



National Environmental Science Programme

Final Report

Assessing the human dimensions of the Great Barrier Reef: A Wet Tropics Region focus

Margaret Gooch, Allan Dale, Nadine Marshall and Karen Vella



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A Wet Tropics Region focus

Margaret Gooch¹, Allan Dale¹, Nadine Marshall² and Karen Vella³

¹ The Cairns Institute, James Cook University

² CSIRO

³ Queensland University of Technology



Australian Government



Supported by the Australian Government's
National Environmental Science Program

Project 3.2.2: The IMS 2050 Human Dimensions Project: Cost-effective Indicators and Metrics for key GBRWHA human dimensions linked to Reef 2050 Plan objectives and targets

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National Library of Australia Cataloguing-in-Publication entry:
978-1-925514-15-5

This report should be cited as:

Gooch, M., Dale, A., Marshall, N., & Vella, K. (2018). *Assessing the human dimensions of the Great Barrier Reef: A Wet Tropics Region focus*. Report to the National Environmental Science Programme. Reef and Rainforest Research Centre Limited, Cairns (61pp).

Published by the Reef and Rainforest Research Centre on behalf of the Australian Government's National Environmental Science Programme (NESP) Tropical Water Quality (TWQ) Hub.

The Tropical Water Quality Hub is part of the Australian Government's National Environmental Science Programme and is administered by the Reef and Rainforest Research Centre Limited (RRRC). The NESP TWQ Hub addresses water quality and coastal management in the World Heritage listed Great Barrier Reef, its catchments and other tropical waters, through the generation and transfer of world-class research and shared knowledge.

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ACRONYMS

ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ABS	Australian Bureau of Statistics
ABGA	Australian Banana Growers Association
ABC	Australian Broadcasting Corporation
AMSA	Australian Maritime Safety Authority
AUD	Australian Dollar
BMP	Best Management Practice
CAFNEC	Cairns and Far North Environment Centre
CBD	Central Business District
CCC	Cassowary Coast Council
COC	Codes of Conduct
DAE	Deloitte Access Economics
DEHP	Department of Environment & Heritage Protection
DSC	Douglas Shire Council
EA	Ecotourism Australia
EBIT	Earnings Before Interest & Taxation
EMS	Environment Management System
ERP	Estimated Resident Population
FNQ	Far North Queensland
FNQROC	Far North Queensland Regional Organisation of Councils
FONR	Friends of Ninney Rise
GBR	Great Barrier Reef
GBRMPA	Great Barrier Reef Marine Park Authority
GBRWHA	Great Barrier Reef World Heritage Area
GFC	Global Financial Crisis
GRP	Gross Regional Product
GSP	Gross State Product
GVP	Gross Value of Production
HESB	High Efficiency Sediment Basins
IMO	International Maritime Organization
IPA	Indigenous Protected Area
IPBES	Intergovernmental Panel on Biodiversity and Ecosystem Services
JCU	James Cook University
LGA	Local Government Area
LMAC	Local Marine Advisory Committee
LPG	Liquid Petroleum Gas
MOU	Memorandum of Understanding
NDRRA	Natural Disaster Relief & Recovery Arrangement
NESMG	North-East Shipping Management Group
NESP	National Environmental Science Programme
NFZ	Net Free Zone
NGO	Non Government Organisation
NQ	North Queensland
NRM	Natural Resource Management
NUE	Nitrogen Use Efficiency

OUV	.....	Outstanding Universal Value
PMP	.....	Property Management Plan
PN	.....	Ports North
PSSA	.....	Particularly Sensitive Sea Area
QDEHP	.....	Queensland Department of Environment and Heritage Protection
QGSO	.....	Queensland Government Statistician's Office
QPWS	.....	Queensland Parks and Wildlife Service
RAC	.....	Reef Advisory Committee
RDA FNQ&TS	.....	Regional Development Australia Far North Queensland and Torres Strait
REIQ	.....	Real Estate Institute of Queensland
RIMReP	.....	Reef Integrated Monitoring and Reporting Program
RRRC	.....	Reef and Rainforest Research Centre
RUSWMIG	.....	Reef Urban Storm Water Management Implementation Group
SEQ	.....	South East Queensland
SELTMP	.....	Social and Economic Long-Term Monitoring Program (for the GBR)
SM	.....	Spanish Mackerel
SVA	.....	Social Ventures Australia
TAFE	.....	Technical and Further Education
TEK	.....	Traditional Ecological Knowledge
TO	.....	Traditional Owner
TRA	.....	Tourism Research Australia
TSS	.....	Total Suspended Solids
TTNQ	.....	Tourism Tropical North Queensland
TUMRA	.....	Traditional Use of Marine Resources Agreements
WH	.....	World Heritage
WHA	.....	World Heritage Area
WQ	.....	Water Quality
WQIP	.....	Water Quality Improvement Plan
WT	.....	Wet Tropics
WTMA	.....	Wet Tropics Management Authority
WTMIP	.....	Wet Tropics Major Integrated Project
WTWHA	.....	Wet Tropics World Heritage Area
WTHWP	.....	Wet Tropics Healthy Waterways Partnership
WWF	.....	World Wildlife Fund

ACKNOWLEDGEMENTS

Funding was provided by the Australian Government's National Environment Science Program Tropical Water Quality Hub. Many thanks also for the contribution of Katrina Keith, Jennifer McHugh and our participating actors/experts.

EXECUTIVE SUMMARY

This report focuses on the trial of a regionally-specific framework to assess and monitor the human dimensions of the Wet Tropics Region and the adjacent section of the Great Barrier Reef (GBR). To ensure GBR policy makers and managers better consider the needs of GBR-dependent communities and industries, the aim of this project is to develop a participatory approach to the assessment, monitoring and bench-marking of human dimensions of relevance to the region and to the GBR. In considering the area's human dimensions, the project team has gathered evidence from peer-reviewed literature, the grey literature and other forms of knowledge such as Indigenous and local knowledge. The process involves synthesising evidence from diverse sources, presenting the evidence as a series of tables, and allocating draft scores to attributes of each key human dimension theme or cluster. The tables and proposed scores are to be discussed in regional expert panel meetings using a consistent set of decision rules for scoring regional resilience based on available evidence. Key findings from the evidence gathered so far include:

Aspirations, capacities and stewardship: Reasonably high formal education levels suggests a high level of capacity to ensure high quality stewardship of the GBR and associated catchments, however educational inequalities exist for poorer people, rural and Indigenous people. There is also a need to improve broader societal awareness about climate change and impacts on GBR health. Some growth has emerged in GBR stewardship-related education programs, but more program cohesion is required, as is the development of focused workforce strategies to enhance stewardships skills over time. Significant progress has been made on sewage treatment and energy efficiency practices, and more effort is emerging in regard to urban storm water practices. Point sources for water pollution are reasonably well regulated. Significant progress has been made on tourism, port management and the management of shipping in the GBR. Extreme weather contingency planning by Pro-Vision shows leadership in GBR stewardship. Most fisheries are reasonably well regulated, but recreation fishing may require increased compliance effort.

Community vitality: High levels of wellbeing related to the GBR are reported in both regional and Australian populations. There is a generally high level of health and wellbeing within the Wet Tropics region, but this is tempered by significant inequalities within Indigenous populations and poorly employed younger populations. There is significant Indigenous mobility across the region and declines in populations in some smaller regional communities – particularly in the Hinchinbrook Shire and the Cassowary Coast, since Cyclones Larry (2005) and Yasi (2011). The region's generally high levels of housing and personal security are slightly offset by increasing levels of insurance affordability. Solid infrastructure and service arrangements in the region enhance the linkages between the region, tourists and the GBR.

Culture and Heritage: World Heritage values are exceptionally high for this region as it contains two World Heritage Areas—the Wet Tropics WHA and the GBRWHA. However, recent extreme weather events and two consecutive summers of mass coral bleaching due to higher than average water temperatures has significantly impacted upon the Region's World Heritage values. There is a strong overall cultural understanding of the importance of the GBR and many regional sub-cultures are respectful of GBR values. Traditional Owners remain strongly affiliated to land and sea country but are challenged in their efforts to protect and

enhance their cultural systems leading to stronger GBR stewardship. Capacities of land and sea institutions and formal agreements for managing use have improved dramatically over the past decade but generally continue to have capacity concerns. Significant work still remains in securing sea country rights and financially viable (Indigenous led) land and sea management capacities in sea country estates across the Wet Tropics. While there is a strong historical heritage asset across the GBR coast, the asset remains poorly defined, planned and managed. This is a major knowledge gap for GBR managers, communities and partners.

Economic values: The Wet Tropics region has sound economic infrastructure for the GBR-related economy. However, ongoing resource decline and regional-capital city inequities could drive declining equity and promote economic fragility. GBR-dependent industries (mainly commercial fishing and marine tourism) rely on a healthy GBR system. Repeated bleaching and extreme weather events mean that many corals do not have time to recover and even pristine reefs are not immune. Post cyclone and bleaching events, resource impacts have reduced natural resource resilience to future shocks in significant areas. GBR-dependent industries generally have comparable equity with other industries; although compensation for extreme weather events between terrestrial and marine industries (e.g., fishing & agriculture) is not equitable. Also, there are claims that commercial fishing is compromised by recreational and illegal fishing activities. Commercial fisheries are progressing towards industry sustainability but competition with conservation/recreation may decrease profitability. While agricultural production continues to grow in the Wet Tropics, water availability and seasonal and storage proposals are expensive and may have viability limits. Continued growth and diversification in agriculture needs to be neutral or positive with respect to GBR outcomes. There is potential to refocus economic diversity through new industries that link to GBR-related lifestyle values. The Wet Tropics regional economy has a very strong workforce exposure to volatility in the tourism industry and a very high dependence on backpackers. Further, significant economic disparities exist for Indigenous communities and younger people; both appear to be strongly marginalised in employment arrangements. Employment levels between 8 and 10% are still higher than the rest of Australia (with the exception of Townsville). Despite the region's economic vulnerabilities, increasing confidence in the tourism sector and the growth of the services economy has delivered new business confidence.

Governance: Basic GBR-wide and bilateral strategic planning framework is in place via the Reef 2050 Long-Term Sustainability Plan (Reef 2050 Plan) and possible implementation strategies and institutional arrangements exist at all required scales for delivery. A strong framework for ongoing and adaptive monitoring, evaluation and review is emerging via the Reef 2050 Integrated Monitoring and Reporting Program (RIMReP). There is a significant ongoing likelihood of decline in GBR health as a result of poor connectivity among key governance subdomains affecting GBR outcomes and the risk of significant implementation failure related to the Reef 2050 Plan. All required institutional players are well engaged in GBR governance, but capacities are limited across government, industry, community and Indigenous sectors. Biophysical knowledges (including models and decision support tools) are generally strong across the marine and catchment space, though social and economic sciences are not developed enough to deliver truly integrated decisions.

1.0 INTRODUCTION

The GBR, one of the seven natural wonders of the world, is facing an unforgiving deadline due to climate change and other threats to its very existence (De'ath, Fabricius, Sweatman & Puotinen, 2012; Deloitte Access Economics [DAE], 2017; Great Barrier Reef Marine Park Authority [GBRMPA], 2014a; Hughes et al., 2017; Hughes, Schaffelke & Kerry, 2016). People across the world and in its catchment love the GBR and value it to the tune of \$56 Billion dollars (DAE, 2017). Its annual contribution to Australia's national economy is more than \$6 Billion per annum (DAE, 2017). People such as Traditional Owners (TOs), recreational users, commercial fishers and tourism operators who use and depend on the GBR; and everyone else who values it for its social, cultural and economic benefits, are suffering in the wake of declining GBR health. Policy makers, managers and partners have long recognised that maintaining the health of the GBR both now and in the future will rely on mobilising the energy, motivation and aspirations of those who value and love the Great Barrier Reef (GBRMPA, 2014a).

There is growing recognition that local communities and their actions have a much more dynamic relationship with marine and coastal resources than merely causing negative impacts (Ban et al., 2017; Christie et al., 2003; Cinner & David, 2011; Edgar, Russ & Babcock, 2007; Kittinger et al., 2014; Pollnac et al., 2010). In focussing solely on the human impacts on the GBR, managers may miss valuable opportunities to empower people to work in partnership with management, harnessing powerful sources of custodianship, and deepening social, cultural and economic ties to the GBR. Providing opportunities for strengthening socially-enabling factors such as equity, trust, participation and compliance can be the way forward for GBR managers to achieve their goals, and at the same time, provide tangible benefits to local, national and international communities (Christie et al., 2003). In particular, to improve GBR health, policy makers and managers need to understand and monitor: (a) people's relationship with the GBR including how many people directly use/visit the GBR, where they go, how they get there, what they do, and why; (b) psychological forces driving behaviours that affect the GBR (positively or negatively); (c) the role of GBR decision-makers including users, managers, partners, communities and industry in affecting change; (d) equity and inclusion of multiple perspectives; and (e) the adaptive capacity of industries and communities who depend on a healthy GBR for the economic, social, or cultural values that it provides.

This report is the first in a series of six regional reports produced as part of a 12 month National Environmental Science Programme (NESP) project (*NESP Project 3.2.2: Cost-effective indicators and metrics for key GBRWHA human dimensions*). The project is trialling a regionally-specific and robust framework to assess and monitor the human dimensions of the GBR and its catchment. The GBR catchment lies within six Natural Resource Management (NRM) regions and a report is being produced for each part of the GBR and catchment that falls within each region, i.e., the Wet Tropics; Eastern Cape York (part of the Cape York region); Burdekin; Mackay-Whitsunday; Fitzroy; and Burnett- Mary. These six areas are administrative regions based on sub-catchments within the larger GBR catchment. The NRM regions were established over ten years ago by the Commonwealth and Queensland governments to help deliver environment and sustainable agriculture programs (Australian Bureau of Statistics [ABS], 2016a). They extend beyond the coastline to include part of the GBR Marine Park and are shown in Figure 1.

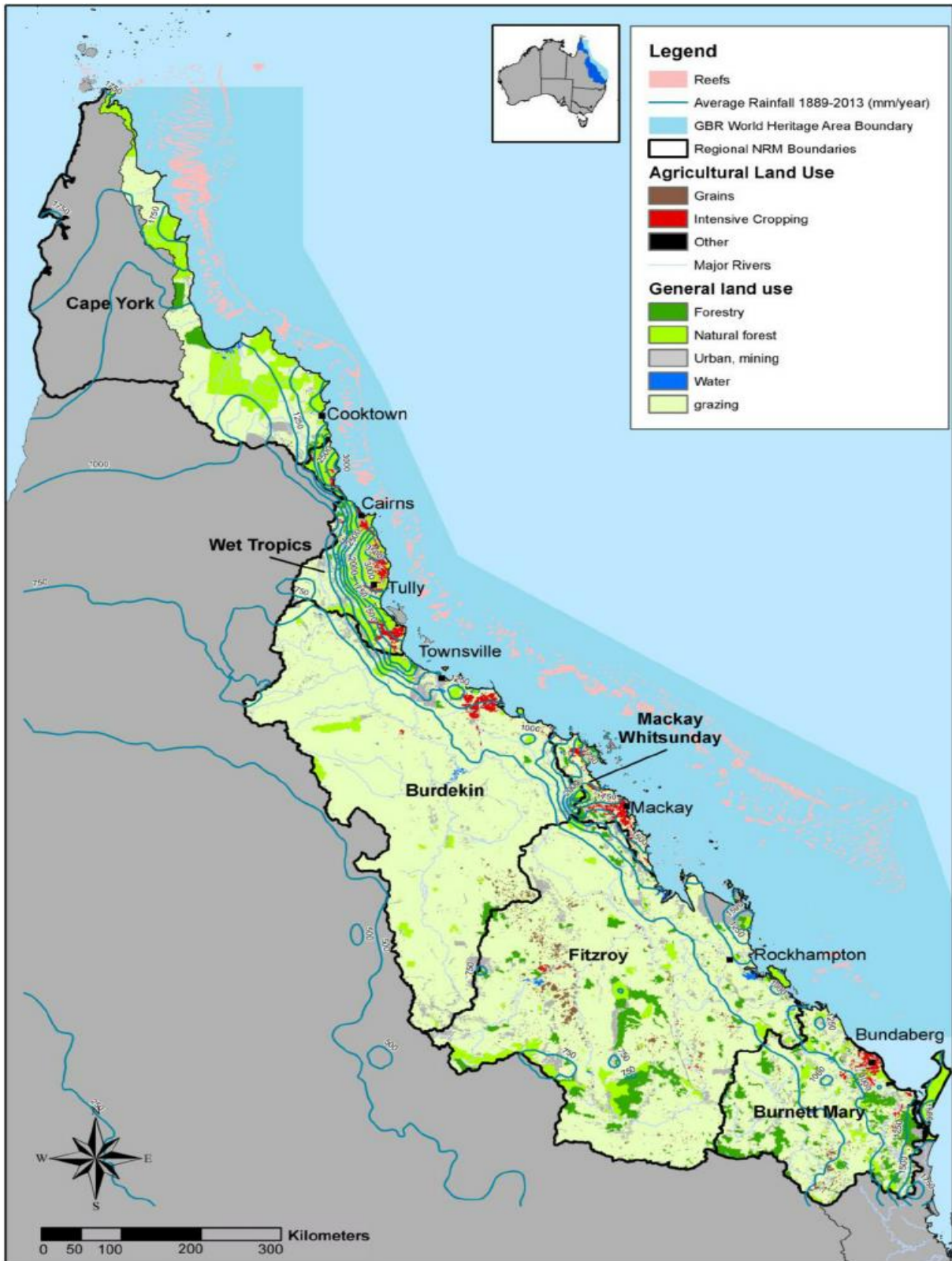


Figure 1: NRM Regions in the Great Barrier Reef catchment

(SOURCE: Thorburn, Wilkinson & Silburn, 2013, p. 5).

The human dimensions of the GBR are the social, cultural, institutional and economic factors that shape people's relationship with the GBR. Managers realise that these relationships are diverse and wide-ranging and include collective actions by industries, communities and

governments, each influencing GBR resilience¹. In turn, the resilience of the GBR influences the resilience of these communities. To be effective, GBR managers need to know more about these relationships. At the most basic level, managers are interested in how many people directly use or visit the GBR; who these people are, where they go, what they do and why. Marshall et al. (in review) identified eight cultural benefits derived from the GBR, and these are used throughout this document to illustrate the richness of people's relationship with it.

Table 1: Eight cultural benefits associated with the GBR

Marshall et al. (in review)

Cultural benefits	Description
Identity	The feeling of belonging to a place or social group with its own distinct culture and common social values and beliefs.
Pride in resource status	Refers to a satisfied sense of attachment towards a place or its status such as World Heritage Area status. It can be linked to a signal of high social status.
Place importance/ Attachment to place	The emotional and physical bond between person and place which is influenced by experiences, emotions, memories and interpretations. It often provides a reason for people to live where they live.
Aesthetic appreciation	Describes the aesthetic value that an individual attributes to aspects of an ecosystem. Aesthetic responses are linked to both the characteristics of an environment and culturally or personally derived preferences.
Appreciation of biodiversity	Describes how people are emotionally inspired by biodiversity and other measures of ecosystem integrity at a particular place.
Lifestyle	The expression of 'visible' culture that has evolved around a natural resource or ecosystem; describes the extent to which people lead their lives around a natural resource and how people interact with it for recreation.
Scientific value	The value that people associate with learning opportunities in the past, present and future. The legacy and appreciation of ecosystems and natural resources that have been inherited from the past and their sense of continuity across time.
Wellbeing maintenance	The extent to which individuals are concerned for their own wellbeing if the health of the natural resource were to decline.

Reviewed literature reveals that people's relationship with the GBR is also influenced by attitudes towards, and perceptions of the GBR and its management. These have changed considerably over time, and will no doubt change again in future. It confirmed that attitudes and perceptions are shaped by culture, societal norms, context and circumstances, including personal experiences, word-of-mouth, and print media. Indigenous Traditional Owners have had the longest association with the GBR, and their attitudes and perceptions have been relatively constant over millennia as custodians and sustainable exploiters of the GBR and its resources. By contrast, non-Indigenous attitudes and perceptions are varied and can change relatively quickly, especially for those new to the GBR and its catchment. The literature has already highlighted factors likely to affect attitudes/perceptions relating to the GBR including:

- Familiarity with the GBR and its management
- Occupation

¹ This description of the human dimensions of the Great Barrier Reef and catchment was developed through discussions with managers and researchers, and will be developed further to inform the up-dated Great Barrier Reef Water Quality synthesis statement.

- Proximity to the GBR
- Access to the GBR and its resources
- Identity with and/or affinity for the GBR
- Dependency on the GBR's resources for income or other benefits
- Where people go and what they do in the GBR
- What people value about the GBR
- Motivations for visiting the GBR
- Sense of optimism about the future of the GBR
- Understanding of factors that threaten GBR health
- Knowledge of the current condition of the GBR
- Levels of satisfaction with GBR-based experiences
- Levels of confidence and trust in GBR management (Gooch, 2016).

The GBR's human dimensions include residents in GBR catchment towns and cities (including TOs) as well as national and international people who either have an interest in the GBR or who influence (directly or indirectly) the condition of the GBR. This also includes those in government agencies (e.g., local, state and Commonwealth governments). They also include people in the following GBR maritime and catchment industries:

- Cane
- Grazing
- Dairy
- Horticulture
- Grains
- Aquaculture
- Research
- Mining/extractive industries
- Urban development and construction
- Ports and shipping
- Forestry
- Marine and coastal recreation
- Commercial fishers
- Marine and coastal tourism.

People are also involved in a vast range of non-commercial activities related to the GBR including TO use of marine and coastal resources; non-commercial recreational activities such as boating, diving, snorkelling; defence activities in designated areas; fishing – recreational as well as illegal fishing (i.e., intentional targeting of protected zones).

The Great Barrier Reef Marine Park Authority (GBRMPA) works with a specific set of human dimension values used for assessment, monitoring and management of activities within its jurisdiction. These are:

- Access to GBR resources
- GBR aesthetics
- Appreciation, understanding and enjoyment of the GBR
- Human health associated with the GBR
- Personal connection to the GBR

- Intra and inter-generational equity associated with the GBR
- Empowerment derived from the GBR
- Employment and income derived from GBR-dependent industries
- Heritage (GBRMPA, 2017a). *See Attachment A for detailed descriptions of each value.*

Traditional Owners in particular still maintain connection to, and responsibility for caring for their particular country, through membership in a descent group or clan. There are more than 70 TO groups along the GBR (GBRMPA, 2016a). Traditional Owner heritage values include all customs, lore and places that are part of Aboriginal and Torres Strait Islander peoples' spiritual links to land or sea country and which tell the story of Indigenous peoples from time immemorial to the present. Traditional Owner values comprise tangible and non-tangible attributes which often overlap—including sacred sites, sites of particular significance and places important for cultural tradition; Indigenous structures, technology, tools and archaeology; stories, songlines, totems and languages; and cultural practices, observances, customs and lore. Traditional Owner heritage values are connected to and inter-related with other GBR values and should be considered holistically (DAE, 2017; GBRMPA, 2005; 2016a). Non-Indigenous cultural heritage includes buildings, monuments, gardens, industrial sites, landscapes, cultural landscapes, archaeological sites, groups of buildings and precincts, or places which embody a specific cultural or historic value. Historic heritage relates to the occupation and use of an area since the arrival of European and other migrants and describes the way in which the many cultures of Australian people have modified, shaped and created the cultural environment. GBRMPA recognises four historic maritime heritage values of the GBR Marine Park - World War II features and sites; historic voyages and shipwrecks; lighthouses; and other places of historic significance (GBRMPA, 2005, 2017b, 2017c).

The Approach

A human dimensions indicator framework was constructed based on five themes or clusters describing different aspects of human dimensions. Each cluster is further described by a set of attributes as listed in Table 2. The clusters were modified from the work by Vella, Dale, Cottrell and Gooch (2012) who defined four main groupings of indicators derived from Social Impact Assessment literature (e.g., Vanclay, 1999); social-ecological resilience literature (e.g., Berkes & Folke, 1998); and the Millennium Ecosystem Assessment (MEA, 2005), to describe the human dimensions of communities in north Queensland. These four groupings formed the basis of a framework for evaluating social resilience in the Wet Tropics Region of the GBR catchment (Dale et al., 2016c; Dale, George, Hill & Fraser, 2016a). To construct the framework we also reviewed the work of the Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES), which recognises that healthy human systems depend (either directly or indirectly) on a healthy ecosystem (Díaz et al., 2015). We then aligned the IPBES and Dale et al. (2016c) frameworks with values articulated in the Great Barrier Reef Strategic Assessment (GBRMPA, 2014a), the Great Barrier Reef Outlook Report (GMRMPA, 2014b) and published regional report cards for the GBR (Fitzroy Partnership for River Health, 2015; Gladstone Healthy Harbour Partnership, 2016; and the Healthy Rivers to Reef Partnership: Mackay Whitsundays, 2016). We added a fifth cluster, culture and heritage, based on the cultural significance of the GBR, and its world heritage status Table 2.

Table 2: The five GBR human dimension clusters and their alignment with Reef 2050 Plan themes

Reef 2050 Plan Theme	The five human dimensions cluster and their attributes
<p>All seven themes – i.e., economic benefits, community benefits, heritage, governance, water quality, biodiversity and ecosystem health.</p>	<p>Aspirations, capacity and stewardship Cohesive vision and aspirations for the future of the GBR together with awareness, skills, knowledge and capacities to turn aspirations into action. Personal and collective (including industry) efforts to: (a) minimise impacts on the GBR and catchment; (b) restore degraded marine, coastal and catchment ecosystems; (c) apply Ecologically Sustainable Development (ESD) principles; and (d) be actively involved in GBR and catchment management.</p> <p>ACS1 Levels of community awareness & education about the GBR ACS2 Community capacity for stewardship ACS3 Adoption of responsible/ best practice – GBR recreational users ACS4 Adoption of responsible/ best practice – Agricultural & land sector. ACS5 Adoption of responsible/ best practice – Industry & urban sector. ACS6 Adoption of responsible/ best practice – Marine industries.</p>
<p>Community benefits An informed community that plays a role in protecting the Reef for the benefits a healthy Reef provides for current and future generations</p>	<p>Community Vitality is characterised by demographic stability, security, happiness and well-being. Community vitality associated with the GBR includes how & why people access, use and value the GBR; services and infrastructure supporting the interface between the community and GBR; and the social health derived from the GBR, e.g., nature appreciation, relaxation, recreation, physical health benefits, and other lifestyle benefits derived from the GBR. A healthy GBR community derives high levels of appreciation and enjoyment from the GBR and is highly satisfied with the GBR and its management.</p> <p>CV1 Demographic stability across the catchment CV2 Security in the catchment including housing, safety & risk management. CV3 Wellbeing/ happiness within the general community. CV4 Community health/ wellbeing/ satisfaction associated with the GBR. CV5 Regional services & service infrastructure supporting the interface between the community & GBR.</p>
<p>Heritage Indigenous and non-Indigenous heritage values are identified, protected, conserved and managed such that the heritage values maintain their significance for current and future generations</p>	<p>Culture and Heritage Status of integrated and diverse culture and heritage associated with the GBR catchment. Cultural and heritage connections promote a sense of place associated with GBR coastal communities, and there is strong place attachment and identity associated with the community, because of its association with the GBR. This cluster also includes values of significance in accordance with Traditional Owner practices, observances, customs, traditions, beliefs or history. Historic heritage is specifically concerned with the occupation and use of an area since the arrival of European and other migrants. Contemporary culture is how the GBR is experienced by people today.</p> <p>CH1 World Heritage – underpinned by ecosystem health, biodiversity & water quality CH2 Indigenous (Traditional Owner) heritage CH3 Contemporary culture CH4 Historic maritime heritage (since European settlement).</p>
<p>Economic Benefits Economic activities within the Great Barrier Reef World Heritage Area and its catchments sustain the GBR's Outstanding Universal Value (OUV)</p>	<p>Economic values This includes the monetary advantages that people derive directly or indirectly from a healthy and well-managed GBR. Fundamental is the premise that economic activities within the Great Barrier Reef World Heritage Area (GBRWHA) and its catchments are ecologically sustainable. GBR-dependent industries rely on a healthy GBR and include GBR-based commercial fishing, tourism, recreation, research and TO use. GBR-associated industries include industries that may impact on the GBR, but are not economically dependent on GBR health, e.g., shipping, catchment industries such as agriculture, urban development, port development.</p> <p>EV1 Size and diversity of regional economic growth EV2 Economic viability of GBR-associated industries</p>

	<p>EV3 Economic viability of GBR-dependent industries</p> <p>EV4 Inclusiveness & economic fairness/ equity</p> <p>EV5 Workforce participation & employment</p> <p>EV6 Economic confidence within the region.</p>
<p>Governance The OUV of the Reef is maintained & enhanced each successive decade through effective governance arrangements & coordinated management activities.</p>	<p>Governance refers to the health of GBR-based decision-making systems (from local to international scales), including levels of connectivity between different parts of the governance system, effective use of diverse knowledge sets and system capacity for effective action. Also includes viability of institutional arrangements; community participation in GBR management; and use of ESD principles in planning and management.</p> <p>G1 Strategic focus of governance system</p> <p>G2 Connectivity within & between key decision making institutions & sectors</p> <p>G3 Adaptive governance capacity of key decision making institutions & sectors</p> <p>G4 Adaptive use & management of integrated knowledge sets.</p>

In constructing the tables for each region, the project team gathered evidence from peer-reviewed literature, grey literature and other forms of knowledge such as Indigenous and local knowledge. We drew on qualitative and quantitative data. Quantitative data sets used in the analysis include the following:

- **Australian Bureau of Statistics [ABS].** (2017a). *Data by region*. Retrieved from <http://stat.abs.gov.au/itt/r.jsp?databyregion>
- **ABS.** (2015). *Information paper: An experimental ecosystem account for the Great Barrier Reef Region, 2015* (cat. no. 4680.0.55.001). Retrieved from <http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/4680.0.55.001Main%20Features202015?opendocument&tabname=Summary&prodno=4680.0.55.001&issue=2015&num=&view=>
- **ABS.** (2017b). *Census*. Retrieved from <http://www.abs.gov.au/websitedbs/D3310114.nsf/Home/Census?opendocument&ref=topBar>
- **ABS.** (2016b). *Community profiles*. Retrieved from <http://www.abs.gov.au/websitedbs/censushome.nsf/home/communityprofiles>
- **Australian Bureau of Agricultural and Resource Economics and Sciences [ABARES].** (2017b). *Data sets*. Retrieved from <http://www.agriculture.gov.au/abares/data>
- **ABARES.** (2017c). Land use and management information for Australia. Retrieved from <http://www.agriculture.gov.au/abares/aclump>
- **ABARES.** (2017a). *Catchment scale land use of Australia*. http://www.agriculture.gov.au/abares/display?url=http://143.188.17.20/anrdl/DAFFService/display.php%3Ffid%3Dpb_luausg9abll20160616_11a.xml
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The process involved synthesising evidence from diverse sources, presenting the evidence as a series of tables, and allocating draft scores to attributes of each human dimension cluster. We then invited people to review the tables through a series of expert panel meetings held in each region. Meeting participants were selected on the basis of: (a) their experience and knowledge of the Great Barrier Reef from a regional, community, industry (GBR-dependent and GBR-associated industries), or governance perspective; and/or (b) their involvement in social, economic and/or environmental initiatives which contribute to regional community wellbeing. If an invited person was unable to attend, but could offer a proxy who could represent them, then the proxy was accepted. Panel members comprised chairs of GBRMPA's Local Marine Advisory Committees; Chairs and/or CEOs of NRM bodies; local government; Regional Development Australia; tourism organisations; commercial fishers; regional healthy waterways partnership members; Traditional Owners; and researchers on the project team. There were usually around 10 people on each panel. Specifically, panel members were invited to appraise evidence about the GBR's human dimensions presented in the tables; add additional knowledge to fill data gaps; and record data gaps and limitations. During the meeting discussions, the multiple lines of evidence were weighed up using a set of decision rules (Table 3) then used to score attributes within each of the five human dimension clusters. The scores were used to make critical judgements on the state or condition of regional community resilience as a way of representing the human dimensions of that part of the GBR. The process helped all involved in the meetings and their interested parties to plan for the future, and to alert GBR managers, partners and stakeholders to emerging issues and risks. Reference to the *regional community* included all levels of government, industry, Traditional Owners and local residents viewed through the regional geographic lens. A thriving, resilient community can anticipate risks and limit impacts while still retaining the same function, structure, purpose, and identity. Sometimes a regional community may get trapped in an undesirable state, unable to change over time. Being able to understand which attributes of a community need attention is an important first step to overcome stagnation or decline (Community & Regional Resilience Institute, 2013; Walker & Salt, 2006). The *broader community* includes national and international people who either have an interest in the GBR or who influence (directly or indirectly) the condition of the GBR including industry sectors, Traditional Owners and government agencies.

Table 3: Decision rules for assessing resilience of regional communities that will influence social, economic and environmental outcomes of relevance to the GBR

Index Rating	Decision Rule
5	The regional community will easily manage the GBR sustainably, maintaining or improving their economic and social wellbeing and the health of the GBR over time.
4	The regional community will make reasonable progress on managing the GBR sustainably, at least maintaining but also improving their economic and social wellbeing and the health of the GBR over time.
3	The regional community will suffer some shocks associated with managing the GBR sustainably, taking considerable time and investment to secure their economic and social wellbeing and the health of the GBR over time.
2	The regional community will struggle to manage the GBR sustainably, resulting in declining social and economic wellbeing and ongoing decline in the health of the GBR over time.
1	The regional community will be unable to manage the Reef sustainably, and their social and economic wellbeing and the health of the GBR will be unlikely to recover over time.

2.0 THE WET TROPICS REGION

The Wet Tropics of Far North Queensland is rugged and spectacular—it is the place where ancient Gondwanan rainforests meet fringing coral reefs, and where two world heritage areas lie side by side. Aboriginal people of the region have lived here continuously for at least 5,000 years, developing a distinctive cultural heritage and traditions which helped them thrive in the landscape (Terrain NRM, 2016a).

For the purposes of this study, the Wet Tropics region covers the Wet Tropics Natural Resource Management (NRM) region and the adjacent GBR ecosystems. This includes the six local government areas of Douglas, Tablelands, Cairns, Yarrabah, Cassowary Coast, and Hinchinbrook. Wherever possible, data are derived from these Local Government Areas (LGAs), which comprise the statistical units of the ABS. The entire area lies within the Regional Development Australia Far North Queensland and Torres Strait (RDA FNQ&TS) region.

The region covers around 2.2 million hectares and several river catchments flowing to the Great Barrier Reef (see Figure 2.) It supports tourism, fishing, mining, cane growing, horticulture, bananas, dairy, grazing and forestry, and has an estimated population of around 282,790 people, including 20 TO groups of about 20,000 Aboriginal people. The region's population is steadily increasing by about 1.5% p.a. except for the Cassowary Coast which remains stable (0% p.a.) and the Hinchinbrook Shire which has a declining population (-0.8%) (QGSO, 2017a; Terrain NRM, 2016a).

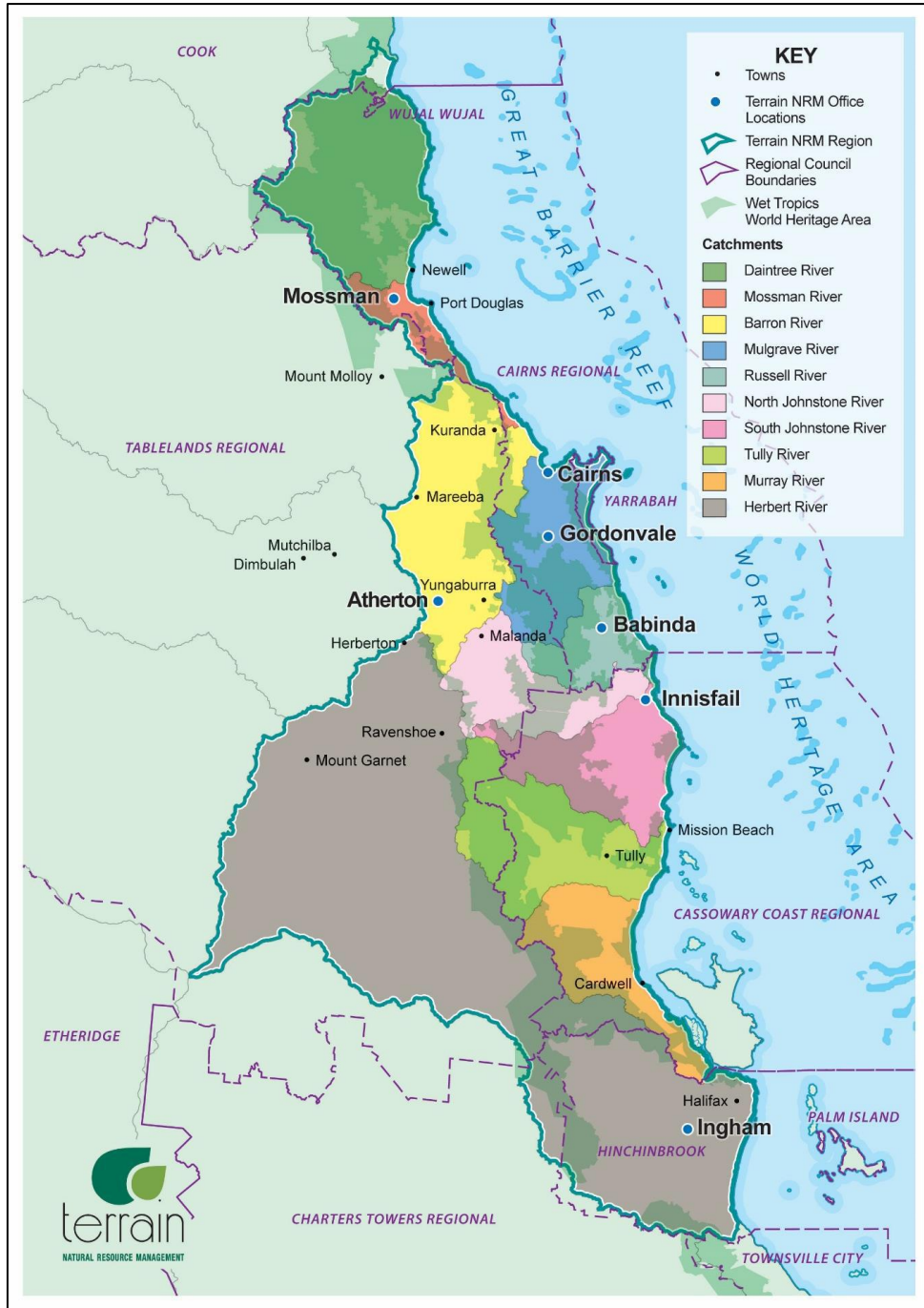


Figure 2: Wet Tropics Region and adjacent Great Barrier Reef

(Terrain NRM, 2017a)

Cluster One: Aspirations, capacities and stewardship

Cohesive vision and aspirations for the future of the GBR together with awareness, skills, knowledge and capacities to turn aspirations into action. Personal and collective (including industry) efforts to: (a) minimise impacts on the GBR and catchment; (b) restore degraded marine, coastal and catchment ecosystems; (c) apply ESD principles; and (d) be actively involved in GBR and catchment management.

Table 4: Aspirations, capacities and stewardship

Attribute Component	Possible Pressure, State & Trend Indicators	Evidence	Conclusions	Proposed Value & Logic
ACS1 Levels of community awareness & education	<ul style="list-style-type: none"> Education/skills levels. Awareness of NRM issues Awareness of GBR & waterway condition & threats. GBR learning opportunities. 	<p>Wet Tropics (WT) general education/ skills levels</p> <ul style="list-style-type: none"> Rate of school & post-school education in Far North Queensland (FNQ) is higher than the Queensland average (QGSO, 2017a); however in 2014, 81% job applicants in Cairns did not qualify for an interview (Department of Employment, 2014). <p>Regional NRM awareness</p> <p><i>WT General public perceptions of NRM issues</i></p> <ul style="list-style-type: none"> Perception that water quality is a big problem: 44.3%; c.w. 41.4% for rural & regional Aust & 43.7% rural & regional Qld (University of Canberra, 2017). Perception that soil erosion is a big problem: 39.5%; c.w. 41% for rural & regional Aust & 39.4% % rural & regional Qld (University of Canberra, 2017). Perception that environmental degradation in general is a big problem: 34.5 % c.w. 40.4% for rural & regional Aust & 40.7% % rural & regional Qld (University of Canberra, 2017). <p>Awareness of GBR and waterway condition & threats</p> <p><i>Wet Tropics Region residents</i></p> <ul style="list-style-type: none"> 75% WT residents are interested in learning “more about the condition of the GBR”; 47% agree they have knowledge & skills to reduce their GBR impacts; only 38% agree that coral reefs in the region are in good condition; 55% agree that mangroves are in good health; 51% agree that estuarine & marine fish are in good condition; 73% are worried about the 	<ul style="list-style-type: none"> Reasonably high formal education levels suggests a high level of capacity to ensure high quality stewardship of the GBR & associated catchments. Educational inequalities do, however, exist for poorer people, rural & Indigenous people. There has been growth in engaged government & NRM organisations’ focused on community education programs (e.g., GBRMP’s Reef Guardians & Local Management Advisory Committees, Terrain environmental education, commonwealth & state government programs, etc.). Understanding about climate change & other threats to the GBR & to natural resource sustainability appears to be highly varied/ inconsistent. It is possible that people may recognise that GBR health is 	<p>3.5</p> <p>Broader societal awareness about climate change & impacts on GBR health is needed. Some growth has emerged in GBR & stewardship-related education programs, but more program cohesion is required.</p>

		<p>status of freshwater fish in the region; 51% DISAGREE that freshwater rivers & creeks in the region ARE NOT in good condition; 81% DISAGREE that they ARE NOT worried about climate change impacts on the GBR; (Marshall & Pert, 2017).</p> <ul style="list-style-type: none"> 45% WT residents believe climate change is the greatest threat to the GBR; 43% say the greatest threat is pollution; and 25% say over-fishing is the greatest threat to the GBR (Marshall & Pert, 2017). <p>GBR learning opportunities</p> <ul style="list-style-type: none"> 93% WT residents value the GBR because it provides opportunities for learning through scientific discoveries; 82% would like to learn more about the condition of the GBR; 76% value the GBR because it provides a place where people can continue to pass down wisdom, traditions and a way of life (Marshall & Pert, 2017). 	<p>declining, but not necessarily due to climate change.</p> <ul style="list-style-type: none"> Recent environmental variability provides an opportunity to build awareness levels about GBR health & natural resource sustainability. Local institutions with a media profile (e.g., Cairns and Far North Environment Centre (CAFNEC)) & greater access to sources of information (online, media, politics, & academia) improves awareness.
<p>ACS2 Community capacity for stewardship</p>	<ul style="list-style-type: none"> Sense of responsibility towards the environment. Sense of responsibility towards the GBR & coastal waterways. Numbers of individuals & groups participating in Reef-based stewardship activities. Numbers & types of TO, industry & community engagement in on-ground Water Quality (WQ) 	<p>Sense of responsibility towards the environment</p> <ul style="list-style-type: none"> 86% WT residents agree that they make every effort to use energy efficiently at home and at work; 78% DISAGREE that they RARELY CONSIDER environmental impacts of production processes for goods & services that they purchase; 85% DISAGREE that they DON'T USUALLY make any extra effort to reduce waste; 82% re-use or recycle most goods & waste; 14% WT respondents are part of an environmental community-based group (Marshall & Pert, 2017). <p>Sense of responsibility towards the GBR & coastal waterways</p> <ul style="list-style-type: none"> 88% WT residents agreed they would like to do more to help protect the GBR; 88% agreed they like to do more to improve water quality in local waterways (including rivers, creeks); 70% DISAGREE that they CANNOT make a difference in improving GBR health; 87% DISAGREE that it is NOT their responsibility to protect the GBR; 72% agree that they feel a social expectation to reduce impacts they may have on the GBR; 70% DISAGREE that they DO NOT HAVE the time or opportunity to reduce their impacts on the GBR (Marshall & Pert, 2017). <p>WT Region NRM actions/programs</p>	<ul style="list-style-type: none"> WT resident responses to a Social & Economic Long-Term Monitoring Program (SELTMP) survey suggest that they have relatively high aspirations & levels of capacity & stewardship around the GBR. Stewardship levels were relatively high within the region. Terrain NRM Group has a large influence on community capacity for stewardship which should be strengthened through the WTMIP. The WTMIP is being developed & implemented by a consortium of over 40 organisations and hundreds of people. It has created new partnerships between landholders, local government, TOs, the corporate sector & researchers.

3.5

	<p>improvement & monitoring.</p> <ul style="list-style-type: none"> • Terrain NRM Group runs regular regional environmental education & awareness raising activities (Terrain NRM, 2016b). • Wet Tropics Major Integrated Project (WTMIP) 2017-2020 provides a partnership opportunity for industry, communities, agencies, NRM organisation, researchers & investors to shape & deliver a water quality improvement program over 3 years (Terrain NRM, 2017c). • Cairns Local Marine Advisory Committee (LMAC) supports several NRM activities including the Great Northern Clean-Up (GBRMPA, 2017b). • National Dugong & Turtle Protection Plan 2014–2017 includes education & compliance training for 28 Indigenous rangers in NQ & FNQ. Agreement between Queensland Parks and Wildlife Service (QPWS) & Giringun rangers allows protected area program activities to be delivered jointly by QPWS & Giringun rangers. (GBRMPA, 2016a). • Terrain NRM has assisted TOs to undertake water quality improvement activities such as protecting native vegetation, stream bank rehabilitation works & collecting wetland condition data to inform the Paddock to Reef Program (Office of the Great Barrier Reef, 2016) <p>GBR-wide catchment residents</p> <ul style="list-style-type: none"> • Coastal resident survey respondents strongly agreed that they would like to do more to help protect the GBR (av. 7.3/10 in 2013 & 7.75/10 in 2017 (Marshall & Pert, 2017). • Coastal resident survey respondents generally agreed that they have a personal responsibility to protect the GBR would like to do more to help protect the GBR (av. 7.12/10 in 2013 & 6.8/10 in 2017 (Marshall & Pert, 2017). <p>GBR-wide Reef-education programs</p> <ul style="list-style-type: none"> • GBR-wide Reef Guardians Program - 276 schools, 120,000 students, 7,400 teachers; 16 Councils covering 300,000 km²; 17 commercial fishers (line, trawl, net, collection); 24 sugarcane, banana, horticulture & broad-acre farmers & 5 beef graziers (GBRMPA, 2016a).
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		<ul style="list-style-type: none"> • A \$700,000 Reef Trust Marine Debris project (2015–16) engaging over 4000 people in marine debris removal (GBRMPA, 2016a). 		
<p>ACS3 Adoption of responsible/best practice – GBR recreational/artisanal users</p>	<p>Regional</p> <ul style="list-style-type: none"> • Extent & type of stewardship practices • Threats to GBR health.& waterways from recreational users • How many people visit this section of the GBR? • Where do they go? • How do they get there? • What do they do? • Why people go 	<p>Extent & type of stewardship practices</p> <ul style="list-style-type: none"> • Cairns – very high levels of non-compliance with GBR management among recreational fishers. 33% more reported infringements since 2014 (GBRMPA, 2016b). <p>Threats from rec. users</p> <ul style="list-style-type: none"> • Insufficient data to assess <p>Number of GBR visitors</p> <ul style="list-style-type: none"> • 88% WT residents interviewed in SELTMP 2017 survey visited the GBR at least once in the past 12 months (Marshall & Pert, 2017). • In 2015-16 the WT region had ~2M day trippers, 9M domestic overnight visitors & 6M international visitors (DAE, 2017). • No. of recreational vessels registered in the Region (excluding Douglas LGA) peaked in 2012 with 21,313.00, but declined slightly to 19,648.00 in 2016 (GBRMPA, 2017c). <p>Where recreational visitors go</p> <ul style="list-style-type: none"> • Not enough evidence to assess <p>Why do they visit? What do they do?</p> <ul style="list-style-type: none"> • 8% WT residents belong to a GBR based club or community group (Marshall & Pert, 2017). • 18.9% of the Cairns region’s pop’n & 27.6% of the Far North Hinterland fish at least once each year, compared with state av. of 17% (Department of Agriculture & Fisheries, 2015). • Top three activities contributing to WT residents’ use & enjoyment of the GBR (ranked using mean ratings on 1-10 scale) were sightseeing/exploration = 7.96; Wildlife watching = 7.82; Viewing coral and reef habitats = 7.51 (Marshall & Pert, 2017). 	<ul style="list-style-type: none"> • Recreational fishing continues to be a very important recreational activity. • While recreational catch data are sparse, vessel registrations of “reef capable” vessels have increased significantly over the last decade (Tobin, Lewis & Tobin, 2016) – but could be stabilising (GBRMPA, 2017c). • Hard to get regionally specific data on use patterns & stewardship efforts of recreational/artisanal users. 	<p>2.5</p> <p>Insufficient data to assess with confidence.</p>
<p>ACS4 Adoption of best practice systems – Agricultural & land sector.</p>	<p>Regional</p> <ul style="list-style-type: none"> • Extent & type of stewardship practices of agricultural industries. 	<ul style="list-style-type: none"> • ~40% WT cane farmers & 15% WT graziers likely to be industry focused; ~25% cane farmers & 35% graziers have strong industry networks; prefer innovation through co-learning & are farm-focused. ~25% cane farmers & 40% graziers have limited capacity for change; very strong occupational identity/place attachment & lack capacity or skills to manage 	<ul style="list-style-type: none"> • Adoption of Best Management Practices has been progressing well in the last 10 years, but significant improvements are still required. 	<p>2.5</p> <p>Significant improvements in practice changes</p>

<p>(including Aquaculture)</p>	<p>change. Barriers to change include occupational identity; place attachment; low employability; weak networks; (Marshall et al., 2014a; Marshall & Stokes, 2014).</p> <ul style="list-style-type: none"> • WTMIIP aims to improve water quality from cane & banana farms in Tully & Johnstone catchments (Terrain NRM, 2017b). <p><i>Grazing Target: 90 per cent of grazing lands are managed using best management practice systems by 2018</i></p> <ul style="list-style-type: none"> • 935 graziers over 698,000ha land – mostly rangelands in the upper Herbert R catchment, where small numbers of larger holdings strongly influence Best Management Practice (BMP) (Queensland Government, 2016a). • In 2016 21% grazing land was under BMP relating to pasture (hillslope) erosion; 82% for streambank erosion & only 3% for gully erosion. Overall BMP for WT graziers is D (Queensland Government, 2016a). <p><i>Sugar Target: 90 per cent of sugarcane lands are managed using best management practice systems by 2018</i></p> <ul style="list-style-type: none"> • 1,343 growers farm 136,00ha sugarcane. • In 2016, 52% sugarcane land was under BMP for pesticides, 16% for nutrients & 30% for soil. Overall BMP for WT cane farmers is D (Queensland Government, 2016a). • WT sugarcane water quality risk over time, by pollutant. <ul style="list-style-type: none"> ○ Soil: In 2016 12% mod.-high risk c.w. 16% before 2014. ○ Nutrients: 0% mod –high risk c.w. 6% before 2014. ○ Pesticides: 0% mod –high risk c.w. 7% before 2014 (Queensland Government, 2016a). • Terrain NRM worked with 128 growers in implementing change: <ul style="list-style-type: none"> ○ 45 farms changed row spacing ○ 35 included legume break crops in rotation with sugarcane ○ 39 modernised tillage equipment ○ 38 changed timing of nitrogen fertiliser application ○ 24 applied fertiliser below the soil surface ○ 23 reduced loss of residual herbicides ○ 54 improved application of residual herbicides, and a further 53 indicated they were changing residual use in ratoon cane ○ 16 changed management of rainfall run-off 	<ul style="list-style-type: none"> • Changing land use practice alone will not achieve Reef 2050 targets - this requires substantive practice change & system repair (Department of Environment & Heritage Protection [DEHP], 2016). • Revisiting the program logic of the first Reef Plan is now underway to reinstate a systematic approach to investments in practice change that will guide the willing & able; provide financial incentives for the financially constrained; & regulate where necessary. • Even then, full agriculture practice adoption under the Reef 2050 Plan targets will not deliver sufficient reductions in nutrient, sediment delivery to the GBR lagoon. New & better institutionalised stewardship frameworks & skills are required to progress greater systems & catchment repair effort. • Practices trialled by WT cane growers likely to have high adoption rates if they improve profitability; are easy to trial; do not require a high capital investment, new skills & contractors. Barriers include: high capital investment; new skills & information; low impact on profitability (Thomson et al., in press). 	<p>affecting GBR water quality outcomes are progressing well, but still require substantive effort. Legacy issues from old ag developments – acid sulphate soils – Trinity Inlet. NB: Data gap – aquaculture.</p>
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- 22 reduced applied nitrogen as fertiliser by 116T pa (Queensland Government, 2016a).
 - Smartcane BMP program engaged with 557 businesses & accredited 75 WT cane growers (Queensland Government, 2016a).
 - DAF cane extension team reported improvements on 35 farms:
 - 10 growers implemented controlled traffic farming systems.
 - 21 increased row spacing & used zonal tilled legume/cover crop.
 - 10 reduced cultivation to < 5 passes & 11 moved to zonal tillage only.
 - 18 improved residual herbicide use (Queensland Government, 2016a).
 - Most WT cane growers strongly agree that practices to improve GBR water quality require new skills & information; however new practices will not be readily adopted if they do not improve profitability (Thompson, Poggio, Arief & Connellan, in press).
 - Terrain NRM supports 39 Project Catalyst cane growers to implement & share learnings about innovative farm practices to improve GBR water quality (Terrain NRM, 2017b).
 - Reef Trust Phase 1 (2014-2018) now in place with \$1.4M; seeking 14 farmers - to trial practices to improve Nitrogen Use Efficiency (NUE). During 2015-16 the project engaged 14 cane famers; 10 completed Nutrient Management Plans. Analysis of fertiliser use data showed that growers reduced the amount of Nitrogen (N) applied by 86 tonnes. Reef Trust Phase III (2016-2019) \$10.8M across cane, bananas, dairy & multi-crop. Provision of extension & training, grants & support; & grants for innovation projects (Terrain NRM, 2016b).
- Banana growing target: 90% banana growing lands are managed using best management practice systems by 2018*
- 250 banana growers farm 11,800ha land. In 2016, BMP applied in 60% sediment; 63% for nutrients. Pesticides not reported due to low levels of toxicity. Overall BMP for WT banana farmers is C (Queensland Government, 2016a).

	<ul style="list-style-type: none"> • Terrain NRM & Australian Banana Growers Association (ABGA) worked with 30 farms: <ul style="list-style-type: none"> ○ 4 implemented minimum tillages practices ○ 5 improved inter-row ground cover management ○ 4 implemented changes to reduce loss of N & P ○ 20 installed automated fertigation systems & implemented nutrient management plans ○ 13 improved irrigation application methods ○ 10 improved their irrigation scheduling (Queensland Government, 2016a). • Banana BMP program worked with 73 WT businesses (Queensland Government, 2016a).
<p>ACS5 Adoption of best practice systems – Industry & urban sector</p>	<ul style="list-style-type: none"> • Extent & type of stewardship practices of regional urban councils & industries. • Most of the region’s sewage treatment systems are tertiary standard & council activities will include use of energy efficiency, Reef Urban Storm Water Management Implementation Group (RUSWMIG) & coastal adaptation/mitigation (Far North Queensland Regional Organisation of Councils [FNQROC], 2016). • Douglas Shire Council (DSC) Waste Services started a recycling program for refrigerant & Liquid Petroleum Gas (LPG) gas in 2015. DSC is improving their wastewater treatment system & minimising GBR water quality impacts. Outfall flow meter installed at Port Douglas plant & Mossman meter was relocated to give more accurate readings. Automatic changeover generator systems installed to prevent accidental releases (GBRMPA, 2016c). • Three Cassowary Coast Council (CCC) projects for 2017 include energy efficient lighting for Tully Civic Centre, solar power for a caravan park, & a new community composting program. CCC adopted a new planning scheme to regulate land use & development, including protecting ecological values by limiting development to existing urban areas (GBRMPA, 2016c). • SPP (Department of Infrastructure, Local Government and Planning [DILGP], 2017) states that all exposed soil areas >2,500 m² must have sediment controls implemented & maintained to achieve 80% hydrologic effectiveness (50mg/L <ul style="list-style-type: none"> • Progressive planning & cooperation across WT councils through FNQROC. • Some councils have gone beyond legislative compliance to ensure best practice systems are in place, however, across the GBR catchment, traditional sediment basins are often not designed or maintained to minimum standards & thus ineffective. Local councils are calling for support from other governments in the form of an independent, dedicated compliance team that would travel the State. (S. Choudhury personal communication).

3.5
 Significant progress has been made on sewage treatment & energy efficiency practices. More effort is emerging in regard to urban storm water practices. Point sources for water pollution are reasonably well regulated.

	<p>Total Suspended Solids (TSS) or less & pH bet. 6.5–8.5). One method for achieving compliance is to implement High Efficiency Sediment Basins (HESBs) (Turbid Water Solutions, 2017). To date NO LGAs in the GBR catchment have HESBs on working construction sites within their jurisdictions (S. Choudhury personal communication).</p>				
<p>ACS6 Adoption of best practice systems – Marine sector</p>	<table border="0"> <tr> <td data-bbox="405 387 667 1026"> <ul style="list-style-type: none"> • Extent & type of stewardship practices of GBR-associated industries. • Arrangements to ensure GBR shipping is safe. • Number of shipping accidents • Extent to which ports & shipping apply 'best practice' principles • Extent & type of stewardship practices of GBR-dependent industries – tourism & commercial fishing </td> <td data-bbox="678 387 1406 1367"> <p>WT Region – ports & shipping</p> <ul style="list-style-type: none"> • Ports North (PN) maintain compliance & are members of Wet Tropics Healthy Waterways Partnership (WTHWP), Reef Advisory Committee (RAC), & LMACs. PN Environment Management System (EMS) provides a process to identify & manage impacts of operations. Benthic community surveys at & adjacent to Cairns dredge material placement area indicated that irregular low volumes of maintenance dredge material have a very localised, minimal impact to the seafloor. During 2016, 57 environmental incidents on PN land or facilities. 12 near-miss events contained & cleaned up with no release to the environment (Ports North, 2016). • Ships >70m, loaded chemical & oil tankers, & loaded liquefied gas carriers must embark a licenced coastal pilot when transiting Cape York to Cairns. Australian Maritime Safety Authority (AMSA) proposes compulsory pilotage in the upper middle Inner Route, from Cairns to Townsville (North-East Shipping Management Group [NESMG], 2014). <p>GBR-wide tourism</p> <ul style="list-style-type: none"> • 67 GBR tourism operators have Ecotourism Australia’s (EA) ECO Certification & carry 69% GBR tourists (GBRMPA, 2016a). 52% tourists prefer those with ‘green’ credentials; 63% tourism operators said they “regularly get involved in GBR research &/or management”; 98% agreed they “try to encourage other people to reduce their GBR impacts”; 90% agreed that they “provide interpretation for tourists that promotes conservation or sustainable use of the GBR”; 88% use fuel efficient engines; 84% separate waste for recycling; 83% participate in industry BMP (e.g., codes of practice, Memorandums of Understanding (MOUs); 45% participate in GBRMPA’s Eye on the Reef monitoring program; 43% use </td> <td data-bbox="1417 387 1832 1367"> <ul style="list-style-type: none"> • Compliance of commercial fishers increased or was stable across most regions between 2012 & 2013, except for the Far Northern marine region. No inspections increased across all regions from 2012 to 2013. Several MOUs & Codes of Conduct (COCs) for commercial fishers, but formal information is lacking. • The GBR is an International Maritime Organization (IMO) Particularly Sensitive Sea Area (PSSA) to which Australia can apply specific maritime controls, e.g., compulsory pilotage, designation of shipping routes & mandatory location reporting. CAFNEC consider the North-East Shipping Management Plan is vague about existing & future impacts of shipping in the GBR. World Wildlife Fund (WWF) & AMSA recognise that the plan provides important priority actions, but urgent changes are needed (e.g., compulsory pilotage for the entire GBR; use of high-standard ships in GBR waters, & improved marine </td> <td data-bbox="1843 387 2029 1193"> <p>3.5</p> <p>Significant progress has been made on tourism, port management & the management of shipping in the GBR. Extreme weather contingency planning by Pro-Vision shows leadership in GBR stewardship. Most fisheries are reasonably well regulated, but recreation fishing requires increased compliance effort.</p> </td> </tr> </table>	<ul style="list-style-type: none"> • Extent & type of stewardship practices of GBR-associated industries. • Arrangements to ensure GBR shipping is safe. • Number of shipping accidents • Extent to which ports & shipping apply 'best practice' principles • Extent & type of stewardship practices of GBR-dependent industries – tourism & commercial fishing 	<p>WT Region – ports & shipping</p> <ul style="list-style-type: none"> • Ports North (PN) maintain compliance & are members of Wet Tropics Healthy Waterways Partnership (WTHWP), Reef Advisory Committee (RAC), & LMACs. PN Environment Management System (EMS) provides a process to identify & manage impacts of operations. Benthic community surveys at & adjacent to Cairns dredge material placement area indicated that irregular low volumes of maintenance dredge material have a very localised, minimal impact to the seafloor. During 2016, 57 environmental incidents on PN land or facilities. 12 near-miss events contained & cleaned up with no release to the environment (Ports North, 2016). • Ships >70m, loaded chemical & oil tankers, & loaded liquefied gas carriers must embark a licenced coastal pilot when transiting Cape York to Cairns. Australian Maritime Safety Authority (AMSA) proposes compulsory pilotage in the upper middle Inner Route, from Cairns to Townsville (North-East Shipping Management Group [NESMG], 2014). <p>GBR-wide tourism</p> <ul style="list-style-type: none"> • 67 GBR tourism operators have Ecotourism Australia’s (EA) ECO Certification & carry 69% GBR tourists (GBRMPA, 2016a). 52% tourists prefer those with ‘green’ credentials; 63% tourism operators said they “regularly get involved in GBR research &/or management”; 98% agreed they “try to encourage other people to reduce their GBR impacts”; 90% agreed that they “provide interpretation for tourists that promotes conservation or sustainable use of the GBR”; 88% use fuel efficient engines; 84% separate waste for recycling; 83% participate in industry BMP (e.g., codes of practice, Memorandums of Understanding (MOUs); 45% participate in GBRMPA’s Eye on the Reef monitoring program; 43% use 	<ul style="list-style-type: none"> • Compliance of commercial fishers increased or was stable across most regions between 2012 & 2013, except for the Far Northern marine region. No inspections increased across all regions from 2012 to 2013. Several MOUs & Codes of Conduct (COCs) for commercial fishers, but formal information is lacking. • The GBR is an International Maritime Organization (IMO) Particularly Sensitive Sea Area (PSSA) to which Australia can apply specific maritime controls, e.g., compulsory pilotage, designation of shipping routes & mandatory location reporting. CAFNEC consider the North-East Shipping Management Plan is vague about existing & future impacts of shipping in the GBR. World Wildlife Fund (WWF) & AMSA recognise that the plan provides important priority actions, but urgent changes are needed (e.g., compulsory pilotage for the entire GBR; use of high-standard ships in GBR waters, & improved marine 	<p>3.5</p> <p>Significant progress has been made on tourism, port management & the management of shipping in the GBR. Extreme weather contingency planning by Pro-Vision shows leadership in GBR stewardship. Most fisheries are reasonably well regulated, but recreation fishing requires increased compliance effort.</p>
<ul style="list-style-type: none"> • Extent & type of stewardship practices of GBR-associated industries. • Arrangements to ensure GBR shipping is safe. • Number of shipping accidents • Extent to which ports & shipping apply 'best practice' principles • Extent & type of stewardship practices of GBR-dependent industries – tourism & commercial fishing 	<p>WT Region – ports & shipping</p> <ul style="list-style-type: none"> • Ports North (PN) maintain compliance & are members of Wet Tropics Healthy Waterways Partnership (WTHWP), Reef Advisory Committee (RAC), & LMACs. PN Environment Management System (EMS) provides a process to identify & manage impacts of operations. Benthic community surveys at & adjacent to Cairns dredge material placement area indicated that irregular low volumes of maintenance dredge material have a very localised, minimal impact to the seafloor. During 2016, 57 environmental incidents on PN land or facilities. 12 near-miss events contained & cleaned up with no release to the environment (Ports North, 2016). • Ships >70m, loaded chemical & oil tankers, & loaded liquefied gas carriers must embark a licenced coastal pilot when transiting Cape York to Cairns. Australian Maritime Safety Authority (AMSA) proposes compulsory pilotage in the upper middle Inner Route, from Cairns to Townsville (North-East Shipping Management Group [NESMG], 2014). <p>GBR-wide tourism</p> <ul style="list-style-type: none"> • 67 GBR tourism operators have Ecotourism Australia’s (EA) ECO Certification & carry 69% GBR tourists (GBRMPA, 2016a). 52% tourists prefer those with ‘green’ credentials; 63% tourism operators said they “regularly get involved in GBR research &/or management”; 98% agreed they “try to encourage other people to reduce their GBR impacts”; 90% agreed that they “provide interpretation for tourists that promotes conservation or sustainable use of the GBR”; 88% use fuel efficient engines; 84% separate waste for recycling; 83% participate in industry BMP (e.g., codes of practice, Memorandums of Understanding (MOUs); 45% participate in GBRMPA’s Eye on the Reef monitoring program; 43% use 	<ul style="list-style-type: none"> • Compliance of commercial fishers increased or was stable across most regions between 2012 & 2013, except for the Far Northern marine region. No inspections increased across all regions from 2012 to 2013. Several MOUs & Codes of Conduct (COCs) for commercial fishers, but formal information is lacking. • The GBR is an International Maritime Organization (IMO) Particularly Sensitive Sea Area (PSSA) to which Australia can apply specific maritime controls, e.g., compulsory pilotage, designation of shipping routes & mandatory location reporting. CAFNEC consider the North-East Shipping Management Plan is vague about existing & future impacts of shipping in the GBR. World Wildlife Fund (WWF) & AMSA recognise that the plan provides important priority actions, but urgent changes are needed (e.g., compulsory pilotage for the entire GBR; use of high-standard ships in GBR waters, & improved marine 	<p>3.5</p> <p>Significant progress has been made on tourism, port management & the management of shipping in the GBR. Extreme weather contingency planning by Pro-Vision shows leadership in GBR stewardship. Most fisheries are reasonably well regulated, but recreation fishing requires increased compliance effort.</p>		

	<p>green energy (e.g., solar); 28% use emissions calculator; 19% use carbon offsets; 8% use alternative fuels (Marshall et al., 2013a).</p> <p>WT Region - fishing</p> <ul style="list-style-type: none"> • Pro-vision Reef, (Qld marine aquarium collection fishery) agreed not to collect in areas north of Cairns affected by severe coral bleaching. In June 2016, the Sea Cucumber Association agreed to not pursue reopening of black teatfish fishery, as its habitat is in severely bleached areas north of Cooktown (GBRMPA, 2016a). • 8% commercial fishers have fuel efficient vessels; 81% participate in industry best practice; 13% use an emissions calculator (Marshall et al., 2013a). 	<p>biosecurity arrangements (Commonwealth of Australia, 2014).</p>
<p>Rating</p>	<p>19</p>	
<p>Maximum for this Attribute</p>	<p>30</p>	

Cluster Two: Community vitality

Community vitality is characterised by demographic stability, security, happiness and well-being. Community vitality associated with the GBR include services and infrastructure supporting the interface between the community and GBR as well as the social health derived from the GBR, e.g., nature appreciation, relaxation, recreation, physical health benefits, and other lifestyle benefits derived from the GBR. A healthy GBR community derives high levels of appreciation and enjoyment from the GBR and is highly satisfied with the GBR and its management.

Table 5: Community vitality

Attribute Component	Possible Pressure, State & Trend Indicators	Evidence	Conclusions	Proposed Value & Logic
CV1 Demographic stability across the WT region	<ul style="list-style-type: none"> Basic demographic characteristics (e.g., population, age structure, migration & growth rates). Migration intentions over the next 12 months. 	<ul style="list-style-type: none"> In 2015 WT population (estimated resident population (ERP)) was 282,790 c.w. 991,978 for the GBR catchment, & 4,778,854 for Qld. WT population projected to be 313,899 by 2036. Within the WT, Cairns has the largest population with 160,285. Cairns LGA grew by 1.5% from 2010 to 2015. Cassowary Coast LGA was stable (0%) & Hinchinbrook LGA declined (-0.8%). Douglas grew by 0.9%; Tablelands by 0.6% & Yarrabah 0.7%. All of Qld grew by 1.6% & South East Queensland (SEQ) by 1.8% (QGSO, 2017a, 2017b). In 2016, 18.8% of residents were born overseas, compared with 21.6% across Qld; & 9.7% residents were Indigenous people c.w. 4% for Qld (QGSO, 2017a). 2006 Census identified that compared to the rest of Australia, Queensland in general & Cairns in particular, had “a far greater percentage of people identified as homeless” (Dawes & Gopalkrishnan, 2014). High number of young families & young single people living alone compared to Qld averages (QGSO, 2017a). <p>Likelihood of moving in the next 12 months</p> <ul style="list-style-type: none"> In 2016, only 7.4% WT residents were likely to shift in the next 12 months (University of Canberra, 2017). 16.6% of the WT population had a different address 12 months ago c.w. 17.5% for Qld (QGSO, 2017a) 	<ul style="list-style-type: none"> Latest ABS statistics indicate that 2014-15 was very poor for population growth outside SEQ, but Cairns continued to consolidate its position as the most populous LGA in North Queensland (NQ) – ERP of 282,790. Overall, population growth is stable (Cummings, 2016). Greater portion of young children & adults at working age within the Cairns population & fewer older people than the state average. Modest population growth impacts could be accommodated with minimal additional GBR impacts. High regional (in & out) migration rates present problems local knowledge retention problems re climate change & GBR health. 	<p>3.5</p> <p>Demographic stability in the region is strong, but affected by high tourism levels. There is significant Indigenous mobility & post-cyclone population declines in smaller regional communities. Modest growth, if well managed can progress without significant GBR impacts.</p>

	<ul style="list-style-type: none"> Across the whole GBR catchment, 77% of residents planned to still reside in the catchment in 5 years' time. Of these, 86% planned to stay even if cyclones & floods occurred more frequently (Marshall et al., 2014b). 	<ul style="list-style-type: none"> The most vulnerable sector in terms of disaster response may be young people living on their own, & homeless people. These sectors also have the least capacity for mid-term GBR stewardship. New state economic development policy focused on coal risks setting up negative legacies when viewed in the context of GBR health. Uncertainty exists about future development opportunities.
<p>CV 2 Security in the catchment including housing, safety & risk management.</p>	<ul style="list-style-type: none"> Financial distress: (i) delay or cancel non-essential purchases; (ii) could not pay bills on time; (iii) went without meals, or unable to heat or cool home; (iv) asked for financial help from friends or family. Crime rates Perceptions of safety Housing including availability & affordability. <p>% residents with high financial distress (2, 3 or 4 factors)</p> <ul style="list-style-type: none"> 24% WT residents c.w. 20.9% rural & reg. Aust & 22.3% rural & reg. Qld (University of Canberra, 2017). <p>Regional Crime Rates & domestic safety</p> <ul style="list-style-type: none"> Rate of total reported offences in the WT region for 2016–17 was 13,437 per 100,000 persons c.w. 10,142 per 100,000 persons for Qld (QGSO 2017a). <p>Perceptions of safety – “This is a safe place to be”</p> <ul style="list-style-type: none"> 81.2% WT residents c.w. 80.7% rural & reg. Aust; 83.3% rural & reg. Qld (University of Canberra, 2017). <p>Housing including availability & affordability</p> <ul style="list-style-type: none"> 58.0% WT residents in highest risk of homelessness quintile c.w. 23.8% for Qld. In 2011 there were 91.2 homeless persons per 10,000 c.w. 44.5/10 000 for Qld; Innisfail - Cassowary Coast had the highest rate (195.2 persons per 10,000). (NB: no data from Yarrabah) (QGSO, 2017c). In June 2017, 39.7% WT Qld housing register applicants had a very high need for social housing; c.w. 35.4% for Qld. This did not include data from Yarrabah (QGSO, 2017c). In 2016, 47.1% Cairns North low income private rental tenants were paying 30% or more of their gross income on private rent 	<ul style="list-style-type: none"> Compared with the rest of Qld, the region has higher levels of: <ul style="list-style-type: none"> financial distress the need for social housing homelessness > double state av. stress due to rental affordability. Regional perceptions of safety are about the same as that of other Qld residents & rural & regional Australians; however the crime rate is above the state average. Modern building standards & improvements in disaster response mechanisms should minimise extreme weather impacts in future, however, there is anecdotal evidence suggesting difficulty of urban communities and new residents <p>3</p> <p>Generally high levels of housing & financial stress slightly offset by increasing levels of insurance affordability. Homelessness is double that of other places in Qld, but perceptions of safety are on par with other Q'landers.</p>

		<p>c.w 42.2% of Qld low income private rental tenants (QGSO, 2017c).</p> <ul style="list-style-type: none"> Severe tropical cyclones in Far North Qld means house insurance premiums are higher than elsewhere in the country (Harwood, Smith, & Henderson, 2016). In 2011 following Cyclone Yasi house sale prices in north Queensland dropped by nearly 3% (Lynch, 2011). At the same time, insurance premiums for strata-title residences in FNQ increased up to 350% (Hayes, 2011). However, in 2016 Suncorp released its Cyclone Resilience Benefit program which allows homeowners in cyclone-prone regions to receive up to 20% off premiums based on features of their home that reduce vulnerability in cyclones (e.g., window shutters) (Harwood et al., 2016). 	<p>knowing what to do in the case of extreme weather events.</p> <ul style="list-style-type: none"> Insurance costs have increased significantly leading to insurance risks (e.g., less cover being taken out/none at all). This is reducing peoples' capacity to be self-sufficient adding to greater government costs. This may be addressed through new initiatives such as Suncorp's Cyclone Resilience Benefit program. 	
<p>CV3 Wellbeing/ happiness within the general community</p>	<ul style="list-style-type: none"> Community Wellbeing (1-7): (i) great place to live; (ii) coping with challenges; (iii) pride; (iv) optimism; (v) community spirit. Decreasing community liveability: (i) liveability; (ii) friendliness; (iii) local economy; (iv) local landscape. Personal Wellbeing (0-100). Satisfaction with: (i) standard of living; (ii) health; (iii) achievements; (iv) relationships; (v) safety; (vi) 	<p>Perceptions of community wellbeing</p> <ul style="list-style-type: none"> 5.4 c.w. 5.5 rural & regional Aust; 5.5 rural & regional Qld (University of Canberra, 2017). Amongst Wet Tropics residents, the environment is more important than industry to overall quality of life & those who earn income from mining or ports would be relatively less impacted by environmental decline than individuals associated with other industries (Wet Tropics Management Authority [WTMA], 2015). <p>Perceptions of decreasing community liveability</p> <ul style="list-style-type: none"> 26% WT residents c.w. 20.2% rural & reg. Aust; 25.5% rural & reg. Qld (University of Canberra, 2017). <p>Perceptions of personal wellbeing</p> <ul style="list-style-type: none"> 70.9% WT residents c.w. 73.7 rural & regional Aust; 73 rural & regional Qld (University of Canberra, 2017). Health & safety of family & friends is the most important value among Indigenous & non-Indigenous WT residents, followed by time spent with loved ones (Esparon et al., 2014). <p>Perceptions of poor health</p> <ul style="list-style-type: none"> 10.6% WT residents c.w. 5.2% rural & reg. Aust; 5.1% rural & reg. Qld (University of Canberra, 2017). <p>Probability of serious mental illness</p>	<ul style="list-style-type: none"> Broad indicators suggest generally high levels of happiness/wellbeing within the region, though this may change as climate change intensifies. Evidence suggests socioeconomic disadvantage is a key driver of regional health & wellbeing disparities (Beard, Tomaska, Earnest, Summerhayes & Morgan, 2009). Considerable wellbeing disparities emerge for key populations within the region (particularly Indigenous & younger peoples). Higher temperatures, sea level rise & more intense extreme events associated with climate change may substantially reduce liveability, particularly in low-lying islands & coastal locations (Moran & Turton, 2014). 	<p>3.5</p> <p>There is a generally high level of health & wellbeing within the region, but this is tempered by significant inequalities within Indigenous populations & poorly employed younger populations.</p>

	<p>Feeling part of community; (vii) future security.</p> <ul style="list-style-type: none"> • Health. • Mental illness. <ul style="list-style-type: none"> • 11.4% WT residents c.w. 9.6% rural & reg. Aust; 10.8% rural & reg. Qld (University of Canberra, 2017). • Psychological impacts associated with climate change could be severe in future, especially if communities can no longer remain economically viable. Future climate related physical health risks may include those associated with heat exhaustion & dehydration during heatwaves; there may be increased cases of some vector-borne diseases (Marshall et al., 2014b).
<p>CV4 Community health/ wellbeing/ satisfaction associated with the GBR</p>	<ul style="list-style-type: none"> • Stress associated with decline in GBR health. • GBR contributions to quality of life & wellbeing. GBR contribution to: (i) QoL; (ii) ecosystem services, e.g., fresh; (iii) optimism about the future; (iv) satisfaction with GBR experiences; (v) GBR experiences (negative & positive); (vi) physical &/or mental health. • Indigenous health associated with the GBR. • Commercial fishers' wellbeing. <p>Stress associated with decline in GBR health</p> <ul style="list-style-type: none"> • 79% WT residents DISAGREE that they would NOT be personally affected if GBR health declined; 76% admitted that thinking about coral bleaching makes them feel depressed (Marshall & Pert, 2017). • 54% of Australians would be personally affected if the health of the GBR declined c.w. 81% GBR coastal residents (Marshall et al., 2013a). <p>GBR contributions to quality of life & wellbeing</p> <ul style="list-style-type: none"> • 83% WT residents agree that the GBR contributes to their quality of life & wellbeing; 95% love living beside the GBR; 88% value the GBR because it supports a desirable & active way of life; 72% value the GBR because it inspires artistic or thoughtful ways 66% value the GBR for the fresh seafood it provides; only 44% feel optimistic about the future of the GBR; & 82% value the GBR because it makes them feel better physically and/or mentally; only 47% WT residents like the colour/clarity of water along the beaches in their region (c.w.95% in Burnett-Mary) & 79% feel there is too much rubbish on their beaches (Marshall & Pert, 2017). • 2/3 Australian & international survey respondents are prepared to pay to protect the GBR. Of these 61% alluded to its importance to the planet; 59% felt future generations should be able to visit it; 59% cited its importance to biodiversity; 52% felt it was morally & ethically right to pay for its protection (DAE, 2017). • GBR contributes to quality of life & wellbeing of 85% WT fishers (Tobin et al., 2014). <ul style="list-style-type: none"> • Evidence suggests that the GBR plays an important role in the health & wellbeing of residents & visitors. <p>3.5 High levels of wellbeing related to the GBR are reported in both regional & Australian populations.</p>

- **Tourism Operators' wellbeing.**
 - 76% of GBR tourism operators indicate that they live in the catchment because of the GBR. Some 92% are proud the GBR is a World Heritage Area & 97% agree that “the aesthetic beauty of the GBR is outstanding” (Marshall et al., 2013a).
 - Even at the height of the coral bleaching event in 2017, <5% of surveyed tourists rated their GBR experience as poor or awful. This positive message was never picked up in the media or used effectively by the destination to combat the generally poor media coverage (Prideaux, Carmody & Pabel, 2017).
 - 75% GBR coastal residents rate satisfaction with GBR experiences as very high (i.e., rating > 8/10). Greatest +ive influence on experiences were visual quality, weather, hospitality/company, habitat quality, & fish number. Greatest -ive influences were number of fish, habitat quality & weather. 80% GBR tourists rated their satisfaction with their GBR experience as very high (i.e., >8/10). Highest scores for sightseeing & photography (8.6), GBR seafood (8.5), wildlife watching (8.5), scuba diving (8.4), camping & hiking (8.3) & snorkelling (8.2). Greatest positive influence on tourists' GBR experience were aesthetics, weather, perceived GBR health, hospitality & wildlife; absence of crowding. Greatest negatives for tourists were bad weather & issues associated with tourism operators (e.g., service, cleanliness, cost). 74% international & 57% domestic tourists came to the catchment because of the GBR, & rated their overall satisfaction with GBR experiences as 8.4/10. 85% international tourists & 96% domestic tourists hope to revisit the GBR in future (Marshall et al., 2013a).
 - Indigenous health & wellbeing is affected by a significant collection of chronic health conditions which can & are being minimised by access to & use of GBR resources. Known health & wellbeing benefits are only limited by the extent to which Indigenous & non-Indigenous people are able to be actively & culturally engaged in the use & management of natural resources such as the GBR (Hill & Lyons, 2014).
- **Coastal residents' wellbeing**
 - In 2013, 75% GBR coastal residents were very satisfied with GBR experiences (i.e., rating >8/10). Greatest +ive influences

	<p>were visual quality, weather, hospitality/company, habitat quality, & fish number. Greatest -ive influences were number of fish, habitat quality & weather. 80% GBR tourists were very satisfied with GBR experiences (8/10). Highest scores for sightseeing & photography (8.6), GBR seafood (8.5), wildlife watching (8.5), scuba diving (8.4), camping & hiking (8.3) & snorkelling (8.2).</p> <p>Tourists' wellbeing</p> <ul style="list-style-type: none"> • Greatest positive influence on tourists' GBR experience were aesthetics, weather, GBR health, hospitality & wildlife; absence of crowding. Greatest negatives were bad weather & issues associated with tourism operators (e.g., service, cleanliness, cost). • In 2013, 74% intern'l & 57% domestic tourists came to the catchment because of the GBR, & rated overall satisfaction with GBR experiences as 8.4/10 (Marshall et al., 2013a). <p>Commercial fishers' wellbeing</p> <ul style="list-style-type: none"> • In 2013, the GBR contributed to quality of life & wellbeing of 85% WT fishers (Tobin et al., 2014). <p>Tourism Operators' wellbeing</p> <ul style="list-style-type: none"> • In 2013, 76% GBR tourism operators lived in the catchment because of the GBR.
<p>CV5 Regional services & infrastructure supporting the interface between the community & GBR</p>	<ul style="list-style-type: none"> • Energy security. • Quality of infrastructure. • Impacts on infrastructure. • Perceptions of access to health, education, aged care & child care. • Perceptions of access to roads & public transport. <p>Energy security</p> <ul style="list-style-type: none"> • Qld residents on Tariff 11 can expect a 3.3% increase in the annual price for 2017, & Qld customers on the main small business retail tariff (T20) can expect a 4.1% increase (Queensland Competition Authority, 2017). <p>Quality of Infrastructure</p> <ul style="list-style-type: none"> • WT residents highly value the (generally good) quality of roads, hospitals, schools & other regional infrastructure (Esparon et al., 2014). • Cairns is the northern-most terminus of Qld's rail & road networks & the international airport is located on the shoreline of the Central Business District (CBD) area (Cummings, 2009). • Cairns is the leading aviation servicing centre for much of North Australia & the South-West Pacific & provides training, <ul style="list-style-type: none"> • Infrastructure & services are generally good, however, there are major disparities between Indigenous & non-Indigenous communities. • All physical & social infrastructure can be severely damaged in extreme weather, leading to adverse impacts on GBR-dependent communities & industries. • Annualised transport infrastructure is more vulnerable under more severe events. <p>3.5 Solid infrastructure & service arrangements in the region enhance the linkages between the region & tourist population & the GBR, increasing regional resilience.</p>

	<p>repairs & maintenance, equipment sales, charters & other services (Cummings, 2009).</p> <ul style="list-style-type: none"> The existing poor state of infrastructure & services in Indigenous communities such as housing, water, energy, sewerage & roads is likely to further deteriorate under climate change (Hill & Lyons, 2014). <p>Impacts on infrastructure</p> <ul style="list-style-type: none"> Infrastructure is predicted to deteriorate more rapidly in the future due to more frequent, extensive inundation of WT coastal areas, strong winds, storm surges & heavy rainfall associated with more intense tropical cyclones (Moran & Turton, 2014). After Cyclone Yasi infrastructure damage impacted commercial fishers' ability to get fish to market, & tourism operators were affected by damaged infrastructure, e.g., jetties, resorts, roads, rail & airports (Gooch, Vella, Marshall, Tobin & Pears, 2013). <p>Perceptions of good access to health, education, aged care & child care</p> <ul style="list-style-type: none"> 63% WT residents c.w. 75% for both rural & regional Aust & rural & regional Qld (University of Canberra, 2017). <p>Perceptions of good access to roads & public transport</p> <ul style="list-style-type: none"> 40.8% WT residents c.w. 50.3% for rural & regional Aust & 53.9% rural & regional Qld (University of Canberra, 2017). 	<ul style="list-style-type: none"> Coastal airport, road & port infrastructure is vulnerable to inundation due to sea level rise or during storm, cyclone or flood events. Natural Disaster Relief & Recovery Arrangement (NDRRA) funding models are not well suited to progressive betterment. The potential for major port & airport disruption has not yet been realised, but may have implications for the GBR. Progressive improvement in road infrastructure has been emerging. On farm infrastructure assets annually vulnerable but could be better managed through real time data & information management. Security of electricity is good; affordability is becoming more difficult.
Rating		17
Maximum for this Cluster		25

Cluster Three: Culture and heritage

Status of integrated and diverse culture and heritage associated with the GBR catchment. Cultural and heritage connections promote a sense of place associated with GBR coastal communities, and there is a strong sense of place attachment and identity associated with the community, because of its association with the GBR. This cluster also includes values of significance in accordance with Traditional Owner practices, observances, customs, traditions, beliefs or history. Historic heritage is specifically concerned with the occupation and use of an area since the arrival of European and other migrants. There are 4 major attributes associated with this cluster: World heritage; Indigenous heritage; contemporary culture; historic cultural heritage.

Table 6: Culture and heritage

Attribute Component	Possible Pressure, State & Trend Indicators	Evidence	Conclusions	Proposed Value & Logic
CH1 World Heritage – underpinned by ecosystem health, biodiversity & water quality	<ul style="list-style-type: none"> State of regional natural assets. Perceptions of the GBR’s natural beauty & other world heritage attributes. Impacts on GBR-Wide World Heritage values. 	<p>Regional natural assets</p> <ul style="list-style-type: none"> WT Region’s marine & coastal habitats contain globally significant World heritage – 2 WHAs (Wet Tropics World Heritage Area (WTWHA) & GBR); & include turtle & seabird nesting & roost sites; coral spawning, migrating whales, fish spawning aggregations; superlative natural beauty above & below the water (Context, 2013). <p>Perceptions of natural beauty & other World Heritage attributes</p> <ul style="list-style-type: none"> 89% WT residents value the GBR because it attracts people from all over the world & 91% value the GBR simply because it exists, even if they don’t use or benefit from it (Marshall & Pert, 2017). 95% regional residents agree that the GBR’s aesthetic beauty is outstanding & 96% value the GBR because it supports a variety of life, such as fish and corals; however only 47% WT residents like the colour/clarity of water along the beaches in their region, & 79% feel there is too much rubbish on these beaches (Marshall & Pert, 2017). Environmental values, including the health of native plants & animals, undeveloped scenery, & presence of iconic species, 	<ul style="list-style-type: none"> Indigenous peoples’ cultural practices rely on access to resources that are likely to be impacted negatively by climate-induced changes & reduction in species availability (Hill & Lyons, 2014). Assessment & monitoring of OUV & aesthetics is a new field, & methods are being trialled now for application in the future. 	<p>3.5</p> <p>Very high based on OUV of two WHAs within the region; but recently damaged by extreme weather events & two consecutive years of coral bleaching. Potentially threatened by coastal development.</p>

consistently ranked higher among WT residents than economic factors such as employment income from mining, tourism & agriculture (Esparon et al., 2014).

- 82% of associations with the GBR in a national survey were 'positive' & referred to natural phenomena (e.g., beauty, diversity, fish, & corals) (Marshall et al., 2013a).

Impacts on GBR-Wide World Heritage values

- Coral health is integral to GBR values. From 2007 to 2013, coral condition in the WT region declined by 30% c.w. 28% for whole GBR (ABS, 2015). Tropical Cyclone Yasi likely caused the greatest loss of GBR coral cover in a 24-hour period since 1985 (Beeden et al., 2015). 2017 is the first ever "back-to-back" bleaching event, most severely from Townsville to Port Douglas (Australian Broadcasting Commission [ABC], 2017). Chronic stresses from reduced water quality hinders coral recovery (GBRMPA, 2011, 2014a, 2014b).
- Poor marine water quality associated with pollutant run-off from the adjacent catchments, especially during major floods, affects the GBR's natural heritage (Waterhouse et al, 2017).
- Inshore seagrass meadows and coral reefs continue to recover from previous losses due to major run-off events and cyclones, but remain in moderate to poor condition.
- Mid-shelf & outer shelf reefs in the southern GBR can rapidly recover from previous disturbances; however, a severe mass thermal coral bleaching event in 2016 resulted in significant coral mortality, especially north of Port Douglas (Waterhouse et al, 2017).
- Ongoing, warmer-than-average sea temperatures resulted in a further widespread mass coral bleaching event in 2017 which was most intense on reefs between Cairns and Townsville. In addition, a severe Tropical Cyclone Debbie affected reefs in the Mackay Whitsunday region and subsequent flooding also affected the Fitzroy region. Impacts of these events have yet to be quantified (Waterhouse et al, 2017).
- Climate change is predicted to increase the intensity of extreme weather events, which are significant in driving

	<p>impacts to coastal and marine ecosystems (Waterhouse et al, 2017).</p>			
<p>CH 2 Indigenous (Traditional Owner) heritage</p>	<ul style="list-style-type: none"> ID, state & trend of Indigenous heritage values. TO management of GBR resources including number & strength of: (i) TO connections with GBR resources incl. identification, protection & management of Indigenous cultural heritage in sea country; (ii) TO benefits derived from the GBR; (iii) partnerships, institutional arrangements & agreements between TOs & all GBR stakeholders; (iv) TO-driven frameworks & participatory monitoring methods. Levels of TO satisfaction with: (i) identification, documentation & storage of cultural information; (ii) TO 	<p>ID, state & trend of Indigenous heritage values</p> <ul style="list-style-type: none"> 49% regional residents agree that the GBR is important for traditional or cultural practices; & 69% value the GBR because of its rich TO heritage (Marshall & Pert, 2017). TOs have observed impacts on Indigenous cultural integrity & heritage values from rising sea levels (e.g., fish traps in Giringun country are being affected (GBRMPA, 2014a). New GBRMPA guidelines for TO heritage impact assessment (GBRMPA, 2016a). GBRMPA's FMP manages cultural & Indig. heritage on island national parks & Comm. Islands, including developing heritage management plans to protect significant sites & active maintenance & restoration at some locations (GBRMPA & Queensland Government, 2016). GBRMPA is developing cultural protocols to guide management of Indigenous heritage & is partnering with TOs to determine how to store, handle & manage Indigenous knowledge appropriately. GBRMPA is also developing an Indigenous Heritage Strategy to improve understanding & protection of Indigenous heritage values in the GBR (GBRMPA, 2016a). <p>TO management of GBR resources</p> <ul style="list-style-type: none"> Indigenous people in the region continue to have strong place attachment including cultural connections to land & sea areas & retain custodian responsibilities to ensure their protection (Grant, 2012). TO aspirations for securing rights & managing GBR cultural value have been well defined over the past 20 years since Sea Forum (Dale et al., 2016b). There are 8 Traditional Use of Marine Resources Agreements (TUMRAs) covering 24.6% of the GBR, i.e., 45,200 km² - & involve 16 TO groups. TUMRAs address issues such as the sustainable take of culturally significant species, & supporting cultural practice in GBR conservation & management. The 	<ul style="list-style-type: none"> Cultural processes & sites of cultural significance for TOs remain adversely affected by pressures as such development & extreme weather events, then stories & songlines are compromised & customary practice sometimes have to be changed (GBRMPA, 2014a). There is an increasing capacity of Indigenous land & sea institutions, but much work needs to be done to progress rights & to substantively progress country based planning, strategy development & implementation. Better supporting Indigenous peoples to document & share TEK is a first step to the bigger challenge of engaging with Indigenous processes of knowing about environmental change (Hill & Lyons, 2014). 	<p>2.5</p> <p>Indigenous groups remain strongly affiliated to country but are challenged in their efforts to protect & enhance their cultural systems leading to stronger GBR stewardship. Capacities of land & sea institutions & formal agreements for managing use have improved dramatically over the past decade but generally continue to have capacity concerns.</p>

	<p>methodologies; (iii) participation in GBR management; (d) extent to which Traditional Ecological Knowledge (TEK) is identified, maintained & transferred.</p> <ul style="list-style-type: none"> Levels of TO use & dependency on the GBR. 	<p>agreements incorporate traditional & contemporary scientific knowledge for GBR management (GBRMPA, 2016a).</p> <ul style="list-style-type: none"> Sea claim activity & effort in the WT region remains under-developed relative to locations such as the Torres Strait, however Indigenous land & sea institutions have been growing in their strength & reach over the past decade, leading to much greater control over & engagement in land & sea management e.g., Girringun Indigenous Protected Area (IPA) provides opportunities for 8 TO groups to actively manage their diverse land & sea country & re-engage with culture & language through country. Girringun Aboriginal Corporation partners with local, state & federal governments as well as numerous Non Government Organisation (NGO) & research partners to achieve shared outcomes for country (Social Ventures Australia [SVA], 2016). Recognition of Traditional Knowledge, as opposed to working within a western scientific framework will require a change of mindset within management agencies TOs feel this has, & will, prove to be challenging into the future (Grant, 2012). <p>Levels of Traditional Owner satisfaction</p> <ul style="list-style-type: none"> Insufficient data currently exists. <p>Levels of TO use & dependency on the GBR</p> <ul style="list-style-type: none"> Insufficient data currently exists. 	
<p>CH 3 Contemporary culture associated with the GBR</p>	<ul style="list-style-type: none"> Place attachment, identity. GBR as culture – levels of pride, inspiration & personal connection to the GBR. National connections to the GBR. 	<p>General regional place attachment % <i>disagreement</i> with: 'I like the environment & surrounds I live in':</p> <ul style="list-style-type: none"> 0.8% WT residents c.w. 4.2% for rural & regional Aust & 5.3% rural & regional Qld (University of Canberra, 2017). <p>GBR as 'culture'</p> <ul style="list-style-type: none"> 58% WT residents see the GBR as an important part of their culture; 95% love living beside the GBR; 94% WT residents are proud the GBR is a World Heritage Area; 68% agree that the GBR is part of their identity;& 64% value the GBR because it is spiritually important to them (Marshall & Pert, 2017). <p>National Connections to the GBR</p> <ul style="list-style-type: none"> In 2013, 93% Australians described the GBR as inspiring, 46% believed it is the most inspiring natural icon in Australia; 82% had positive associations with the GBR; 84% were proud the 	<ul style="list-style-type: none"> GBR values are deeply reflected in contemporary national culture. WT continues to have strong & distinct cultural integrity around key localities, communities & industries. - 99% WT residents like their local environment. Cultural values associated with the region's natural resource base are highly vulnerable to extreme weather impacts, e.g., cyclones, floods, mass coral bleaching. <p>3.5 Strong overall cultural understanding of the importance of the GBR. Cultures leading to GBR friendly land management are improving.</p>

	<p>GBR is a WHA; 64% saw the GBR as part of their identity (Marshall et al., 2013a).</p>	<ul style="list-style-type: none"> • When an extreme weather event threatens a person’s ability to continue living where they do, place attachment can act as a barrier to change & reduce capacity to adapt (Marshall, Park, Adger, Brown & Howden, 2012).
<p>CH4 Historic maritime heritage (since European settlement)</p>	<ul style="list-style-type: none"> • Identification, protection & management of historic heritage in GBR environments. • Cultural significance of historic heritage values for the GBR. <ul style="list-style-type: none"> • Friends of Ninney Rise (FONR) at Mission Beach celebrated a significant GBR heritage event in 2017, which led to the establishment of the GBRMP (FONR, 2017). • >800 historic shipwrecks in GBRWHA, but only ~40 located & only ~20 positively identified (P. Illidge, personal communication). • A nationally significant RAAF WWII Catalina wreck Frankland Islands south of Cairns is protected through a GBRMP special management area. People can apply for a permit to access the site for cultural heritage purposes, including monitoring, research and stabilising the wreck (GBRMPA, 2015). • Queensland Department of Environment and Heritage Protection (QDEHP) & GBRMPA have conservation management plans for 6 historic shipwrecks which should be revised in 3-5 years. (GBRMPA, 2016a; P. Illidge, personal communication). • GBRMPA is developing an overarching Heritage Strategy to improve understanding & protection of Indigenous & historic heritage values in the GBR (GBRMPA, 2016a). • Most submerged WWII sites have not been located, & minimal information recorded. Action HA 11 under Reef 2050 Plan to identify, map & prioritise historic shipwrecks are not met (P. Illidge, personal communication). • Some GBR historic lightstations are monitored annually (Steph. Lemm, personal communication), e.g., Lowe Isles. • When sea level was much lower, Indigenous people walked across the land (now the GBRWHA) leaving many archeological sites both under the sea and on islands, but 	<ul style="list-style-type: none"> • Key historical maritime heritage assets tend to be considered & managed by a disparate range of institutions & agencies (e.g., historical societies, QPWS, Indigenous Land & Sea Institutions). • The evidence base concerning the identification, protection & management of historical maritime heritage in the Wet Tropics remains limited & fragmented. • Events such as the Ninney Rise celebrations reflect local and national interest in GBR history.

2.5

While there is a strong interest in historical maritime heritage across the GBR coast, the asset remains poorly defined, planned & managed.

	knowledge is scattered & not well documented (P. Illidge, personal communication).	
Rating		11.5
Maximum for this Attribute		20

Cluster Four: Economic values

This includes the monetary advantages that people derive directly or indirectly from a healthy and well-managed Great Barrier Reef. Fundamental to this cluster is the premise that economic activities within the Great Barrier Reef World Heritage Area and its catchments are ecologically sustainable. GBR-dependent industries rely on a healthy GBR and include GBR-based commercial fishing, tourism, recreation, research and Traditional Owner use. These industries generate income and employment for thousands of people in coastal communities near the Great Barrier Reef, and beyond. The GBR tourism industry generates and collects the Environmental Management Charge which directly benefits GBR Marine Park management, which has flow on benefits to the broader community and society. GBR-associated industries include industries that may impact on the GBR, but are not economically dependent on GBR health, e.g., shipping, catchment industries such as agriculture, urban development and port development.

Table 7: Economic values

Attribute Component	Possible Pressure, State & Trend Indicators	Evidence	Conclusions	Proposed Value and Logic
EV1 Size & diversity of regional economic growth	<ul style="list-style-type: none"> Gross Regional Product (GRP). Core industries. 	<p>Gross Regional Product</p> <ul style="list-style-type: none"> Cairns GRP represents 2.7% of Qld's Gross State Product (GSP) (Cairns Regional Council, 2015) -down from 3.2% in 2011. <p>Core Industries</p> <p><i>Agriculture</i></p> <ul style="list-style-type: none"> In 2014–15, the Gross Value of Production (GVP) for agriculture in LGAs of Cairns, Cassowary Coast & Yarrabah was \$925M - 8% of total GVP for agriculture in Qld (\$11.9M). Most important in 2014-15 were bananas (\$427M), sugarcane (\$219M) & cattle (\$77M). In 2014–15 the area produced 39% Qld's avocados (worth \$48M). <p><i>Tourism</i></p> <ul style="list-style-type: none"> Tourism earnings have returned to where they were 10 years ago. From 2008-09 to 2011-12, the sector suffered 25% drop in revenue (Cummings, 2016). The Wet Tropics region experienced a decline of about 6.9M international visitor nights in 2007 to 5.3M in 2012 (DAE, 	<ul style="list-style-type: none"> Regional models of GRP are not sophisticated at this point in time. Natural assets remain the biggest drivers for the economy's base industries of agriculture, fishing & tourism, all of which are highly vulnerable to climate change as demonstrated by the extensive environmental & economic impacts of successive cyclones & bleaching events. Tourism & fishing industries (i.e., GBR-dependent) remain specifically vulnerable to the impacts of the Global Financial Crisis (GFC) & 	<p>3</p> <p>Economic fragility in the region remains high due to high dependence on tourism & risks from factors related to GBR health. While Australia technically is not in recession, we have had negative growth over the last two quarters & wage growth is at a record low. This will have implications on domestic visitation &</p>

	<p>2013), but in 2015-16 TNQ achieved \$1.086B in international expenditure (up 8.6%) & \$2.279B in domestic expenditure (Tourism Tropical North Queensland [TTNQ], 2016).</p> <p><i>Fishing</i></p> <ul style="list-style-type: none"> The 2013-14 GVP for Cairns inshore fishery was \$1.9M (mostly net & line). Additional activity though production & consumption was \$3.7M. Combined, the Cairns inshore fishing industry generated >\$5.6M, i.e., 3 times value of landings (Pascoe et al., 2016). <p><i>Ports & shipping</i></p> <ul style="list-style-type: none"> Contribution to Earnings Before Interest & Taxation (EBIT) from Cairns port activities was \$15.37M for 2015-16 c.w. \$14.4M for 2014-15; an increase of \$0.96M. <p><i>Human Services Sector</i></p> <ul style="list-style-type: none"> There has been growth in the human services & University/ Technical and Further Education (TAFE) sector recently (TTNQ & Tourism Queensland, 2010). 	<p>repeated large weather events.</p> <ul style="list-style-type: none"> Regional base industries earning income outside the region (i.e., tourism, marine, aviation, agriculture, government & defence) face economic pressure due to changing global & national markets & are subject to external economic conditions (e.g., exchange rates, GFC, etc.). There is significant variability & volatility from time to time in those industries. The economy remains extremely tourism reliant, indicating a need to diversify & to increasingly link lifestyle values & GBR activities to new industries, however need to balance industry expansion with protection of OUV (WTMA, 2015). Extreme events, particularly those that damage important areas of the GBR for tourism, may generate severe & long-lasting reductions in visitation. Further, media portrayal of extreme weather events will negatively influence visitor perceptions & may exacerbate the negative economic consequences on the tourism industry (Stoeckl et al., 2014). New growth is emerging in 	<p>the size of the regional economy. Continued growth & diversification in agriculture are possible but needs to be neutral or positive with respect to GBR outcomes. Potential exists to refocus economic diversity through new industries that link to GBR-related lifestyle values.</p>
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		<p>agriculture, but more effort is needed to ensure positive, not declining impacts on water quality.</p> <ul style="list-style-type: none"> • Increased construction work, water quality & decreased perceptions of tourist safety all reduce the likelihood of repeat visits & impact tourist revenues, risking the financial viability of the industry (Jarvis, Stoeckl & Liu, 2016). • The sugar & tourism are stronger than they were 10 years ago while fishing remains under pressure. • The development of Cairns as a regional service hub is enabling diversification & may complement GBR values but development is lagging in key services. Their growth is not so reliant on natural assets.
<p>EV 2 Economic viability of Reef-associated industries²</p>	<ul style="list-style-type: none"> • Agriculture. • Ports & shipping. • Human Services Sector. • Energy & water security. <p>Agriculture</p> <ul style="list-style-type: none"> • Cane farms (549) account for 34% all farms in the area, followed by beef cattle properties (29%) (ABARES, 2016). • In FNQ, farm cash income declined from ~\$120,300 per farm in 2013–14 to \$45,000 per farm in 2014–15 due to Cyclone Ita (ABARES, 2016). <p>Ports & shipping</p> <ul style="list-style-type: none"> • Cairns was the most highly used GBR port for commercial fishing - Reef line, Spanish Mackerel (SM) & coral harvest vessels (Tobin et al., 2014). 	<ul style="list-style-type: none"> • The primary industries sector which has been providing stability to the regional economy has suffered shocks due to environmental policy & frequent extreme weather events. • Energy security remains vulnerable. The regional economy is dependent upon <p>3</p> <p>While agricultural production continues to grow, water availability & seasonal & storage proposals are expensive & may have viability limits.</p>

² Reef-associated industries are those which do not depend on the health of the GBR but which may have an impact on GBR health (e.g., urban industries in catchment cities & towns; agricultural industries in GBR catchments; ports & shipping).

	<ul style="list-style-type: none"> Trade volume was less than 2014-15 with sugar, molasses, fertiliser & petroleum all down. Marina revenue was up on 2014-15, with strong growth in passenger levies & GBR fleet income due to growing tourist numbers. This offset a fall in superyacht revenue (Ports North, 2016). Some 706 vessels arrived at Cairns Port in 2012-13, (Ports North, 2016) & the marine services economy is experiencing some level of revival. 	<p>Human Services Sector</p> <ul style="list-style-type: none"> 2015 marked the 20 year anniversary of the opening of the JCU Cairns Campus. With 900 students in 1995 to 4,500 in 2015 (Haines, 2016; James Cook University [JCU], 2015). <p>Energy & water security</p> <ul style="list-style-type: none"> The Region has a high level of dependency on power generated from southern coal-fired power stations (despite a higher level of hydro-power than the Queensland average). Domestic prices remain lower due to Community Service Obligation subsidies, but industrial costs are vulnerable. Across the region, water resources are nearing their full consumptive allocation & may be over-allocated in certain areas of the Tablelands (Queensland Government, 2016b; van Oosterzee, Dale, & Preece, 2014). 	<p>fossil fuels, which are not produced locally. Renewable energy sources are available (solar, hydro, wind & biofuel).</p> <ul style="list-style-type: none"> Food security could be threatened by an increase in the severity &/or regularity of major weather events. Water availability for agriculture & urban expansion is reaching allocation limits & will become a bigger issue. More prolonged dry spells under future climate means that water storage & security of water supplies will become more important in the region (Queensland Government, 2016b; van Oosterzee et al., 2014). 	<p>Unrealised potential exists for environmental services markets. Sustainable energy supply is on the increase but there are no clear transition strategy.</p>
<p>EV3 Economic viability of Reef-dependent industries³</p>	<ul style="list-style-type: none"> Vulnerability of GBR-dependent industries Adaptive capacity of GBR-dependent industries Economic viability of GBR-tourism Economic viability of GBR-commercial fishing. 	<p>Vulnerability & adaptive capacity of GBR dependent industries</p> <ul style="list-style-type: none"> 96% regional residents feel the GBR is a valuable asset for the WT regional economy (Marshall & Pert, 2017); however, GBR tourism, recreation & fishing industries remain specifically vulnerable to the impacts of the GFC & repeated large weather events (Marshall et al., 2013a; Marshall, Tobin, Marshall, Gooch & Hobday, 2013b). In particular, fishers & tourism operators are sensitive to changes in GBR condition (Marshall et al., 2013a; Marshall et al., 2013b). 	<ul style="list-style-type: none"> Tourism, recreation & fishing associated with natural resources are highly vulnerable to declines in biodiversity & ecosystem health. Extreme events, particularly those that damage important areas of the GBR for tourism, may generate severe & long-lasting reductions in visitation. 	<p>2.5</p> <p>Repeated bleaching means many corals do not have time to recover & even pristine reefs are not immune. Post cyclone & bleaching events, resource impacts have reduced natural resource resilience to</p>

³ Reef-dependent industries/activities are those which depend on healthy GBR ecosystems for their prosperity, e.g., commercial fishing, marine tourism, recreation, GBR-related research TO use of GBR resources.

	<ul style="list-style-type: none"> • Coral-dependent tourism destinations such as Cairns & Port Douglas are unprepared for a future decline in tourism. These economic contributions to local economies are therefore vulnerable (Prideaux et al., 2017). • Need to re-skill & provide assistance to develop business plans to help the commercial fishing industry cope with change & be resilient (Sutton, Lédée, Tobin, & De Freitas, 2010). • GBR tourism operators & commercial fishers with comparatively smaller businesses, higher levels of occupational identity, place attachment, formal networks, & strategic approaches have higher levels of adaptive capacity (i.e., sensitivity to change may be offset by adaptive capacity & improved skills levels) (Marshall et al., 2013a). • GBR commercial fishers have a limited capacity to manage risk, but moderate to high perceived ability to plan, learn & reorganise; good psychological & financial buffers & interest in adapting to change (Tobin et al., 2014). In 2014, the GBR tourism industry was more optimistic & had better perceived (i.e., self-reported) ability to plan & adapt to change than the fishing industry (Marshall et al., 2014a). <p>Economic viability</p> <ul style="list-style-type: none"> • The Region has the highest level of modelled economic activity for GBR-dependent industries (i.e., commercial fishing, tourism & recreation) across the GBR, with \$2.7B in expenditure & \$1.2B in direct value add, showing a strong link between resource condition & economic futures (DAE, 2013). <p><i>Fishing</i></p> <ul style="list-style-type: none"> • Between 2001 & 2014 fishing decreased in value across the whole GBR by 39% (i.e., from \$190M to \$115.1M). Physical production dropped 36% (15,341 tonnes to 9,858 tonnes). Production dropped from 1716 tonnes to 1123 tonnes – 65% (ABS, 2015). • Over the last decade the asset value of coral trout commercial quota has reduced to <10% of peak value, i.e., numbers of coral trout have declined (Tobin et al., 2016). 	<p>Further, media portrayal of extreme weather events will negatively influence visitor perceptions & may exacerbate the negative economic consequences on the tourism industry (Stoeckl et al., 2014).</p> <ul style="list-style-type: none"> • The value of GBR tourism in the region has remained steady, slightly increasing since 2011-12; however the value of GBR commercial fishing has declined ~45% over the same period – perhaps reflecting decline in GBR health in this region (or the impacts of Net Free Zone (NFZs). • To overcome economic vulnerability of the tourism industry to coral bleaching, Prideaux et al. (2017) suggest the following: <ul style="list-style-type: none"> ○ Increase community understanding & develop unified communications from the GBR tourism industry supporting both global emissions reductions AND local actions for mitigation/adaptation. ○ Empower local businesses & communities to act & take leadership in increasing economic and community resilience to 	<p>future shocks in significant areas, though there has been some substantial work to shore up water & energy resources. ourism depends on quality of experiences. Commercial fisheries are progressing towards industry sustainability but competition with conservation/recreation may decrease profitability.</p>
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	<ul style="list-style-type: none"> • Among WT commercial fishers, household financial dependency on fishing is high. It is an aging industry. Most are owner-operators rather than ‘investors’, & operate in one fishery type - line, trawl, net, pot or harvest (Tobin et al., 2014). • On average, WT fishers had been in the industry for 29 years; 59% strongly agreed that they wouldn’t want to be anything else other than a comm. fisher; 87% agree that the fishing industry is a lifestyle, not just a job; 82% plan to remain in the industry in 5 years (Tobin et al., 2014). <p><i>Tourism</i></p> <ul style="list-style-type: none"> • The GBR is the key destination pull factor for international tourists in Cairns, Port Douglas & the Whitsundays. Further coral bleaching may lead to a significant decline in international tourism, with resultant economic impact (Prideaux et al., 2017). • If severe bleaching continues, regions adjacent to the GBR risk losing more than 1 million visitors annually - equivalent to at least \$1 billion in tourism spending & 10,000 jobs. (Hughes, Steffen, Alexander, & Rice, 2017). • A survey conducted before the latest coral bleaching event in three major tourism hotspots in Queensland (Port Douglas, Cairns & Airlie Beach) found that 69% of tourists said they wanted to visit the GBR “before it was gone” (Piggott-McKellar & McNamara, 2016). This “last chance” tourism, which in the short-term may contribute to the local economy, is likely to be unsustainable in the long-term (Hughes et al., 2017). 	<p>coral bleaching events on the GBR.</p> <ul style="list-style-type: none"> ○ Diversify GBR tourism options including increasing local stewardship to counter potential or perceived declines in GBR health. ○ Diversify land-based tourism options to supplement GBR tourism options. ○ Undertake regular monitoring of tourists, local communities & the business sector.
<p>EV 4 Inclusive-ness & economic fairness/equity</p>	<ul style="list-style-type: none"> • Income – personal & household. • Opportunities for GBR TOs. • Equity between Reef-dependent industries/activities. <p>Regional Income</p> <ul style="list-style-type: none"> • In 2011, 31.9% of WT Region residents were in the most disadvantaged quintile; median personal income ranged from \$693 p.w. in Cairns to \$288 p.w. in Yarrabah c.w. \$660 p.w. for Qld; 27% WT people earned <\$20,800pa;(61.6% in Yarrabah, c.w. 28.4% State-wide); 4.9% WT residents earned >\$104,000 c.w. 7.1% for Qld. (QGSO, 2017a). <p>Opportunities for GBR Traditional Owners</p>	<ul style="list-style-type: none"> • Significant economic disparities remain for younger & Indigenous peoples. • Most of the Region’s population is on low income (i.e., 1/3 of the population earns >\$400/week while costs of living is rising). <p>2.5 Ongoing resource decline & regional-capital city inequities could drive declining equity.</p>

	<ul style="list-style-type: none"> Indigenous peoples in remote parts of the WT face a double disadvantage burden of high prices & low incomes; likely to be exacerbated as climate extremes pressure transport infrastructure, costs & availability of bush foods & resources (Hill & Lyons, 2014). Aboriginal participation in GBR tourism industry is very low, as measured by ads in local tourism trade literature (DAE, 2017). <p>Equity between Reef-dependent industries/activities</p> <ul style="list-style-type: none"> GBR-dependent industries generally have comparable equity with other industries; although compensation for extreme weather events between terrestrial & marine industries (e.g., fishing & agriculture) is not equitable. 	<ul style="list-style-type: none"> There are post-cyclone compensation disparities for fishing c.f. agriculture. 	
<p>EV5 Workforce participation & employment</p>	<ul style="list-style-type: none"> Regional employment participation rates & trends. GBR- related employment. Many Cairns professionals face a choice between moving for employment or staying behind but remaining unemployed (Haines, 2016). Increase in capital investment in Qld mining from 2010-2015 was not accompanied by a significant increase in employment or fall in unemployment. Total employment in regional Qld fell in 2015 to levels below where they were before the boom (pre 2010). Increases in mining employment were offset by stalled growth & job losses in non-mining industries (Swann & Ogge, 2016). 2016 unemployment was 8.5%, c.w. 7.8% in 2012. (Yarrabah - highest rate of 58.5%; Douglas lowest at 7.1%) c.w. 6.1% across Qld (QGSO, 2017a). 12,884 businesses registered in 2015 c.w. 13,495 in 2012. Most businesses were associated with Construction (19%, 2015; 19.8% 2012) followed by Agriculture, Forestry & Fishing (5.6% 2015; 6.2% 2012). Since 2012, the number of businesses associated with Financial & Insurance Services rose from 6.2% to 7.4%. Health Care & Social Assistance rose from 4.8% in 2012 to 5.6% in 2015 (ABS, 2016b). 99.4% of regional employment is via small business; a strongly small business economy (Cummings, 2010). 	<ul style="list-style-type: none"> Although the region has had strong employment creation, unemployment continues to run higher than most areas around Australia. Indigenous & youth unemployment is high. People often choose to stay for lifestyle reasons (Haines, 2016). Employment is largely via small businesses with lower per capita income & low turnover. Vulnerabilities are created by a lack of seasonal work for locals due to weather events adversely affecting industries that have high workforces using low skilled & casualised labour. In these industries, employment is seasonally based but opportunities have become 	<p>3</p> <p>The WT economy has a very strong workforce exposure to volatility in the tourism industry & a very high dependence on backpackers. Youth & indigenous sectors are strongly marginalised in employment arrangements.</p>

	<ul style="list-style-type: none"> • Some 1/3 of all backpackers visiting Australia include Cairns in their itinerary. In 2015 Cairns hosted 202,000 backpackers (TRA, 2015). • WT employment growth in the past five years: education & training; public administration & safety; healthcare & social assistance (Haines, 2016). • WT employment declines in past five years have included: accommodation & food services; construction; professional, scientific, & technical services; retail (Haines, 2016). Youth unemployment: 22.1% compared to Queensland average of 14.1% (Haines, 2016). • The highest average GBR tourism employment was recorded in 2011-12, of 15,700 people (ABS, 2015). 	<p>increasingly limited in recent years.</p> <ul style="list-style-type: none"> • Transient 'backpacker' populations skew workforce participation figures & creates problems in building a diversified & stable workforce. • Employment in construction, agriculture, GBR-based fishing & tourism is particularly vulnerable to impacts of global economic shifts & climatic events. • Has been reasonable impact of state government & other redundancies on regional workforce.
<p>EV6 Economic confidence in the Region</p>	<ul style="list-style-type: none"> • Regional economic confidence. • Confidence in GBR industries. • Economic recovery following GFC & cyclone Yasi is slow, but some industries are experiencing positive growth & expenditure & investment is slowly increasing (Cummings, 2010). • Highest levels of business optimism for 2016 were in Accommodation, Cafes & Restaurants, Education, Health & Manufacturing & Health & Community Services sectors. Lowest were in Construction & Retail Trade (Cairns Chamber of Commerce, 2015). 47% of Cairns Chamber of Commerce survey respondents report their business performance is stronger/much stronger than in 2014. Profitability & turnover increased for most respondents. Industries reporting most improved performance were in Manufacturing, Business & Property Services & Health & Community Services. Lowest in Construction, Education & Retail Trade industries (Cairns Chamber of Commerce, 2015). • Most professions find it hard to attract staff away from major metropolitan centres, due to limited range of community services in FNQ (Cummings, 2006). 	<ul style="list-style-type: none"> • Confidence in parts of the region, particularly in the Hinchinbrook Shire & the Cassowary Coast, has declined since Cyclone Yasi causing demographic instability as people are not returning to those areas (QGSO, 2017a). • Nevertheless, almost half of Cairns Chamber of Commerce survey respondents reported stronger business performance in 2015 c.w. 2014. In addition, the strong downward movement in the Australian Dollar (AUD) in 2015 sparked a resurgence of domestic & international

3.5

Increasing confidence in both the tourism sector & the growth of the services economy has delivered new business confidence. This can be easily undermined through various economic shocks.

	<ul style="list-style-type: none"> • Cairns has highest density of startups of any Qld region (e.g., 1 per 5,300 c.w. 1 per 12,700 in SEQ). However, money raised in Cairns is relatively low. Top markets addressed by startups in Cairns: Professional Services; Agriculture; Education & Training; Tourism; Information Media (Haines, 2016). • 26% GBR tourism operators think “the GBR areas that my operation uses are not in great condition”; 24% are not optimistic about the future of their business in the GBR; 43% are “confident things will turn out well for them, regardless of future events; 39% are “uncertain how to plan for changes in the GBR” 59% have planned for financial security (Marshall et al., 2013a). • 71% commercial fishers are optimistic about the GBR’s future, but only 52% are optimistic about the future of their business in the GBR. They scored 5.4/10 in their belief that things will turn out well for them in future. 6.2/10 are uncertain of how to plan for change. They are more likely to adapt than other coastal residents (7.4) & many plan for their financial security (6.7). Many are keen to learn how to better prepare for change (6.7) (Marshall et al., 2013a). • FNQ building approvals plateaued during 2015: well down on levels 10 years ago (Cummings, 2016). Domain Group recorded a drop of 1.9% in Cairns’ median house prices over the 2016 March quarter, despite growth of 10% in the previous 5 years (Quelch, 2016). By the end of 2016, however, Cairns was the only city outside of SEQ to be rated by Real Estate Institute of Queensland (REIQ) as a rising market for both houses & units, indicating a return of confidence in the region (Wivell, 2016). 	<p>tourism to the region (Cummings, 2016).</p> <ul style="list-style-type: none"> • There are opportunities to showcase the positive things people are doing & building their resilience to economic shocks & a more positive narrative across sectors.
<p>Rating</p>	<p style="text-align: right;">17.5</p>	
<p>Maximum for this Cluster</p>	<p style="text-align: right;">30</p>	

Cluster Five: Governance

Governance refers to the health of GBR-based decision-making systems (from local to international scales), including levels of connectivity between different parts of the governance system, effective use of diverse knowledge sets and system capacity for effective action. Also includes viability of institutional arrangements; community participation in GBR management; and use of ESD principles in planning and management.

Table 8: Governance

Attribute Component	Possible Pressure, State & Trend Indicators	Evidence	Conclusions	Proposed Value & Logic
G1 Strategic focus of GBR governance system	<ul style="list-style-type: none"> No./ type of opportunities for improved Reef 2050 Plan Governance. No./ severity of system-wide problems for delivery of key Reef 2050 Plan targets. 	<p>No./ type of opportunities for improved Reef 2050 Plan</p> <ul style="list-style-type: none"> The Reef 2050 Plan represents the one fully integrated, bilaterally agreed strategy concerning the future health of the GBR. The Reef 2050 Plan exists in a first phase development form with clear (but not yet highly robust) targets but also with more limited strategy development (Commonwealth of Australia, 2015). The Reef 2050 Plan represents the one fully integrated, bilaterally agreed strategy concerning the future health of the GBR. The Reef 2050 Plan exists in a first phase development form with clear (but not yet highly robust) targets but also with more limited strategy development (Commonwealth of Australia, 2015). This framework includes ongoing management of the GBR World Heritage Values & the strategic improvement of water quality flowing into the Reef lagoon. <p>No./ severity of system-wide problems for delivery of key Reef 2050 Plan targets</p> <ul style="list-style-type: none"> Basic core delivery mechanisms, particularly at catchment scale are operational & in place across most GBR catchments (e.g., Regional NRM, Water Quality Improvement Plans (WQIPs), Land Use Plans, Property Management Plans (PMPs)/BMPs etc). (Dale et al., 2016c). Strong foundations exist (via the RIMReP framework) & are developing for monitoring GBR health & water quality. Human dimension monitoring arrangements are just emerging. Outlook 	<ul style="list-style-type: none"> Clear strategic planning & coordination frameworks for planning & action are emerging at GBR, Wet Tropics region level, catchment & property scales. Frameworks for monitoring, evaluation & review are emerging in the RIMReP & outlook context. These arrangements are increasingly looking towards inclusion of the human dimensions of the GBR asset. 	<p>3</p> <p>Basic GBR-wide & bilateral strategic planning framework is in place via the Reef 2050 Plan & possible implementation strategies & institutional arrangements exist at all required scales for delivery.</p>

<p>G2 Connectivity within & between key decision making institutions & sectors</p>	<p>reporting presents a five year formalised opportunity for review (Dale et al., 2016c; Gooch et al., 2017).</p> <ul style="list-style-type: none"> No./ type governance subdomains (or policy areas) that counteract Reef 2050 Plan targets/action. Status of partnerships, inter-governmental arrangements. Levels of transparency, ownership, accountability, responsiveness. Sectoral/community contributions to decision-making. Inter-generational equity in Reef-related decision-making. Intra-generational equity in Reef-related decision-making. <p>No./ type governance subdomains (or policy areas) that counteract Reef 2050 Plan targets/actions</p> <ul style="list-style-type: none"> At least 5 non-GBR governance subdomains have been identified as negatively impacting of GBR health (in broader social, economic & environmental terms) (Dale et al., 2016c). <p>Status of partnerships, inter-governmental arrangements</p> <ul style="list-style-type: none"> Refer back to CH2. The commissioning of new coal mines such as that planned for the Galilee Basin, & the pursuit of polluting & expensive “clean coal” projects & new gas plants, is completely at odds with protecting the GBR & other reefs globally (Hughes et al., 2017). Commercial fishers are under increased pressure for GBR access from recreational fishers, conservation based closures, & onshore activities (e.g., coastal development) that impact where vessels may operate (Pascoe et al., 2016). <p>Levels of transparency, ownership, accountability, responsiveness</p> <ul style="list-style-type: none"> Connectivity between the Reef 2050 Plan governance subdomain & other key subdomains negatively influencing GBR outcomes is poor (most notably the climate change & greenhouse gas abatement subdomain (Dale et al., 2016c). <p>Inter-generational equity in Reef-related decision-making</p> <ul style="list-style-type: none"> 33% WT residents feel that future generations have been adequately considered in GBR management (Marshall & Pert, 2017). <p>Intra-generational equity in Reef-related decision-making</p> <ul style="list-style-type: none"> Only 66% regional residents agree that they have fair access to the GBR compared to other user groups (Marshall & Pert, 2017); while only 67% WT commercial fishers believe they have fair access to GBR resources (Tobin et al., 2014). <ul style="list-style-type: none"> There is significant risk of implementation failure because of poor connectivity between the design of policy & delivery systems. In the wider GBR & Reef 2050 Plan context, consultative approaches exist within policy & delivery system design, but is not based on strong, durable & adaptive partnerships. Limited capacity for integration of environmental & social development thinking across governance subdomains that significantly influence outcomes in the GBR. Within the context of the Reef 2050 Plan, capacity in integrated strategy development & delivery design in both federal & state policy building institutions is currently limited. Required catchment scale institutions to improve water quality exist but face unstable statutory recognition & stable resourcing. <p>2 There is a significant ongoing likelihood of decline in GBR health as a result of poor connectivity among key governance subdomains affecting GBR outcomes & the risk of significant implementation failure related to the Reef 2050 Plan.</p>
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<p>G3 Adaptive governance capacity of key decision making institutions & sectors.</p>	<ul style="list-style-type: none"> Levels of integrated strategy development & delivery design. Support for management. Confidence in management. Sectoral/community contributions to decision-making. 	<p>Levels of integrated strategy development & delivery design</p> <ul style="list-style-type: none"> Within the context of the Reef 2050 Plan, capacity in integrated strategy development & delivery design in both federal & state policy building institutions is currently limited. Required catchment scale institutions to improve water quality & reef protection & management action exist but face unstable statutory recognition with respect to these role & lack stable resourcing (Dale et al., 2016c). <p>Support for management</p> <ul style="list-style-type: none"> 66% regional residents support current rules and regulations that affect GBR access & use; 69% support rules & regulations that affect access & use of local freshwater areas (Marshall & Pert, 2017). <p>Confidence in management</p> <ul style="list-style-type: none"> Only 25% WT residents think enough is being done to effectively manage the GBR; a mere 47% are confident that the GBR is well managed; 50% are confident that local freshwater areas are well managed (Marshall & Pert, 2017). <p>Sectoral/community contributions to decision-making</p> <ul style="list-style-type: none"> TOs are routinely marginalised in development of policy & delivery systems (Dale et al., 2016a). 60% regional residents feel like they can contribute to GBR management (Marshall & Pert, 2017). 	<ul style="list-style-type: none"> Greater connectivity is now emerging between marine & catchment-based planning systems through the implementation of the Reef 2050 Plan. Policy making capacities limited in regard to designing effective delivery systems, risking implementation failure. Local residents are not confident that the GBR is well managed, & do not believe enough is being done to effectively manage the asset. More than half, however, believe they can contribute to management. 	<p>2.5</p> <p>All required institutional players are well engaged in GBR governance, but capacities are limited across government, industry, community & Indigenous sectors.</p>
<p>G4 Adaptive use & management of integrated knowledge sets.</p>	<ul style="list-style-type: none"> Availability of integrated knowledge sets. Use of integrated knowledge sets in decision-making. 	<ul style="list-style-type: none"> Core biophysical knowledges concerning marine & catchment science are strong. Decision support models & prioritisation tools are relatively advanced in the GBR planning space. Funding through Reef & Rainforest Research Centre (RRRC) has returned to regional design & implementation but remains poorly linked to state-based scientific investment & effort. 	<ul style="list-style-type: none"> Strong biophysical science capacity & decision support tools exist in both the marine & catchment space. Limited social & economic knowledge is levered within GBR decision making systems. 	<p>3</p> <p>Biophysical knowledges are generally strong across the marine & catchment space, though</p>

	<ul style="list-style-type: none"> • Management of integrated knowledge sets. 	<ul style="list-style-type: none"> • Lack of access to timely & relevant regional social & economic data is a constraint within decision-making system across the GBR & loss of QGSO from Cairns weakens regional data availability. 	<ul style="list-style-type: none"> • Declining health in historical & traditional knowledge sets. • Knowledge & experience in the region needs to be re-acquired on a regular basis, limiting program effectiveness. 	<p>social & economic sciences are not developed enough to deliver truly integrated decisions.</p>
<p>Rating</p>				<p>10.5</p>
<p>Maximum for this Attribute</p>				<p>20</p>

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ATTACHMENT A

Access refers to people's ability to enter and use the Marine Park and its resources. Millions of people visit the Marine Park each year. It provides a wide range of recreational opportunities such as boating, snorkelling, diving, fishing and nature appreciation. There are also opportunities for commercial fishing, marine tourism and education. In some key locations, management arrangements such as Plans of Management separate or limit certain use to avoid conflicts. Access also refers to the potential for people to visit and use the Marine Park in the future.^{1,2,3}

Aesthetic values are associated with healthy intact ecosystems. They are connected to both environmental attributes (such as bays, beaches, continental islands, coral cays, mangroves, marine animals, water, as well as seagrass meadows) and experiential attributes (presented by beauty, discovery, naturalness, remoteness, sense of inspiration, as well as tranquillity and solitude).³ The aesthetics values of the Great Barrier Reef are experienced and described from a variety of perspectives:

- panoramic – above in the air or high lookout points. This perspective displays patterns of waters, reefs, cays and islands, and as a vast landscape.
- at water or land level – the Great Barrier Reef at eye level, as sky, water, and land emerging from water and with a sense of world beneath the water.
- below the water – the Great Barrier Reef is an underwater landscape. The three-dimensional qualities of the underwater landscape.³

Aesthetics refers to people's perceptions of the beauty of a site or object. While aesthetics are strongly influenced by visual appearance, all the senses play a role—sight, sound, smell, touch and taste. Aesthetics influence the way in which people value and enjoy the Great Barrier Reef. Aesthetics is highly personal—one person may seek solitude and quiet, while another seeks social interactions. The same person often values different elements at different times. Places that are easy to access are less likely to provide opportunities for enjoying solitude or tranquillity, but may enhance opportunities for socialising and personal comfort. Perceptions of the beauty and desirability of natural areas are influenced by people's personal experiences and cultural backgrounds. Psychological, social or cultural dimensions of aesthetics include a sense of history, a sense of place, inspiration, spiritual connections; and opportunities for learning, relaxation, recreation and escapism.³ Indigenous perspective on aesthetic values may include cultural expressions such as storytelling, mythology, spirituality, literature, music/art, symbols of power, wealth.³ Aesthetics are recognised under criterion (vii) of the World Heritage Convention: for attributes which 'contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance.' Aesthetics are closely linked to the condition of natural, cultural and historic heritage values within the Marine Park. The natural beauty of most of the Marine Park remains intact, especially for offshore coral reefs and aerial vistas, as well as for neighbouring islands (many of which are Queensland national parks). Significant loss of coral cover has reduced underwater aesthetic value at many inshore reefs, particularly since the Year 2000 due to severe weather, crown-of-thorns starfish and increased sea surface temperature increases. Aesthetics is linked to wellbeing are also closely linked to social values such as access, understanding, appreciation and personal connection.

Understanding, appreciation and enjoyment

Understanding refers to people's knowledge of the Marine Park, its values and the interconnected systems that support life on the Great Barrier Reef.

Understanding comes from learning, either in-person or remotely. The levels of understanding held by coastal residents and GBR visitors is an important factor in how they may respond to potential impacts on GBR health. Personal experiences, together with scientific knowledge and cultural knowledge gained from stories passed from one generation to the next (including intergenerational aspects of learning for wise decision-making)¹, provide a context for understanding the Marine Park and its values. Understanding allows reflection on what the Great Barrier Reef may have been like in the past; how it contributed to human wellbeing; and how it has responded to human activities.

Appreciation refers to realising and feeling grateful for the uniqueness of the Great Barrier Reef. Appreciation often grows with understanding.

Enjoyment refers to the positive emotions people experience when they visit or see the Marine Park. Most people in the world will never visit the Marine Park in person, but many still enjoy the Marine Park through photographs, videos or stories. The Marine Park's biophysical and heritage values are the primary reasons why people visit the Reef either as part of a commercial tourist program or in a recreational capacity. There are many opportunities for coastal residents and visitors to learn about and help protect the Great Barrier Reef. A key component of many tourism programs is presenting and interpreting the Marine Park to their guests. Close to 70% of visitors to the Marine Park travel with certified high standard tourism operators. These operators are committed to a high standard of presentation and interpretation as part of their daily operation. Through GBRMPA's [Reef Guardian](#) stewardship program, local stakeholders are encouraged to take hands-on actions to care for the Great Barrier Reef. The program includes schools, local councils, farmers, graziers and commercial fishers. Participants are encouraged to go beyond what is required by law in their day-to-day activities and to become active stewards. This includes sharing information about their actions. Other stewardship initiatives such as the [Eye on the Reef](#) program contribute vital information about Marine Park values from people who are in the Marine Park daily, such as tourism operators, researchers, students, as well as Queensland Parks and Wildlife Service officers. Participants contribute substantially to understanding trends in the condition of values through time and at many locations throughout the Marine Park.

Human health refers to the physical and mental health benefits that residents and visitors derive from the Marine Park. People benefit from relaxation and stress reduction through recreational activities and access to natural settings; healthy inputs to diets from freshly caught local seafood; and exercise from snorkelling, boating and fishing. Conversely, people may be negatively affected if Reef health declines—depression and anxiety have been associated with environmental decline.⁴ The health benefits people derive from the Marine Park are diminished by those impacts that make the Marine Park a less attractive and fulfilling place to visit, and by those that reduce the quality and availability of its food resources, clean air, water or sediment.

⁴ Louv, R. (2008). *Last child in the woods: Saving our children from nature-deficit disorder*. Chapel Hill, NC: Algonquin Books;

Speldewindea, P., Cook, A., Davies, P., & Weinstein, P. (2009). A relationship between environmental degradation and mental health in rural Western Australia *Health & Place*, 15(3), 880–887. doi:10.1016/j.healthplace.2009.02.011

Personal connection refers to people's aspirations, spiritual connections, cultural ties, employment, stewardship activities, places of residence and recreational activities that are associated with the Marine Park. It links each individual stakeholder, visitor, local resident and Traditional Owner to the Marine Park. The Great Barrier Reef is a key part of the identity of adjacent coastal communities. It is a major source of pride and distinction for these communities. More than 95% of nearby residents have visited the Great Barrier Reef at least once in their lives. Many coastal residents report that they chose where they live so as to be close to the Great Barrier Reef and that there are 'not many other places better than the Great Barrier Reef for the recreation activities they enjoy'.⁴ Commercial fishers and tourism operators identify very strongly with their occupations and the places where they live and work. This is highlighted by the fact that few, if any, who were directly affected by Severe Tropical Cyclone Yasi or the central Queensland floods in 2011 changed their jobs or moved elsewhere, despite economic imperatives to find alternative income.⁵ Traditional Owners continue to maintain connection to their sea country, for example, through stories and songlines, sites of cultural significance and important saltwater ceremonies. Australians in general also identify strongly with the Great Barrier Reef as a national icon. A 2014 survey conducted as part of the Social and Economic Long Term Monitoring Program found that 80% of Australians see the Great Barrier Reef as vital to their identity.⁴ Across the world, people of many nations feel a strong personal connection to the Great Barrier Reef, even if they have never visited in person.

Equity relates to fairness in the distribution of benefits and impacts across the community and depends on sustainable use that meets the needs of the current generations without compromising the ability of future generations to meet their own needs⁵. Impacts to equity may result in changes to the current and future generations' access, enjoyment, appreciation and use of the Great Barrier Reef. Equity may also be compromised if there are impacts to human health through the decline of ecosystem health and/or contamination of air, water or sediments.

Empowerment is the process that enables citizens, groups, communities, stakeholders, and organisations to undertake actions and participate meaningfully in the protection and management of the Great Barrier Reef. Factors that enhance human wellbeing of Reef-dependent people may contribute to empowerment.

Employment and income

Employment refers to jobs created or maintained as a result of sustainable activities conducted in the Marine Park. Income refers to money that people receive as a result of activities conducted in the Marine Park. The benefits that businesses, individuals and communities derive from the Marine Park are founded on its biodiversity, species distribution and abundance, geomorphological features, and the range of social, Indigenous and historic heritage values. Employment and income are therefore affected by impacts that diminish the condition of these foundational values. Activities in the Marine Park generate income and employment for tens of thousands of people both within and outside the Marine Park, as the flow-on benefits reach far beyond the boundaries of the Marine Park. The Marine Park supports significant commercial uses linked to recreation, tourism and commercial fishing. These

⁵ Brundtland, G. H., & World Commission on Environment and Development. (1987). *Our common future: Report of the World Commission on Environment and Development*. Retrieved from <http://www.un-documents.net/wced-ocf.htm>

industries play an important role in regional Queensland and rely on a healthy Reef ecosystem for long-term economic stability. The economic contribution generated by tourism, recreation, commercial fishing and scientific research in the Great Barrier Reef catchment and the World Heritage Area in 2012 was estimated to be \$5.6 billion. This has been relatively stable over the past five years.⁶ Commercial marine tourism is a major use of the Marine Park, both in terms of economic value and employment. It is estimated that, in 2011–12, Great Barrier Reef-based tourism contributed approximately \$5.2 billion to the Australian economy and supported employment equivalent to about 69,000 full-time positions.⁶ It is important to note, the economic estimates are likely to be only a portion of the total economic value of the Great Barrier Reef, as most ecosystem services that are not traded in markets have not yet been calculated. For example, the non-market economic value of a healthy coral reef system in providing a physical barrier from wave and tsunamis impacting coastal areas, or mangrove habitats that also provide a buffer between land and sea and filter sediment and nutrients.

Heritage

A place's natural and cultural environment having aesthetic, historic, scientific or social significance, or other significance, for current and future generations of Australians.

Historic heritage includes places associated with the non-Indigenous cultural heritage of Australia encompassed in the country's history. It can include historic shipwrecks, World War II features and sites, lightstations, places of scientific significance, e.g., research stations, expedition sites; places of social significance, e.g., iconic sites such as Ninney Rise (Mission Beach), buildings, monuments, gardens, industrial sites, landscapes, cultural landscapes, archaeological sites, groups of buildings and precincts, or places which embody a specific cultural or historic value. Historic places tell us about national and social developments in Australia over the past few centuries, technical and creative achievements, and provide a tangible link to past events, processes and people.

Indigenous heritage includes all places that are part of Aboriginal and Torres Strait Islander peoples' spiritual links to the land or which tell the story of Indigenous peoples from time immemorial to the present. It can include cultural practices, observances, customs and lore, sacred sites, sites of particular significance, places important for cultural tradition; stories, songlines, totems and languages; Indigenous structures, technology, tools and archaeology; ceremonial sites like bora rings and rock art, fish traps, burials, middens, scarred trees, camp sites and semi/permanent settlements.

World Heritage – sites of natural beauty and outstanding natural phenomena.



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