Journal of Environmental Management 117 (2013) 226–234

Contents lists available at SciVerse ScienceDirect

Journal of Environmental Management

journal homepage: www.elsevier.com/locate/jenvman

Sense of place as a determinant of people's attitudes towards the environment: Implications for natural resources management and planning in the Great Barrier Reef, Australia

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ARTICLE INFO

Article history:
Received 21 February 2012
Received in revised form
14 November 2012
Accepted 23 November 2012
Available online 31 January 2013

Keywords:
Coastal planning
Place attachment
Wellbeing
Biodiversity
Natural resources management
Great Barrier Reef

ABSTRACT

Integrating people's values and perceptions into planning is essential for the successful management of natural resources. However, successful implementation of natural resources management decisions on the ground is a complex task, which requires a comprehensive understanding of a system's social and ecological linkages. This paper investigates the relationship between sense of place and people's attitudes towards their natural environment. Sense of place contributes towards shaping peoples' beliefs, values and commitments. Here, we set out to explore how these theoretical contributions can be operationalized for natural resources management planning in the Great Barrier Reef region of Australia. We hypothesise that the region's diverse range of natural resources, conservation values and management pressures might be reflected in people's attachment to place. To tests this proposition, variables capturing socio-demographics, personal wellbeing and a potential for sense of place were collected via mail-out survey of 372 residents of the region, and tested for relationships using multivariate regression and redundancy orientation analyses. Results indicate that place of residence within the region, involvement in community activities, country of birth and the length of time respondents lived in the region are important determinants of the values assigned to factors related to the natural environment. This type of information is readily available from National Census and thus could be incorporated into the planning of community engagement strategies early in the natural resources management planning process. A better understanding of the characteristics that allow sense of place meanings to develop can facilitate a better understanding of people's perceptions towards environmental and biodiversity issues. We suggest that the insights gained from this study can benefit environmental decision making and planning in the Great Barrier Reef region; and that sense of place is a concept worthy of further investigation elsewhere.

1. Introduction

Recent accelerating rates of species extinctions are linked to human actions (Pimm et al., 1995; Graham et al., 2011), hence, efforts to conserve what remains of biodiversity, and to manage natural resources sustainably, are increasing (SCBD, 2008; Fischer, 2010). Conservation and natural resources management (NRM) planning may provide an effective tool for identifying comprehensive, adequate, and representative regions (Raymond and Brown, 2006; Pressey et al., 2007; Pressey and Bottrill, 2008). Biological and ecological considerations have routinely been the basis of conservation and NRM plans; however, planners and practitioners are now recognizing the importance of prioritizing other aspects of the social-ecological system to achieve successful outcomes (Sarkar and Margules, 2002; Brown and Raymond, 2007; Wallace, 2007; McDonald, 2009). For example, it is recognised that conservation and management objectives should be set in the relevant socio-political context (Wilson et al., 2009), consider the full range of associated costs (Polasky, 2008), incorporate information on ecosystem service priorities (Raudsepp-Hearne et al., 2010) and integrate individuals' values and preferences into the planning process (Larson, 2010a). A sense of place concept may present an opportunity for incorporating these values.

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0301-4797/$ – see front matter © 2012 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.jenvman.2012.11.035

Structured approaches, such as systematic conservation planning, sustainable natural resources management, or integrated catchment management, attempt to integrate environmental, social and economic characteristics to find a balance between ecological sustainability and improved human wellbeing (Larson, 2011). Key stages of such processes incorporate stakeholder involvement with the double aim of ensuring that there is sufficient "buy-in" from the relevant communities and thus support for planning outcomes, and that plans meet wider social and economic objectives. Although the values individuals' hold influence and are influenced by management (Hicks et al., 2009), the inclusion of multiple perspectives remains problematic and has consequently only occasionally been accounted for in the planning processes (Kaltenborn, 1998; Brown et al., 2004). One difficulty is that well-being, priorities and values are inherently complex, subjective qualities that are associated with individuals' experiences and meanings rather than being spatially explicit (Kaltenborn, 1998; Bott et al., 2003; Brown et al., 2004). However, individuals can ascribe values and meanings to specific places in which case they possess a sense of place (Davenport and Anderson, 2005). Meanings, associated with a particular place can therefore provide an opportunity to attach site-specific values to subjective perceptions (Brown, 2005). A better understanding of the relationship between place meanings and the values individuals assign to the natural environment may help managers and practitioners find better ways to address, identify and engage residents in conservation and NRM planning processes (Bott et al., 2003).

Therefore, in this paper we investigate the relationships between the values individuals assign to the natural environment and personal attributes associated with the development of place based meanings. We then discuss the implications of this relationship, that is, how linking residents place based attributes with an understanding of what they value the most could guide planners and managers to develop context specific approaches and thus increase support for conservation and natural resources management planning. This understanding can aid us in creating better awareness and communication campaigns and might be reflected in increased commitment, involvement and implementation of natural resources management efforts.

1.1. Sense of place

People develop and construct meanings and identities through their experiences with places (Harvey, 2001). Places are therefore directly experienced phenomena of the lived world, rather than abstractions (Graham et al., 2009). The meanings and identities associated with places may derive from the natural environment, but are more often made up of a mix of natural and cultural features in the landscape, and include people. Places therefore, in addition to their physical setting, include a range of human activities; social and psychological processes (Gieryn, 2000; Stedman, 2002); meanings; and values (Cheung et al., 2003; Sampson and Goodrich, 2009). Researchers conceptualise the complex connections between individuals and the environments they encounter as 'sense of place' (Williams and Stewart, 1998; Davenport and Anderson, 2005), creating a powerful medium for framing the relationship between people, place and events. By recognising that people are part of the ecosystem – and *vice versa*, sense of place has the potential to bridge the gap between the science of ecosystems and their management (Eisenhauer et al., 2000). In Europe for example, policy protects or creates new sites as part of a cultural landscape ensuring the attachment to place persists (McDonald, 2009). Similarly, Walker and Ryan (2008) found that place attachment strongly influenced residents' willingness to engage in conservation and land use planning strategies in America. Conservation initiatives therefore have the potential to build on existing, or create new, sense of place identities.

A number of disciplines have explored sense of place which has led to the use and development of a diversity of approaches, concepts, and methods. Some academics consider the diversity of approaches to have generated a chaotic literature (Jorgensen and Steadman, 2001), with incoherent concepts (Stedman, 2003), that "resists any precise definition …or consensus on what the concept should contain, how it should be constructed, or measured" (Kaltenborn, 1998, p172). Social anthropology, environmental and social psychology, and human geography represent three of the most divergent disciplines addressing this topic (Graham et al., 2009). Anthropologists are interested in the complex nature of places in daily, lived experience and examine these relationships through records of people's daily interactions. Human geographers approach place through experience but are keen to allow people to describe the importance of place to them. Environmental and social psychology, built on human geography's view of sense of place, have sought to turn these ideas into indicators which can then be explored quantitatively and produce positivist knowledge. A division exists between 'sense of place' as a highly qualitative, complex and involved concept that cannot be reduced to a quantitative calculation (Geertz, 1996); and 'sense of place' composed of place attachment, place dependence and place identity, that can be broken down and measured along a scale (Shamai and Ilatov, 2005). Although we see great value in continued research along both conceptualisations of sense of place, including how they may complement one another, it is not the intention of this paper to add to this discussion beyond recognising the depth and divergence of meanings ascribed to sense of place.

A variety of indicators have been developed to capture the multidimensional character of sense of place (Walker and Ryan, 2008) and although these indicators are gaining acceptance through testing, they remain complex and costly to collect. Furthermore, sense of place is ultimately about the meanings and connections individuals develop, and full examination of sense of place should therefore qualitatively, and quantitatively, explore these connections. However, we can identify conditions that enable individuals to develop a sense of place. Where these conditions are present, there is a potential for a deeper connection to place. For example, because individuals develop connections and meanings over time, the length of time they have spent in a place is likely to influence their sense of place (Giuliani and Feldman, 1993; Hay, 1998; Stedman, 2003; Brown and Raymond, 2007). However, sense of place also develops through the social connections and interactions people have in a place. Social cohesion, civil participation (Lewicka, 2005; Livingston et al., 2008), local ancestry (Hay, 1998; Stedman, 2003; Brown and Raymond, 2007), and perceived insider status (Kaltenborn, 1998; Hay, 1998) are therefore likely to influence the connections and meanings people develop through the time they spend in a place. Based on these relationships we identified seven variables that help develop the meanings associated with sense of place: length of time a person stays in a place; location of residence; where they were born; community involvement; membership of associations; whether they feel respected; and whether are considered a local. These variables give an initial indication of an individual's potential sense of place. Further exploration is needed to understand the meanings formed and whether the connections are actually deeper. The benefit of this approach for natural resources management planning is that information on most of these variables is available from secondary data, both in Australia and in other countries. We explore whether these variables can be used to determine values assigned to the natural environment, and set this in the broader context of social and economic priorities.

2. Methods

2.1. Study area

The Great Barrier Reef (GBR) extends over 2300 km, parallel to the coast of eastern Australia in Queensland, and covers an area of approximately 350,000 km^2. The GBR consists of an archipelagic complex of over 2900 reefs and was proclaimed a Marine Park in 1975 and a World Heritage site in 1981. Forty catchments, covering a total area of almost 426,000 km^2, drain into the GBR lagoon. The research presented in this paper was conducted in two areas of the GBR: the Whitsunday rivers catchments (with total areas of some 2000 km^2) in the local government area of Whitsunday Shire; and the Tully and Murray River catchments (with total areas of around 2500 km^2) in the local government area of Cardwell Shire (Fig. 1).

Resident populations for the Whitsunday and Cardwell Shire at the time of the last Census in 2006 was around 17,500 and 11,500 people, respectively. The estimated annual growth rate was around 2.5%, with the population aged 65 years or more growing the fastest. In the Whitsunday Shire, tourism provides the largest

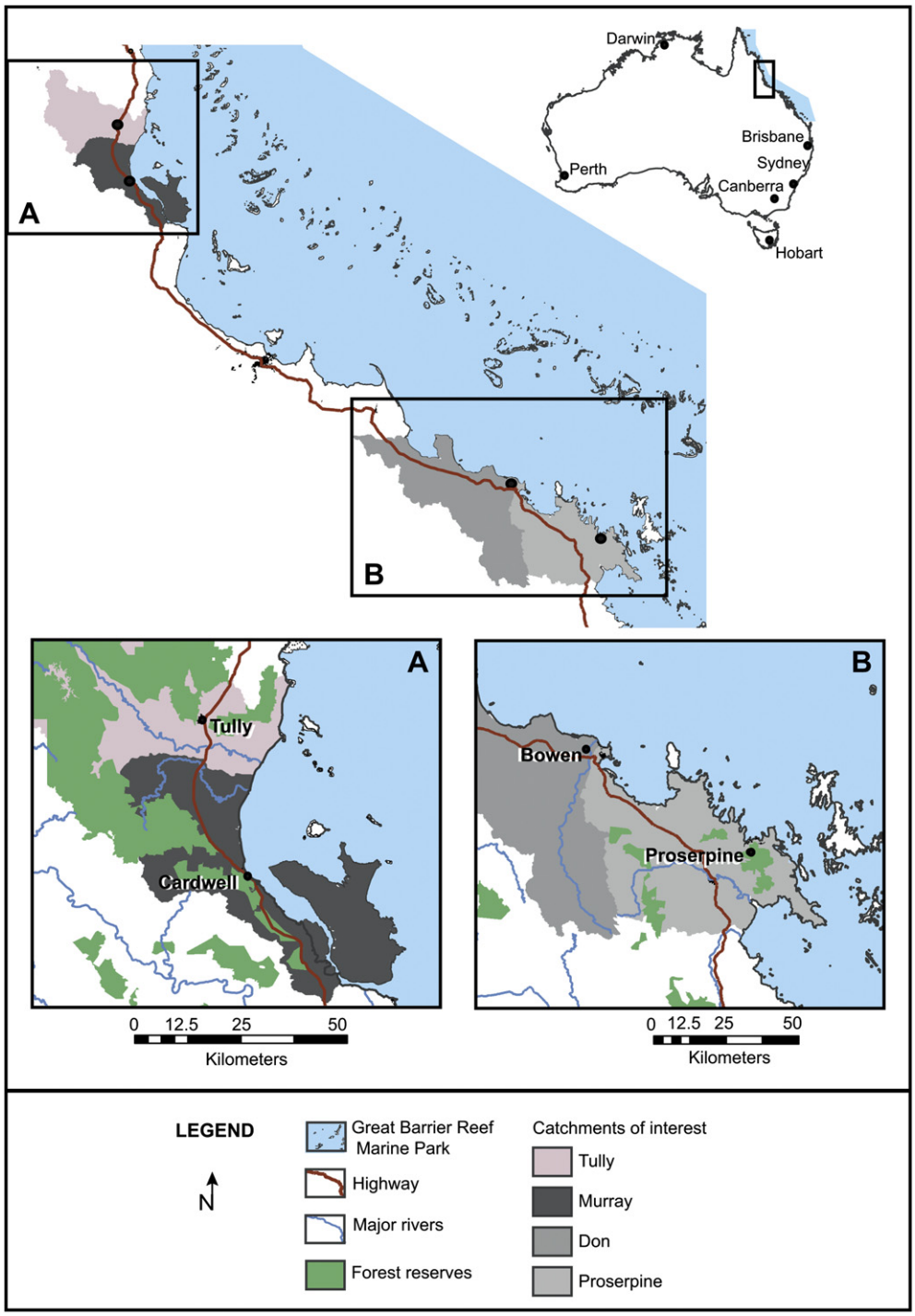

Fig. 1. Study areas of Cardwell Shire and Whitsunday Shire with catchment areas overlain. Reprinted with permission from Larson (2010a). Copyright Pion Limited, London.

percentage revenue and employs about 20% of the work force (ABS, 2006). Whitsunday Islands group comprises74 tropical islands and draws more than 700,000 tourists to the Whitsunday region annually (WDC, 2008). Although some 60% of the land in this area is in agricultural production, revenue from agriculture amounts to only half of the tourism-related revenue (OESR, 2006). On the other hand, the majority of employment and revenue in Cardwell Shire is derived from agricultural production, in particular sugar cane and tropical fruit.

The study areas are located in the tropic climatic zone, characterised by a wet season from December to March, and a dry season from April to November. Average daily maximum and minimum temperatures are around 29 °C and 17 °C, with an average annual rainfall of over 1500 mm (OESR, 2005). Landscapes of the region are characterised by forest-covered hills that slope into fertile floodplains dominated by cleared cultivated land and coastal beaches, wetlands and estuaries. Both shires are adjacent to the Great Barrier Reef World Heritage Area. In addition, about 50% of the land in Cardwell Shire is also a part of the Wet Tropics World Heritage Area, while large parts of the Whitsunday Islands are designated as a National Park. In addition to the Word Heritage Areas, both regions studied host a number of state forests; wetlands of national significance; protected habitats of endangered and endemic species; as well as more than a hundred recorded Aboriginal archaeological sites.

Thus the two locations studied contain a diverse range of natural resources, conservation values and management pressures. Literature suggests that stronger attachments tend to develop with attractive landscapes (Kaltenborn, 1998), hence, it would be expected that this might be reflected in residents' attachment to place.

2.2. Primary data collection

The questionnaire developed for this study was based on the work of Larson (2009, 2011) and consisted of three categories of questions: (1) socio-demographic questions; (2) questions about respondents' community activities and perceptions (sense of place questions); and (3) questions about respondents' perceptions of factors contributing to their wellbeing. Basic socio-economic data was recorded for each respondent in order to ensure representativeness of the sample. The sense of place questions were based on findings from the literature and explored the extent to which each respondent felt a part of the community and the extent of their involvement in the social life of the community. Sense of place variables included in the survey and percentages of respondents in each category are presented in Table 1.

The questionnaire also elicited respondents' perceptions about the most important contributors to their wellbeing. This elicitation of subjective perceptions of wellbeing allowed for experiences, interpretations, needs and priorities of individuals to be communicated (Diener and Suh, 1997). The personal wellbeing questions investigated the relative contribution of each factor to respondents overall wellbeing (Larson, 2009, 2010a, 2011). The wellbeing factors included in the study were based on examples from the literature and findings of the focus group discussions and face-to-face interviews.

The proposed list of wellbeing factors, based on the findings from the literature, was discussed in the context of local conditions with relevant stakeholders and residents, both in focus groups discussions and during face-to-face interviews. Focus group discussions were held with the key informants from the region, comprising seven representatives of local commercial, government and non-government groups. The focus group discussed both factors of wellbeing to be included in the mail-out stage and the questionnaire in general. As a result, several additional factors were included in the list of potential wellbeing contributors, while some others were excluded. In the next step, the updated list of wellbeing contributors was discussed during face-to-face interviews with 27 residents of the region. Discussions included both comments on the wellbeing factors explored, as well as explorations of the meanings respondents associated with the sense of place and wellbeing questions.

Table 1
Sense of place variables and percentages of respondents in each category ($n = 372$).

Sense of place variables	Categories	% Respondents
Case study	Cardwell	47.8
	Whitsunday	52.2
Country of birth	Australia	85.5
	Overseas	14.5
Do you consider yourself a "local"?	Yes	92
	No	8
Do you consider yourself respected?	Yes	73
	No	27
Are you involved in community activities?	Yes	60
	No	40
Do you belong to any associations?	Yes	24
	No	76
Location of residence	Coastal	41
	Non-coastal	59
Years lived in area	<5 years	11
	5–15 years	30
	>15 years	33
	My whole life	26

Thus, the questionnaire included a total of 27 wellbeing factors deemed as important in this particular biophysical and socio-economic setting, grouped into three domains: Social domain (family and community), Environment (natural environment), and Economy and services domain; comprising nine factors each. The Natural environment domain, discussed in this paper, comprised: air quality; water quality; soil quality; access to the natural areas; biodiversity; swimming, bush walking and other activities in the nature (referred to as swimming); fishing, hunting and collecting other produce (fishing); beauty of the landscape and beaches; and condition of the landscape and beaches. An option to specify other important factors was also provided.

The questionnaire was used in a mail survey following the Dillman method (Dillman, 1978, 2000). A comprehensive set of sampling techniques was applied to minimise most common survey errors including sampling error; coverage error; non-response error and measurement error (Groves, 1989; Fowler, 1993; Lavrakas, 1993; Bernard, 1995). The potential "population" of respondents was deemed to be all permanent residents listed in a database of residential addresses within postal codes located either partially or wholly within the study area. In order to minimize the sampling and coverage errors, a type of stratified systematic randomization method was used in the selection of the survey sample (Bernard, 1995). The population list was first stratified by locality, and then alphabetically organized, in order to ensure geographic representation in the sample. Selection of participants was then based on a randomly chosen first number, followed by every sixth entry in the original database.

To minimise potential bias due to the placing of the questions, six versions of the questionnaire were produced, each with different placing of both wellbeing domains and factors within wellbeing questions. A total of 826 surveys were mailed out, with equal numbers of all six versions mailed out to prevent measurement error. Invalid returned questionnaires were replaced with new randomly selected samples from the same location. Reminders and replacement surveys were also mailed, as per Dillamn's

method, and mail-out stage of data collection yielded a total of 137 and 144 valid responses in Whitsunday and Cardwell Shire, respectively.

The final mail sample received was tested for non-response error using a comparison of socio-demographic characteristics of the respondents with that of secondary data available from the Australian Bureau of Statistics (ABS). Samples were compared to shire data in terms of locality, gender, age, marital status, cultural background, educational levels, sectors of employment and income levels. Gaps identified between the secondary data statistics and sample characteristics, such as under-representation of the young people, in particular young males in the survey sample, were filled by additional targeted face-to-face interviews. As a result of these interviews, an additional 57 responses from Whitsunday Shire and 34 responses from Cardwell Shire were added to the total survey numbers. Face-to-face interviews were conducted using the same survey instrument used during the mail-out phase of the data collection. Thus, a total of 372 valid responses, 194 from Whitsunday and 178 from Cardwell Shire, were collected (Appendix A). Although 826 questionnaires mailed covered less than three percent of total population of two shires, the final sample size of 372 valid responses is in excess of the recommended sample size of 367 samples which would ensure a 5% confidence interval (Krejcie and Morgan, 1970).

2.3. Data analyses

Respondents' sense of place characteristics (Table 1) were tested against (a) the values respondents assigned to the nine natural environment factors; and (b) the relative values assigned to the natural environment, compared to social and economic components. It is important to note that this survey collected data in two steps. In the first step, respondents were asked to select factors from the three domains that contribute to their wellbeing, and in the second step they were asked to assign weights to the wellbeing contributors selected. Thus, respondents did not weight wellbeing factors they perceived as of no importance to them.

Linkages between values assigned to the nine factors in the natural environment domain and the sense of place characteristics were tested using two methods. First, multiple regression models (standard regression model and the stepwise model, Coakes and Steed, 2007) were constructed to test the strengths of relationships between the sense of place characteristics and wellbeing. Second, in order to examine associations among sense of place characteristics and how these relate to wellbeing factors, we ran a multivariate redundancy analysis. A redundancy analysis combines concepts of ordination with concepts of regression to bring out all the variance in respondents' wellbeing measures that were related to sense of place characteristics (Legendre and Legendre, 1998). The approach was deemed appropriate given the multifaceted nature of the data, strong correlations and weak explanation of variation by individual variables. Analyses were based on correlations between 'sense of place' variables, centred by wellbeing factors. Monte Carlo significance tests were run to test for significance of the resultant ordinations on the first and all canonical axis together (ter Braak, 1995).

A multivariate redundancy analysis was also used to test linkages between sense of place characteristics and the relative values assigned by respondents to the natural environment, compared to societal and economic considerations.

3. Results

Seventy seven percent of the respondents selected aspects from the natural environment as being of high importance to their wellbeing. Water quality and air quality were selected by the greatest percentage of respondents, while biodiversity followed by soil quality was selected by the fewest (Table 2).

Six variables that help develop the meanings associated with sense of place emerged as statistically significant determinants in the selection and importance of aspects of natural environment (Table 2). For example, respondents who were born in Australia assigned more importance to the fishing, hunting, and collection of produce (referred to as fishing in the table), but less importance to soil quality and access to natural areas than those born overseas. Those involved in community activities were less likely to value air quality or biodiversity, while respondents living in the region for a longer time assigned less importance to condition of the landscape and beaches and to the natural environment overall (Table 2).

However, the stepwise multivariate regression analyses model reported in Table 2 indicates that the predictive power of all the tests was rather weak. This indeed might be due to the relatively

Table 2
Sense of place determinants of importance of selected wellbeing factors, summary of the stepwise multivariate (regression) analysis.

Factor	Determinants sign. at 1%	Determinants sign. at 5%	Adjusted R^2 F, d.o.f.[a]	%[b]
Fishing	–	Born in Australia (+)	.105 6.500 (1,46)	15.8
Swimming	–	–	–	11.6
Air quality		Involved in community activities (–)	.044 4.983 (1,85)	28.0
Water quality	–	–	–	46.6
Soil quality	–	Born in Australia (–)	.144 4.695 (1,21)	7.9
Beauty of the landscape	–	–	–	19.2
Condition of the landscape	Live longer in the region (–)		.046 4.246 (1,66)	23.2
Access to the natural areas	–	Born in Australia (–)	.071 4.423 (1,44)	14.4
Biodiversity	–	Involved in community activities (–)	.180 5.388 (1,19)	7.0
Overall - Natural environment		Live longer in the region (–)	.016 5.115 (1,250)	77.0

No determinants were found to be significant at 10% level.
[a] Degrees of freedom (regression, residual).
[b] % of respondents who selected this factor as an important contributor to their wellbeing and were included in analyses.

low numbers of respondents in some of the tests. On the other hand, the predictive power of the model for the natural environment is one of the lowest, explaining only 1.6% of variation in responses, although the cases to variables ratio of 36:1 for this factor is more than sufficient to satisfy model construction requirements. Thus, to further test the initial findings, the multivariate redundancy analysis was conducted.

Individuals who felt access, condition and beauty of the natural environment contributed the most to their wellbeing were coastal residents, had lived in the area for shorter periods of time and tended to be members of professional associations. Those who chose swimming, fishing, air, and water quality as contributing most to their wellbeing tended to be born in Australia, but were not involved in community activities. Respondents who felt soil quality contributed most to their wellbeing were most likely to live further inland, had spent longer time in the area, and felt as "locals" (Fig. 2).

The multivariate redundancy analysis was also used to analyse the importance assigned to the Environmental domain (natural environment) relative to the importance assigned to the Social (family and community) and Economic (economy and services) domains. Individuals who had lived a shorter length of time in the area and who lived in coastal settlements assigned greater importance to the environmental domain (Fig. 3). Individuals who were born in Australia, felt considered a local, and were involved in community activities assigned greater importance to social domain (Fig. 3). Finally, individuals who had spent longer in the area, were members of associations, and who, to a lesser extent, considered themselves to be respected, assigned greater scores to the economic domain.

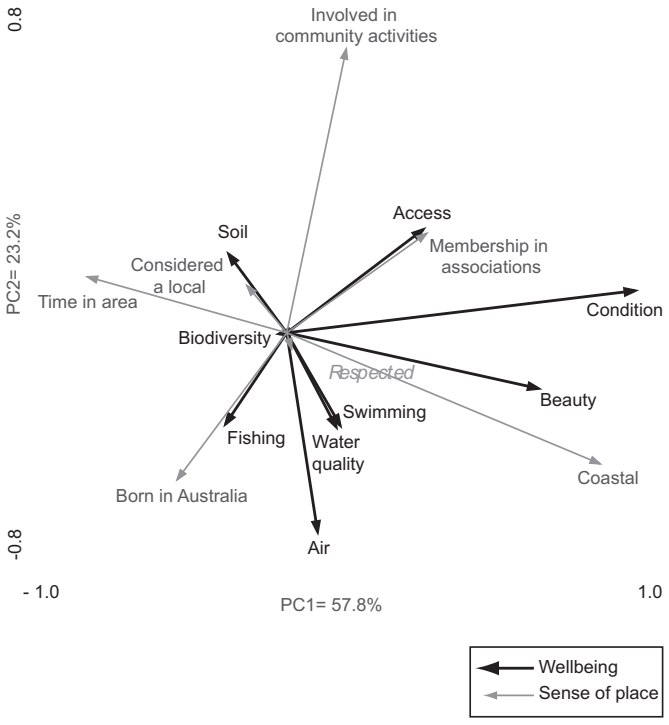

Fig. 3. Sense of place characteristics association with nine wellbeing factors from the natural environment domain (Monte Carlo test for significance $P = 0.016$ and $F = 1.51$).

4. Discussion

In this study we set out to explore the relationship between characteristics that engender a sense of place and residents' natural environment preferences and wellbeing choices. We intentionally chose sense of place variables that are readily available in secondary data such as Census for their ease of application to a planning process. We identified seven characteristics from the literature that engender sense of place, including: place of birth; location of residence; years lived in the area; involvement in community activities; and membership of professional associations. Feeling as a local and respected, although subjective perceptions not available in the existing secondary data, were also included as they have been identified as important. We found that people's environmental wellbeing could be satisfactorily categorised into four sense of place typologies and that their social, environmental and economic wellbeing could be categorised into three sense of place typologies.

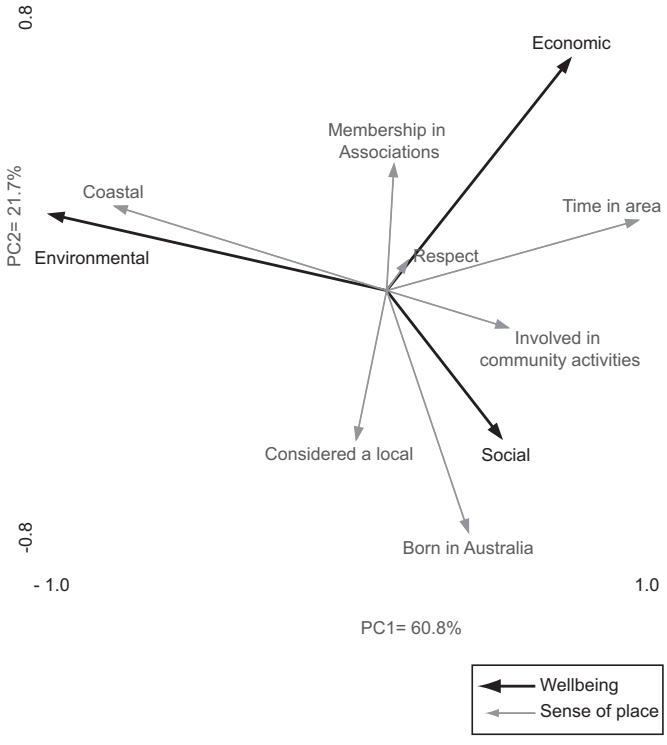

Fig. 2. Sense of place characteristics association with environmental, social and economic wellbeing domains (Monte Carlo test for significance $P = 0.08$ and $F = 1.49$).

We explored the relationship between sense of place and environmental wellbeing to find four sense of place typologies associated with environmental values. First, beauty and condition of the environment were important environmental values for coastal residents who had spent the least time in the area. This finding is in line with the reports from the literature, which have been successful in identifying positive correlations between sense of place characteristics and aesthetic, intrinsic and future environmental values (Kaltenborn and Bjerke, 2002; Brown and Raymond, 2007). Second, fishing and good air and water quality were important environmental values for individuals who were born in Australia. These individuals also assigned the greatest overall importance to social values, confirming Stedman's (2002) results who found social attachment to correlate with preferences for good air and water quality elsewhere. Third, soil quality was considered most important to individuals who had spent the greatest time in the area, considered themselves local, and were not coastal residents. These individuals were also more likely to have greater economic and social values, and to be farmers. Greater social and economic values have been related to exploitative relationships with the natural environment such as farming (Drenthen, 2009). Fourth, access to natural resources and the condition of the

environment were important considerations for individuals who were members of professional associations but were not born in Australia. These individuals were also more likely to have greater economic values.

We found three sense of place typologies, dependent on whether respondents prioritised environmental, social or economic wellbeing. First, residents who assigned a greater importance to environmental wellbeing, had spent less time in the area and tended to live in coastal areas. Indeed, correlations between length of time in a place and environmental values have been reported in the literature (Brown and Raymond, 2007), and the strength of connection has been shown to vary over time (Drenthen, 2009). Similar to findings from our study, connections with a place initially tend to be associated with greater environmental wellbeing, and over time these connections give way to stronger social connections (Moore and Graefe, 1994;Cantrill, 1998; Stedman, 2000; Smaldone et al., 2008). In addition, the literature suggests that stronger attachments tend to develop with attractive landscapes (Kaltenborn, 1998) supporting our findings that higher importance to environmental aspects was assigned by those living in coastal areas. Second, we found that residents who assigned greater importance to social wellbeing were more likely to be born in Australia, involved in community activities, and to feel considered a local. Studies have suggested that social wellbeing is a key consideration of sense of place (Riley, 1992) and, as discussed above, that environmental wellbeing considerations give way to social considerations over time. The third typology found was that residents who assigned a greater importance to economic wellbeing had lived the longest in the area, were members of professional associations, and felt respected. Similar results are reflected by Berry (1989) who found that strong social ties including membership and status were associated with a greater potential for the accumulation of capital through access and property rights.

Most of our characteristics measuring the potential for a sense of place, including community activities, professional associations, time lived in area and country of birth, represent data that can be easily collated over large spatial scales, using existing council, polling or census data. Our data show that these characteristics, which are not timely or costly to collect, are representative of the values held by individuals surveyed. The two characteristics thought to engender sense of place that would require primary data collection, to establish whether individuals feel they are considered local and respected, were found to show only weak association with choices made, and therefore may not be the preferred variables to collect when measuring potential sense of place. We therefore suggest that sense of place variables available in the secondary data could be used as proxies for assessing potential attitudes of residents towards the natural environment.

Although establishing the potential sense of place has proven valuable for identifying individuals' wellbeing and environmental preferences, the information collected should represent only a first stage in a planning process. These indicators do not capture sense of place meanings but can indicate where those meanings are likely to have developed. Comprehensive long term qualitative or mixed-method consultation and engagement strategies should then be devised and implemented as soon as feasible so that complex meanings that are at the root of sense of place concepts are captured and explained.

An important consideration in natural resources management and planning is suitability of communication with the stakeholders. Understanding and determining intangible phenomena such as sense of place does not necessarily lead to better management strategies without continuous and proactive community involvement. Power structures and dynamics can also make it difficult to reach consensus, and "the majority rules" approaches will not necessarily create a fair and equal platform for negotiations. On-the-ground stakeholders may find the goals of conservation planning, or other environmental sustainability concerns, difficult to operationalize. The understanding and acceptance of such principles by the local stakeholders on the ground could be improved if the goals were "translated" into issues relevant to them. Furthermore, the relevance of the national or other higher level goals to the on-the-ground stakeholders could be improved through communication of concerns of stakeholders to the policymakers. Such "translations" could also aid us in creating better awareness and communication campaigns (Larson, 2010b). For example, if we were to develop a management plan aimed at protecting coral reef fish diversity in a region where many residents are members of professional associations, a starting plan for consultation could focus on improving or publicising available access to natural resources. A similar plan in coastal areas could focus on improving the beauty of public beaches and publicising expected improvements in the condition.

An interesting finding of this study in support of this argument is that biodiversity does not feature as an important component of environmental wellbeing and is not associated with sense of place. This is likely to be a result of different understandings individuals have of nature and is potentially a key consideration for any conservation plan. Although biodiversity *per se* was not an important consideration for the majority of residents, characteristics associated with biodiversity – such as fishing, hunting and collecting produce and beauty of the landscape and beaches – were found to be important. Therefore, there is a need to better understand the role nature plays for individuals, which might not be best described with the use of concepts such as "biodiversity", or best captured through scientific merit. Rather, synergistic opportunities whereby biodiversity as well as condition, beauty or access to nature, are enhanced by conservation planning, should be explored and maximised. The findings are in line with discussions in the literature that promote stakeholder involvement as means of ensuring that plans meet socio-economic considerations (Sarkar and Margules, 2002; Brown and Raymond, 2007; Wallace, 2007; McDonald, 2009). Conservation and sustainability sciences therefore need to develop a better understanding of factors that motivate people to support landscape protection and the sustainable management of natural resources. Such an approach would allow conservation and NRM objectives to be set in the relevant socio-political context, enabling successful implementation of actions and objectives.

Gaining the support of residents for proposed conservation strategies, thus increasing the potential for compliance, needs to consider what is important to the residents, and integrate these aspects into draft plans (Sutton and Tobin, 2009). The literature indicates that place attachment strongly influences residents' willingness to engage in conservation and land use planning strategies (Walker and Ryan, 2008). In addition, the integration of individuals' values and preferences into planning documents increases the likelihood of successful and sustainable natural resources management (Gooch, 2003; McCook et al., 2010).

5. Conclusions

Relationships between the importance of the natural environment and seven sense of place attributes of residents from the Great Barrier Reef region on the Australian coast were explored in this paper. We found that residents' sense of place characteristics played an important role in determining their wellbeing choices, and thus issues that they found of highest importance. Five out of seven sense of place attributes tested, that is involvement in community activities, membership of professional associations,

time lived in the area, location of the residence and country of birth, are readily available in secondary data such as census. Importantly, these five factors were found to be strongest determinants of respondents' wellbeing choices related to natural environment.

The findings of this study illustrate the importance of information that is typically available from local or national data collection agencies and therefore the relative ease with which such information could be incorporated in timely and cost effective manner into early stages of planning processes. Collection of more specific and comprehensive qualitative data would nonetheless be required in later stages of planning.

Overall, this study found sense of place to be an interesting and valuable concept worth further investigation. We also support propositions that an improved understanding of what residents value the most could guide planners and managers towards generating increased support for future conservation and NRM initiatives.

Acknowledgements

Funding of the primary data collection was provided by CSIRO Water for a Healthy Country Flagship program and the Division of Sustainable Ecosystems. Sincere thanks to Mr Peter Wiegand for his assistance with mail-out and data entry. This research project was approved by the James Cook University Human Ethics Subcommittee in March 2006 (Approval number H2314). Useful comments on an earlier draft were provided by Dr Tom Measham and Dr Eric Vanderduys.

Appendix A. Supplementary material

Supplementary material related to this article can be found at http://dx.doi.org/10.1016/j.jenvman.2012.11.035.

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