

## **SOCIAL VALUES AND GROWTH AND THEIR IMPLICATIONS FOR ECOSYSTEM SERVICES IN THE LONG-RUN**

### **Michelle Esparon**

Post-doctoral researcher, College of Business, Law and Governance and the Cairns Institute, James Cook University, Townsville, QLD, 4814, Australia.  
Email: [Michelle.Esparon@jcu.edu.au](mailto:Michelle.Esparon@jcu.edu.au).

### **Marina Farr**

Post-doctoral researcher, College of Business, Law and Governance and the Cairns Institute, James Cook University, Townsville, QLD, 4814, Australia.  
Email: [Marina.Farr@jcu.edu.au](mailto:Marina.Farr@jcu.edu.au).

### **Silva Larson**

Research fellow, College of Business, Law and Governance and the Cairns Institute, James Cook University, Townsville, QLD, 4814, Australia. Email: [Silva.Larson@jcu.edu.au](mailto:Silva.Larson@jcu.edu.au).

### **Natalie Stoeckl**

Professorial research fellow, College of Business, Law and Governance and the Cairns Institute, James Cook University, Townsville, QLD, 4814, Australia.  
Email: [Natalie.Stoeckl@jcu.edu.au](mailto:Natalie.Stoeckl@jcu.edu.au).

**ABSTRACT:** Social values are dynamic and may change with development, potentially having severe consequences on a region's ecosystem services. These values are often inadequately captured. We consider a region rich in natural capital—the Wet Tropics World Heritage Area, Australia—and examine how important a range of different factors which include, but are not limited to, ecosystem services (ES) are to people's overall quality of life. We acknowledge that people's perception of the importance of different factors vary systematically between those who are dependent upon different industries for their household income. Community values are thus shown to depend upon industry composition and demographic composition. We conclude that in small communities, rapid growth in particular sectors may start an endogenous cycle of changing values which define future economic trajectories. This will affect ecological trajectories.

**KEY WORDS:** ecosystem services; social values; quality of life; Wet Tropics World Heritage Area, endogenous growth.

**ACKNOWLEDGEMENTS:** The study was financially supported by the Australian Government's National Environmental Research Program, Tropical Ecosystems Hub and James Cook University. We gratefully acknowledge and appreciate the contributions made by the Rainforest Aboriginal Peoples Alliance (RAPA), and other research assistants for their assistance collecting data, all those who participated in our workshops or completed our questionnaires.

## 1. INTRODUCTION

In June 2015, the Australian Government released its White Paper on developing Northern Australia. Fundamental to this development, is rapid population growth, boosted by migration, of four to five million people by 2060 (Australian Government, 2015). While aspirations for the large population increases can be understood as providing the workforce required for development, questions around environmental damage and sustainability associated with these increases remain (Taylor *et al.*, 2015). These concerns are particularly important given the region is well known for its natural areas which support a variety of unique and reasonably unmodified ecosystems (Woinarski *et al.*, 2007), and for its largest concentration of Indigenous Australians (ABS, 2011). The region's rich endowment of natural resources supports a number of pillar industries, including agriculture, mining and tourism. In fact, these three industries are amongst those identified as having the most potential for growth (Australian Government, 2015).

Ensuring that development occurs in ways that enhance the quality of life and well-being for its residents, without undermining the integrity of the environment on which they depend is important. In this light, an understanding of the implications of future development changes, particularly, the impact on ecosystems and their services is required. By nature, ecosystems are complex and dynamic, impacted by a range of drivers and interventions that operate both directly with multiple anthropogenic stressors (e.g., resource extraction, land degradation) and indirectly through various socio-economic drivers (e.g., demographic, economic, and technological developments) (Henrichs *et al.*, 2010).

The body of literature relating to economic growth and development is well-established, and the burgeoning research on ecosystem services assessments and on the contribution that healthy ecosystems make to people's life and well-being has added valuable insights for decision makers (MEA, 2005; TEEB, 2010; Ash *et al.*, 2010; Häyhä and Franzese, 2014). Several tools have also been developed, providing realistic and quantitative hypotheses to inform modelling. Likewise, there is a

significant body of knowledge focused on the dynamic interactions between economic, social and ecological systems (Smulders, 1995) (hereafter, socio-ecological systems) and widespread acceptance of the fact that having a solid understanding of the links within these socio-ecological systems is particularly important in regions where there are strong interactions between the natural (i.e. biophysical) and human sub-systems (Gunderson and Holling, 2002). Nonetheless, few researchers have formally considered the endogenous and interactive role values play in these systems, despite their inherent nature to cause change—it is widely acknowledged that social values are dynamic and will thus change, and cause changes over time (Wade *et al.*, 2011). Therefore, any forward-looking ecosystem assessment or future development, must also consider the changing patterns of social values, defined here in line with Ray (2008, p. 1), as ‘most important life priorities’. This paper contributes to that small, but growing body of literature, focusing on the endogenous role of social values. The hypothesis that underlies our investigation is as follows:

*If there are discernible differences in the values of different demographic groups or in the values of people associated with different industries, then rapid or substantial changes in either the demographic or the economic composition of a region could initiate a process of endogenous growth or decline – in both the economy and the environment.*

Our study region is the Wet Tropics World Heritage Area (WTWHA) in North Queensland, Australia. It is one of the most frequented areas, receiving around 5 million visitors annually (WTMA, 2015) and lies adjacent to two substantially growing urban zones of Northern Australia—Cairns and Townsville (Taylor *et al.*, 2015). The Area is also home to 20 tribal groups of Rainforest Aboriginal people. We analysed data collected from a sample of 546 Indigenous and non-Indigenous residents of the WTWHA, specifically seeking to answer the following questions:

- 1) What do people feel contributes most/least to their overall quality of life?
- 2) Does indigeneity, or other characteristics, including dependence upon different industries for household incomes, influence the way people feel about those contributors?
- 3) How might those differences impact choices and thus future growth options and trajectories?

Our empirical insights are of particular interest to those in the WTWHA. Our methodological approach and our conceptualisation of the socio-

ecological system with endogenous values provide insights that are of interest to those concerned with conservation, economic growth and sustainability.

## 2. METHODOLOGY

### *Identification of Values for Assessment and Determination of How to Assess those Values*

Although concepts of ‘quality-of-life’ and ‘well-being’ are very similar, they are not fully interchangeable. The delineations between the concepts often blur, and they are sometimes defined differently by different researcher schools (Haybron, 2008). Costanza *et al.* (2007), for example, refer to ‘well-being’ as a subjective perception of one’s quality of life—and it is to this definition that we adhere. Well-being is sometimes viewed through a relatively narrow lens that focuses on physical and mental/social health, but in many contexts, well-being is considered much more broadly encapsulating social, economic, ecological, institutional, cultural and other concerns (Larson, 2009). We also adopt that broad conception.

Several contemporary frameworks have highlighted the contribution that ecosystems make to human well-being (for example, MEA, 2005; TEEB, 2010; Díaz *et al.*, 2015; 2018). In this paper, we use the ecosystem services (ES) view of value, where ES are defined as the benefits that people obtain from ecosystems (MEA, 2005, Haines-Young and Potschin, 2013) and the value of a particular ES is commensurate with the contribution it makes to human well-being. In line with our broad view of well-being, we note that it is not only ES that have value; other social, economic, institutional and cultural factors are valuable in that, they too, contribute to well-being.

We held workshops with a variety of stakeholders, comprising of representatives of the local community, Indigenous, government and tourism associations and those from the Wet Tropics Management Authority (WTMA)—the statutory authority for the protection and management of the WTWHA. The aim was to seek and prioritise the many ES provided by the WTWHA, to identify other factors (beyond ES) that were considered important to well-being and to learn more about the managerial and policy context in which stakeholders were operating. This information was used to generate a list of 27 factors for further assessment (Table 1). These span several social and regional scales, including macro-economic regional factors such as jobs and income through to interpersonal local factors such as spending time with family or the relevance of Country in respect to Indigenous people. In line with our broad conceptualisation

of well-being, we note that some factors are associated with ES and some are associated with other social, physical or institutional issues (e.g. having good schools and hospitals). Including this broad range of factors has the added advantage of allowing us to meaningfully compare measures of importance across different domains (e.g. environmental, economic and social). The factors most closely associated with the core management and policy issues relevant to the Wet Tropics Management Authority (WTMA) and which are given particular attention in the analytical part of this paper are marked with an \* (four in total: waterfalls and clear water; healthy native plants; undeveloped scenery; and Aboriginal culture).

Respondents were asked how important each of the factors listed in Table 1 were to their overall quality of life (using a 5-point Likert scale ranging from 2 (Very important) to -2 (Very unimportant). The order in which questions are presented is known to influence responses (Cai *et al.*, 2011), so we produced 24 versions of the survey, randomising and varying only the order in which benefits were presented, all else being equal.

**Table 1.** Community Defined Benefits with Descriptors Used in Questionnaire and Shortened Term Used Hereafter (in brackets).

---



---

Benefiting either directly or indirectly from the jobs and income linked to:	<ul style="list-style-type: none"> <li>the tourism industry (Tourism)</li> <li>the mining industry (Mining)</li> <li>the agricultural industry (Agriculture)</li> <li>Other industry/sector – e.g. fishing, retail, education (<i>Other Industry</i>)</li> </ul>
Being able to access the rainforest via:	<ul style="list-style-type: none"> <li>Walking tracks &amp;/or dirt roads (<i>walking tracks</i>)</li> <li>Bitument roads &amp; bridges (<i>Bitument roads</i>)</li> <li>Rail/Skyrail (<i>Skyrail</i>)</li> </ul>
Being able to:	<ul style="list-style-type: none"> <li>Learn more about a unique &amp; ancient Australian environment (<i>Learning about unique</i>)</li> <li>Hear from Aboriginal people about their sense of place (<i>Hearing about Aboriginals</i>)</li> <li>Go on rainforest walks (<i>Rainforest walks</i>)</li> <li>** Visit waterfalls &amp; swim in clear, clean rivers/streams/waterholes (<i>Waterfalls and clear water</i>)</li> <li>See iconic land species in the wild – e.g. cassowary, kangaroos (<i>Iconic land species</i>)</li> <li>Relax and/or reflect in a natural environment (<i>Relax and reflect</i>)</li> <li>Enjoy uncrowded camping &amp; picnic areas (<i>Uncrowded camping</i>)</li> <li>Enjoy the scenic beauty &amp; peacefulness of the rainforest (<i>Scenic beauty</i>)</li> </ul>
Having:	<ul style="list-style-type: none"> <li>**Healthy native plants &amp; animals (<i>Healthy native plants</i>)</li> <li>**Beautiful undeveloped scenery to look at (<i>Undeveloped scenery</i>)</li> <li>Two world heritage sites side by side (<i>Two WHAs</i>)</li> </ul>
Protecting	<ul style="list-style-type: none"> <li>**Places that have Aboriginal cultural values (<i>Aboriginal culture</i>)</li> <li>Places that have other cultural values (<i>Other culture</i>)</li> <li>The WTWHA either for its own sake or for future generations (<i>Preserving WTWHA</i>)</li> </ul>
Being able to	<ul style="list-style-type: none"> <li>Spend time with friends and family (<i>Time with family</i>)</li> <li>Enjoy city entertainment (<i>City entertainment</i>)</li> <li>Have some control over what is happening in your life (<i>Control over life</i>)</li> <li>Join in community activities (<i>Community activities</i>)</li> </ul>
Knowing that	<ul style="list-style-type: none"> <li>Friends and family are healthy and safe (<i>Family safe</i>)</li> <li>Good quality roads, hospitals, schools etc are there if need be (<i>Roads and hospitals</i>)</li> </ul>

---

Notes: Benefits most closely associated with core management and policy issues (as identified by stakeholders), are those focused on in the analytical part of this paper and are marked with asterisks \*\*. Source: the Authors.

### ***Sampling***

Data were collected using a mail-out survey of resident households in 33 postcodes that are partially or entirely within the WTWHA. Following the Dilman (2007) survey methodology, 60 randomly selected households in each postcode were contacted, ensuring that each postcode received an equal number of each version of the questionnaire. Given limitations with response rates from mail-out surveys by Indigenous people (Zander *et al.* 2013), we contracted the Rainforest Aboriginal People's Alliance (RAPA) to manage data collection in the Indigenous communities.

### ***Importance of Factors to Quality of Life and Socio-Demographic Influences***

First, we looked at the distribution of responses regarding the importance of each factor to overall quality of life. We then focused on the top 10 (most important) factors. We ran stepwise Ordinary Least Squares (OLS) regression to find statistically significant relationships between various socio-demographic descriptors of respondents and the importance scores they assigned to each of the top 10 factors.

We then regressed each of our four 'focal' factors from table 1 (Waterfalls and clear water, Healthy native plants, Undeveloped scenery, Aboriginal culture) against the same set of socio-demographic variables. Coefficients from the models were used to compare predicted 'average' importance scores which different groups of people (by indigeneity and by industry dependency for household incomes) attributed to those four key factors, whilst controlling for other demographic variables.

## **3. RESULTS AND DISCUSSION**

### ***Response Rates and Respondents***

We estimate that over 1 500 questionnaires reached their intended recipients, and we received 386 completed questionnaires, giving an estimated response rate of 24.8 per cent, corroborating those of Zander *et al.* (2013) and Larson *et al.* (2013). An additional 160 questionnaires were collected from Indigenous residents.

Table 2 compares our Indigenous and non-Indigenous samples. Across both groups, the majority of respondents were females, in a relationship, and were born in Queensland. Of the non-Indigenous respondents, 33 per

cent had completed a university degree, whereas 18 per cent of their Aboriginal counterparts had done similarly. Our combined government-provided services sector, which includes health and education, was the main source of income for over a quarter of our resident sample. There was a clear difference between the incomes of Indigenous and non-Indigenous households, with the former being poorer than the latter, on average.

**Table 2.** Comparative Background Data of Indigenous and Non-Indigenous Residents.

Socio-demographic background		Indigenous	Non-Indigenous
Pre-tax household income per annum (% of total)	\$1-\$20 000	26	11
	\$20 000 - \$40 000	17	16
	\$40 000 - \$60 000	5	14
	\$60 000 - \$80 000	11	15
	\$80 000 - \$100 000	3	8
	\$100 000 - \$150 000	6	11
	\$150 000 - \$200 000		6
	>\$200 000		3
	prefer not to specify	14	9
I do not know	19	6	
Household income (AUS\$)	Mean	41 298	73 510
	Median	30 000	70 000
Gender (% of total)	Male	38	40
	Female	62	60
Household size	Mean	3.97	2.53
	Median	3.00	2.00
Education (% of total)	Primary school	9	5
	High school (year 10)	33	24
	High school (year 12)	32	16
	Trade/apprenticeship	5	17
	University	18	33
	Other	3	6
Age group (% of total)	under 20	10	0
	20-40	50	12
	40-60	34	51
	60-80	6	34
	>80		4
Relationship status (% of total)	In a relationship or other	54	84
	Single	46	16

Source: the Authors.



**Table 2 (Continued).** Comparative background data of Indigenous and non-Indigenous residents.

Socio-demographic background		Indigenous	Non-Indigenous
Place of birth (% of total)	NSW	2	12
	QLD	94	51
	TAS	1	1
	VIC	1	10
	WA	1	1
	ACT		1
	NT		1
	SA		4
	Elsewhere (overseas)	1	19
Most important source of household income	Retail	10	3
	Accommodation, cafes, restaurants	2	3
	Government, health, education	38	29
	None of these	20	29
	Agriculture and Forestry	2	16
	Manufacturing	4	2
	Tourism	5	5
	Fishing		1
	Mining	1	8
	Ports		1
	I do not know	19	4

Source: the Authors.

### *The Importance of Different Factors to Overall Quality of Life*

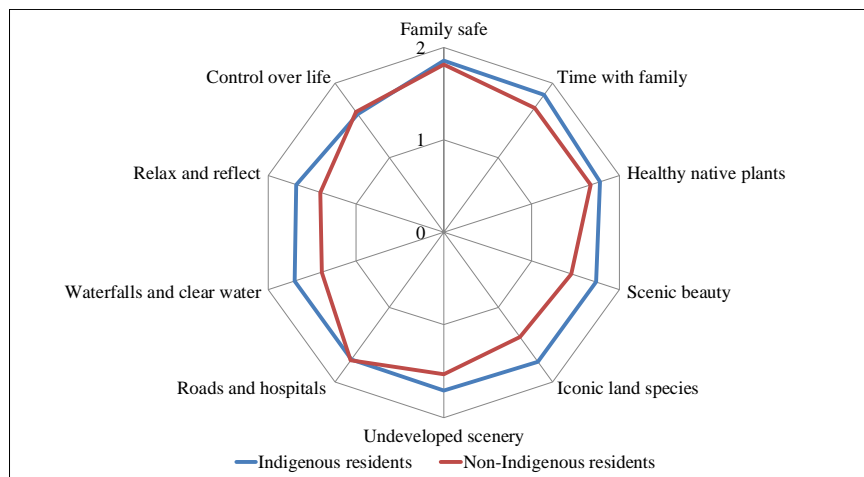
Overall, of the 27 factors, spending time with, and safety of family and friends contributed the most to overall quality of life. This accords with findings from elsewhere in the world: research shows that healthy social contact is essential for life satisfaction (Diener and Biswas-Diener, 2002; Achor, 2010).

Healthy native plants and various aesthetic factors (undeveloped scenery, scenic beauty, relax and reflect) are also core contributors to overall quality of life. These findings corroborate a growing body of literature that has established a link between life satisfaction and scenic amenities (Ambrey and Fleming, 2011), ecosystem diversity (Ambrey and Fleming, 2014), or adverse environmental effects i.e. air and water pollution (Cunado and de Garcia, 2013; Levinson, 2012).

Specific factors innate to our Indigenous sample such as the protection of places with Aboriginal cultural values and the opportunity to learn about culture and Country were very important to this group. However, due to their relative unimportance to non-Indigenous people, they appear somewhat less important overall (although they still rate more highly than most economic factors). This result was expected: it is widely acknowledged that Indigenous people have deep connections to Country, (Garnett and Sithole, 2007; Ganesharajah, 2009).

There is a relative unimportance of market/economic factors indicating that residents of the WTWHA may choose to live in this region for environmental lifestyle / amenity reasons rather than for economic ones (Cebula and Vedder, 1973; Chen and Rosenthal, 2008, Faggian and Royuela, 2010).

Figure 1 illustrates in more detail, the top 10 most important factors for Indigenous and non-Indigenous residents. There is broad agreement between Indigenous and non-Indigenous residents that the safety of family, good quality roads, schools and hospitals, and control over one's life is important to their overall quality of life. Although non-Indigenous residents rated environmental and aesthetic factors as important, they did not assign as much importance to these factors as did Indigenous residents.



**Figure 1.** Mean importance score for the top 10 most important factors compared – by Indigeneity. Note: Responses were compared, using the (non-parametric) Mann Whitney U test to highlight statistically significant differences. \*\*\*Significant at 1% level; \*\*significant at 5% level. Blue asterisk depicts significantly higher importance by Indigenous residents. Source: the Authors.

**Differences in the Importance Scores Assigned by Different People**

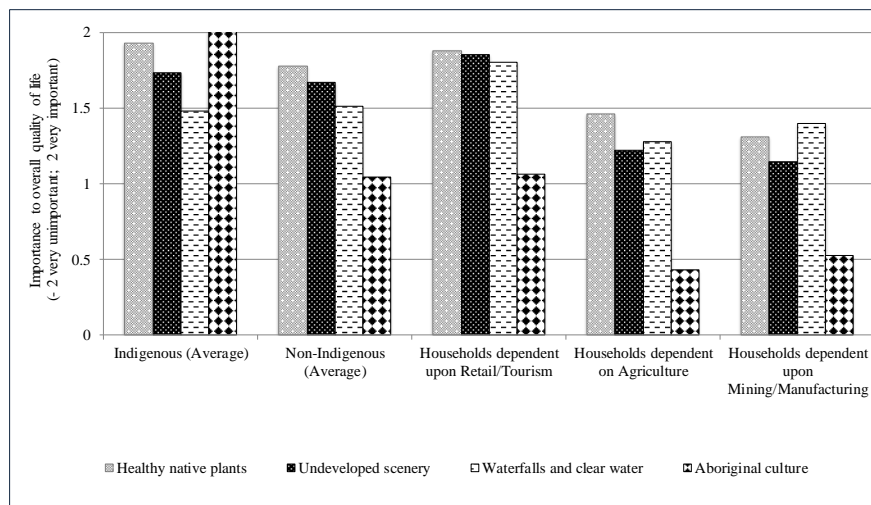
Differences in the importance that different people assigned to different factors are highlighted in Table 3. Males attached lower importance scores to most factors, notably to spending time with family, and to factors associated with the environment and aesthetics, than their female counterparts did. This result corroborates findings from other studies reporting that females have stronger environmental attitudes and behaviour than males (Diamantopoulos *et al.*, 2003; Esparon *et al.*, 2014). Other demographic characteristics were associated with relatively low scores for environmental factors, namely marital status (single people), and sector of employment. Generally, Indigenous people rate family as more important than non-Indigenous people. Indigenous people and those dependent upon the tourism and retail sectors for their household income also attach higher importance scores to environmental and aesthetic factors, than those whose income are dependent upon the mining and agricultural industries.

**Table 3.** Characteristics of Respondents Found to have a Statistically Significant Relationship with the ‘Importance’ Scores Given to top ten Benefits.

Top 10 scores	Male	Single	Age	Education	QLD born	Indigenous	Household size	Government	Agriculture	Mining & Manufacturing	Tourism & Retail
<i>Importance of:</i>											
Family safe						(+)**	(-)**	(-)**	(-)*		
Time with family	(-)**			(-)**				(-)**	(-)**		
Roads and hospitals		(-)**		(-)**							
Healthy native plants		(-)*				(+)*	(-)*	(-)**	(-)**		
Control over life								(-)**	(-)*		
Undeveloped scenery	(-)**	(-)*						(-)**	(-)**	(+)**	
Scenic beauty						(+)*		(-)**	(-)*	(+)**	
Iconic land species	(-)**					(+)*		(-)**	(-)**		
Waterfalls & clear water	(-)**	(-)*	(-)**		(+)*			(-)*		(+)**	
Relax and reflect	(-)**	(-)*						(-)**	(-)**	(+)*	

Note: A ‘+’ sign indicates that these respondents found the variable to be relatively more important than their counterparts did, and the relationship was statistically significant with the score assigned to the corresponding value; a ‘-’ sign indicates that these respondents found the variable to be relatively less important than their counterparts did, and the relationship was statistically significant; a blank indicates no statistically significant relationship. Source: the Authors.

Table 4 presents findings on the importance of the four focal factors linked to the key management priorities for the Area. Column two shows the mean of each explanatory variable. To generate an average predicted importance score for each factor across all respondents (1.73), we simply multiplied each coefficient (associated with each of the independent variables) by the mean of each respective independent variable and summed the results. To generate different predicted importance scores for Indigenous residents, we did not use the mean value of Indigenous (0.322); instead it was set 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. Figure 2 provides a visual comparison of the predicted values.



**Figure 2.** Predicted Importance Scores for Four Key Factors by Indigeneity and Industry of Association. Source: the Authors.

**Table 4.** Results from the OLS Regression.

Variable	Healthy native plants				Waterfalls and clear water				Undeveloped scenery			Aboriginal culture		
	Mean	Stand err	Coeff	Coeff* mean	Stand err	Coeff	Coeff* mean	Stand err	Coeff	Coeff* mean	Stand err	Coeff	Coeff* mean	
Male	0.40	0.07	-0.10	-0.04	0.09	-0.19**	-0.07	0.09	-0.24***	-0.10	0.12	-0.28**	-0.11	
Single	0.25	0.09	-0.14*	-0.04	0.14	-0.25*	-0.06	0.13	-0.22*	-0.06	0.16	-0.03	-0.01	
QLD born	0.63	0.07	-0.02	-0.01	0.10	0.17*	0.10	0.09	-0.04	-0.03	0.12	-0.11	-0.07	
Education	3.37	0.02	0.00	-0.01	0.03	-0.01	-0.04	0.03	-0.04	-0.13	0.04	-0.04	-0.12	
Ln(Income)	10.73	0.05	-0.03	-0.30	0.07	-0.04	-0.46	0.07	0.03	0.35	0.09	0.04	0.39	
Age	50.65	0.00	0.00	0.05	0.00	-0.01**	-0.43	0.00	0.00	0.03	0.00	0.00	0.04	
Household size	2.79	0.02	0.00	-0.01	0.03	0.01	0.03	0.04	0.00	0.01	0.04	0.01	0.02	
Tourism & Retail	0.12	0.07	0.10	0.01	0.13	0.29**	0.03	0.09	0.18**	0.02	0.22	0.01	0.00	
Government	0.32	0.07	-0.12*	-0.04	0.11	0.01	0.00	0.11	-0.10	-0.03	0.13	-0.12	-0.04	
Agriculture	0.12	0.11	-0.31***	-0.04	0.13	-0.23*	-0.03	0.13	-0.45***	-0.05	0.19	-0.62***	-0.07	
Mining & Manufacturing	0.07	0.15	-0.47***	-0.03	0.19	-0.11	-0.01	0.19	-0.53***	-0.04	0.24	-0.52**	-0.04	
Indigenous	0.32	0.08	0.15*	0.05	0.13	-0.03	-0.01	0.15	0.07	0.02	0.12	0.96***	0.31	
Constant	1.00	0.58	2.13	2.13	0.88	2.45	2.45	0.83	1.59	1.59	1.11	0.91	0.91	
Overall predicted value				1.73			1.50			1.59			1.21	
F statistics		3.48***			2.72***			3.74***			12.58***			
p-value		0.0001			0.0018			0.0000			0.0000			
Number of observations		284			277			280			281			

Note: \*\*\* significant at 1% level; \*\* significant at 5% level; and \*significant at 10% level. Source: the Authors

### ***Long-Term Changes to the Importance of Factors Due to Growth in Population and or with Different Types of Growth***

If all sectors of the economy or society grow equally, then social values may remain relatively stable (Ray, 2008), but if growth is dominated by indigeneity, or by one particular sector, then social values are more likely to change over time. In North-eastern Australia, the tourism industry is highly dependent upon the quality of its natural environment (Esparon *et al.*, 2015), and tourist satisfaction is negatively impacted by some types of economic growth (e.g. construction – Jarvis *et al.* 2016). As such, the growth rate of that industry will, amongst other things, be influenced by the quality of the environment, and potentially adversely affected by the growth of other industry. Growth in industries that degrade the environment may cause direct damage to the tourism industry. Although that can be avoided (with, for example, solid environmental management), the tourism industry may be negatively impacted by other industry activities.

Even if that can be avoided, it is still possible that the environment is affected by ensuing changes in community attitudes. Thus, a region may begin as one where the community is willing to forgo significant economic gain to protect the environment (sharing and *environmental ethos*), and the community may enact that protection through, for example, political processes. However, if there is growth in a sector that attracts workers who do not feel similarly, then over time, community values (and hence the voter base) will change. Therefore, even if the environment is not damaged directly by growth in some industries, changes in community attitudes may ultimately undermine the political process that protects it.

This may result into an endogenous (self-sustaining) cycle, if the ensuing environmental damage shrinks industries that employ workers with an *environmental ethos* further diluting the community's environmental ethos, which will subsequently reduce the growth of that environmentally focused industry. In short, industry growth rates are endogenously determined alongside social values.

## **4. IMPLICATIONS AND CONCLUDING REMARKS**

Our results indicate that in the WTWHA, non-market cultural ecosystem services (e.g. aesthetic services) are considered by residents to be more important to their overall quality of life than other factors more closely related to the market (e.g. jobs and incomes associated with different industries). Our results also indicate that different people feel differently

about various factors, suggesting that any type of growth that alters the demographic mix or economic composition of the population will lead to a change of underlying priorities in the community.

Agriculture, mining and tourism are the region's pillar industries based on the rich endowment of natural resources and are three key industries identified in the White Paper as having the most potential for growth (Australian Government, 2015). However, in order to demonstrate the benefits from this growth, the Government will need to incorporate social values in its planning and development models. Having a better understanding of people's values and the most effective means of enhancing them is thus key, to allowing for more targeted operationalisation of natural resources management strategies and the potential ecosystem trade-offs (Larson, 2009; Larson *et al.*, 2013).

While balanced growth will generate minimal change to underlying social values, significant growth in only one industry or sector of the economy could cause changes in community values, which, in subsequent years will impact a communities' willingness to protect (or not) the environment. It is evident that growth of some industries could cause damage to the environment. Our research shows that even if industry is managed in a way that ensures no direct damage to the environment, 'unbalanced' growth (that prioritises one sector over another) could damage it indirectly by diluting the environmental *ethos* of growth communities. There is a risk that this damage may begin a cycle of endogenous degradation if the damage slows the growth of industries that attract employees with a strong environmental ethos.

Our empirical results are context specific, but our key finding is not. We have highlighted the fact that values are endogenous primarily because they are associated with dynamic populations. In large metropolises, growth of one industry may have little effect on underlying community values, because subsequent population changes may be small compared to the total population. However, in small communities, rapid growth in particular sectors may start an endogenous cycle of changing values which define future economic trajectories. This will affect ecological trajectories.

## REFERENCES

- ABS. (2011). Estimates of Aboriginal and Torres Strait Islander Australians, June 2011. Online version accessed 25 November 2015, <http://www.abs.gov.au/ausstats/abs@.nsf/mf/3238.0.55.001>
- Achor, S. (2010). *The happiness advantage: The seven principles of positive psychology that fuel success and performance at work*. Crown Business, New York.
- Ambrey, C. L. and Fleming, C. M. (2011). Valuing Scenic Amenity Using Life Satisfaction Data. *Ecological Economics*, 72, pp. 106-115. doi: [10.1016/j.ecolecon.2011.09.011](https://doi.org/10.1016/j.ecolecon.2011.09.011).
- Ambrey, C. L. and Fleming, C. M. (2014). Valuing Ecosystem Diversity in South East Queensland: A Life Satisfaction Approach. *Social Indicators Research*, 115(1), pp.45-65. doi: [10.1007/s11205-012-0208-4](https://doi.org/10.1007/s11205-012-0208-4)
- Ash, N., Blanco, H., Brown, C., Garcia, K., Henrichs, T., Lucas, N., Raudsepp-Hearne, C., Simpson, R., Scholes, R., Tomich, T., Vira, B., and Zurek, M. (2010). *Ecosystems and Human Well-Being: A Manual for Assessment Practitioners*. Island Press, Washington, D.C., USA .
- Australian Government (2015). *Our North, Our Future: White Paper on Developing Northern Australia*. Commonwealth of Australia, Canberra.
- Cai, B., Cameron, T. and Gerdes, G. (2011). Distal Order Effects in Stated Preference Surveys. *Ecological economics*, 70(6), pp. 1101-1108.
- Cebula, R. J. and Vedder, R. K. (1973). A Note on Migration, Economic Opportunity, and the Quality of Life. *Journal of Regional Science*, 13(2), pp. 205-211.
- Chen, Y. and Rosenthal, S. S. (2008). Local Amenities and Life-Cycle Migration: Do People Move for Jobs or Fun? *Journal of Urban Economics*, 64(3), pp. 519-537.
- Costanza, R., Fisher, B., Ali, S., Beer, C., Bond, L., Boumans, R., Danigelis, N. L., Dickinson, J., Elliott, C., Farley, J., Elliott, G., MacDonald, G., Hudspeth, T., Mahoney, D., McCahill, L., McIntosh, B., Reed, B., Turab, R., Rizzo, D. M, Simpatico, T. and Snapp, R. (2007). Quality of Life: An Approach Integrating Opportunities, Human Needs, and Subjective Well-Being. *Ecological Economics*, 61, pp. 267-276.



- Cuñado, J. and de Gracia, F. P. (2013). Environment and Happiness: New Evidence for Spain. *Social Indicators Research*, 112(3), pp. 549-567. doi: [10.1007/s11205-012-0038-4](https://doi.org/10.1007/s11205-012-0038-4).
- Diamantopoulos, A., Schlegelmilch, B., Sinkovics, R. and Bohlen, G. (2003). Can Socio-Demographics Still Play a Role in Profiling Green Consumers? A Review of the Evidence and an Empirical Investigation. *Journal of Business Research*, 56(6), pp. 465-480.
- Díaz, S., Demissew, S., Carabias, J., Joly, C., Lonsdale, M., Ash, N., Larigauderie, A., Adhikari, J. R., Arico, S., Báldi, A., Bartuska, A., Baste, I. A., Bilgin, A., Brondizio, E., Chan, K. M. A., Figueroa, A., Duraiappah, V. E., Fischer, M., Hill, R., Koetz, T., Leadley, P., Lyver, P., Mace, G. M., Martin-Lopez, B., Okumura, M., Pacheco, D., Pascual, U. Pérez, E. S., Reyers, B., Roth, E., Saito, O., Scholes, R. J., Sharma, N., Tallis, H., Thaman, R., Watson, R., Yahara, T., Hamid, Z. A., Akosim, C., Al-Hafedh, Y., Allahverdiyev, R., Amankwah, E., Asah, T. S., Asfaw, Z., Bartus, G., Brooks, A. L., Caillaux, J., Dalle, G., Darnaedi, D., Driver, A., Erpul, G., Escobar- Eyzaguirre, P., Failler, P., Fouda, A. M. M., Fu, B., Gundimeda, H., Hashimoto, S., Homer, F., Lavorel, S., Lichtenstein, G., Mala, W. A., Mandivenyi, W., Matczak, P., Mbizvo, C., Mehrdadi, M. Metzger, J. P., Mikissa, J. B., Moller, H., Mooney, H. A., Mumby, P. Nagendra, H., Nesshover, C., Oteng-Yeboah, A. A., Pataki, G., Roué, M., Rubis, J., Schultz, M., Smith, P., Sumaila, R., Takeuchi, K., Thomas, S., Verma, M., Yeo-Chang, Y. and D., Zlatanova (2015). The IPBES Conceptual Framework — Connecting Nature and People. *Current Opinion in Environmental Sustainability*, 14, pp. 1-16. <http://dx.doi.org/10.1016/j.cosust.2014.11.002>.
- Díaz, S., Pascual, U., Stenseke, M., Martín-López, B., Watson, R. T., Molnár, Z., Hill, R., Chan, K. M. A., Baste, I. A., Brauman, K. A., Polasky, S., Church, A., Lonsdale, M., Larigauderie, A., Leadley, P. W., van Oudenhoven, A. P. E., van der Plaats, F., Schröter, M., Lavorel, S., Aumeeruddy-Thomas, Y., Bukvareva, E., Davies, K., Demissew, S., Erpul, G., Failler, P., Guerra, C. A., Hewitt, C. L., Keune, H., Lindley, S. and Shirayama Y. (2018a). Assessing Nature's Contributions to People. *Science*, 359(6373), pp. 270-272. <http://dx.doi.org/10.1126/science.aap8826>.
- Diener, E. and Biswas-Diener, R. (2002). Will Money Increase Subjective Well-Being? *Social Indicators Research*, 57(2), pp.119-169.

- Dilman, D. A. (2007). *Mail and Internet Surveys: the Tailored Design Method*. John Wiley and Sons, Inc., San Francisco.
- Esparon, M., Stoeckl, N., Farr, M. and Larson, S. (2015). The Significance of Environmental Values for Destination Competitiveness and Sustainable Tourism Strategy Making: Insights from Australia's Great Barrier Reef World Heritage Area. *Journal of Sustainable Tourism*, 23(5), pp. 706-725.
- Esparon, M., Gyuris, E. and Stoeckl, N. (2014). Does ECO Certification Deliver Benefits? An Empirical Investigation of Visitors' Perceptions of the Importance of ECO Certification's Attributes and of Operators' Performance. *Journal of Sustainable Tourism*, 22, pp. 148-169.
- Faggian, A. and Royuela, V. (2010). Migration Flows and Quality of Life in a Metropolitan Area: the Case of Barcelona-Spain. *Applied Research in Quality of Life*, 5(3), pp. 241-259.
- Ganesharajah, C. (2009). *Indigenous Health and Wellbeing: The Importance of Country*. Native Title Research Report No. 1/2009. Native Title Research Unit, Australian Institute of Aboriginal and Torres Strait Islander Studies, Canberra.
- Garnett, S. and Sithole, B. (2007). *Sustainable Northern Landscapes and the Nexus with Indigenous Health: Healthy Country, Healthy People*. Land and Water Australia, Canberra.
- Gunderson, L. and Holling, C. (2002). *Panarchy: Understanding Transformations in Human and Natural Systems*. Island Press, Washington, DC.
- Haines-Young, R. and Potschin, M. (2013). *Common International Classification of Ecosystem Services (CICES): Consultation on Version 4, August–December 2012*. EEA Framework Contract No EEA/IEA/09/003. Online version accessed 3 November 2014, [www.cices.eu](http://www.cices.eu) or [www.nottingham.ac.uk/cem](http://www.nottingham.ac.uk/cem).
- Haybron, DM. (2008). *The Pursuit of Unhappiness: The Elusive Psychology of Wellbeing*. Oxford University Press, Oxford UK
- Häyhä, T., and Franzese, P. (2014). Ecosystem Services Assessment: A Review Under an Ecological-Economic and Systems Perspective. *Ecological Modelling*, 289, pp. 124-132.
- Henrichs, T., Zurek, M., Eickhout, B., Kok, K., Raudsepp-Hearne, C., Ribeiro, T., van Vuuren, D. and Volkery, A. (2010). Scenario Development and Analysis for Forward-Looking Ecosystem Assessments. In N. Ash, H. Blanco, C. Brown, K. Garcia, T. Henrichs, N. Lucas, C. Raudsepp-Hearne, R. Simpson, R., Scholes, T. Tomich, B. Vira and M. Zurek (Eds). *Ecosystems and Human*

- Well-Being: A Manual for Assessment Practitioners*. Island Press, Washington, D.C., USA.
- Jarvis, D., Stoeckl, N. and Liu, H. B. (2016). The Impact of Economic, Social and Environmental Factors on Trip Satisfaction and the Likelihood of Visitors Returning. *Tourism Management*, 52, pp. 1-18
- Larson, S. (2009). Communicating Stakeholder Priorities in the Great Barrier Reef Region. *Journal of Society and Natural Resources*, 22(7), pp. 650-664.
- Larson, S., Stoeckl, N., Neil, B. and Welters, R. (2013). Using Resident Perceptions of Values Associated with the Australian Tropical Rivers to Identify Policy and Management Priorities. *Ecological Economics*, 94, pp. 9-18.  
doi: <http://dx.doi.org/10.1016/j.ecolecon.2013.07.005>.
- Levinson, A. (2012). Valuing Public Goods Using Happiness Data: the Case of Air Quality. *Journal of Public Economics*, 96(9/10), pp. 869-880. doi: [10.1016/j.jpubeco.2012.06.007](http://dx.doi.org/10.1016/j.jpubeco.2012.06.007).
- Millennium Ecosystem Assessment (MEA) (2005). *Ecosystems and Human Well-being: A Framework for Assessment*. Island Press, Washington, DC.
- Ray, P. (2008). *The Cultural Creatives. The potential for a new, emerging culture in the U.S.* Online version accessed 25 November 2015,  
<https://www.wisdomuniversity.org/CCsReport2008SurveyV3.pdf>.
- Smulders, S. (1995). Entropy, Environment, and Endogenous Economic Growth. *International Tax and Public Finance*, 2(2), pp. 319-340.
- Taylor, A., Payer, H. and Brokensha, H. (2015). *The Demography of Developing Northern Australia*. Charles Darwin University, Northern Institute, Darwin.
- The Economics of Ecosystems and Biodiversity (TEEB) (2010). *The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A Synthesis of the Approach, Conclusions and Recommendations of TEEB*.
- Wade, M. D., Liu, L. A. and Vacek, J. (2011). Values and Upward Influence Strategies in Transition: Evidence from the Czech Republic. *Journal of Cross-Cultural Psychology*, 42(2), pp. 288-306.
- Woinarski, J., Mackey, B., Nix H. and Traill, B. (2007). *The Nature of Northern Australia: Natural Values, Ecological Processes and Future Prospects*. The Australian National University, Canberra.

- Wet Tropics Management Authority (WTMA) (2015). *State of the Wet Tropics report 2014-2015: Economic Value of the Wet Tropics World Heritage Area*. Wet Tropics Management Authority, Cairns.
- Zander, K. K., Parkes, R., Straton, A. and Garnett, S. T. (2013). Water Ecosystem Services in Northern Australia—How Much Are They Worth and Who Should Pay for Their Provision? *PloS one*, 8(5), e64411.