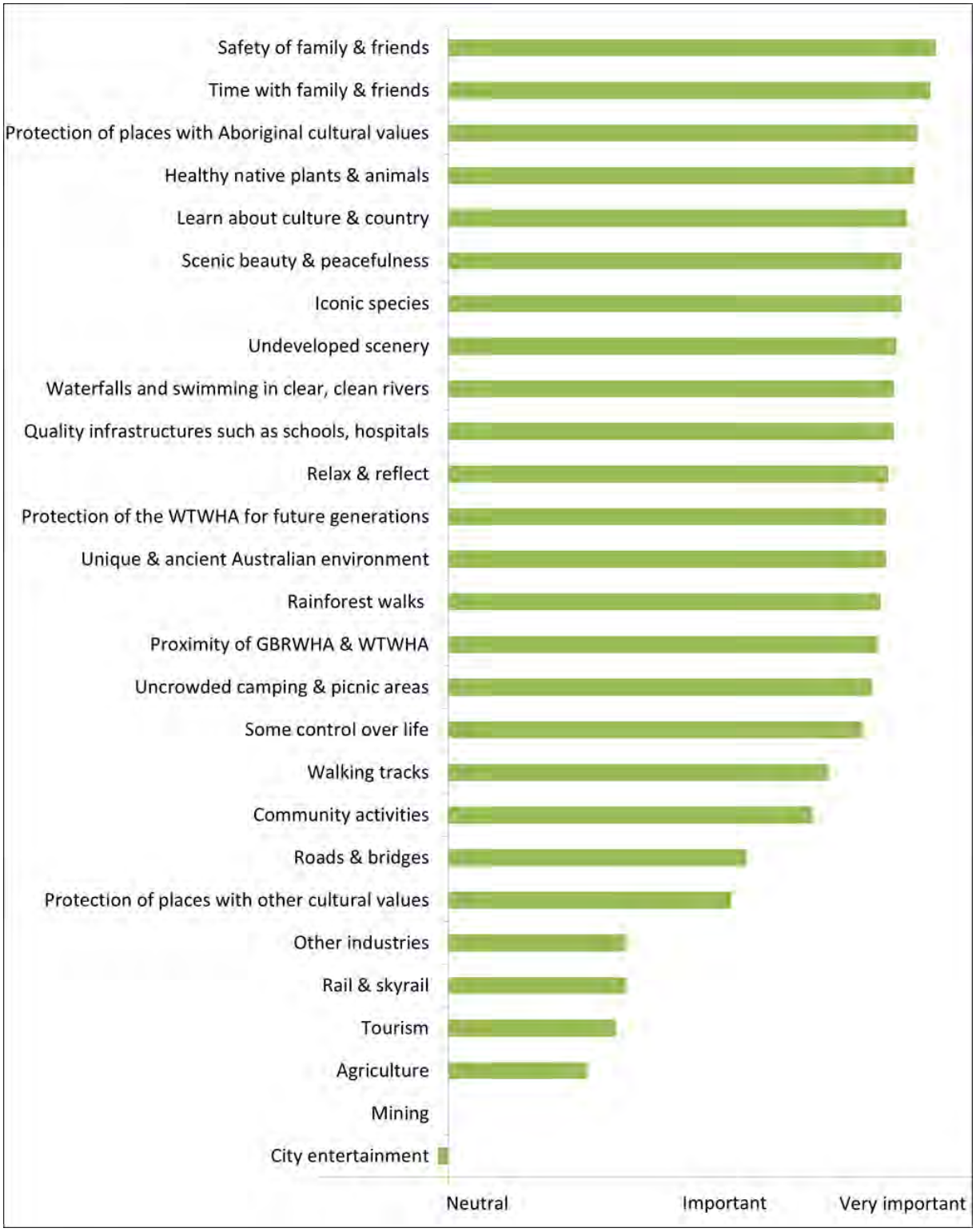



**Figure 38:** Importance to overall quality of life - Rainforest Aboriginal residents

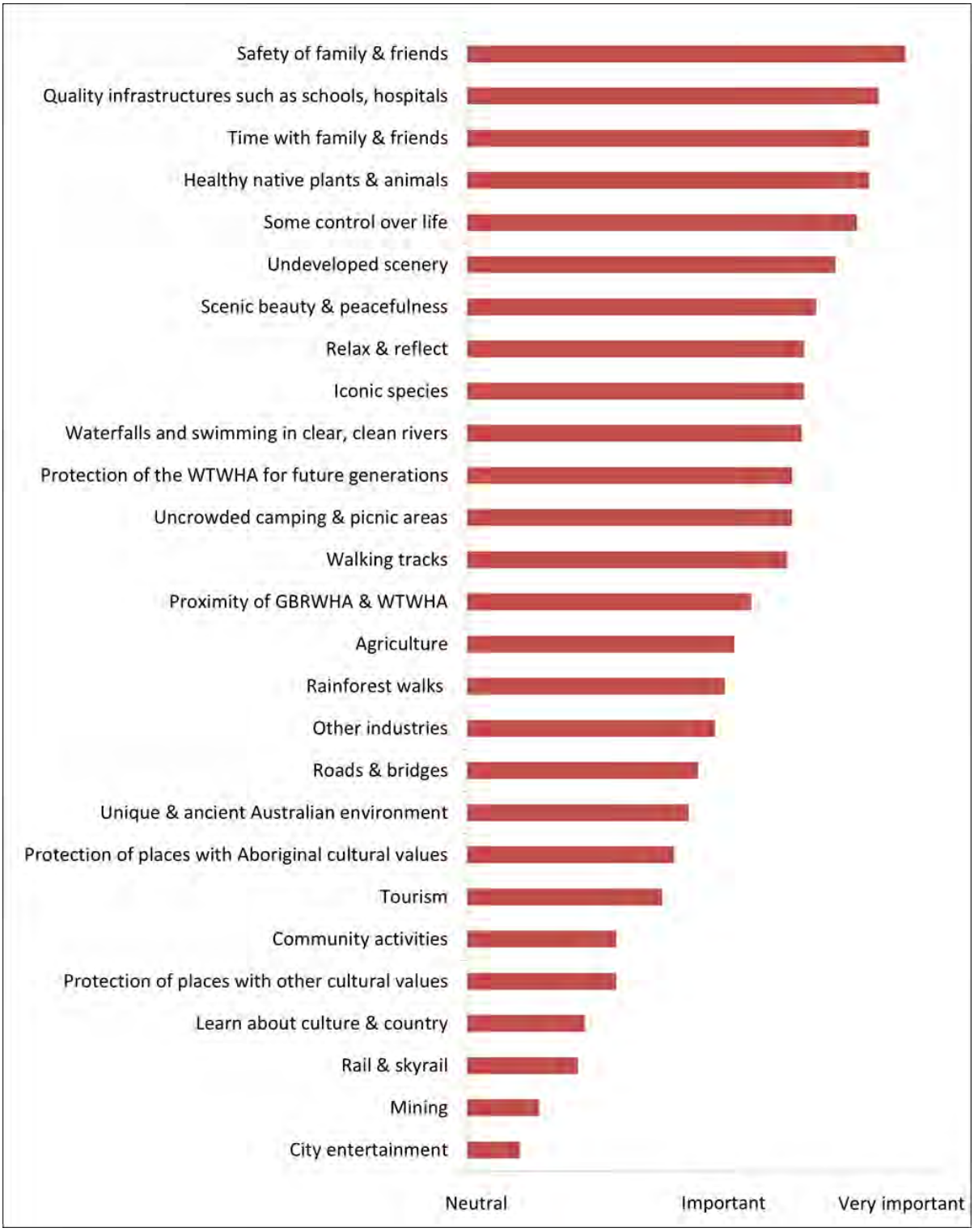



**Figure 39:** Importance to overall quality of life - Non-Indigenous residents

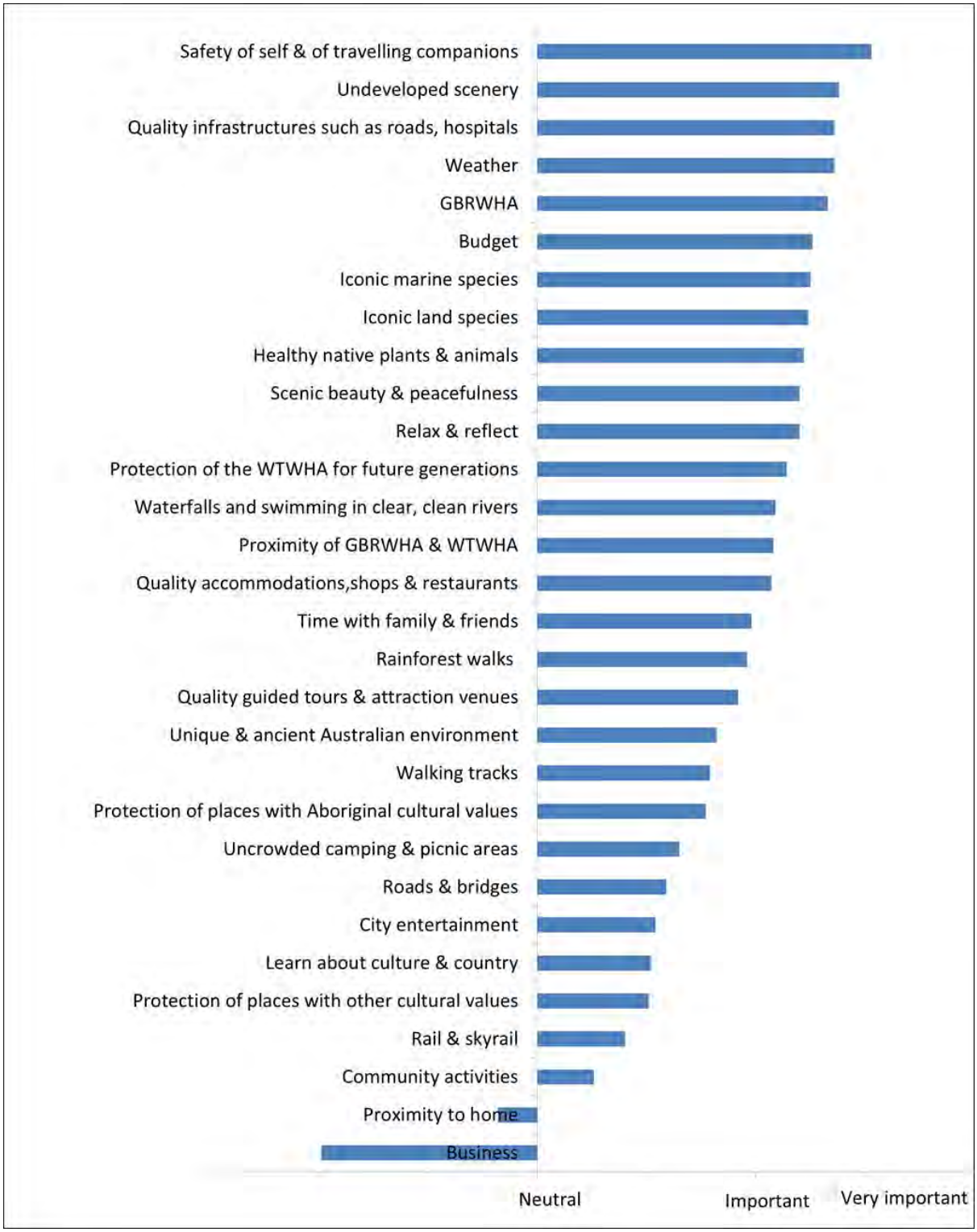



**Figure 40:** Importance as a reason for coming to this part of Australia

Focusing on the top 10 most important factors, we found that Indigenous residents were of the opinion that family-related and environmental values are more important to overall quality of life than their non-Indigenous counterparts. There was little difference in the importance scores which these to groups ascribed to infrastructures and having some control over life (
Figure **41**).

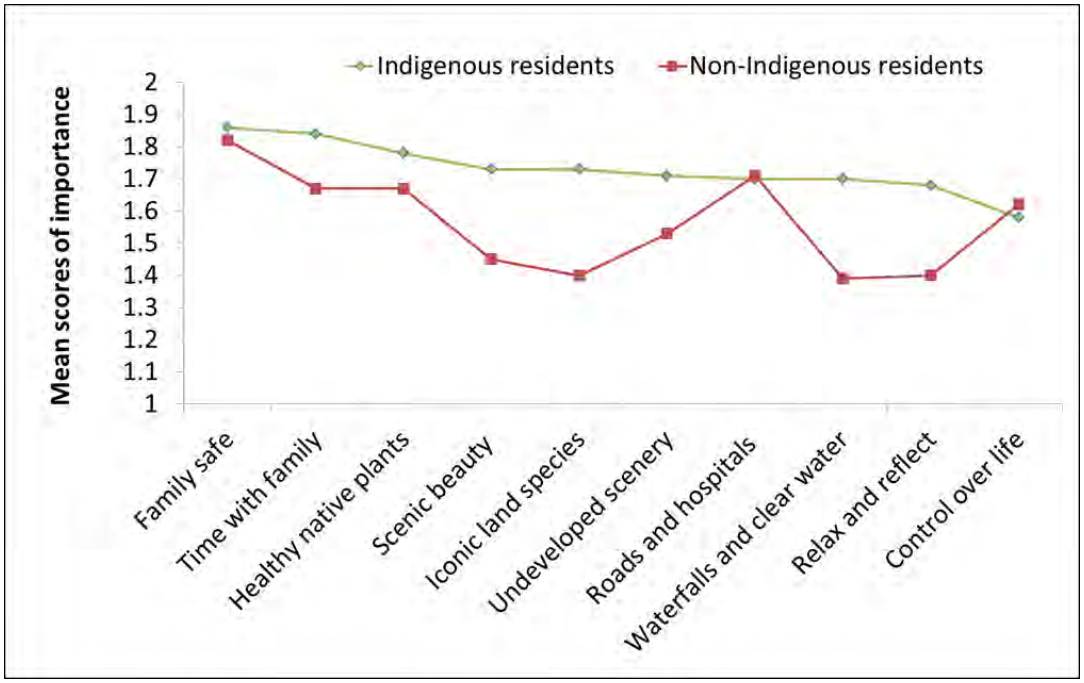



**Figure 41:** Mean importance scores for 'top 10' values – Indigenous and non-Indigenous residents compared

In our parallel study in the GBRWHA, environmental factors such as having healthy coral reefs and reef fish, no visible rubbish, iconic marine species, clear ocean water, and mangroves and wetlands were deemed more important to overall quality of life than economic factors (Stoeckl et al. 2014; Larson et al. 2014; Farr et al. 2014, Esparon et al. forthcoming). In that study, respondents were not asked to rate social factors such as culture and family. The key point to be made here, is once social/family factors are included, these are rated as being the most important contributors to overall quality of life or trip motivation. After that, our results are consistent with those from the GBRWHA: environmental factors are generally considered to be more important than economic factors.

### *5.2.2 How satisfied are people with the ES that the WTWHA provides?*

Tourists were generally satisfied with their safety and that of their travelling companions, the weather, being able to relax and reflect, and with the scenery (all received more than 1 point, where 1= satisfied). Similarly, residents were satisfied with the safety of their loved ones and with the time spent with them. Indigenous residents were also satisfied with community activities (
Figure **42**).

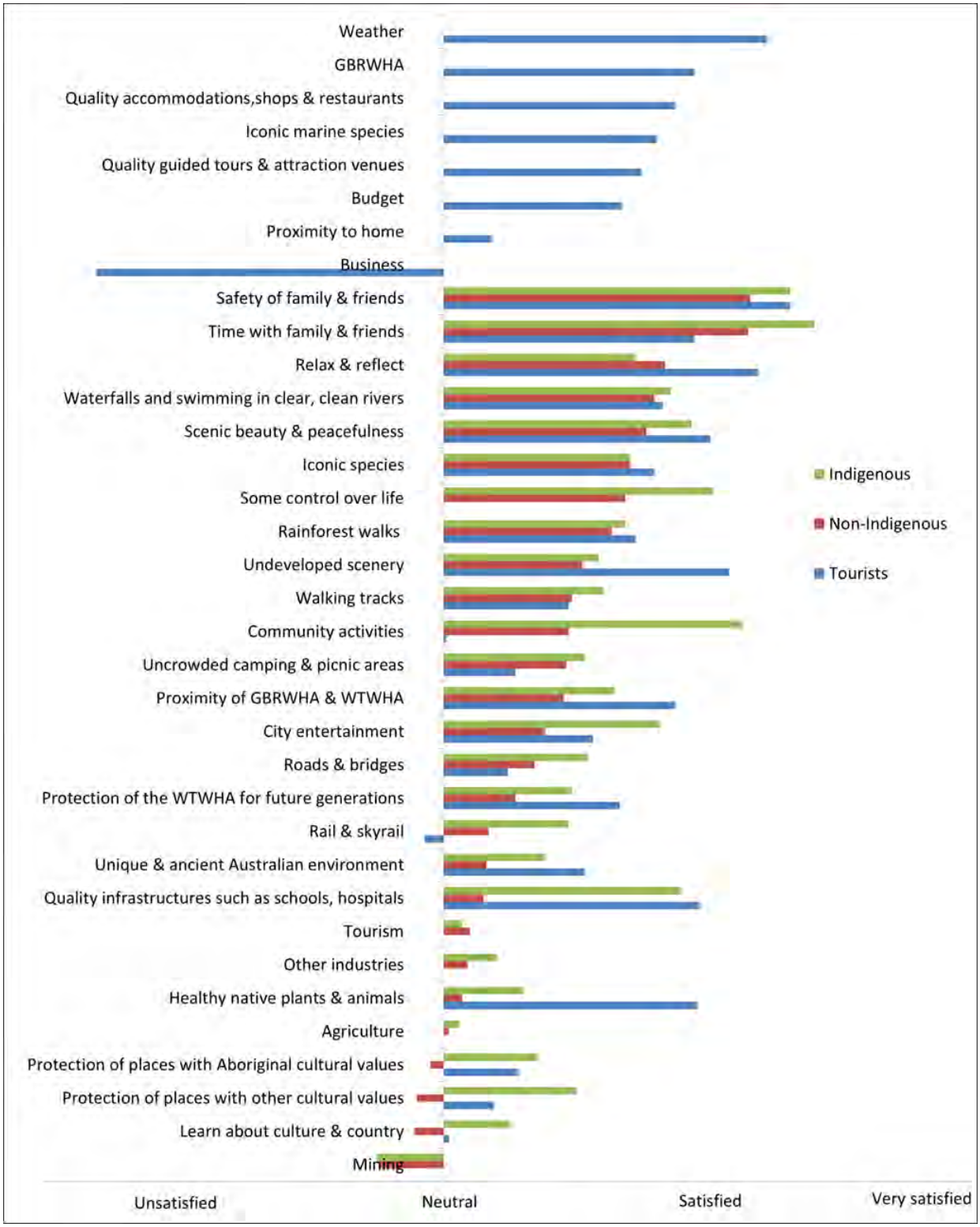



**Figure 42:** Satisfaction with various ecosystem services – by type of respondent

### *5.2.3 Are people satisfied with the things that matter most?*

The following diagrams depict responses from those who answered both the importance of and satisfaction with the different values. The most notable observation is that importance is, for the majority of values, higher than satisfaction. This is the case, irrespective of the group of respondents (
Figure **43**, Figure 44 and Figure 45). However, the gap between importance and satisfaction is not necessarily an issue, unless the gap is statistically significant. The Wilcoxon signed rank test revealed that differences between importance and satisfaction were statistically significant for most items (indicated with a * on those figures). Moreover, many of the largest 'gaps' between importance and satisfaction relate to the Area's environmental values, signaling potential problems for the intrinsic values of the region.

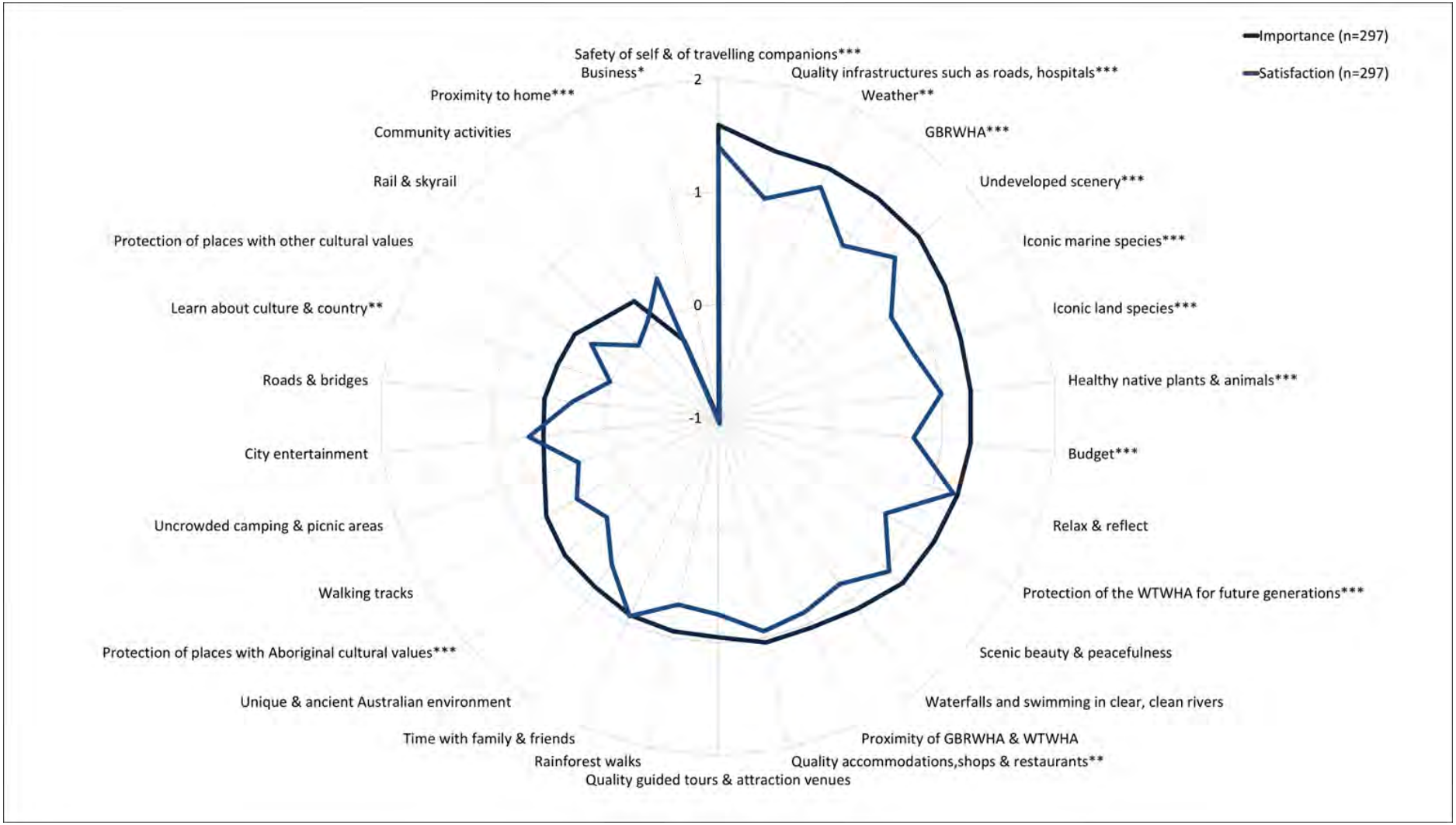



**Figure 43:** Mean importance and satisfaction scores – Tourists

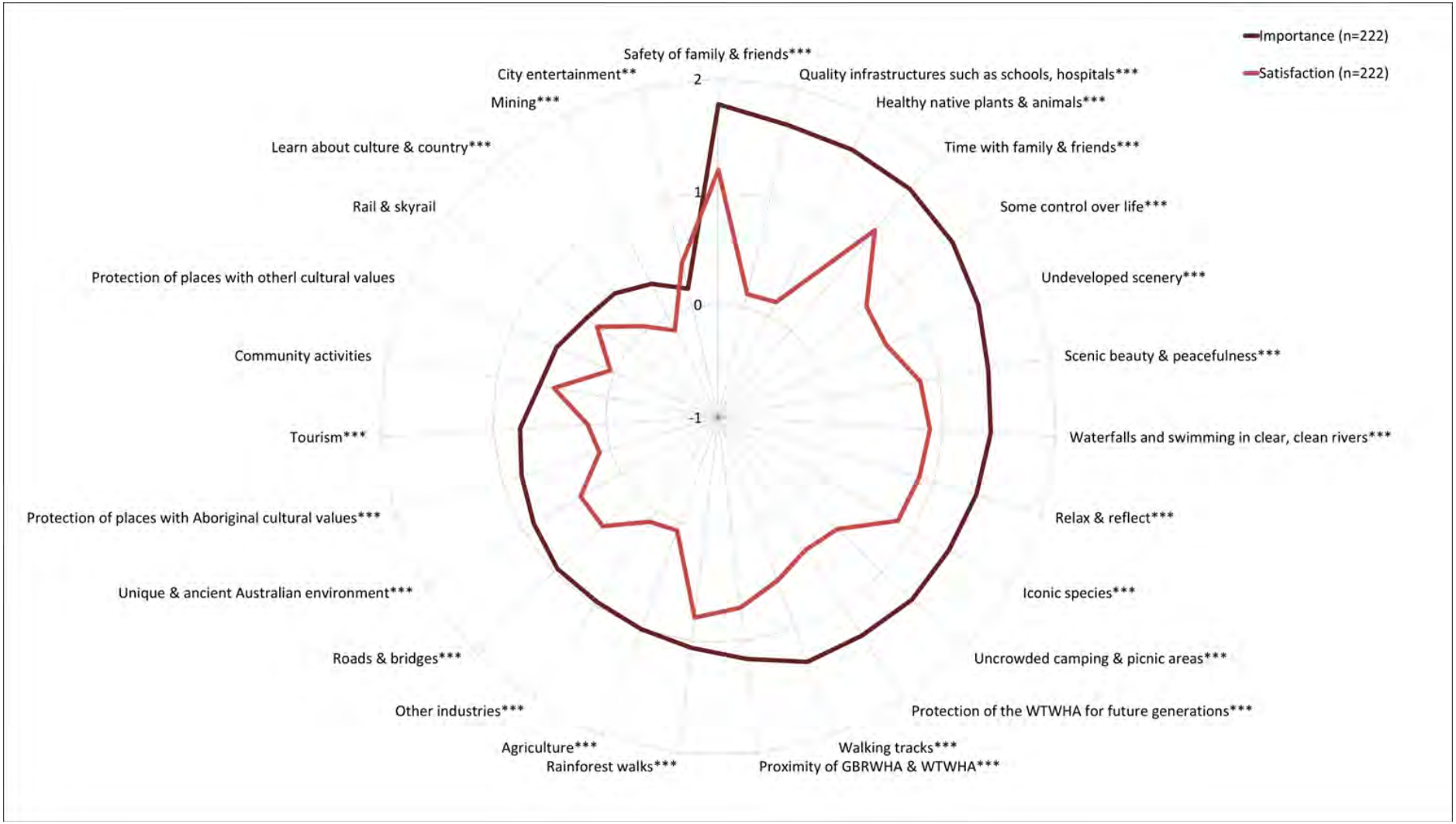



**Figure 44:** Mean importance and satisfaction scores - Non-Indigenous residents

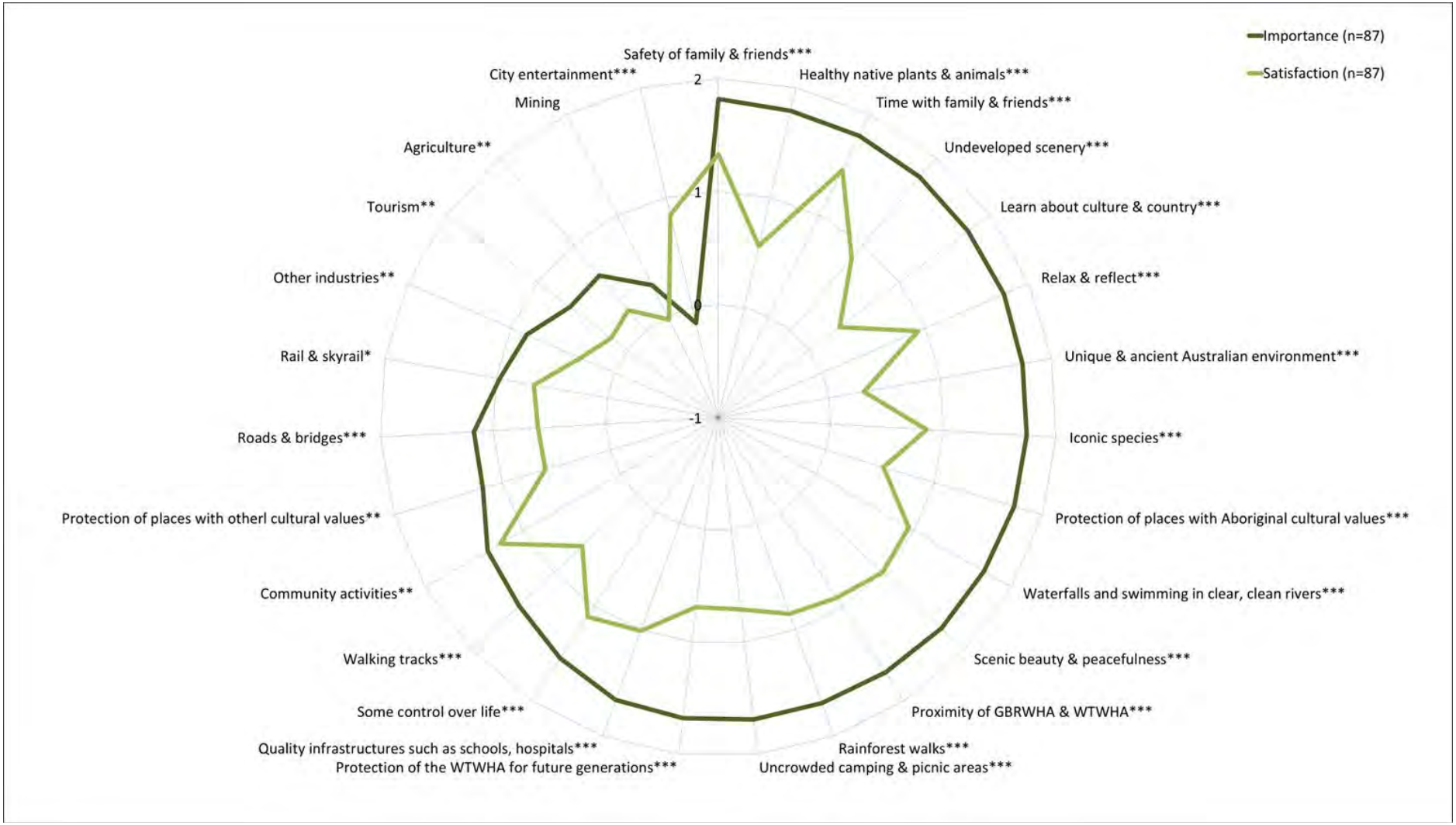



**Figure 45:** Mean importance and satisfaction scores - Rainforest Aboriginal residents

Of note, is the size of the gaps, being smaller for tourists, larger for non-indigenous residents and largest for the Rainforest Aboriginal residents (Figure 43, Figure 44 and Figure 45). There are potentially many reasons for these differences, one being varying reference points. In other words, perceptions of importance and satisfaction are highly reference dependent, which implies that people make judgements about satisfaction in terms of losses and gains compared to some reference point. The basis of evaluations is, *compared to what?* So when asked to evaluate something, most people will search for a reference point for comparison in order to ease the mental task. In the case of tourists, for example, those coming from countries where the environment is not as pristine as the WTWHA will likely be very satisfied.

For residents, however, the gaps may be bigger because they have been here longer (especially the Rainforest Aboriginals), and as such, are able to more cogently assess these values. Previous research has shown that local communities often have a deep sense of ownership and sense of place (McIntyre-Tamwoy, 2004; Carmody & Prideaux, 2008). For the Indigenous residents in particular, the Rainforest is intimately linked to their sense of identity. As highlighted by McIntyre-Tamwoy (2004), long term residents have recollections of an area based on experiential engagement of the landscape, not just on appreciation of scientific value or resource use.

Linked to the idea of reference point, and a key issue for conservation, is the concept of 'shifting baselines'. This term first came to prominence in fisheries management. It was argued that each new generation of fisheries scientists accepts a baseline (e.g. stock size, species composition) that occurred at the beginning of their careers, and uses this to evaluate changes (Pauly, 1995; Bunce et al. 2008; Ainsworth et al. 2008). Each generation the stocks decline further, however, when the careers of the next generation of scientists begin, it is the current stock that is used as the new baseline (often referred to as generational amnesia, where knowledge extinction occurs because younger generations are not aware of past biological conditions). Hence, with every new generation, the baseline 'shifts', giving rise to a gradual accommodation of the creeping disappearance of resource species and inappropriate reference points for evaluating economic losses from overfishing, or for identifying targets for rehabilitation measures (Pauly, 1995). This phenomenon not only occurs with every generation but also in individuals (referred to as personal amnesia, where knowledge extinction occurs as individuals forget their own experience) (Papworth et al. 2009). Essentially, what is viewed as 'pristine nature' by this current generation would likely be seen by the previous as 'degraded' and 'natural' by the generation to follow.

One of the biggest challenges in assessing the implications of shifting baselines is the lack of empirical evidence. Images of past (pristine) and contemporary (degraded) environments are useful tools to help illustrate the changing environments, and the addition of historical data can also prove powerful. In this study, people's perceptions of changes were not compared with actual changes taking place in the environment, nor were they compared with historical data. Although this was not of specific interest in this study, we recognise the potential need for such information in future studies. This is particularly important for the region given the likely changes in value systems as the population changes.

### *5.2.4 How are the different values related?*

The results of our PCA with Varimax rotation and Kaiser normalisation are presented in Table 3. Our 27 resident importance scores collapsed into 6 factors: the most 'important' being that associated with society; the next most important being those associated with the environment (closely associated with what economists would likely term 'non-use' values). Culture also had higher importance scores than industry. Enjoying city entertainment (city) remained separate. The order of groups values (from most to least important) generally corrobate findings from the

related study (project 10.2) of the GBRWHA; i.e. environmental 'values' are rated as being more important than industry-related values.

Our PCA analysis of the tourist data yielded 5 groups from the original 27 values (Table 6). They suggest a clear distinction between different types of visitors: some came to enjoy a very wide variety of things, some are primarily interested in experiencing culture, for some it's the safety and quality of infrastructures that matters most, while others came for the city/community entertainment or to do business. 'Local' visitors also seem to stand as a separate group.

The initial list of themes and concepts produced from the Leximancer analysis of the resident data was examined further. Similar terms used by respondents such as *job* and *work* were merged, and so were *community* and *people*; and *live*, *Live* and *living*. Others which we considered not to be concepts related to the phenomenon in question (i.e. satisfaction with overall quality of life) were not included in any further steps of the analysis (e.g. *able, plus, I'm, things, need*). The final output is illustrated in
Figure 46, highlighting 10 themes and 14 concepts. As depicted, *live* and *beautiful* were the most frequent and related concepts in the text. *Family* (represented by the bigger size of the point) had a strong connection with *work*, *friends*, *community*, and *healthy*. They appear near one another because of statements such as the following:

*"I am satisfied with my lifestyle and job, and having a healthy family"*

*"Great family, great area to live, fantastic friends, great school"*

*"Healthy, great place to live, satisfying family life"*

*"….to enjoy the pristine environment. I live in a rainforest environment, have beautiful clear water to me all the time, enjoy a beautiful natural garden…"*

*"I have access to my land and live with my elders. I learn, walk, eat culturally everyday and I love it"*

*"I like where I live, I have good family support and have an opportunity to hunt and gather as I like to do for bush tucker and medicinal plants"*

*"Live in a great community"*

*"I love the area we live in, the lifestyle it offers and the variety of wildlife in the area"*

*"We live in a little piece of paradise"*

*"I live in one of the world's most scenic areas"*

**Table 5:** Factors created using PCA on importance scores, with factor loadings – All residents

| Society | Environment | Access to nature | Culture | Industry | City |
|---|---|---|---|---|---|
| *Average Importance score for the group:* | | | | | |
| 1.72 | 1.47 | 0.97 | 0.95 | 0.71 | 0.15 |
| Friends and family being safe (.857) | Undeveloped scenery to look at (.842) | Bitumen roads (.796) | Hearing from Aboriginals about their culture (.855) | Tourism industry (.783) | Enjoying city entertainment (.655) |
| Good quality roads and hospitals (.743) | Healthy native plants and animals (.784) | Walking tracks (.664) | Preserving Indigenous culture (.784) | Importance of the mining industry (.737) | |
| Spending time with family and friends (.744) | Enjoying the scenic beauty and peacefulness (.699) | Rail and skyrail (.580) | Learning about a unique environment (.726) | Importance of agricultural industry (.858) | |
| Having 'some' control of one's life (.588) | Preserving for future generations (.720) | | Protecting other cultures (.562) | Importance of other industries (.829) | |
| | Two WHAs side by side (.725) | | Participating in community activities (.595) | | |
| | Being able to relax and reflect (.666) | | | | |
| | Iconic land species (.634) | | | | |
| | Rainforest walks (.601) | | | | |
| | Waterfalls and clear clean rivers (.538) | | | | |
| | Uncrowded camping and picnic areas (.508) | | | | |

(in brackets) = Factor loading

**Table 6:** Factors created using PCA on importance scores, with factor loadings – Tourists

| Safety | All else | Culture | City/business/ communiy | Proximity |
|---|---|---|---|---|
| | *Average importance score for the group* | | | |
| 1.40 | 1.04 | 0.70 | 0.01 | -0.13 |
| Travelling companion being safe (.988) | Being able to relax & reflect (.839) | Indigenous culture (.601) | Enjoying city entertainment (.551) | Visiting a place that is close to where I live (.459) |
| Good quality roads & hospitals (.777) | Enjoying the scenic beauty & peacefulness (.780) | Protecting other cultures (.539) | Importance of business (.435) | |
| | Waterfalls & clear clean rivers (.758) | | Participating in community activities (.412) | |
| | Iconic marine species (.741) | | | |
| | Iconic land species (.731) | | | |
| | Uncrowded camping & picnic areas (.684) | | | |
| | Good quality accommodation shops & restaurants (.681) | | | |
| | Healthy native plants & animals (.670) | | | |
| | Rainforest walks (.653) | | | |
| | Sunshine & warmth (.645) | | | |
| | Undeveloped scenery to look at (.638) | | | |
| | Two WHAs side by side (.633) | | | |
| | Importance of matching my budget (.614) | | | |
| | Good quality tours & attractions (.605) | | | |
| | Preserving for future generations (.593) | | | |
| | Importance of the GBRWHA (.567) | | | |
| | Learning about a unique environment (.557) | | | |
| | Walking tracks (.555) | | | |
| | Bitumen roads (.553) | | | |
| | Spending time with family & friends (.528) | | | |
| | Rail and skyrail (.502) | | | |
| | Hearing from Aboriginals about their culture (.480) | | | |

(in brackets) = Factor loading

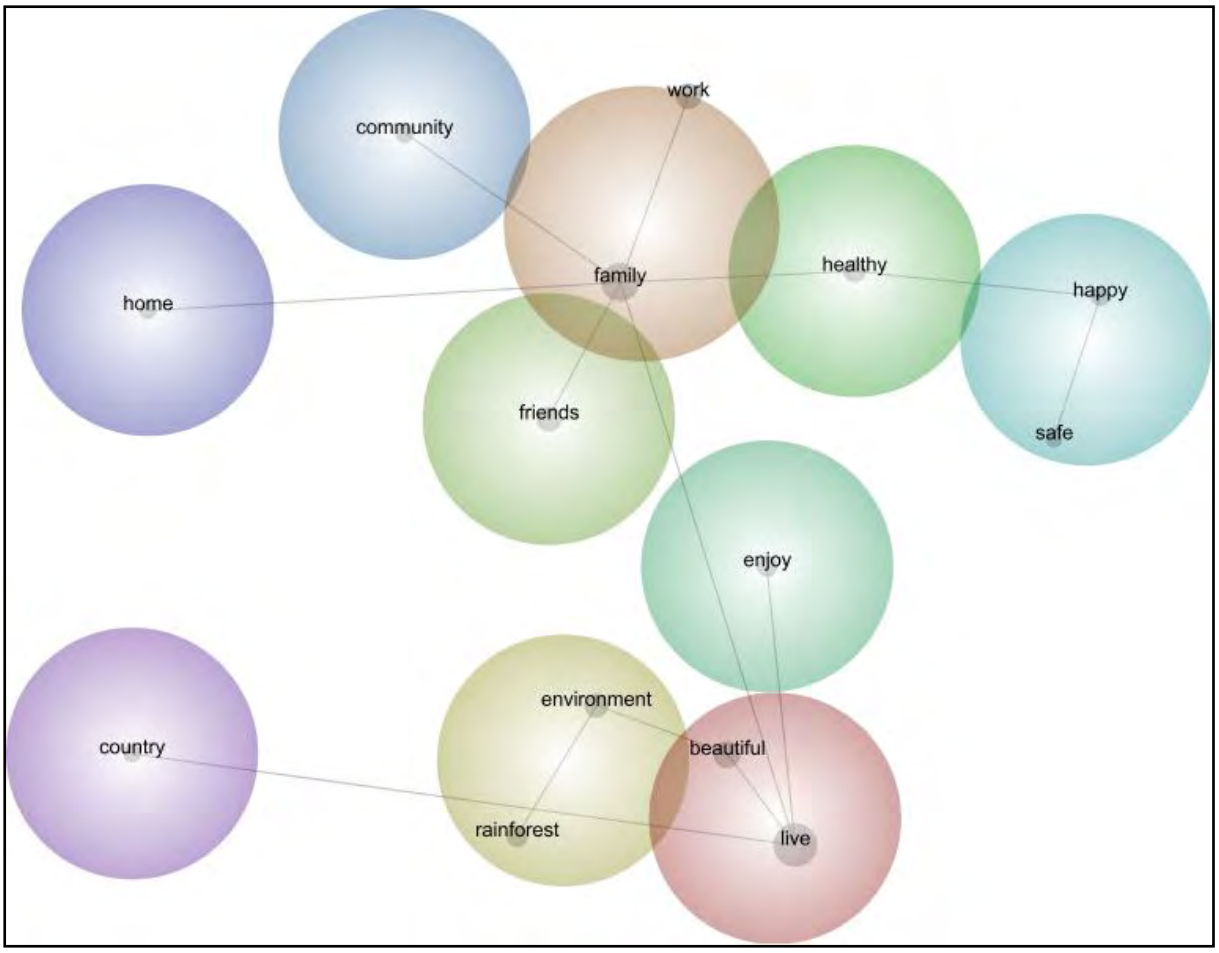



Figure 46: Concept map – Residents[8]

Other examples of the content expressed by residents which shows the links between concepts are provided below:

*"I am blessed to live in such a beautiful place and climate"*

*"Unique, special and clean environment to live in"*

*"I live in a beautiful area"*

*"We enjoy the place we live. We have fairly stable employment and are able to live comfortably, and have reasonable access to service"*

*"Work and family life are going well"*

*"I live in the community minded and inclusive area and they pull together after cylcones"*

*"I live in a very pristine environment with pure air and water, with privacy and peaceful environment"*

*"I love where I live, I have a good job, I am able to control my life"*

*"Very good area to live and bring up a family"*

*"I get to live and work in an unspoilt natural environment"*

[8] Themes and connectivity: live 100%; family 84%; environment 38%; friends 25%; healthy 20%; enjoy 14%; happy 14%; community 08%; home 07%; country 06%.

*"Life is ok. I am healthy, my children and grandchildren are healthy"*

*"Healthy and happy"*

We followed the same procedure for tourists. Similar concepts were merged (e.g. *beautiful*, *Beautiful*, *nice*, *amazing*; *WTWHA*, *rainforest*, *nature* and *environment*; *animals* and *wildlife*), and those not related to the phenomenon in question (i.e. satisfaction with overall trip) deleted (e.g. *lots*, *everything*, *trip*, *time*, *place*). The final output, as shown in
Figure 47 consisted of 10 themes and 21 concepts. *Beautiful* and *rainforest* were mentioned the most frequently and were the most strongly related concepts with others. Below are examples of tourists' views on the reasons they are satisfied with their trip, which helps explain the linkages between the different concepts.

*"Beautiful beach and rainforest"*

*"Beautiful landscape, endless amount of activities, friendly people"*

*"Beautiful nature and wildlife"*

*"It was an amazing trip"*

*"Beautiful place, nature is amazing"*

*"Beautiful place and nice people"*

*"Nice weather, good tours"*

*"Nice weather, beautiful beaches and nature"*

*"Good weather, nice rainforest trip and diving"*

*"I was satisfied with the services, accommodations and sights, facilities and tours. They measured up to the standards and expectations"*

*"It is always nice to see the environment the way it is meant to be seen all the time"*

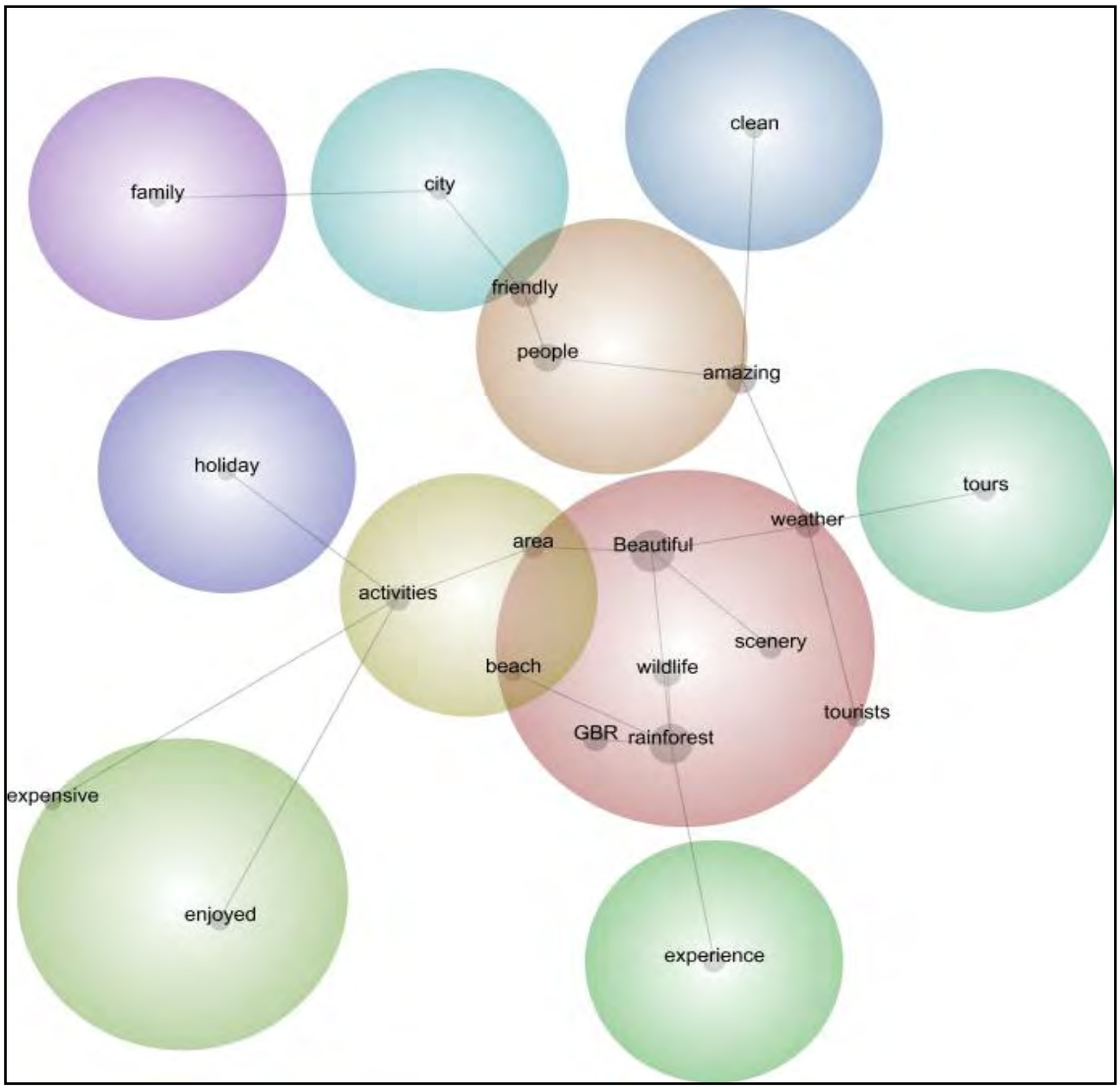



Figure 47: Concept map - Tourists[9]

### *5.2.5 Do different people 'value' different things?*

Regressing the factor scores against various socio-demographic variables revealed that different people do, as expected, consider different things to be important. Table 7 and Table 8 summarise the results. Only significant determinants are presented.

Although there was widespread agreement amongst residents that the environment is more important than industry to overall quality of life (as per the importance scores in Table 5), those employed in the mining and ports sector perceived the environment to be relatively less important than those employed in other sectors. Most socio-demographic variables were significantly correlated with scores assigned to culture: as anticipated, culture was deemed more important to Indigenous residents than to non-Indigenous residents, but males, those dependent upon agriculture for their household income, and those earning a high income

[9] Themes and connectivity: beautiful 100%; amazing 42%; activities 20%; enjoyed 06%; experience 06%; tours 06%; city 05%; clean 04%; holiday 03%; family 02%.

thought that Indigenous values were relatively less important than their respective counterparts (Table 7).

As regards tourists, there were far fewer statistically significant links between socio-demographic variables and importance scores than there were for residents (Table 8). Visitors from Queensland and males felt that safety was relatively more important as a regional draw-card than visitors from elsewhere or females. Those visiting from Germany thought that visiting somewhere close was not as important as others originating from closer to the WTWHA. Males were inclined to rate culture as less important than females.

**Table 7:** Determinants of importance of each factor – All residents

| | **Society** | **Environment** | **Access to nature** | **Culture** | **Industry** | **City** |
|---|---|---|---|---|---|---|
| | | | *Average importance score* | | | |
| | 1.72 | 1.47 | 0.97 | 0.95 | 0.71 | 0.15 |
| *Industry:* | | | | | | |
| Mining & Ports | | (-) | | | | |
| Agriculture | | | | (-) | | |
| Other industry | | | | | (-) | |
| *Demographics:* | | | | | | |
| Single | | | | | (-) | |
| Indigenous | | | | (+) | | |
| Male | | | | (-) | | |
| QLD born | (+) | | | | | (-) |
| HH Income | | | (-) | (-) | | |
| Age | | | (-) | | | |
| HH size | | | | | | (-) |

**Table 8:** Determinants of importance of each factor – Tourists

| | **Safety** | **All else** | **Culture** | **City/business/ communiy** | **Proximity** |
|---|---|---|---|---|---|
| | | | *Average importance score* | | |
| | 1.40 | 1.04 | 0.70 | 0.01 | -0.13 |
| *Origin:* | | | | | |
| QLD | (+) | | | | |
| Germany | | | | | (-) |
| *Demographics:* | | | | | |
| Male | (+) | | (-) | | |

We also regressed scores of the top 10 most important values and scores of the top 10 values residents and tourists were most satisfied with, against the socio-demographic variables (Table 9 and Table 10). Males (residents and tourists) were consistently less satisfied than their female counterparts, and the male residents attached less importance to environmental and safety values than females did. Those dependent upon the mining and agriculture industries generally perceived environmental values to be less important than others did, while those dependent upon tourism and retail, felt the environment was relatively more important than others. Visitors from Queensland (QLD) generally thought all of these top 10 values were less important than their international counterparts, and international visitors were generally more satisfied than domestic visitors.

**Table 9:** Characteristics of respondents found to have a statistically significant relationship with the 'importance' scores given to top ten benefits – Residents

| Top 10 scores | Male | Single | Age | Education | QLD born | Indigenous | HH size | Government | Agriculture | Mining & Ports | Retail & Tourism |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Importance of:* | | | | | | | | | | | |
| friends & family being safe | | | | | | (+) | | (-) | (-) | (-) | |
| spending time with family & friends | (-) | | | (-) | | | | | (-) | (-) | |
| good quality roads & hospitals | | (-) | | (-) | | | | | | | |
| healthy native plants & animals | | (-) | | | | (+) | | (-) | (-) | (-) | |
| having 'some' control of one's life | | | | | | | | | (-) | (-) | |
| undeveloped scenery to look at | (-) | (-) | | | | | | | (-) | (-) | (+) |
| enjoying the scenic beauty & peacefulness | | | | | | (+) | | | (-) | (-) | (+) |
| iconic land species | (-) | | | | | (+) | | | (-) | (-) | |
| waterfalls & clear clean rivers | (-) | (-) | (-) | | (+) | | | | (-) | | (+) |
| being able to relax & reflect | (-) | (-) | | | | | | | (-) | (-) | (+) |
| *Satisfaction with:* | | | | | | | | | | | |
| spending time with family & friends | (-) | | | | | | (-) | | (-) | | (-) |
| the safety of family & friends | | | | | | | | | | (-) | |
| scenic beauty & peacefulness | | | | | | | (-) | | | (-) | |
| waterfalls & clear clean rivers | | | | | | | | (+) | | | (+) |
| relaxation & reflection | (-) | | | | | | (-) | | | | |
| having 'some' control of one's life | | | | | | | | | | | |
| iconic land species | | | (+) | | | | | | | | |
| rainforest walks | (-) | | | | | | (-) | | | | |
| community | | | | | | | | | | | |
| undeveloped scenery to look at | | (-) | (+) | | | | | (+) | | | |

**Table 10:** Characteristics of respondents found to have a statistically significant relationship with the 'importance' scores given to top ten benefits – Tourists

| Top 10 scores | Single | Age | Education | HH Income | QLD | HH size | Asia | Germany | UK | Rest of Europe | North America |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Importance of:* | | | | | | | | | | | |
| travelling companions being safe | | | | | (-) | | | | | (-) | |
| undeveloped scenery to look at | | | | | (-) | | (-) | | | | |
| weather | | | | (-) | | | (-) | (+) | | | |
| good quality roads & hospitals | | | | | (-) | | | | | (-) | |
| the GBRWHA | | | | (-) | | | | (+) | (+) | (+) | (+) |
| matching my budget | | (-) | | | (-) | | | | | | |
| iconic marine species | | | | (-) | (-) | | | | (+) | | (+) |
| iconic land species | | (-) | | (-) | | | | (+) | (+) | (+) | |
| healthy native plants & animals | | (+) | | | (-) | | | | | | |
| being able to relax & reflect | | | | (-) | | | | | | | |
| *Satisfaction with:* | | | | | | | | | | | |
| the safety of travelling companions | (-) | | | | | | | | | | (+) |
| weather | | | | | | | | (+) | | | |
| relaxation & reflection | (-) | | | (-) | | | | | | | |
| undeveloped scenery | | | | (-) | | | (-) | | | | |
| overall experience in GBRWHA | | | | | | | (-) | | | | |
| scenery | (-) | | | | | | | | | | (+) |
| quality of roads & hospitals | (-) | | | | (-) | | | | | | (+) |
| native flora & fauna | (-) | | | (-) | | | (-) | | | | |
| the GBRWHA | (-) | | (-) | (-) | | | | | (+) | | (+) |
| friends & family | (-) | (-) | | (-) | | | (-) | (-) | (-) | | |

We then focused on the importance of the 4 values linked to the key management priorities for the Area: having healthy native plants and animals; visiting waterfalls &/or swimming in clear, clean rivers, streams & waterholes; having beautiful undeveloped scenery to look at; and protecting places that have aboriginal cultural values. The complete sets of results from the OLS regressions for all 4 values are provided in Appendix 6. Column 2 of Table 11 shows coefficients from the model that looked at the importance of 'having healthy native plants and animals' to illustrate how coefficients were used to generate predicted values for different groups of people. Column 3 of Table 11 shows the 'mean' value of each variable from the model (e.g. the mean age of respondents in this model was 50.65 years. To generate a (mean) predicted importance score across all respondents (in this case, 1.75) we simply multiplied each coefficient, by each respective mean and added. To generate different predicted importance scores for Indigenous residents, we did not use the 'mean' value of Indigenous (0.32); instead setting that variable to 1. For non-Indigenous residents, it was set to 0. Similar approaches were taken to generate predicted importance scores for residents associated with different industries.

**Table 11:** Results from the OLS regression – the importance of having healthy native plants and animals

| | **Having healthy native plants and animals** | | |
|---|---|---|---|
| | Coefficient from OLS regression | Mean of variable | Coefficient multiplied by mean of variable |
| Male | -0.10 | 0.40 | -0.04 |
| Single | -0.14* | 0.25 | -0.04 |
| Born QLD | -0.02 | 0.63 | -0.01 |
| Education | 0.00 | 3.37 | -0.01 |
| Ln(HHIncome) | -0.03 | 10.73 | -0.30 |
| Age | 0.00 | 50.65 | 0.05 |
| HH size | 0.00 | 2.79 | -0.01 |
| Retail & Tourism | 0.10 | 0.12 | 0.01 |
| Government | -0.12* | 0.32 | -0.04 |
| Agriculture | -0.31*** | 0.12 | -0.04 |
| Mining & Ports | -0.47*** | 0.07 | -0.03 |
| Indigenous | 0.15* | 0.32 | 0.05 |
| Constant | 2.13 | 1.00 | 2.13 |
| Overall predicted value | | | 1.73 |

***significant at 10% level, ** significant at 5% level, and *** significant at 1% level***

Figure 48 presents these different 'predicted values' for different groups of residents, and for the 4 different values. It clearly highlights the fact that different groups of people do have different 'values', the implication being that changes to the demographic composition of the resident population will likely be associated with changes in value. It is, for example, evident that environmental and cultural values are more important to the overall quality of life of Indigenous residents than they are to non-Indigenous residents; and that those dependent upon mining, manufacturing or agriculture, feel that environmental and cultural values are less important than those dependent upon tourism.

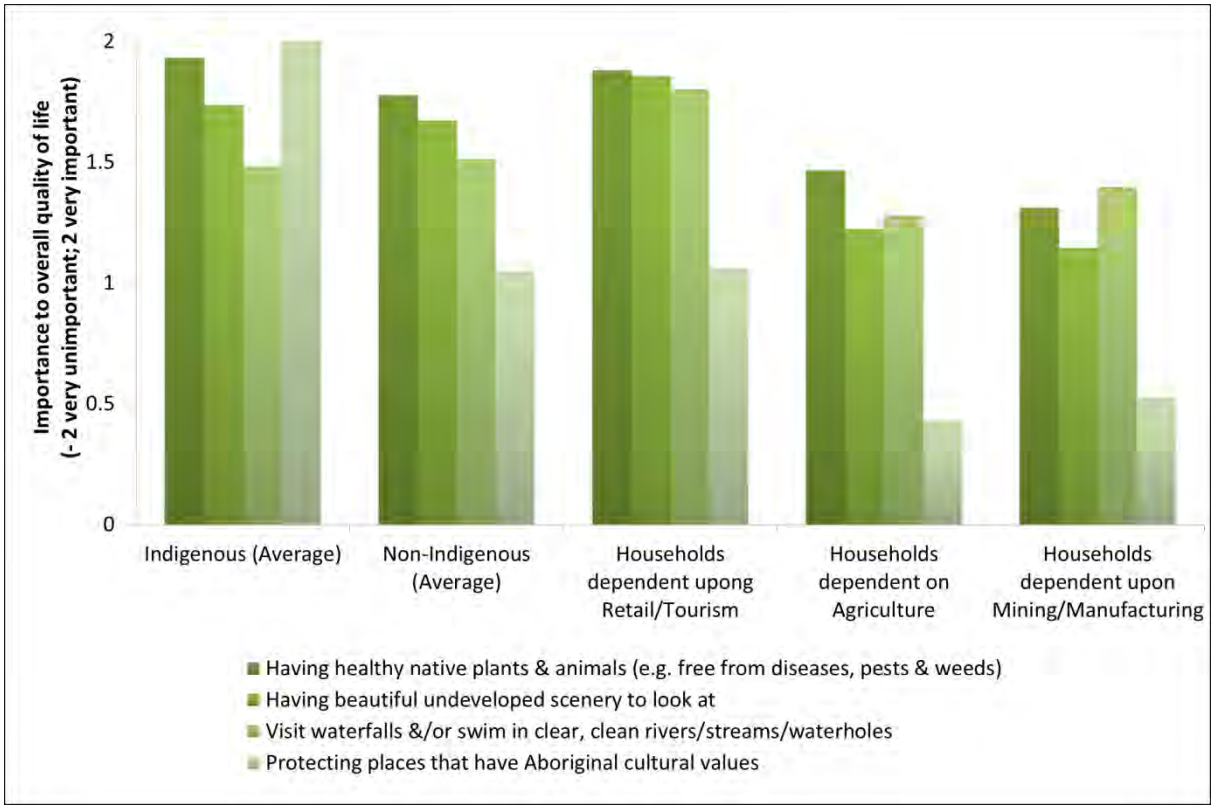
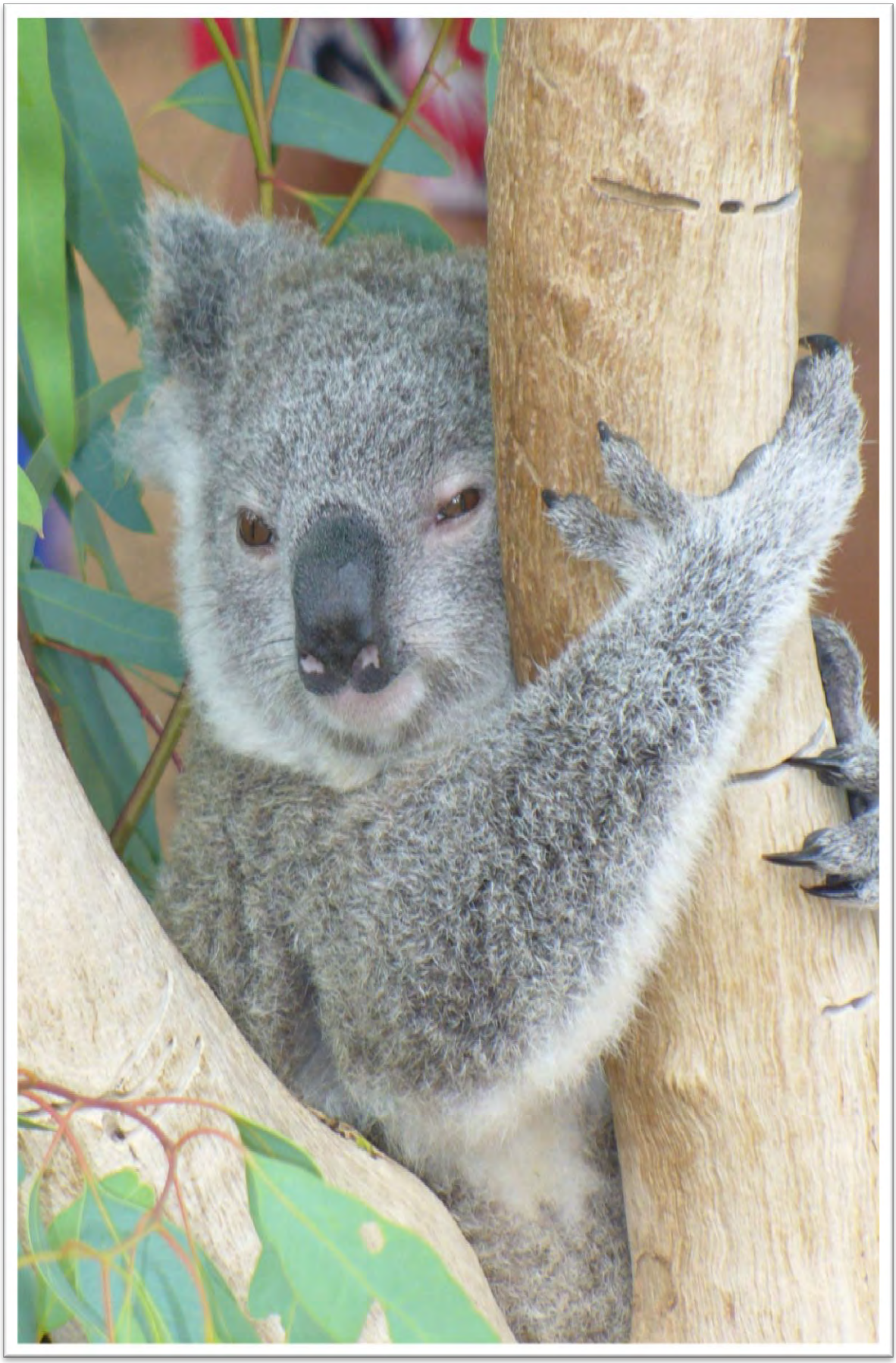



**Figure 48:** Predicted values for the importance of key ES to the overall quality of life of residents – differentiated by Indigeneity, and by Industry of association
(Controlling for other demographic differences such as income and gender)



© Marina Farr

# 6 The 'marginal' value of various ecosystem services in the WTWHA

## 6.1 Some more methodological background

As noted in section 3.2.3, we also decided to assess marginal values by asking about (a) people's willingness to pay (WTP) to help improve various ecosystem services (ES); and about (b) their likely reaction to changes in various ES. Further details are given below.

### 6.1.1 People's WTP to help improve various ES (contingent valuation)

Contingent Valuation (CV) studies often ask people to indicate how much they are willing to pay to prevent/minise a change; although sometimes respondents are asked about their willingness to accept (WTA) compensation for forgoing the benefits (WCPA, 1998). These approaches rely on 'individual responses to contingent circumstances' rather than inferring them from observed behaviours in the marketplace (Dharmaratne & Brathwaite, 1998; Greiner & Rolfe, 2003). They are thus considered to be a type of stated preference valuation method (Figure 15). Since stated preference methods create an hypothetical marketplace in which no actual transactions are made, they can be used to assess the 'value' of goods and services which are not regularly exchanged in markets, or for which it is difficult to observe market transactions under desired conditions (Bateman et al. 2002; Esparon et al. 2013; Farr et al. 2014). As such, stated preference approaches are ideally suited to this study, where the values being impacted by the change (i.e. environment and culture) are not associated with the market. We chose to ask about WTP, rather than WTA.

Like all valuation techniques, CV is imperfect. Of note, is its ability to generate inflated estimates of 'value' (Greiner & Rolfe, 2004) thus leading some researchers to question its reliability (e.g. Hausman, 1992; Diamond & Huasman, 1994). Nonetheless, Duffield & Patterson (1991) argue that the differences between real (i.e. observed) WTP and stated WTP estimates are negligible and predictable enough and a wide panel of experts associated with the National Oceanic and Atmospheric Administration (NOAA) support this conclusion (Arrow et al. 1993, p.3). That said, it is clearly important to remember, and where possible control for, issues such as hypothetical response bias.

When conducting a CV study, valuation questions can be constructed in several ways, the most common being: the open-ended (OE) (basically asking people how much they are willing to pay); dichotomous choice (DC) (e.g. referendums, asking respondents to say yes or no to a question about whether they would be willing to pay $x); and payment card (PC) approaches (where respondents are provided a list of dollar values and asked to select their maximum WTP). Many researchers – e.g. Kealy and Turner (1993) and Ready et al. (1995) – have found that the different question formats generate different WTP estimates.

In the OE approach, participants are essentially being asked to put dollar values on environmental goods or services. But this method has been subject to criticism in its ability to deliver reliable and accurate estimates of WTP. This is because it may be very difficult for respondents to come up with their true maximum WTP 'out of the blue' for a change they are unfamiliar with or have never thought about valuing before (Bateman et al. 2002, p. 138). Hence, OE studies often have large non-response rates and protest answers.

The DC format is simple for respondents hence minimising strategic responses (Hoehn & Randall, 1989) but it can induce anchoring effects (Halvorsen & Soelensminde, 1998) and starting point bias (Holmes & Kramer, 1995, Herriges & Shogren, 1996, McFadden, 1994).

Moreover, empirical investigations need large samples to generate robust models which can be statistically complicated (Cooper & Loomis, 1992; Hanemann, 1989; Cameron & Huppert, 1989). However, the format has been endorsed by NOAA and found to be superior to the OE approach (Arrow et al, 1993; McCollum & Boyle, 2005). That said, there is evidence to suggest that the DC approach can, in some instances, over-estimate WTP variance (Boyle et al, 1996; Hanley et al, 1998), and also mean and median WTP estimates (Boyle et al, 1996; Kristrom, 1997; Welsh & Poe, 1998) – partially because of 'yah-saying' tendencies on the part of respondents.

The payment card (PC) question format gets around the problem of 'yah-saying' by providing respondents with an ordered range of threshold values starting at $0. Participants are asked to circle the highest amount they are willing to pay (Campbell & Luckert, 2002; Loomis & Ekstrand, 1997), and their true valuation point is assumed to lie 'somewhere in the interval between the circled value and the next option' (Hakansson, 2008, pg 176). The PC approach avoids the starting point bias that can occur in traditional bidding applications (Mitchell & Carson, 1989) and allows participants to consider a range of possible WTP bids that represent the participants maximum WTP. As such it lowers effort on the part of the respondent, since even a fairly detailed set of thresholds can be visually scanned quite quickly, and there is no need for prompting by an interviewer (Cameron & Huppert, 1989). As such, the PC approach avoids the high rate of non-response often observed in empirical DC and OE studies. Reaves et al. (1999), for example, found that the rate of protest responses for the PC format was significantly lower than in a DC format. It can, however, suffer from both interval and anchoring effects (Farr et al, 2013; Green et al, 1998).

Based on the above, the PC approach was adopted in this study and care was taken to mininise both the internal and anchoring effects. Specifically, we varied the bid-range presented to respondents - ranging from $500 as the highest value, to $750, $1000 and $2000 (and thus larger interval sizes):

A: $0 $2 $5 $10 $25 $30 $50 $75 $100 $250 $500
B: $0 $5 $10 $20 $30 $50 $75 $100 $250 $500 $750
C: $0 $5 $10 $20 $30 $50 $75 $100 $250 $500 $1000
D: $0 $5 $10 $25 $50 $75 $100 $250 $500 $1000 $2000

Both residents and tourists were asked to indicate how much they would be willing to pay to help 'fix' various threats to the rainforest. Residents were asked how much they would be willing to donate annually (Figure 49); tourists were asked on a per-trip basis. All four 'issues' presented to respondents were those identified as key priority issues for the management of the Area by key stakeholders during the initial stages of the study.

**8. The rainforests of the Wet Tropics faces many threats. Some of these are beyond our control (e.g. cyclones), but not all. For example, we could choose to spend more money controlling pests and less on something else. If a fund was set up to help solve the problems listed below, what is the maximum amount (out of your total household income) you would be willing to donate each and every year to that fund?** (You could ask for the money to be deducted from your wages/salary/pension, or pay it as a lump sum once a year.)

When answering, please consider your household's current financial situation and also consider how much all your donations add up to if donating to more than one problem. *(Tick one box in each row)*

| | Money willing to donate EACH YEAR | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $0 | $2 | $5 | $10 | $25 | $30 | $50 | $75 | $100 | $250 | $500 | More than $500 |
| Protecting native plants and animals from weeds & pests | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ How much? $--------- |
| Improving/maintaining undeveloped scenic beauty & peacefulness of the area | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ How much? $--------- |
| Improving/maintaining quality & clarity of rivers & streams | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ How much? $--------- |
| Protecting the Aboriginal cultural values of the area | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ How much? $--------- |

**Figure 49:** Excerpt of survey question to determine response to WTP – Resident survey

Previous research highlights the fact that the way in which people respond to questions such as these can be 'clouded' by the fact that we are asking about WTP for public goods (i.e. goods which, once made available by just one person, is freely available to all). As such, respondents are being asked to pay not only for something that will benefit them personally, but for something that will benefit others (who might have refused to pay). Consequently, the amount of money elicited in CV surveys reflects not only the benefit respondents attribute to the good or service being assessed, but also the degree to which they find it just, that they should pay for someone's benefit, and the perceived fairness of the payment (Ajzen et al. 2000; Schroder & Mieg, 2008; Farr et al. 2014). People who believe that they are not the only ones required to pay for a public good 'are more likely to be willing to pay, as compared to individuals who do not believe in other people's payments' (Liebe et al. 2011, p 110; Ostrom, 2000).

To capture these types of effects, we thus also asked respondents to indicate the extent to which they agreed/disagreed with each of the following statements (assessed on a 5-point Likert scale):

1) I am not prepared to pay unless all WTWHA users pay too;
2) Only people who live near or visit the WTWHA should care for it; and
3) I am not prepared to pay unless all Australians pay too.

Along with the statements above, we also added others to further understand the altruistic nature of respondents:

4) I am willing to volunteer my time to care for the WTWHA;
5) The WTWHA should be preserved for its own sake; and
6) Efforts are a waste of time in the face of natural disasters and climate change.

Previous research has also highlighted that different people are willing to pay different amounts for environmental goods and services. For the most part, studies find that females are likely to be willing to pay more than males due to their stronger environmental attitudes and behaviour (e.g. Diamantopoulos et al. 2003; Vaske et al. 2001, Esparon et al. 2013, Farr et al. 2014). Other demographic characteristics that have been identified as determinants of WTP include income, education, age, and origin. Of these, income seems to be the most prominent – afterall, WTP is underpinned by the ability to pay, and ability to pay is a function of income. We thus used the hurdle model to look at determinants of WTP. The hurdle model is appropriate because analysis is done in two steps. First it simply divides respondents into two groups, those who are not willing to pay anything at all, and those who are willing to pay something. It

identifies characteristics of respondents that are most/least likely to fall in to one of those two categories. Second, it focuses on only those who are willing to pay something, and identifies characteristics of those willing to pay most/least. We then used the coefficients from those models to generate estimates of the predicted value of WTP for tourists of different origin, the aim being to determine just how significant such differences were.

### *6.1.2 People's stated response to various hypothetical scenarios (contingent behaviour)*

The relative importance of key WTWHA-based values can also be understood by examining how people might be impacted by a particular change or management decisions. In an ideal situation, one would investigate these changes by collecting data before and after a change occurs, measuring how that change impacted values. Such a process, however, is 'data-hungry' and time consuming, requiring that data be collected over a long time period and across different regions. Such data were unavailable, so we have instead used insights from the contingent behaviour (CB) literature to develop questions that supplement those elsewhere in the survey, and which test the likely reaction of respondents to a series of hypothetical senarios.

CB studies are closely related to CV studies. Simplistically, CV studies ask people how much they are willing to pay for a (hypothetical) good or service (or for a hypothetical change in the quality or availabillty of a good or service). In contrast, CB studies ask people how much they would be willing to buy (i.e. how their behaviour would change) following a (hypothetical) change in the price, quality or availability of a good or service (Morton et al. 1995; Englin & Cameron 1996; Grijalva et al. 2002). Some researchers feel that CB studies are more reliable than CV studies because people are better able to predict what they would do in a particular situation, than to predict how much they would pay (Morton et al. 1995; Englin & Cameron 1996; Grijalva et al. 2002). In short, CB questions more closely mimic actual shopping decisions in most western worlds, whereby consumers are presented with a product and its price, and then choose how much to buy (if at all).

We designed 12 hypothetical scenarios based on the items listed in Figure 14 (those focusing on 'changes' and issues confronting regional managers and decision makers). For each scenario, we asked residents how each change would affect their overall quality of life using a 5-point Likert scale (Figure 50). We asked tourists how each change would have affected their decision to visit the WTWHA (Figure 51). Importantly, we included a question about the way in which a 20% increase in local prices would affect people, providing us with a 'market' based change with which to compare / benchmark other responses. This has proven to be an effective way of providing extra information to facilitate meaningful interpretation of responses to hypothetical questions such as these (Mustika et al. forthcoming).

| | I would be much more satisfied | | | I would be much less satisfied | | I do not know |
|---|---|---|---|---|---|---|
| If local prices rose by 20% compared to other places in Australia | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ |
| If there were twice as much rubbish (e.g. bottles, plastic) in the rainforest & in the rivers | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ |
| If there was half as much chance of seeing an iconic animal (e.g. cassowary, kangaroo, rifle birds, musky-rat kangaroo) | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ |

**Figure 50:** Excerpt of survey question to determine response to 'changes' in values – Resident survey

| | POSITIVE IMPACT I may have stayed longer | ALMOST NO IMPACT This would not have affected my decision at all | SOME IMPACT I would have still visited but reduced the length of my stay by about | | | HUGE NEGATIVE IMPACT I would not have come at all | I do not know |
|---|---|---|---|---|---|---|---|
| | | | 25% | 50% | 75% | | |
| If local prices rose by 20% compared to other places in Australia | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ |
| If there were twice as much rubbish (e.g. bottles, plastic) in the rainforest & in the rivers | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ |
| If there was half as much chance of seeing an iconic animal (e.g. cassowary, kangaroo, rifle birds) | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ |

**Figure 51:** Excerpt of survey question to determine response to 'changes' in values – Tourist survey

Here too, we used regression to look for statistically significant relationships between various socio-economic and demographic descriptors of people and their stated responses to these hypothetical scenarios, looking also, at which residents would be most impacted and which visitors will the region lose, if there were deteriorations in these values.

## 6.2 Results and analysis

### 6.2.1 Are people willing to pay to help improve the things they value most?

Our previous results have shown that people perceive environmental and cultural values as vital contributors to their overall quality of life and as a reason for coming to this region. The question asked here, is whether people are willing to pay to help protect the things they claim to value most.

The answer, for a relatively large % of respondents is "No". Almost 20% of Indigenous respondents were unwilling to contribute any amount of money to protect Aboriginal culture or prevent weeds and pests from evading the native flora and flora (Figure 52), despite these values being in the top 5 of most important contributors to their overall quality of life. The (un) willing rate was even higher amongst non-Indigenous residents: between 30% and 50% indicating that they would not be willing to pay anything at all to improve things which they themselves had indicated were vitally important to their overall quality of life (Figure 53).

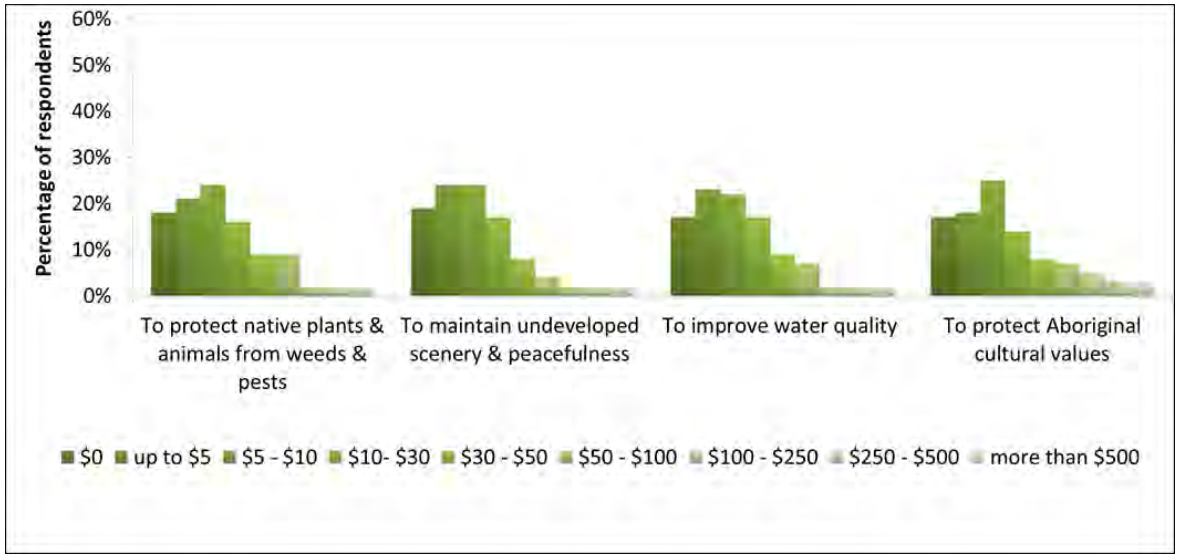



**Figure 52:** Distribution of Indigenous resident to questions about WTP (per annum) to improve various environmental and cultural values

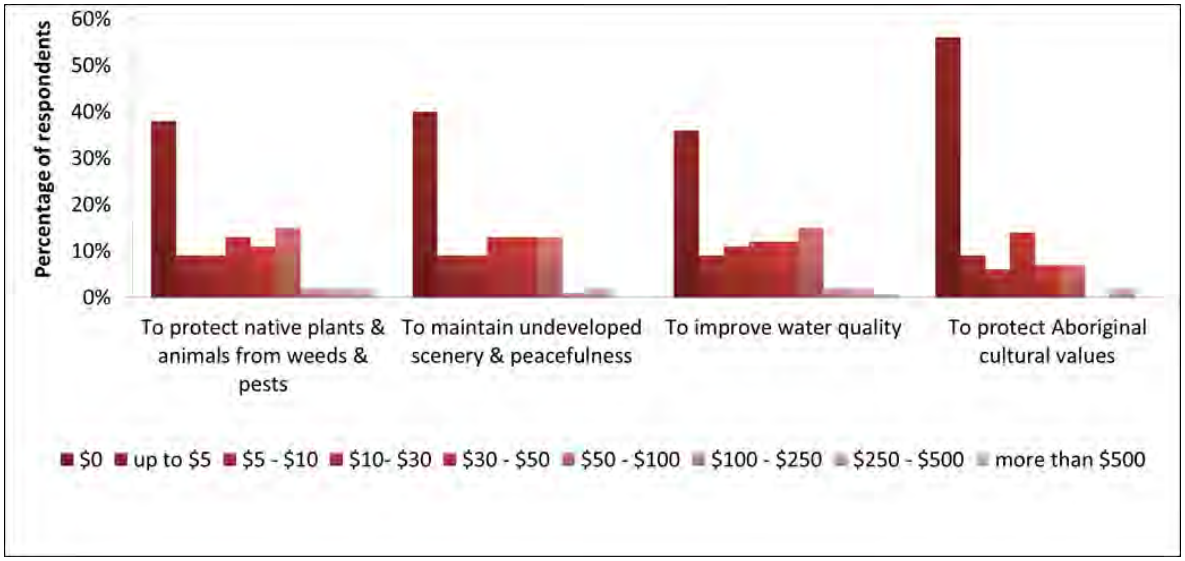



**Figure 53:** Distribution of non-Indigenous resident responses to questions about WTP (per annum) to improve various enviornmental and cultural values

More than a quarter of tourists (31%) were not willing to pay any money towards the maintenance of undeveloped scenery and peacefulness of the area, despite earlier comments about the 'importance' of this in their decision to visit the region (note that the maintenance of undeveloped scenery and peacefulness of the area was ranked the second most important factor on this trip). Thirty-nine percent of our tourist sample was not willing to pay any amount towards the protection of Aboriginal culture (Figure 54).