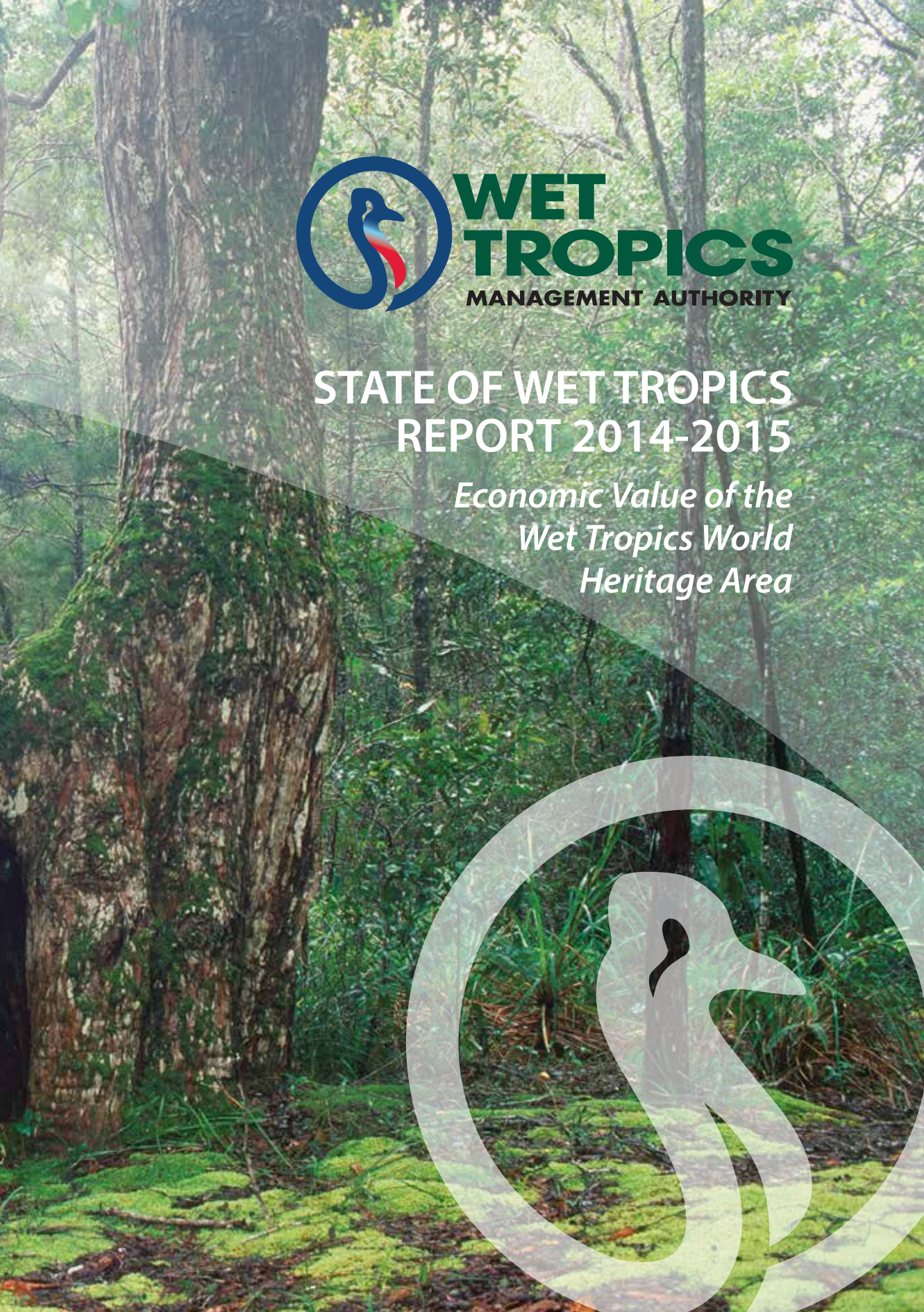

WET TROPICS
MANAGEMENT AUTHORITY

STATE OF WET TROPICS REPORT 2014-2015

Economic Value of the Wet Tropics World Heritage Area

Economic Value of the Wet Tropics World Heritage Area

WET TROPICS
MANAGEMENT AUTHORITY

STATE OF WET TROPICS REPORT 2014-2015

Purpose of the report

Each year the Wet Tropics Management Authority is required to prepare a report on the state of the Area, as required under section 63(1) *Wet Tropics World Heritage Protection and Management Act 1993 (QLD)* section 10 of the *Wet Tropics of Queensland World Heritage Conservation Act 1994 (Cwlth)*. This report fulfils that requirement.

When referring to the Wet Tropics World Heritage Area in this report the words 'World Heritage Area' or 'the Area' is used. Reference to the 'Wet Tropics' or 'the region' refers to the bioregion or the higher rainfall parts of the north Queensland coast in general.

Public availability

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Attribution

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Disclaimer

This document has been prepared with all due diligence and care, based on the best available information at the time of publication. The Authority holds no responsibility for any errors or omissions within this document. Any decisions made by other parties based on this document are solely the responsibility of those parties.

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Executive summary

The Wet Tropics of Queensland World Heritage Area (the Area) is a region of spectacular scenery and rugged topography with fast flowing rivers, deep gorges and numerous waterfalls. Mountain summits provide expansive vistas of the oldest surviving rainforest in the world. The Area is also culturally rich, comprising the traditional lands of more than 18 Rainforest Aboriginal peoples who have been an integral part of the land and seascape, living in and around the World Heritage Area for thousands of years, using traditional practices to manage country. Despite the richness of the regions' natural and cultural values, relatively little is known about the regions' economic contribution or the ecosystem service value of the Wet Tropics World Heritage Area to the regional community. This report asserts that the Area's direct, indirect and non-use ecosystem services are likely to be worth more than $5.2billion annually.

The majority of the studies concerning ecosystem services in the Area have been undertaken by biophysical scientists, with only a small handful of ecosystem services formally valued in economic studies. Furthermore, most of this valuation work has focused on the economic impact of tourism. This is not because tourism is necessarily more important, but because the values associated with tourism are generally more amenable to economic modelling than other ecosystem services.

It is widely recognised that world heritage related tourism generates significant economic value for the region. There are powerful synergies between the Wet Tropics and adjacent Great Barrier Reef making tropical north Queensland one of Australia's premier international and domestic tourist attractions. As a major engine of the north Queensland economy promoting, presenting and sustaining the natural values of the Wet Tropics World Heritage Area are vital contributions to the prosperity of the region.

The Wet Tropics World Heritage Area also provides a broad range of other ecosystem services to different sectors of the community that have economic value. New veins of research have helped us recognise and appreciate the economic value of natural capital and ecosystem services which are now accepted by mainstream environmental economics, and emphasised as especially important in ecological economics. Ecological economists have developed various methodologies for estimating the value of ecosystem services, each with its own advantages and limitations. This report recognises and compares a range of values and benefits within a socio-ecological context with multiple lines of evidence.

In particular, the report seeks to:

- explore the contributions of the region's ecosystem services to the social and economic wellbeing of residents and outline various methods for monetising those values, highlighting the difficulty in doing so, and noting that some of those contributions cannot be monetised
- identify the ecosystem services provided by the Wet Tropics World Heritage Area that are considered most important to residents and tourists
- weigh the importance of non-market services against that of market-based services (e.g. tourism) to infer the implied monetary value of ecosystem services that are not tied directly to markets
- provide insight about the ways residents and tourists may react to changes that threaten the Outstanding Universal Value of the Area
- identify management actions that can help protect the Area's values while fostering sustainable economic development.

The value of tourism in the Wet Tropics

There is a strong economic case to protect the Outstanding Universal Value of the Wet Tropics World Heritage Area. The remarkable aesthetic and recreational services of the region support a thriving tourism industry, estimated (in 2008 figures) to contribute more than $2.6 billion in annual direct and indirect output and household income, as well as 13 351 direct and indirect jobs; demonstrating the very significant value of the Wet Tropics to the regional, State and national economy (Gillespie 2008).

Tourists and visitors to the Wet Tropics World Heritage Area indicate that the region's natural values play an important role in their decision to visit, and that environmental degradation of the World Heritage Area would be more detrimental to their decision to visit than a 20 per cent increase in local prices. Visitors are also willing to contribute financially to protect the natural environment of the Wet Tropics.

The regional community values the Wet Tropics lifestyle

The natural values of the Wet Tropics World Heritage Area are not just important to the region's tourism industry. The region provides aesthetic and recreational opportunities that greatly enhance residents' quality of life. Residents indicate that in addition to family, friends and community, ecosystem services provided by the Area are more important to overall quality of life than the jobs and incomes provided by tourism.

The rich Indigenous heritage of the Area's Aboriginal Traditional Owner groups is also an important draw for regional tourism and a key source of employment for Rainforest Aboriginal peoples. Such enterprises comprise an important opportunity for Traditional Owners to express their knowledge, cultures and practices and helps advance social and economic benefits for the broader community.

Like tourists, residents of the Area are more averse to the prospect of environmental degradation than a 20 per cent increase in local prices. Residents prioritise the health of the environment, particularly native plants and animals, over a range of other issues, including infrastructure and proximity to entertainment. Research has revealed gaps between the importance residents ascribe to the ecosystem services of the region and their level of satisfaction with these services, especially among Indigenous Australians. This suggests we cannot be complacent about protecting the Outstanding Universal Value of the Area, and that there are signs that residents are concerned about the same.

Collective value and management costs

Recent research indicates that residents believe the region's non-market ecosystem services, including but not limited to those associated with aesthetics, recreation and preservation of the region for future generations, are even more important to their quality of life than those tourism values.

The collective worth of the region's natural values is likely to exceed $5 billion annually. This includes the $2.6 billion associated with the tourism industry (Gillespie Economics and BDA Group, 2008), plus at least an additional $2.6 billion generated by non-market values associated with the worth the community place on the natural values. The research indicates that development within the Wet Tropics should not be regarded as an end unto itself, but as one of several factors that contribute to the social and economic welfare of the region.

Futher, analysis of the market value of 16 of Australia's terrestrial world heritage properties, based on expenditure associated with management of the sites as well as expenditure of visitors to the site indicated that the Wet Tropics of Queensland World Heritage Area was one of the highest contributors to the regional, state and national economies. The analysis also showed that in terms of area or visitor numbers or in comparison to economic output, public funding for the Wet Tropics World Heritage Area is lower than for most other world heritage properties in Australia.

Expansion of tourism within the Area can generate considerable economic benefits. But if not properly managed, tourism can adversely affect the natural and social environment of host communities through excessive resource consumption, pollution and generation of waste, disruption and commoditisation of cultures and alienation of members of the community (Moscardo, 2008). Therefore, managers play a critical role in the protection and maintenance of the Area's Outstanding Universal Value, not just for the sake of world heritage status and its importance to tourism, but also for the wellbeing of local residents.

The way forward

Tourism, agriculture, and other industries generate considerable economic impact in the Area, however, economic development should not come at the expense of what residents and visitors value most. Research clearly establishes that local stakeholders place a higher level of importance on the Area's social and ecological values than aspects pertaining to the economy. Beyond minimising trade-offs between economic development and the Outstanding Universal Value of the Wet Tropics, managers need to leverage the region's natural assets to maintain and strengthen sustainable development.

Protection of the Wet Tropics World Heritage Area makes good business sense, not only to support the tourism industry, but also to help attract and retain workers for other sectors by providing 'quality of life', recreation and aesthetic experiences. Priority strategic areas for planning and policy in the future include:

- identifying 'common cause' management objectives, so that decision-makers can generate benefits for industry while protecting the environment
- planning for sustainable development so that development decisions strengthen the economy and the environment simultaneously
- economic growth and development based on wise investment in managing for environmental integrity of the landscape
- leveraging the Area's unique ecological and cultural world heritage values to benefit local stakeholders
- strengthening social commitment to protect the Area. This can be supported by connecting people and identifying peoples' relationships with the landscape by providing them with opportunities to engage through quality experiences and learning opportunities
- enhancing industry's commitment to protecting the Outstanding Universal Value of the Area by communicating the economic value of the region's ecosystem services to businesses.

The Wet Tropics World Heritage Area is a fundamental part of the community in North Queensland, contributing to many aspects of people's lives, industries, organisations and groups.

Sustaining and growing world heritage-based economic activity in the Wet Tropics depends on protecting the environmental and cultural values of the Wet Tropics rainforest asset and protecting the value and reputation of the Wet Tropics World Heritage brand in key markets. Success depends on collaboration between industry, government and community.

Protection of the Wet Tropics World Heritage Area makes good business sense, not only to support the tourism industry, but also to help attract and retain workers for other sectors by providing 'quality of life', recreation and aesthetic experiences.

The Wet Tropics World Heritage Area is internationally regarded as a living museum.

Introduction

Summary points

- *The Wet Tropics World Heritage Area is one of the most popular tourist attractions in Australia, visited by about five million local and international people annually.*
- *The regional population is growing. By 2031, the resident population is predicted to surpass 700 000 people.*
- *Domestic and international tourism has increased at least fourfold over the past 20 years, placing pressure on popular sites which increases demand for infrastructure and presents management challenges.*

The Outstanding Universal Value of the Wet Tropics World Heritage Area

The Wet Tropics World Heritage Area (the Area) is a large (894 420ha), rugged central spine along the Wet Tropic bioregion which extends approximately 450km along the coastline just south of Cooktown in the north to near Townsville in the south and borders the Great Barrier Reef World Heritage Area along a considerable part of the coastline. With more than 2500 individual blocks of land neighbouring the World Heritage Area's 3000km boundary, the Area plays an important function in the life of the community.

The Wet Tropics of Queensland World Heritage Area has outstanding natural value, meeting all four natural criteria for world heritage listing. The Wet Tropics of Queensland is considered to:

1. contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance - *Criterion (vii)*
2. be an outstanding example representing the major stages of Earth's history, including the record of life, and significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features - *Criterion (viii)*
3. be an outstanding example representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals – *Criterion (ix)*
4. contain the most important significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of Outstanding Universal Value from the point of view of science or conservation - *Criterion (x)*.

The Area is internationally regarded as a living museum containing one of the most complete and diverse living records of the major stages in the evolution

of land plants in the world. A recent global analysis based on bird, mammal and amphibian species ranks the Wet Tropics the second most irreplaceable World Heritage Site, and in the top ten most irreplaceable of more than 173 000 protected areas worldwide (Le Saout et al., 2013).

On 9 November 2012 the Wet Tropics World Heritage Area's Indigenous heritage values were included as part of the existing Wet Tropics of Queensland National Heritage Listing. The listing recognises that Rainforest Aboriginal heritage is unique to the Wet Tropics and is a remarkable and continuous Indigenous connection with a tropical rainforest environment. Rainforest Aboriginal people developed a distinctive cultural heritage determined by their dreamtime and creation stories and their traditional food gathering, processing and land management techniques. Reliance on their traditions helped them survive in this at times inhospitable environment. The distinctiveness of the traditions and technical innovation and expertise needed to process and prepare toxic plants as food and their uses of fire is of outstanding heritage value to the nation.

Demographic profile of the Wet Tropics World Heritage Area

The Area spans eleven Local Government Areas (LGAs) (Map 1), though over 80 per cent fall within the Cairns, Tableland and Cassowary Coast Regional Councils. As of 30 June 2013, these combined LGAs were home to some 210 500 people.

The region's population is expanding, with an average annual growth rate of 1.6 per cent over the last five years. By 2031, the combined population of all eleven LGAs within and around the Area is predicted to surpass 700 000. With many younger people leaving the region, ostensibly to seek employment opportunities elsewhere, the Area's population is aging (Esparon et al., 2014). Almost all of the expected future growth is likely to be contributed by those aged 40 years old and above. Hence migration and an aging population play a key role in the region's population growth and shifting demographic makeup.

In 2011, over 36 000 people moved to the Area's three largest LGAs, of whom 20 per cent were born overseas. Approximately half of residents had achieved a Year 11 or 12 maximum level of schooling. The median personal and family incomes were $30 167 and $68 590, respectively. Around 7400 families (14.5 per cent) were considered low-income (earning less than $600 per week or less than $31 200 per year). The largest proportion of employed people worked as professionals (16.5 per cent), followed by technicians and trade workers (16 per cent). Just over 12 per cent of employed people worked in the health care and social assistance industry, followed by retail trade (11.7 per cent) and accommodation and food services (8.9 per cent). In December 2013, unemployment stood at 6.9 per cent (Queensland Government Statistician's Office, 2014) (Figure 1). These figures are generally comparable to those for the rest of Queensland, however, fewer people are employed in manufacturing in the region and more are employed in accommodation and food services than the rest of Queensland (6.9 per cent).

Map 1. Local Government Areas which include the Wet Tropics World Heritage Area

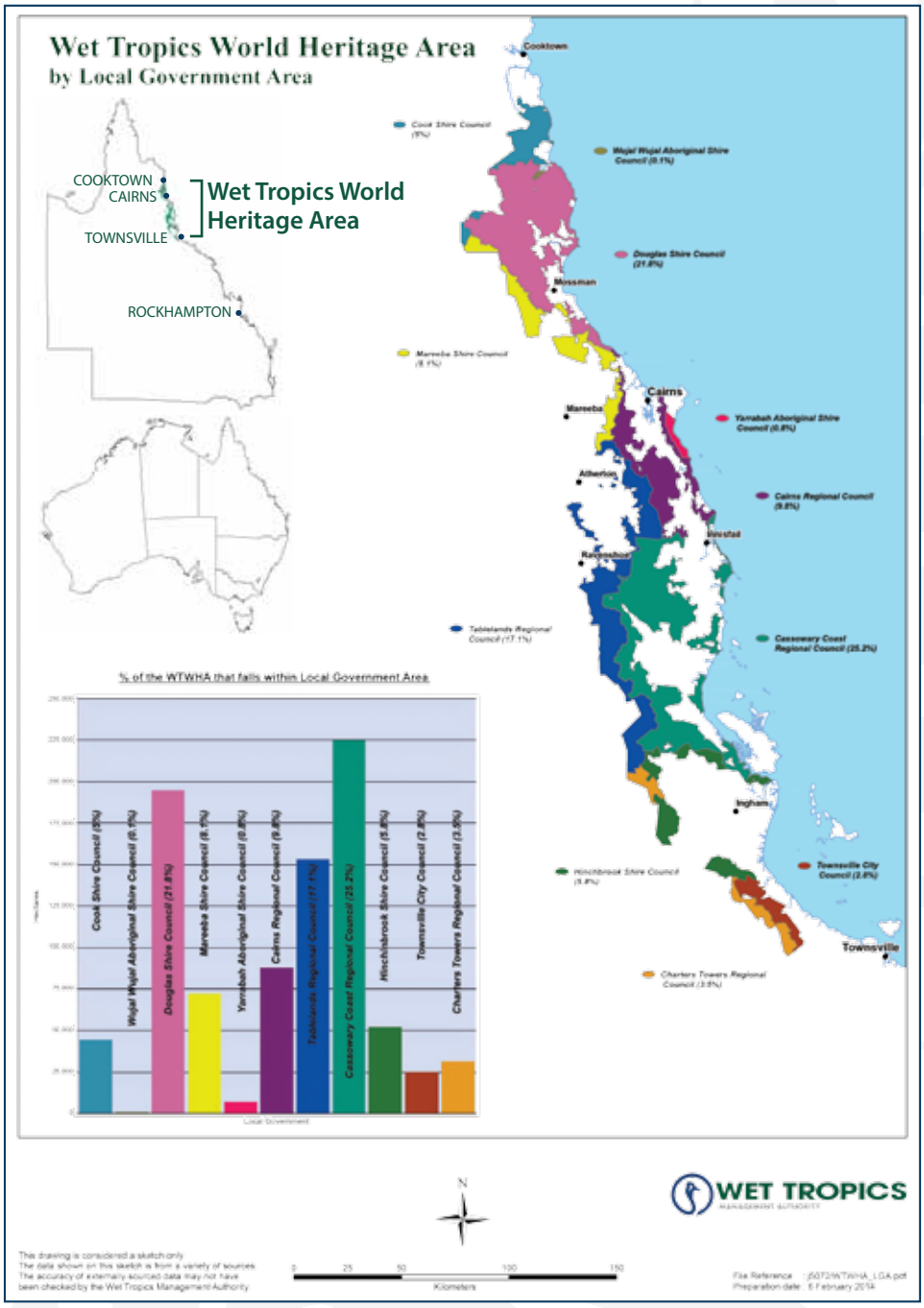
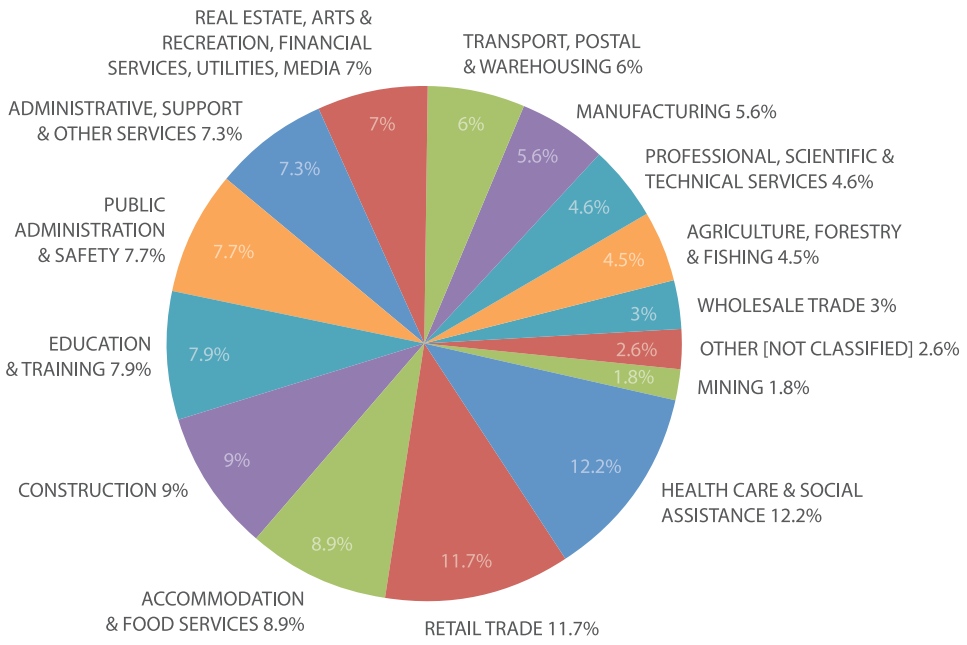


Figure 1. Percentage of workforce employed by industry in the Local Government Areas in and around the Wet Tropics World Heritage Area.



Tourism in the Wet Tropics

The Wet Tropics is one of the most popular tourist attractions in Australia and is visited by about five million local and international people annually. More than 80 per cent of the visitors to the region are domestic, particularly during the winter months. The region contains over 200 visitor sites and 150 managed walks, and has the highest concentration of ecotourism operators in Australia and arguably the world (Tony Charters and Associates 2010).

Community support for protection of the Wet Tropics World Heritage Area

Prior to World Heritage Listing in 1988, the rainforests of the Wet Tropics region were harvested for timber. This logging was opposed by the environment movement and others creating conflict in the region. Despite the challenging start, more than 25 years later, the World Heritage Listing is totally entrenched in the communities of this region. Community support for listing has grown from 50 per cent in 1996 to over 80 per cent in 2007 (Carmody and Prideaux, 2011). Similarly, there is strong support for its protection, with almost all respondents (92 per cent) of a study supporting the general level of protection afforded by the listing (Bentrupperbäumer and Reser, 2006).

Tourism leadership in the Wet Tropics

The Wet Tropics Management Authority promotes a cooperative approach to tourism development and has built extensive networks and established many relationships with tourism operators, researchers, partner agencies and representative groups.

Tourism in the Wet Tropics region has increased at least fourfold over the past 20 years. As a result, increased pressure on popular sites has increased the demand for infrastructure and presented new management challenges. In addition, tour operators are continually exploring new niche markets to stay ahead in this competitive industry.

Most of the current 138 national park commercial activity permits operating in the World Heritage Area allow for guided tours, camping and wildlife viewing in the national parks. Popular destinations are Daintree, Mossman Gorge, Kuranda and Barron Gorge National Parks, and the Atherton Tablelands, Palmerston and Mission Beach areas. Visitor surveys suggest that while a prime motive for visiting north Queensland is to see the Great Barrier Reef, visitors make more trips to the Wet Tropics World Heritage Area during their stay.

Visitors to the Area are looking for nature-based experiences and wildlife interactions. Walking is the most popular visitor activity, with a bias towards generally short walks to attractive features.

Tourism operators in the Wet Tropics are amongst the leaders in sustainable eco-tourism, with 159 products accredited by Ecotourism Australia that operate in north Queensland. Of all eco-certified products in Australia 17 per cent are based in north Queensland.

There is a clear linkage between developing new walkways, quality experiences, conservation and educational opportunities in the Wet Tropics and the potential for local industry to cater to the emerging and dynamic niche markets in sustainable and experience-based tourism.

The community view the World Heritage Area as an integral part of their landscape and lifestyle and feel a strong sense of collective ownership, social identity and responsibility (Bentrupperbäumer and Reser, 2006). Community surveys have showed the growing support for the inclusion of Aboriginal cultural heritage in the World Heritage listing of the Wet Tropics, rising from 63 per cent in 2002 to 72 per cent in 2007 (Carmody and Prideaux, 2008). During the same period, support for Aboriginal co-management of the Area has increased from 52 percent to 66 per cent.

Environmental value, ecosystem services and the World Heritage Area

Summary points

- *The Wet Tropics community are connected to, depend on, and benefit from the regions' ecosystem services.*
- *Estimating the value of the region's ecosystem services is complex, as they are typically not bought or sold through traditional economic markets, and so their value may not be adequately reflected in policy considerations.*
- *Monetising ecosystem services can provide policymakers with information they need to plan responsibly and make the most of sustainable development.*

Ecosystem Services provided by the World Heritage Area

The link between people and nature is complex, and these complexities are even more apparent when attempting to value (in monetary terms) a complex array of interconnected ecosystems such as the Wet Tropics World Heritage Area.

The Area provides a dynamic array of ecosystem services, many of which have been studied in detail by ecologists and other biophysical scientists. Research has also enabled a precise description of the ways in which these interconnected services contribute to human wellbeing. For example, McJannet et al. (2008) found that cloud stripping in the high altitude rainforests of the Wet Tropic World Heritage Area contributes to precipitation, feeding stream flow and replenishing water supplies. This mechanism allows many streams in the World Heritage Area to flow throughout the year. Local rivers can thus be used for power generation.

There are two hydro-electricity stations in the region; Koombooloomba Dam on the Tully River and Barron Falls Hydro on the Barron River. Tourists use the rivers for recreation (for example, white-water rafting), and farmers depend on these flows for agriculture. A further example of how ecosystem services contribute to human wellbeing is the rainforest dwelling insects and birds that assist in pollinating nearby plantation crops, including coffee (Cunningham and Blanche, 2009).

In general, 'ecosystem services' are understood as the various benefits that human beings derive (either directly or indirectly) from the landscapes, habitats and biological processes of the natural environment (Costanza et al., 1997). Fundamentally, this means that people are connected to, depend on, and benefit from nature.

Monetising the value of ecosystem services

Human beings utilise ecosystem services to improve their social and economic welfare. For example, we obtain energy from the movement of rivers, raise livestock and fish for sustenance, and build knowledge and meaning in our lives through our connections with the natural world. Methods for estimating the value of benefits that flow from nature to humans are well established in economic literature (Batemen et al., 2002).

The Common International Classification of Ecosystem Services (CICES) has been developed as part of an on-going effort to establish a meaningful system of environmental accounting. The framework emphasises the importance of living processes for sustaining human wellbeing (Haines-Young and Potschin, 2013). It is a useful starting point for conceptualising the ways in which the natural environment contributes to our economic and social welfare. Furthermore, its structure facilitates mapping and assessment at different thematic and spatial scales (Esparon et al., 2014). From this starting point, we are better able to comprehend the Earth's intrinsically complex and interconnected ecosystems, transmit the values that matter most, track changes to those values over time, and establish clear priorities for sustainable planning and management.

Table 1. A hierarchical structure of ecosystem services and related goods

SECTION	DIVISION	GROUP
Provisioning the ecosystems' ability to provide resources such as nutrients, materials and energy	Nutrition	Biomass Water
	Materials	Biomass Fibre Water
	Energy	Biomassed based energy Mechanical energy
Regulation and maintenance the ways in which living organisms can mediate or moderate the ambient environment that affects human performance	Mediation of waste, toxics and other nuisances Mediation of flows	Mediation by biota Mediation by ecosystems Mass flows Liquid flows
	Maintenance of physical, chemical and biological conditions	Gaseous or air flows Lifecycle maintenance, habitat and gene pool protection
Cultural All the non-material and normally non-consumptive outputs of ecosystems that affect physical and mental state of people	Physical and intellectual interactions with ecosystems and land or seascapes	Physical and experimental interactions Intellectual
	Spiritual, symbolic and other interactions with ecosystems and land or seascapes	Spiritual Other cutltural outputs

One of the key considerations for the design of CICES is its resonance with other widely used frameworks and terminologies often used in discussing ecosystem services. The CICES (Table 1) is hierarchical in structure, with the highest level being the three recognised categories – provisioning, regulating and maintenance, and cultural services.

There is a substantial and rapidly growing body of literature on methods for estimating the value of ecosystem services and other non-priced goods (Bateman et al., 2002). Each method has its own, often considerable, data requirements and constraints, and none should necessarily be viewed as 'correct' (Stoeckl et al., 2011). Rather, with a clear articulation of the valuation's underlying purpose, one may select the approach most appropriate to the task.

Despite the increasing adherence to the structure of the CICES model, many economists categorise ecological benefits using the Total Economic Value (TEV) framework (Pascal et al., 2010). The TEV framework facilitates valuation by dividing services according to how they generate benefits.

Why put a price on the Wet Tropics?

"The services of ecological systems and the natural capital stocks that produce them are critical to the functioning of the Earth's life-support system. They contribute to human welfare, both directly and indirectly, and represent part of the total economic value of the planet" (Costanza et al., 1997).

Sometimes economic activity can deplete and degrade the natural environment upon which it depends. And since many ecosystem services are not bought or sold through markets (for example, the health benefits of clean air or the aesthetic quality of unspoiled waterways), their value may not be adequately reflected in policy considerations. As a result, development projects may have intrinsic costs that outstrip their anticipated benefits (Costanza et al., 1998).

These include 'direct-use' values (i.e., provisioning services, as well as some cultural services such as recreation and aesthetic beauty); 'indirect-use' values (including many regulation and maintenance services); and 'non-use' values, (largely comprised of cultural services, including existence and bequest values). Occasionally, 'option' values (reflecting the potential to use unutilized services in the future) are considered, though there is some debate about whether such values should be categorised separately or classified as particular 'use' and 'non-use' values.

Not all benefits can be neatly categorised. Hence, the TEV framework is perhaps best thought of as a continuum. As one moves along the continuum from direct to indirect and non-use values, the link between benefits and markets becomes increasingly tenuous and the valuation exercise becomes significantly more complicated. Unsurprisingly, the majority of economic valuation research concerning ecosystem services has centred around direct-use values tied to commercial recreation (Liu et al., 2010, Stoeckl et al., 2011).

The value of ecosystem services that can be bought and sold (e.g., timber, guided tours of a natural reserve) can be calculated with relative ease. Monetary estimates of their direct economic impact are simply the product of their market prices and quantity exchanged. In addition, indirect regional economic impact is achieved when a portion of those direct revenues are re-spent on other goods and services in the local economy.

Estimating the total (regional) economic impact of market-based ecosystem services requires information about direct expenditure within a particular industry, as well as information about the 'knock-on' spending patterns of regional business operators and residents (Thomas and Stoeckl, 2015). In an ideal world, indirect economic impacts are estimated using computable

general equilibrium models able to consider spending patterns, price variations and regional and temporal dynamics. These models are data intensive and costly to build, so input-output models are often used instead (see Driml (1994) for an example of an application in the Wet Tropics World Heritage Area).

When an ecosystem service is indirectly tied to an actual market, its dollar value may be approximated through 'revealed preference' techniques such as hedonic pricing and travel cost methods. For example, it may not be possible to estimate the monetary value of a scenic vista directly. Indeed, there is no market for the buying and selling of pleasing views. In the real estate market, however, a clear view of nature often correlates with higher housing prices. Using hedonic pricing, the difference in value between otherwise similar properties may be attributed indirectly to the vista. Similarly, tourists may spend more to visit a pristine environment than a degraded one. The travel cost method utilises differences in visitors' travel expenses to draw inferences about the value of protecting environmental attributes.

Where there are no apparent links between an ecosystem service and the market, researchers may use 'stated preference' techniques. Simplistically, researchers envisage a hypothetical market for certain ecosystem services. For example, respondents may be asked how much they would be willing to pay to receive, protect or improve a particular service. Stated preference methods remain somewhat controversial, as results may be skewed by hypothetical bias. For example, individuals may indicate a higher willingness to pay than would be observed in reality (List and Gallet, 2001).

An emerging body of literature aims to quantify the subjective notion of wellbeing through the lens of 'life-satisfaction.' Rather than investigate individuals' willingness to pay for an ecosystem service, life-satisfaction studies explore the importance of such services to individuals' overall quality of life, or 'utility'. Whether individual utility can be measured directly, rather than simply inferred, remains a subject of considerable debate. Nonetheless, research on subjective wellbeing has become a mainstay of modern economics (Kristoffersen, 2010) and use of non-priced stated preference approaches are increasingly common.

WET TROPICS IMAGES : QUEENSLAND GOVERNMENT

Values associated with the World Heritage Area

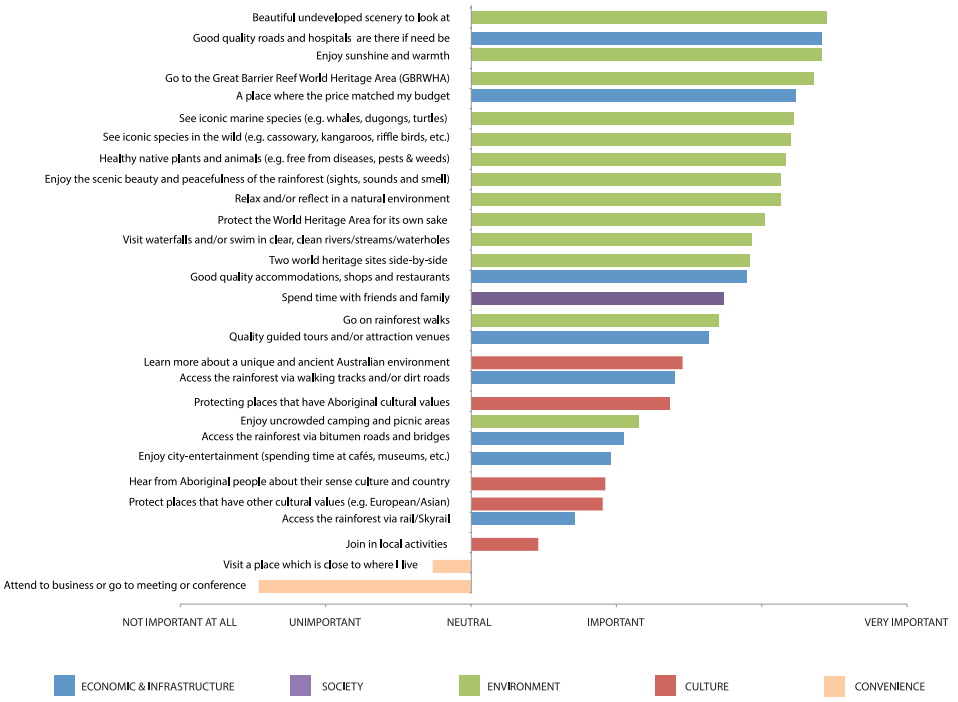
Summary points

- *Recent studies in the Wet Tropics have established that residents and tourists believe environmental factors are more important to overall quality of life than economic factors when deciding to live or visit the Wet Tropics.*
- *These findings are consistent with studies of tourism in the adjacent Great Barrier Reef World Heritage Area, which indicate that a degradation of reef-related ecosystems would likely have substantial negative impact on tourism to the region.*
- *The collective worth of the region's natural assets is likely to exceed $5.2 billion; $2.6 billion stated value associated with tourism market values plus an additional minimum of $2.6 billion from non-market values.*
- *The study suggests that policy and decision makers should not focus on market values alone, such as economic growth, when considering the well-being and community resilience of residents.*

Tourism values

Between August 2013 and June 2014, Esparon et al. (2014) surveyed 621 visitors to the Wet Tropics region. Collecting data at the domestic and international terminals of Cairns Airport and along the waterfront of Cairns, researchers asked tourists to indicate the importance of various ecosystem services associated with the Area, to their decision to visit the region (i.e stated values). Visitors were also asked about other goods and services, enabling comparisons to be made across 36 different items. Items were identified in a series of workshops with local residents, tourism operators, managers and policy makers associated with the Area. Participants were asked to identify and prioritise the ecosystem services they believe are considered important by local residents and visitors to the Area (Figure 2). To enable comparison, participants were also asked to identify other goods and services (associated with the broader economy and society) that contribute to wellbeing and which are likely to attract tourists to the region. After 'safety' (of family and travelling companions), respondents ranked undeveloped scenery as the thing of value to them.

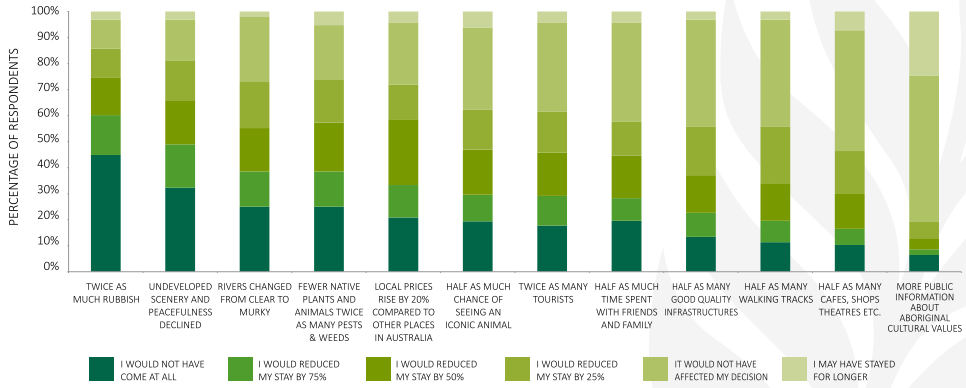
Figure 2. Importance of services in tourists' decision to visit the region



The importance visitors ascribe to these services was then compared with their reported satisfaction with those items once in the Area. Information about tourist satisfaction is particularly pertinent to world heritage managers seeking to deliver high quality visitor experiences and to develop appropriate strategies to attract more tourists (Coghlan, 2012; Esparon et al., 2015). Satisfied visitors are more likely to extend their stay, visit again or make recommendations to friends and family (Saltzer, 2002; Kozak, 2003; Vetitnev et al., 2013). Esparon et al. (2014) indicate that the largest gaps between importance and satisfaction relate to the World Heritage Area's environmental values, signalling potential problems in the future for the intrinsic values of the region, if not properly managed.

Esparon et al. (2014) asked visitors to indicate how various hypothetical changes would have impacted their decision to visit the region. Respondents stated they were more concerned about the prospects of more rubbish, increased development, and environmental decline than higher prices (see Figure 3). Findings suggest that degradation of the Area's Outstanding Universal Value would likely do more harm to local tourism revenues than an increase in local prices (or a commensurate appreciation of the Australian dollar)[1]. These findings are consistent with studies of tourism in the adjacent Great Barrier Reef World Heritage Area, which indicate that a degradation of reef-related ecosystems would likely have substantial negative impact on tourism to the region (Esparon et al., 2015; Mustika et al., 2015; Jarvis et al., forthcoming).

Figure 3. Impact of hypothetical changes on tourists' decision to come to the region



Visitor opportunities

Tourism is the fastest growing industry in the Wet Tropics, providing significant employment opportunities and economic benefits. As one of Australia's most popular tourism destinations, the Wet Tropics World Heritage Area is frequented by about 5 million local and international visitors each year. Development of Cairns International Airport has made the region more accessible, with increases in global travel a key contributor to the region's growth (Queensland Government, 2009).

As well as the draw of the World Heritage Area, the Wet Tropics has a number of popular attractions offered by local operators including excursions to Kuranda Village by scenic railway and the Skyrail Rainforest Cableway, white water rafting on the Barron River, amphibious vehicle tours of Rainforestation, Hartley's Crocodile Adventure, horse riding, quad-biking, scenic flights over Cairns and the Great Barrier Reef, river tube-riding, and the Atherton Platypus Experience (Thomas and Stoeckl, 2015).

The Wet Tropics World Heritage Area's rich Indigenous heritage is also an important draw for regional tourism and a key source of employment for the Rainforest Aboriginal people. Indigenous tourism ventures encompass storytelling, guided tours, camping, cultural centres, traditional dance and the production and sale of arts and crafts (Ignjic, 2001; Zeppel, 2002). In addition to their economic benefits for Indigenous peoples, such enterprises also comprise an important pathway for sustaining the cultural heritage values of the Area.

[1]Esparon et al (2014) also tested for significant differences in responses among different categories of visitors and reported variations across various groups. Female tourists were more concerned by the prospect of seeing fewer iconic animals and were more interested in Aboriginal cultural values than male tourists. Single travellers were more concerned by the prospect of murkier rivers and more interested in Indigenous culture. Elderly travellers were more concerned at the thought of fewer infrastructures or having less time with family. German visitors were relatively more concerned by the prospect of more rubbish and were motivated by opportunities to experience Indigenous culture. Other European visitors were more focused on family and friends, as well as access to cafes. Asian visitors were more concerned by the prospect of reduced scenic values.

Other values compared to tourism values

Only two studies have attempted to estimate the value of non-market based ecosystem services in the Wet Tropics region. Utilising a multi-criteria analysis informed by a Delphi Inquiry (weights assigned by a panel of experts), Curtis (2004) gauged the relative importance of twenty ecosystem attributes associated with the Area (Table 2). These attributes were then benchmarked against market-based 'best use' values (i.e., the opportunity costs of not using land for agriculture, development, etc.), and a conservative estimate of these attributes' implicit monetary value was then generated. Biodiversity and refugia were ranked as the two most important ecological attributes (in 2002 prices) at AUD$18.6 to $20.9 million per year and AUD$16.6 to $18.2 million per year, respectively.

Table 2. Commonly accepted suite of ecosystem services

GROUP	TYPE
Stablisation services	gas regulation (atmospheric conditions) climate regulation (temperature, rainfall) disturbance regulation (ecosystem resilience) water regulation (hydrological cycle) erosion control and soil/sediment retention biological control (populations, pest/disease control) refugia (habitats for residents and transient populations)
Regeneration services	soil formation nutrient cycling and storage (including carbon sequestration) Assimilation of waste and attenuation, detoxification purification (clean water, air) pollination biodiversity
Production of goods	water supply (catchment) food production raw materials (timber, fibre) genetic resources (medicines, scientific and technological resources)
Life fulfilling services	recreation opportunities (nature-based tourism) aesthetic, cultural and spiritual (existence values) Other non-use values (bequest and quasi-option values)

(Curtis, 2004 - Modified after Costanza et al. (1997a) and Cork and Shelton (2000), Curtis (2004))

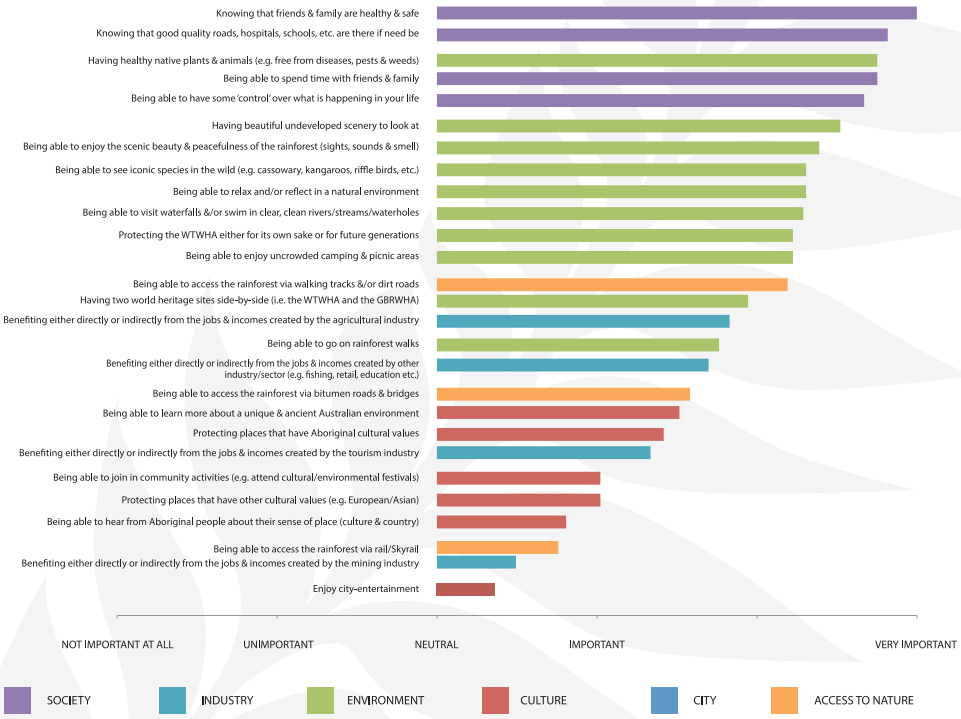
More recently, Esparon et al. (2014) collected data from more than 600 tourists and over 500 residents from the Wet Tropics Area[2] to explore the value of numerous ecosystem services in the region.

Using questionnaires developed through a series of workshops with local stakeholders, residents of the Area were asked to indicate:

- the importance of identified ecosystem services and other values (such as the safety of family and friends) to their overall quality of life
- their satisfaction with each of these factors
- the likely impact of changes to these values on their overall quality of life (a combined life-satisfaction/contingent behaviour approach).

Esparon et al. (2014) found that the health and safety of family and friends is the foremost important value among both Indigenous and non-Indigenous residents, followed by time spent with loved ones (Figures 4 and Figure 5). Notably, environmental values, including the health of native plants and animals, undeveloped scenery, and presence of iconic species, consistently ranked higher than economic factors such as employment income from mining, tourism and agriculture.

Figure 4. Importance to overall quality of life for non-Indigenous residents



[2]*Respondents also included 160 Indigenous residents and a geographically stratified random sample of 386 non-Indigenous residents.*

Figure 5. Importance to overall quality of life for Rainforest Aboriginal residents

This is consistent with findings from a parallel study of the Great Barrier Reef World Heritage Area which found that residents consider environmental factors to be more important to overall quality of life than economic factors (Larson et al., 2014).

There is considerable research documenting threats to the natural environmental assets and derived ecosystem services of the Area. For example, Pert et al. (2012) compiled a threat index tracking forest cover fragmentation, urbanisation, weeds, feral animals and road density to help Area managers and other stakeholders identify threats to the region's vegetation and inform resource allocation priorities. Catterall et al. (2012) investigated the impacts of deforestation on endemic bird populations and the potential of forest restoration for rehabilitating native bird species. Waterhouse et al. (2012) quantified the threat posed by agricultural pollutants flowing from the Wet Tropics region into the catchments of the Great Barrier Reef. To the best of our knowledge, however, only Esparon et al. (2014) have investigated the likely impact of ecosystem degradation on individuals' behaviour and life satisfaction.

Esparon et al. (2014) asked residents of the Wet Tropics to indicate how changes to various ecosystem services would likely impact their overall quality of life. Their findings suggest that some types of environmental degradation would have a stronger adverse impact on overall quality of life than a 20 per cent increase in local prices (Figure 6 and Figure 7).

Figure 6. Hypothetical impact of changes to overall quality of life for non-Indigenous residents

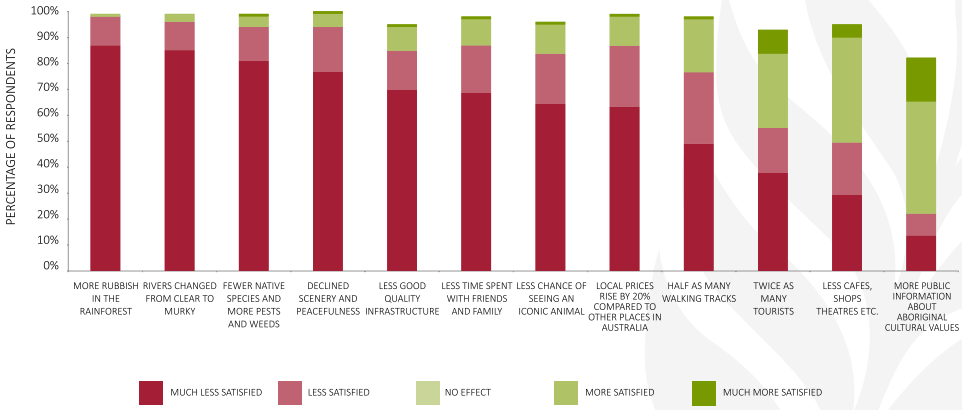
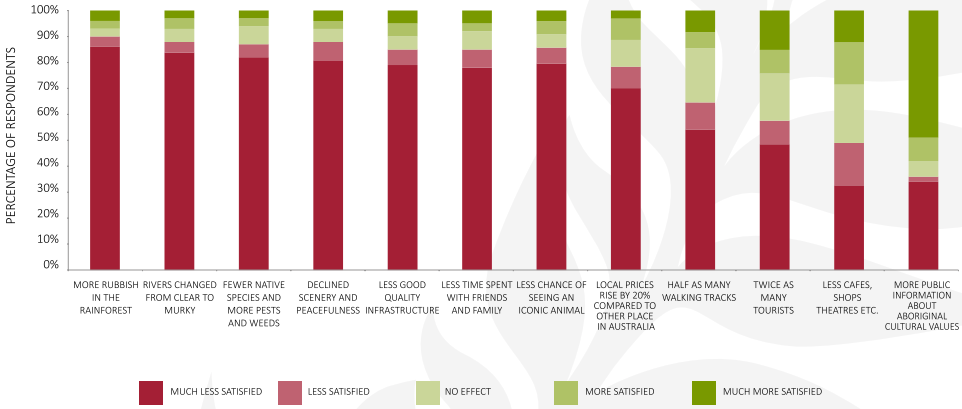


Figure 7. Hypothetical impact of changes to overall quality of life for Rainforest Aboriginal residents



Esparon et al. (2014) also exposed gaps between the importance residents of the Wet Tropics attach to the natural environment and their satisfaction with these values. Critically, many of the largest gaps between importance and satisfaction relate to the Area's environmental values. Gaps tended to be smallest for tourists, larger for non-Indigenous residents and largest for Rainforest Aboriginal residents, possibly signalling disparate points of reference among these groups.

Esparon et al. (2014) reason that apparent gaps between the importance people ascribe to the ecosystem services of the World Heritage Area and their level of satisfaction with these services may be wider among residents because these respondents have a deep sense of ownership and place (McIntyre-Tamwoy, 2004; Carmody and Prideaux, 2011). Rainforest Aboriginal peoples, in particular, derive a keen sense of communal identity from the rainforest.

Long-term residents who have a history of experiential engagement with the landscape (McIntyre-Tamwoy, 2004) may be able to cogently assess a wider range of its values. Tourists whose countries of origin have relatively degraded natural environments, on the other hand, may be less dissatisfied with the seemingly pristine natural qualities of the Area.

Policy makers often ask economists to undertake non-market valuation studies, to provide information that allows them to prioritise activities and programs. But one does not need to assign dollar values to assess priorities. If one looks at both the 'importance' that people assign to various factors, and at their 'satisfaction' with those factors, one can identify factors which residents (or tourists) deem to be particularly important to their overall quality of life, and which they are concerned (or dissatisfied with). Factors that are relatively un-important, or those that are important but seem to be 'on track' may be given a lower priority for policy. This frees valuable resources for policy makers to focus on the 'important things' which people are worried about.

Do different people value different things?

Although there is widespread agreement amongst Wet Tropics residents that the environment is more important than industry to overall quality of life, studies have shown that people who earn income from mining or ports would be relatively less impacted by environmental decline or fewer opportunities to learn about Indigenous heritage than individuals associated with other industries. Respondents with a university degree were also relatively less likely to be negatively affected by higher prices, less infrastructure, or fewer café's and shops than individuals without higher education.

The collective value of the Wet Tropics World Heritage Area ecosystem services

In a recent study, Stoeckl et al (2014) assessed the collective value of numerous ecosystem services associated with the Great Barrier Reef World Heritage Area. Researchers established the importance of identified ecosystem services to individuals' overall quality of life, consolidated these services into thematically similar groups, and compared the respective 'importance' of each group.

Consolidating the identified services is methodologically important, as ecosystems are highly complex and interconnected (Koch et al.,2009). The 'total' value of an entire ecosystem cannot be calculated simply by summing individual values together unless each value can be shown to contribute to welfare (or economic utility) in an additively separable manner (De Groot et al., 2002; Carbone and Smith, 2013). To do otherwise risks double-counting (Fu et al., 2011). Moreover, delineating ecosystem service values also allows managers to minimise trade-offs and enhance synergies (Bennett et al., 2009).

Esparon et al. (2014) used statistical analysis to thematically consolidate values by level of importance (Table 3). As above, values associated with the 'market' grouped together (termed, 'Industry'). Gillespie Economics and BDA Group (2008) estimates that tourism contributes $2.6 billion per annum to the local economy. The cultural and environmental values that were not associated with the market (as per table 3), were assessed by residents as being more important to their overall quality of life than industry (of which tourism is a part). So we can be confident that these other, separable values, must be worth more than the $2.6 billion tourism industry.

It should be noted that although not all of the factors listed under 'environment' and 'culture' in their research relate exclusively to the criteria for which the Wet Tropics World Heritage Area was listed, the correlation is strong. The collective value of the ecosystem services associated with the

ecological and cultural values of the Area assessed are $2.6 billion, suggesting that industrial development within the Area should not be regarded as an end unto itself, but as only one of several factors that contribute to the social and economic welfare of the region (Esparon et al. 2014).

In other words, this research indicates that residents believe that the region's non-market ecoystem services (including but not limited to those associated with aesthetics, recreation and preservation of the region for future generations) are even more important to their quality of life than those tourism values.

Thus the collective worth of the region's natural assets is likely to exceed $5.2 billion per annum; $2.6 billion associated with tourism market values plus an additional $2.6 billion from non-market values (although some of the values associated with the Wet Tropics are inseparable from those associated with the Great Barrier Reef).

This has strong policy implications. In this region, it is clear that one should not just focus on a market-value (e.g. economic growth) when considering the welfare of residents. Non-market values are equally, if not more, important to the overall quality of life of residents in the Wet Tropics. This is not necessarily the case in developing countries, or among society's extremely poor, whose basic needs, such as adequate food and shelter, are not being met. In such cases, economic growth may indeed be paramount.

As such, policy makers need to recognise that economic development within the Area should not be regarded as an end unto itself. It is only one of several factors that contribute to well-being. If economic growth substantially erodes non-market values, economic growth could actually reduce community wellbeing.

Table 3: Relative importance of values to residents' overall quality of life

THEME	AVERAGE IMPORTANCE OF 'THEME' TO OVERALL QULITY OF LIFE	ITEMS [FROM QUESTIONNAIRE] WERE ASSOCIATED WITH THE 'THEME' [ASCERTAINED USING PRINCIPAL COMPONENTS ANALYSIS]
Society	1.72	Knowing that friends and family are healthy and safe Knowing that good quality roads, hospitals, schools, etc. are there if need be Being able to spend time with friends and family Being able to have some 'control' over what is happening in your life
Environment	1.47	Beautiful undeveloped scenery to look at Healthy native plants and animals (e.g., free from diseases, pests and weeds) Enjoy scenic beauty and peacefulness of the rainforest (sights, sounds and smells) Protecting the either for its own sake or for future generations (even if you have never been there or never plan to go) Having two world heritage sites side-by-side (Rainforest and Reef) Relax and/or reflect in a natural environment See iconic species in the wild Go on rainforest walks Visit waterfalls and/or swim in clear, clean rivers/ streams/waterholes Enjoy uncrowded camping and picnic areas
Access to nature	0.97	Access the rainforest via bitumen roads and bridges Access the rainforest via walking tracks and/or dirt roads Access the rainforest via rail/Skyrail
Culture	0.95	Hear from Aboriginal people about their sense of place (culture and country) Protect places that have Aboriginal cultural values Learn about a unique and ancient Australian environment Protect places that have other cultural values (e.g., European/Asian) Join in community activities (e.g., attend cultural/environmental festivals)
Industry	0.71	Direct or indirect benefit from jobs and incomes created by the tourism industry Direct or indirect benefit from jobs and incomes created by the mining industry Direct or indirect benefit from jobs and incomes created by the agricultural industry Direct or indirect benefit from the jobs and incomes created by other industry/sector (e.g., fishing, retail, education etc.)
City	0.15	Enjoy city-entertainment (e.g., spending time at cafés, museums, etc.)

Maintaining and protecting the World Heritage Area

Summary points

- *Based on management expenditure and visitor numbers, the amount of money spent on the Wet Tropics World Heritage Area is the second lowest of the World Heritage Areas examined across 16 World Heritage Sites in Australia.*
- *Sustaining and growing world heritage-based economic activity in the Wet Tropics depends on protecting the environmental and cultural values of the Wet Tropics rainforest asset.*
- *Success depends on collaboration between industry, government and community.*

While tourism generates considerable economic benefits in the Area, the growing number of visitors puts significant additional pressure on local ecosystems. Expansion of tourism within the Area can generate considerable economic benefits. But if not properly managed, tourism can adversely affect the natural and social environment of host communities through: excessive resource consumption, pollution and generation of wastes, disruption and commoditisation of cultures and alienation of members of the community (Moscardo, 2008).

Managers play a critical role in the protection and maintenance of the Area's Outstanding Universal Value - not just for the sake of world heritage status and its importance to tourism, but also for the wellbeing of local residents. Successful management, however, does not come without cost.

Driml and Common (1995) examined the management budgets and user fee revenues of the Great Barrier Reef, Wet Tropics, Kakadu, Uluru and Tasmanian Wilderness World Heritage Areas. At 2.5 per cent the Wet Tropics was shown to generate the smallest proportion of its management resources from user fees (Uluru had the highest, at 68 per cent).

WET TROPICS IMAGES : LIZ GALLIE

WET TROPICS IMAGES : DAVE COOK

In contrast to the Great Barrier Reef World Heritage Area, where user fees may be collected through the Environmental Management Charge (EMC), it is exceedingly difficult to collect compulsory fees in the Area as there are simply too many points of access. Utilising Gillespie Economics' estimates (2007) of management expenditure and visitor numbers, we estimate management expenditure per visitor for 16 World Heritage Areas in Australia. At $2.28 per visitor, the amount spent on management of the Area is the second lowest of the World Heritage Areas examined (Table 4). It is ranked ninth in management expenditure per hectare.

Sustaining and growing world heritage-based economic activity in the Wet Tropics depends on protecting the environmental and cultural values of the Wet Tropics rainforest asset, maintaining and protecting the value and reputation of the Wet Tropics World Heritage brand in key markets, and identifying key domestic and international tourism markets and tailoring experiences and opportunities to suit their needs. Success depends on collaboration between the industry, government and community.

Table 4. The economic impact of 16 of Australia's World Heritage Properties based on management expenditures and visitation, management expenditure per visitor and management expenditure per hectare.

WORLD HERITAGE AREA	MANAGEMENT EXPENDITURE INCLUDING WAGES ($ million 2006/07)	ESTIMATED VISITATION (# OF VISITORS 2006/07)	MANAGEMENT EXPENDITURE PER VISITOR ($ PER VISITOR)	MANAGEMENT EXPENDITURE PER HECTARE ($ PER HECTARE)
Macquarie Island	0.48	750	642.67	137.71
Lord Howe Island	8.30	15 715	528.16	5 704.47
Kakadu	22.10	158 468	139.46	11.16
Purnululu	1.60	23 687	67.55	6.67
Willandra Lakes	2.30	35 881	64.10	9.58
Uluru – Kata Tjuta	14.30	341 700	41.85	107.28
Shark Bay	2.60	90 298	28.79	1.18
Australian Fossil Mammal Site, Naracoorte	0.62	29 322	20.97	2050.00
Tasmanian Wilderness	9.30	500 000	18.60	5.89
Sydney Opera House	59.00	7 250 000	8.14	32 777 777.78
Greater Blue Mountains	11.10	1 500 000	7.40	10.75
Gondwana Rainforests	17.20	2 500 000	6.88	46.93
Fraser Island	8.00	1 400 000	5.71	43.48
Australian Fossil Mammal Site, Riversleigh	0.13	35 000	3.60	12.60
Wet Tropics	11.40	5 000 000	2.28	12.75
Royal Exhibition Centre and Carlton Gardens	1.90	2 544 175	0.75	73 076.92

Management challenges and rewards - a way forward

Summary points

- *Managers need to identify opportunities to leverage the region's natural synergies between the Wet Tropics and adjacent Great Barrier Reef World Heritage Area. Through 'common cause' management objectives, protection of the environment can also be good business.*
- *Managers should prioritise developments that strengthen the economy and the environs simultaneously, promote quality over quantity and leverage the Area's ecological and cultural values to benefit local stakeholders.*

This report brings together a broad range of studies to illustrate the values most important to stakeholders of the Wet Tropics World Heritage Area. The research conducted indicates that while tourism, agriculture, mining and other industries generate considerable economic impact for the region, non-market environmental and cultural values associated with the values of the World Heritage Area is equally economically significant. Collectively the value of the entire area (including tourism, environmental and cultural values) is thus likely to exceed $5.2 billion a year. The region's natural environment is imperative to resident and visitor, and to minimise potential trade-offs and protect the region's Outstanding Universal Value, managers need to identify opportunities to leverage the region's natural synergies between the Wet Tropics and adjacent Great Barrier Reef World Heritage Area.

Identifying 'common cause' management objectives

Environmental stewardship often entails economic co-benefits for businesses and society. Through 'common cause' management objectives, protection of the environment can also be good business.

Research suggests that some agricultural best-practices can strengthen the resilience of the surrounding ecosystem (Mahmoud and Shively, 2004; Norton et al, 2009). Stoeckl et al. (2015) investigated the beneficial impacts of weed control programs in Northern Australia, noting that such practices enhance agricultural output and protect native flora and biodiversity. Weed-control represents a relatively 'efficient' type of environmental protection. Findings by Esparon et al (2014) suggest that pest management programs would be well recieved by residents of the region, who indicate healthy native plants and animals are highly important to their wellbeing. Morevoer, these residents also expressed a positive willingness to pay to reduce weeds and protect native plants and animals.

Yellow crazy ants

Yellow crazy ants are an invasive tramp ant species that can devastate the local ecology. This pest poses a significant threat to the Wet Tropics World Heritage Area. An 800 hectare infestation south of Cairns already includes 60 hectares within the World Heritage Area.

Yellow crazy ants *(Anoplolepis gracilipes)* can prosper in a broad range of habitats and are versatile, omnivorous and aggressive invaders. They devastate the local ecology and kill nearly all other vertebrate and invertebrate species within the infested area.

Yellow crazy ants can have a strong impact on people's quality of life and their ability to enjoy their house and land with family, friends and pets.

The ants can also affect agricultural yields, such as sugar cane and fruit crops, due to the ants' tendency to protect some species of scale insects.

Yellow crazy ant infestations will lower land values and deter new business and social investment in infested areas if left unchecked. Tourism is also likely to be affected if the ants infest local visitor sites.

Eradication of yellow crazy ants will provide multiple benefits for the economy, specifically relating to world heritage values, agricultural production, urban land values and the tourism industry.

The sharing of local knowledge has been demonstrated to promote environmental protection while improving cultural, social and economic outcomes in Indigenous communities. In the Warddeken Indigenous Protected Area (IPA) for example, the West Arnhem Land Fire Abatement program is leveraging traditional knowledge to reduce the region's carbon footprint and create jobs for local residents. Utilising traditional methods, Indigenous rangers carry out controlled burns of bush undergrowth. By thinning these fuel loads early, they reduce the risk of larger, more costly bushfires. The rangers' efforts are reducing CO2 emissions by an estimated 100 000 tonnes a year (North Australian Information Resource, 2015), generating income and strengthening the region's Indigenous cultural values.

Over thousands of years, the Rainforest Aboriginal peoples have amassed a wealth of ecological knowledge concerning management of the Wet Tropics flora, fauna, landscapes and resources. Indigenous residents have mastered complex techniques to process and consume some toxic plants as food and have utilised fire and planting methods to regulate rainforest vegetation communities. As illustrated in the Warddeken IPA, managers may be able to leverage the expertise of Traditional Owners to protect the Area's Outstanding Universal Value, while providing much needed economic opportunities for local Indigenous stakeholders that preserve and strengthen Aboriginal culture.



WET TROPICS IMAGES : MARCELLE HUMPHREYS : CAMPBELL CLARKE : KERRY TRAPNELL

Planning for environmentally sensitive development

Esparon et al. (2014) clearly establish that in the Wet Tropics, residents and tourists place a higher level of importance on social and ecological values than on aspects related to industry and the built environment (i.e., economic indicators). Moreover, they show that degradation of the Outstanding Universal Value of the World Heritage Area could do more harm to residents' overall quality of life and to local tourism revenues than a 20 per cent increase in prices (or a commensurate appreciation of the Australian dollar). These linkages demonstrate that planning for environmentally sensitive development must do more than minimise trade-offs between the economy and the environment. Instead, managers should prioritise developments that:

1. strengthen the economy and the environs simultaneously
2. promote quality over quantity
3. leverage the Area's ecological and cultural values to benefit local stakeholders.

Strengthen the economy and the World Heritage environs simultaneously

If managed to promote environmental stewardship and social inclusion, the tourism industry has much to contribute to the wellbeing of local communities (Crouch and Ritchie, 1999). Furthermore, in decentralised tourism markets, operators who prioritise environmental stewardship have been shown to gain meaningful competitive advantage (Poon, 1994). Yet tourism is an often tumultuous industry, with community fortunes swinging rapidly through boom and bust cycles in response to social, political and economic externalities. These cycles can exaccerbate economic hardship among residents and may encourage policy makers to promote 'mass-tourism' initiatives.

Research has shown that residents' perceptions of the negative impacts of tourism tend to heighten as local tourism increases (Smith and Krannich, 1998). Moreover, concentration of visitors through centralised, mass-tourism products has been shown to narrow the distribution of tourism revenues among a relatively small group of industry players (Poon, 1993; Thomas and

Stoeckl, 2015). Potential local and regional-level distributional impacts should be taken into account in order to foster the development of economically resilient communities.

Diversification within other industry sectors can likewise improve both economic and ecological outcomes. For example, research indicates that agricultural crop diversification may better support and maintain regional biodiversity than monoculture production (Laiolo, 2005; Chavas and Di Falco, 2012; Sauer and Wossink, 2013). Diversified agricultural concerns may also be economically more 'efficient' than monoculture enterprises (Chavas and Aliber, 1993; Paul et al., 2004; Nehring et al., 2005; Villano et al., 2008; Stoeckl et al., 2014). These economic efficiencies can be generated not only through economies of scale, but also of scope (for example, cost savings through diversification).

Promote quality over quantity

High quality goods and services often command price premiums, relieving pressure to increase business volume and turnover. As noted by Sun et al. (2011), Australian demand for organic produce is rising rapidly and 'niche' markets are increasingly common. Importantly, organic farming practices are often less damaging to the environment than non-organic methods (Norton et al., 2009). Of potential concern is the on-going corporate consolidation of agriculture in northern Australia. Evidence suggests that while risk-averse managers tend to generate better biodiversity outcomes (Stoeckl et al., 2015), industrial-scale agricultural enterprises are generally less risk-averse than their smaller counterparts (Livingston and Mishra, 2013).

Research has also found that some types of tourism (mass-tourism offerings, in particular) are likely to impose greater environmental costs than smaller, boutique-scale operations (Johnson 2002). Patrons of some mass-tourism products (such as cruise ship passengers) also tend to spend less per person than their counterparts, so additional expenditures generated through higher turnover may not be commensurate with an overall increase in visitors (Thomas and Stoeckl, 2015).

Leverage the ecological and cultural values of the World Herigate Area to benefit local stakeholders

The Area's rich Indigenous heritage is an important draw for regional tourism and a key source of employment for Rainforest Aboriginal people. Among international tourists in particular, additional opportunities to learn about Indigenous culture and sense of place could result in longer stays, increased spending and enhanced satisfaction. Similarly, a wide range of studies has documented the manifold benefits of eco-tourism in and around the Area (Driml and Common, 1995; Gillespie Economics and BDA Group, 2008; Stoeckl et al., 2010; Deloitte Access Economics, 2013; Mustika et al., 2015).

Increasing social commitment to protecting the Outstanding Universal Value of the World Heritage Area

As demonstrated by Gillespie Economics and BDA Group (2008), the costs associated with management of Australia's World Heritage Areas can be substantial. In a competitive resource environment, adequate support of the Wet Tropics Management Authority and other critical natural resource managers may be bolstered with additional revenue.

Residents of the Wet Tropics express a willingness to pay to protect the region's natural values, but indicate that this willingness is conditioned upon 'collective action' (Esparon et al., 2014). Research indicates that residents are willing to pay to protect the region's ecological assets, if responsibility to do so is shared equitably among the region's many beneficiaries. Moreover, the use of monetary rewards to promote participation in conservation efforts has been shown to undermine the objectives of such programs, as financial incentives can stifle intrinsic social motivations to protect public goods (Gneezy et al., 2011; Ostrom, 2014). Similarly, asking residents (or tourists) to pay a tax or fee may generate resentment towards the Area.

Research strongly suggests that demand among visitors to the World Heritage Area is relatively price inelastic, i.e., a general increase in prices would raise revenue without having a strong negative impact on tourist numbers (Farr et al., 2011; Pascoe et al., 2014). Recreational use fees may thus comprise an efficient and equitable source of supplementary revenues (Knapman and Stoeckl, 1995). As discussed, however, collection of user fees is logistically difficult in the Area, as there are simply too many points of access to manage fee collection efficiently.

Which way our future

Rainforest Aboriginal people are very proud of their Indigenous heritage. In the Wet Tropics region Rainforest Aboriginal people continue to seek recognition as the traditional land owners of the Wet Tropics World Heritage Area with distinct cultures and individual needs.

Currently there are many activities in the Wet Tropics which Aboriginal people lead and are involved in, including on-ground management of their traditional country. Rainforest Aboriginal people seek to be involved in activities such as planning, tourism, walking track and infrastructure development, fire management, research, water quality and wildlife protection. They seek employment, training in ranger work and business opportunities so that they can actively utilise their customary and contemporary land management knowledge to continue their tradition in managing country.

Nonetheless, many visitors are keen to support local conservation efforts and research has repeatedly shown that tourists are willing to pay to help protect and manage the Outstanding Universal Value of the Area (Esparon et al., 2014).

Communicating value to industry stakeholders

The natural values of the Area are clearly important to the tourism industry (Gillespie Economics and BDA Group, 2008), to local residents (Esparon et al., 2014) and, as evidenced by the region's world heritage status, to people throughout the world. Unfortunately, some local businesses—particularly those not dependent upon tourism, may not appreciate the region's natural values as part of their financial bottom line. As a result, industrial development proposals may not take the value of the environment sufficiently into account.

A wide body of literature suggests that the environment may provide a type of wage 'subsidy' (Rosen, 1979; Roback, 1982; Rosen, 1986; Roback, 1988; Lavín et al., 2011). Simplistically, workers may be willing to accept lower relative pay if able to work within a pristine natural environment. On the other hand, employers may be required to pay relatively higher wages to employees who work in degraded (e.g., polluted, congested) environments. Findings by Esparon et al. (2014) that residents place greater importance on the region's aesthetic attributes than values tied to 'Industry' strongly support this hypothesis. While it would be a complicated undertaking to identify and estimate the magnitude of environmental wage subsidies in the Area, doing so might help businesses recognise their own financial interests in preserving the natural values of the region.

Managing for the things that matter most

Despite growing scientific consensus that the ecosystems of the Area are undergoing change, little is known about how these changes are likely to impact the values society derives from the region. This problem is complicated by the phenomenon of 'shifting baselines' (Esparon et al., 2014). Research suggests that each new generation of stakeholders accepts a contemporary level or condition of natural capital stock (e.g., stock size, species composition) as a baseline for the evaluation of change (Pauly, 1995; Ainsworth et al., 2008; Bunce et al., 2008).

Governments routinely monitor financial indicators (e.g., income, wages, GDP, prices, exchange rates). The Australian Bureau of Statistics (ABS) monitors wellbeing, though its conceptual and measurement framework emphasises social and economic factors. The ABS also undertakes some environmental accounting (ABS, 2015), but focuses primarily on provisioning services and use-values (e.g., waste management, water consumption). In other words, Australia's wellbeing accounts all but overlook the environment, while its environmental accounts largely neglect many of the ecosystem services critical to wellbeing. In developing countries, it may be entirely appropriate to focus on provisioning services and income—at the basic level of subsistence, provisioning services may be more pressing than other ecosystem services (Hicks et al., 2015).

Once basic necessities are met, other ecosystem services, for example, those relating to aesthetic and cultural values, may contribute relatively more to wellbeing. The importance of non-use values has been established in the Wet Tropics (Esparon et al., 2014), the Great Barrier Reef World Heritage Area (Larson et al., 2014; Stoeckl et al., 2014), across northern Australia (Larson et al., 2013), in southeast Queensland (Ambrey and Fleming, 2011), and elsewhere in the world (Brereton et al., 2008; Smyth et al., 2008).

Environmental accounting in the Area must consider more than the region's provisioning services, particularly as there may be trade-offs between different types of ecosystem services (Hicks et al., 2015). The ABS framework for Indigenous Wellbeing (ABS, 2010) may also be suited to non-Indigenous residents of the Area, as it explicitly acknowledges the importance and inseparability of the natural environment and could guide the development of a more appropriate set of metrics to be included in the ABS environmental accounts.

Expanding the ABS' environmental and wellbeing frameworks to include a broader range of indicators (particularly those relating to aesthetic and recreational values) will require time and resources. But it may be possible to take account of such factors indirectly in a cost effective and timely manner. Measures of subjective wellbeing are generally found to have a sufficient degree of internal consistency, validity and reliability, as well as a high degree of stability over time (Deiner et al., 1999). Further, indicators of subjective wellbeing capture the collective 'impact' of social, economic and environmental factors on people's lives and livelihoods.

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