

Assessing the human dimensions of the Great Barrier Reef:

A Fitzroy 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



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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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ACRONYMS

4WD	Four Wheel Drive Vehicle
ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ABS	Australian Bureau of Statistics
AMSA	Australian Maritime Safety Authority
BITRE	Bureau of Infrastructure, Transport and Regional Economics
BMP	Best Management Practice
BRMG	Burnett Mary Regional Group
BSL	Boyne Smelters Ltd
CCC	Capricorn Conservation Council
CHRRUP	Central Highlands Regional Resources Use Planning Cooperative Limited
COTS	Crown-of-Thorns-Starfish
CSG	Coal Seam Gas
CQ	Central Queensland
CQHHS	Central Queensland Hospital and Health Service
CQML	Central Queensland Medicare Local
DAE	Deloitte Access Economics
DAF	Department of Agriculture and Fisheries
DCCA	Dawson Catchment Coordination Association
DEHP	Department of Environment and Heritage Protection
DIDO	Drive-in/drive-out
ERP	Estimated Resident Population
ESD	Ecologically Sustainable Development
FBA	Fitzroy Basin Association
FIFO	Fly-in/fly-out
FIN	Fisheries Infringement Notices
FMP	Field Management Program
FPRH	Fitzroy Partnership for River Health
GBR	Great Barrier Reef
GBRMPA	Great Barrier Reef Marine Park Authority
GBRWHA	Great Barrier Reef World Heritage Area
GAWB	Gladstone Area Water Board
GFC	Global Financial Crisis
GH	Gladstone Harbour
GHHP	Gladstone Healthy Harbour Partnerships
GKI	Great Keppel Island
GRC	Gladstone Regional Council
GRP	Gross Regional Product
HESB	High Efficiency Sediment Basins
ICHD	Indigenous Cultural Heritage Database
IPBES	Intergovernmental Panel on Biodiversity and Ecosystem Services
ISO	International Organization for Standardization
LGA	Local Government Area
LNG	Liquefied Natural Gas
LOTE	Language Other Than English
MOU	Memorandum of Understanding

NC	Neighbourhood Catchment
NESP	National Environmental Science Programme
NFZ	Net Free Zones
NLP	National Landcare Program
NRM	Natural Resource Management
NRMIP	Natural Resource Management Investment Program
OUV	Outstanding Universal Value
PCIMP	Port Curtis Integrated Monitoring Program Inc.
PMP	Property Management Plan
PoG	Port of Gladstone
QAL	Queensland Alumina Ltd
QDAF	Queensland Department of Agriculture and Fisheries
QGSO	Queensland Government Statistician's Office
Qld	Queensland
QPWS	Queensland Parks and Wildlife Service
RIMReP	Reef Integrated Monitoring and Reporting Program
RRC	Rockhampton Regional Council
RRRC	Reef and Rainforest Research Centre Limited
SELTMP	Social and Economic Long-Term Monitoring Program
SEQ	South East Queensland
SPP	State Planning Policy
STC	Severe Tropical Cyclone
STP	Sewage Treatment Plants
TC	Tropical Cyclone
TEK	Traditional Ecological Knowledge
TIQA	Trade and Investment Queensland Australia
TO	Traditional Owner
TSS	Total Suspended Solids
TUMRA	Traditional Use of Marine Resources Agreement
TWQ	Tropical Water Quality
VCOP	Voluntary Code of Practice
WH	World Heritage
WHA	World Heritage Area
WQ	Water Quality
WWF	World Wildlife Fund

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EXECUTIVE SUMMARY

This report focuses on the trial of a regionally-specific framework to assess and monitor the human dimensions of the Great Barrier Reef (GBR) as they relate to the Fitzroy Region and the adjacent GBR. To ensure GBR policy makers and managers better consider the needs of Reef-dependent and Reef-associated 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 Fitzroy Region'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 working with key knowledge holders in allocating draft scores to attributes within defined human dimension themes or clusters. The tables developed and proposed scores outlined in this report were 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:

Consistently high levels of international and national awareness and concern about the GBR but this is not consistently translated into all members of society to adopt or implement improved stewardship approaches to activities related to the GBR. Within the general Fitzroy community, there are mixed levels of community awareness and concerns of threats to local ecosystems. With respect to agriculture, substantial progress has been made in strengthening stewardship actions across the region and a mix of mechanisms applied to support this includes both financial incentives with direct extension. In urban areas, industries with a point source pollution impact are regulated under the Queensland *Environmental Protection Act 1994*, however these areas can still sources of water pollution. Several knowledge gaps are evident in management practices of ports and shipping, although these industries generally comply with regulations. There is a lower uptake of eco-efficient practices by commercial fishers, compared with marine tourism operators, although this is expected to improve with implementation of the Queensland Sustainable Fisheries Strategy 2017–2027.

Community Vitality:

Regional population is generally stable, with fluctuations in some areas due to volatility in mining and minerals sectors. The regional Indigenous population is distinctly younger than the overall regional population. Larger urban centres have good services and infrastructure for residents, however facilities in smaller centres are under pressure from influx of fly-in/fly-out/drive-in/drive-out (FIFO/DIDO) workers. In general, the health/wellbeing of people living in this region appears to lag behind other Australians. Key wellbeing issues include high levels of alcohol consumption; limited access to mental health services; and youth risk-taking behaviour (high levels of teen pregnancy compared with the Qld average). As well, smoking remains the single largest cause of premature mortality and ill health but may soon be overtaken by obesity and poor nutrition. There are high rates of hospitalisation particularly for Indigenous residents and major health disparities between Aboriginal and non-Aboriginal people. Rockhampton's crime rates are higher than the state average, and could influence resident's feelings of personal safety and security. However, crime rates for the Livingstone & Banana LGAs are much lower than the state average; and people living adjacent to Gladstone

Harbour are enjoying the harbour more than previous years. The GBR plays an important role in the health and wellbeing of residents, Traditional Owners (TOs) and visitors. Most (with the exception of commercial fishers) are satisfied with management, support rules and believe they have fair access to resources.

Culture and Heritage:

The GBR section in the Fitzroy region has exceptionally high world heritage based on its OUV however the natural heritage is adversely affected by recent cyclones and other extreme weather events, and potentially threatened by coastal development. GBR values are deeply reflected in contemporary regional and national culture. There is a strong overall cultural understanding of the importance of the GBR and many regional sub-cultures are respectful of GBR values. Indigenous cultural heritage is broad and expressed through spiritual and cultural affiliations with areas and through activities undertaken in accordance with customs and traditions. Strong TO use of sea country resources remains across the region, and there is an increasing capacity of Indigenous land and sea institutions. While there is a strong historical heritage asset across the GBR coast, the asset remains poorly defined, planned and managed.

Economic values:

Regional growth is strongest in the services sector and construction activity linked to mining. While regional Reef-associated industries are highly profitable, Reef-dependent industries are steady (tourism) or in decline (commercial fishing). In general, the region has a prosperous economy driven by its central location along major north, south and west transport and freight infrastructure routes, and proximity to major mines and mineral processing plants. Agriculture plays a key stabilising role in the economy. There are, however, some equity disparities between high income earners in mining and minerals sectors and families dependent on welfare. Regional unemployment is above the Qld average, and welfare dependency is high despite strong adult, female and Indigenous workforce participation. There is below average Year 12 completion and a tendency for young adults to bypass post-school education and training for unskilled jobs. Rockhampton's full economic potential is not being realised due to high unemployment; poorly skilled workforce; economy dominated by public sectors; below average economic activity per resident. Rockhampton lacks a large, dynamic and entrepreneurial business community with below average numbers of local businesses and slow business formation. Gladstone LGA is a major industrial hub and includes the state's largest port and LNG plants. The Gladstone housing market is volatile. Agricultural and mining and minerals sectors remain vulnerable to global market forces and extreme weather events which are expected to influence future performance. Nevertheless, global demands for beef, fruit and vegetables are driving expansion of grazing and crop production in the catchment.

Governance:

Basic GBR-wide and bilateral strategic planning framework is in place via the 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 Integrated Monitoring and Reporting Program (RIMReP). There is, however, a significant ongoing likelihood of decline in GBR health as a result of poor connectivity among key governance subdomains affecting GBR outcomes (e.g., greenhouse gas abatement) and the risk of implementation failure related to the catchment-based delivery of regional actions envisaged under the Reef 2050 Plan. All required institutional actors play an important role in GBR governance, but capacities and available resources are often limited

across government, industry, community and Indigenous sectors. Science capacities are generally well suited to resolve significant environmental problems facing the GBR but without sufficient social, cultural and economic considerations. Biophysical knowledges (including models and decision support tools) are generally strong across the marine and catchment space though required further development. Social, cultural and economic sciences are not developed enough to deliver truly integrated knowledge to make sound 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, Schaffelke & Kerry, 2016; Hughes et al., 2017). 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 including Traditional Owners, 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 & Gilbert, 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 fifth 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.

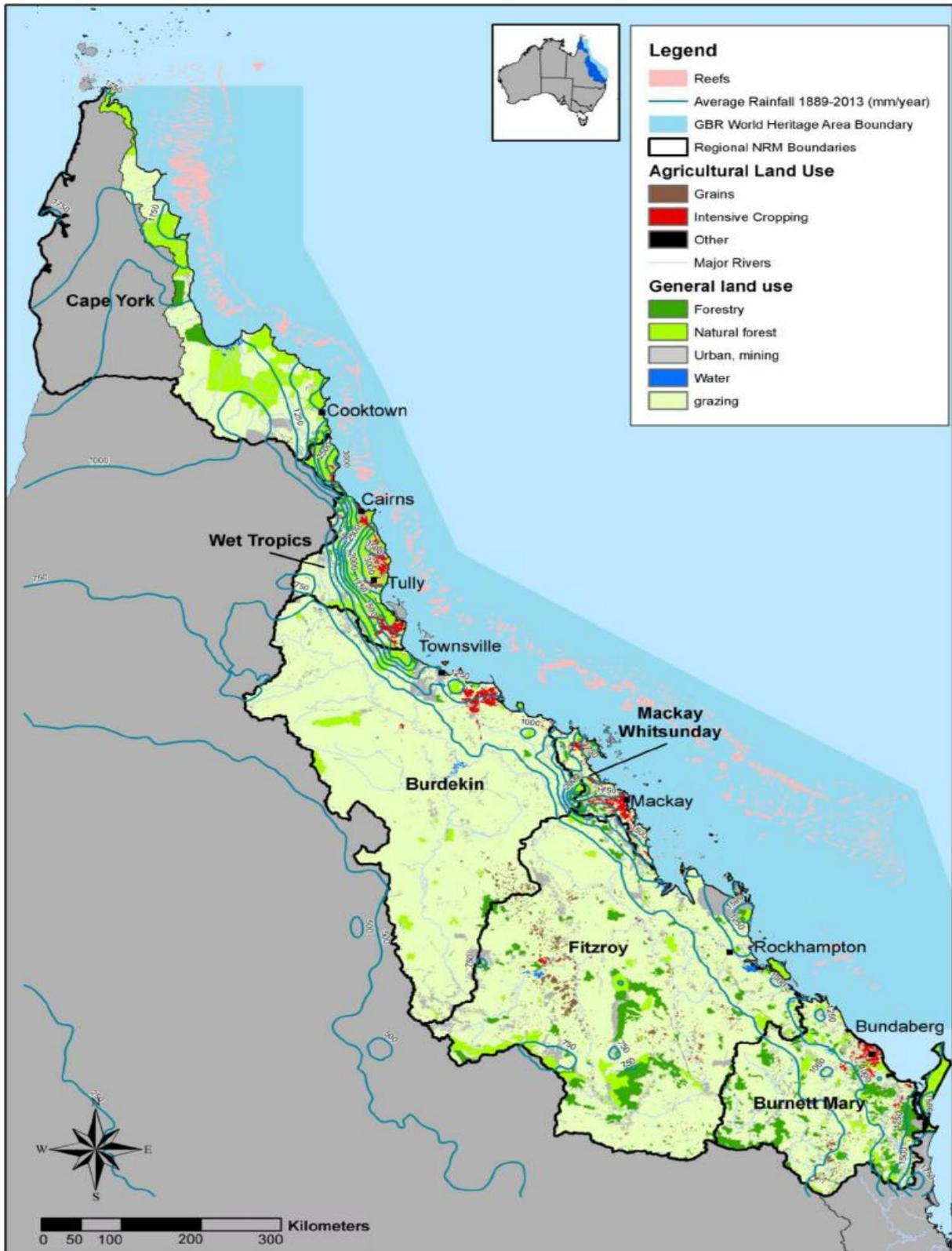


Figure 1: NRM Regions in the Great Barrier Reef catchment

(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

SOURCE: 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

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.

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
- 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 Traditional Owners) 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 (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 Traditional Owner 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, 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, George, Hill & Fraser, 2016a, 2016c). 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 (Diaz 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 [FPRH], 2015; Gladstone Healthy Harbour Partnership, 2016; 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:

- **ABS.** (2017a). *Data by region*. Retrieved from <http://stat.abs.gov.au/itt/r.jsp?databyregion>
- **ABS.** (2015a). *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.** (2017c). *Land account: Queensland, experimental estimates, 2011 - 2016* (cat. no. 4609.0.55.003). Retrieved from <http://www.abs.gov.au/Ausstats/abs@.nsf/0/C513A7FD834B39C2CA25813F00120EFE?OpenDocument>
- **ABS.** (2016b). *Community profiles*. Retrieved from <http://www.abs.gov.au/websitedbs/censushome.nsf/home/communityprofiles>
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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 FITZROY REGION

The Fitzroy Region comprises the largest river basin draining into the GBR, with a footprint of over 156,000km². About 280,000 people live in the region. Rockhampton (around 73,000 people) is the largest urban centre followed by Gladstone, with a (regional council area) population of approximately 58,000; then Emerald, with about 13,000; and the Livingstone Shire Council area, which includes Yeppoon, also supports around 13,000 people. There are several smaller coastal towns and townships, and also regional towns servicing the agricultural and resource industries in the west (Waterhouse, Flint & Johnson, 2015). The region experiences highly variable rainfall, high evaporation rates and prolonged dry periods that are often followed by floods. Fitzroy NRM region includes important areas of remnant and threatened vegetation communities (e.g., Brigalow and native grasslands). Grazing is the predominant land use, but there are also large areas of irrigated (e.g., Emerald, Theodore and Biloela) and dryland cropping. More than 3,700 agricultural businesses operate in the region, comprising almost 20% of Queensland's 12 million head of cattle. There is also extensive coal mining around Moranbah, Dysart, Blackwater, Moura and Middlemount. Coastal areas are dominated by grazing and conservation areas (Waterhouse et al., 2015). The region includes eight sub-catchments comprising 20,000 km of waterways and over 7,000 wetlands: Lower Fitzroy, Isaac-Connors, Comet, Upper and Lower Dawson, Styx-Herbert, Water Park and Boyne-Calliope. The Fitzroy Basin Association describes 192 neighbourhood catchments (NCs) as mini-catchments within the eight sub-catchments, each with their own distinctive characteristics. The Fitzroy marine area covers 85,515 km² and is recognised for its diverse and unique marine and coastal environments, including coral reefs, seagrass meadows, coastal wetlands, estuaries, continental and offshore islands and the species they support. Some of these species are listed as threatened or vulnerable, and have significant cultural values (Fitzroy Basin Association [FBA], 2016, 2017a; Waterhouse et al., 2015).



Figure 2: Map showing the Fitzroy Natural Resource Management region, and the major basins. Inset shows the six GBR NRM regions, and highlights the Fitzroy NRM region

(SOURCE: Waterhouse et al., 2015).

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"> Regional education/ skills levels. Awareness of NRM issues. Awareness of GBR & waterway condition & threats. GBR learning opportunities. 	<p>Regional education/ skills levels</p> <ul style="list-style-type: none"> In 2011, 50.6% region had a post-school qualification c.w.54.2% across Qld (QGSO, 2017a). <p>Awareness of NRM issues</p> <ul style="list-style-type: none"> Perception that <i>water quality</i> is a big problem: 32.2% regional residents c.w. 41.4% for rural & regional Aust & 43.7% rural & regional Qld; perception that <i>soil erosion</i> is a big problem: 31.7% c.w. 41% for rural & regional Aust & 39.4% % rural & regional Qld; perception that <i>environmental degradation in general</i> is a big problem: 33.4% c.w. 40.4% for rural & regional Aust & 40.7% % rural & regional Qld (University of Canberra, 2017). <p><i>The role of FBA</i></p> <ul style="list-style-type: none"> In 2012 FBA opened FLOW - a fun, free & interactive educational space focused on Central Queensland's natural assets; > 20,000 people including 6,000 students, 51 schools & 14,000 international, national & locals have visited FLOW which delivers important environmental messages in innovative ways (FBA, 2017b). FBA works with three sub-regional partners—Dawson Catchment Coordination Association (DCCA), Central Highlands Regional Resources Use Planning Cooperative Limited (CHRRUP) & Capricornia Catchments—to deliver 	<ul style="list-style-type: none"> Yr 12 completion & post-school qualification rates are below state & national average. Awareness of regional NRM issues is variable but enhanced through FBA's FLOW. Awareness of GBR & waterway condition & threats is generally high. GBRMPA's Reef Guardian School's Program has a large influence on community capacity for stewardship. Within the whole GBR catchment, there is a broad societal awareness of the impacts of climate change & catchment-based activities on the GBR. There are high levels of agreement among national residents & catchment residents that it is the responsibility of all Australians to care for the GBR, 	<p>3.5</p> <p>Within the Fitzroy, there are high levels of awareness & concern of threats to the GBR.</p> <p>More broadly, there is a high level of national & international awareness & concern about the GBR that has not translated into cohesive policy action related to key threats.</p>

regional events, workshops & training aimed to help land holders upskill in land management practices that boost profits & address environ. issues (FBA, 2017c).

Awareness of GBR & waterway condition & threats

- Regional community is most concerned about impacts of mining & Coal Seam Gas (CSG), weeds, pests & water quality, but has several NRM knowledge gaps, e.g., groundwater & ecosystems; the role of refugia; cumulative impacts of all industries (FBA, 2017a).
- 56% regional residents agree that coral reefs in the region are in good condition; 68% agree that mangroves are in good health; 69% agree that estuarine & marine fish are in good condition; 59% are worried about the status of freshwater fish in the region; 62% DISAGREE that freshwater rivers & creeks in the region ARE NOT in good condition; 77% DISAGREE that they ARE NOT worried about climate change impacts on the GBR (Marshall & Pert, 2017).
- 48% regional residents say the greatest threat to the GBR is pollution; 40% believe climate change is the greatest threat to the GBR & 23% say poor water quality is the greatest threat to the GBR (Marshall & Pert, 2017).

GBR catchment residents

- In 2013, 52% GBR coastal residents believed climate change is an immediate threat to the GBR. In 2017, this increased to about 65% (Marshall et al., 2013a; Marshall & Pert, 2017).

National/International perspectives

- Australians consider pollution, climate change & people to be the biggest threats to the GBR c.w. shipping, & agricultural runoff mentioned by catchment respondents. Tourists listed the most serious threats as tourism (41%), climate change (40%), & commercial fishing (22%). Commercial fishers list agricultural run-off (34%) new ports & port expansions (31%), shipping (31%). Only 18% of fishers see climate change as a major GBR threat (Marshall et al., 2013a).
- 81% Australians agree that all Australians should be responsible for the GBR c.w.94% GBR coastal residents. 54%

indicating that cohesive stewardship efforts at local, regional & national scales would be a sound investment.

	<p>Australians are optimistic about the GBR's future (Marshall et al., 2013a).</p> <p>GBR learning opportunities</p> <ul style="list-style-type: none"> 68% regional residents are interested in learning “more about the condition of the GBR”; but only 37% agree they have knowledge & skills to reduce their GBR impacts; 76% value the GBR because it provides opportunities for learning through scientific discoveries; & 52% value the GBR because it provides a place where people can continue to pass down wisdom, traditions & a way of life (Marshall & Pert, 2017). <p><i>GBR-wide Reef-education programs</i></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). 				
<p>ACS2 Community capacity for stewardship</p>	<table border="0"> <tr> <td data-bbox="405 738 660 1391"> <ul style="list-style-type: none"> Sense of responsibility towards the environment. Sense of responsibility towards the GBR & coastal waterways. Regional Reef-based stewardship activities Numbers & types of TO involvement in on-ground water Quality (WQ) improvement & monitoring. </td> <td data-bbox="683 738 1400 1391"> <p>Sense of responsibility towards the environment</p> <ul style="list-style-type: none"> 80% regional residents agree that they make every effort to use energy efficiently at home & at work; 75% DISAGREE that they RARELY CONSIDER environmental impacts of production processes for goods & services that they purchase; 84% DISAGREE that they DON'T USUALLY make any extra effort to reduce waste; 71% re-use or recycle most goods & waste; 9% are part of an environ. community-based group (Marshall & Pert, 2017). <p>Sense of responsibility towards the GBR & coastal waterways</p> <ul style="list-style-type: none"> 72% residents agreed they would like to do more to help protect the GBR; 68% agreed they like to do more to improve water quality in local waterways (including rivers, creeks); 59% DISAGREE that they CANNOT make a difference in improving GBR health; 74% DISAGREE that it is NOT their responsibility to protect the GBR; 54% agree that they feel a social expectation to reduce impacts they may have on the GBR; 59% DISAGREE that they DO NOT HAVE the time or opportunity to reduce their impacts on the GBR (Marshall & Pert, 2017). </td> <td data-bbox="1422 738 1825 1284"> <ul style="list-style-type: none"> Burnett-Mary (B-M) resident responses to a Social & Economic Long-Term Monitoring Program (SELTMP) survey suggests that they have relatively high aspirations & levels of capacity & stewardship around the GBR. Stewardship levels & sense of responsibility are relatively high within the region—perhaps due to the high numbers of well-established & effective groups involved in coastal management, conservation & catchment care, coordinated mostly by Burnett Mary Regional Group (BRMG). </td> <td data-bbox="1848 738 2036 1141"> <p>3.5</p> <p>NRM groups & other groups very active (community engagement, & education, e.g., FLOW visitor centre), but resources are somewhat limited.</p> </td> </tr> </table>	<ul style="list-style-type: none"> Sense of responsibility towards the environment. Sense of responsibility towards the GBR & coastal waterways. Regional Reef-based stewardship activities Numbers & types of TO involvement in on-ground water Quality (WQ) improvement & monitoring. 	<p>Sense of responsibility towards the environment</p> <ul style="list-style-type: none"> 80% regional residents agree that they make every effort to use energy efficiently at home & at work; 75% DISAGREE that they RARELY CONSIDER environmental impacts of production processes for goods & services that they purchase; 84% DISAGREE that they DON'T USUALLY make any extra effort to reduce waste; 71% re-use or recycle most goods & waste; 9% are part of an environ. community-based group (Marshall & Pert, 2017). <p>Sense of responsibility towards the GBR & coastal waterways</p> <ul style="list-style-type: none"> 72% residents agreed they would like to do more to help protect the GBR; 68% agreed they like to do more to improve water quality in local waterways (including rivers, creeks); 59% DISAGREE that they CANNOT make a difference in improving GBR health; 74% DISAGREE that it is NOT their responsibility to protect the GBR; 54% agree that they feel a social expectation to reduce impacts they may have on the GBR; 59% DISAGREE that they DO NOT HAVE the time or opportunity to reduce their impacts on the GBR (Marshall & Pert, 2017). 	<ul style="list-style-type: none"> Burnett-Mary (B-M) resident responses to a Social & Economic Long-Term Monitoring Program (SELTMP) survey suggests that they have relatively high aspirations & levels of capacity & stewardship around the GBR. Stewardship levels & sense of responsibility are relatively high within the region—perhaps due to the high numbers of well-established & effective groups involved in coastal management, conservation & catchment care, coordinated mostly by Burnett Mary Regional Group (BRMG). 	<p>3.5</p> <p>NRM groups & other groups very active (community engagement, & education, e.g., FLOW visitor centre), but resources are somewhat limited.</p>
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	<ul style="list-style-type: none"> In 2017, GBR coastal residents strongly agreed that they would like to do more to help protect the GBR (av. 7.3/10 in 2013 & 7.75/10 & generally agreed that they have a personal responsibility to protect the GBR (av. 6.8/10 in 2017) (Marshall & Pert, 2017). <p><i>Regional stewardship activities</i></p> <ul style="list-style-type: none"> Through funding from the National Landcare Program (NLP), FBA supports many community groups to pick up rubbish, weed & replant critical areas, raise awareness of best practice, & monitor key species (FBA, 2017c). <p>Reef-based stewardship activities</p> <ul style="list-style-type: none"> A \$700,000 Reef Trust Marine Debris project (2015–16) engaged over 4,000 people in marine debris removal across the length of the GBR (GBRMPA, 2016a). 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). <p>Numbers & types of TO involvement in on-ground WQ improvement & monitoring</p> <ul style="list-style-type: none"> Little/no data available. 				
<p>ACS3 Adoption of responsible/ best practice – GBR recreational/ artisanal users</p>	<table border="0"> <tr> <td data-bbox="405 983 658 1391"> <ul style="list-style-type: none"> Extent & type of stewardship practices. How many people visit this section of the GBR? Where do they go? What do they do? How do they get there? </td> <td data-bbox="680 983 1402 1391"> <p>Extent & type of stewardship practices</p> <ul style="list-style-type: none"> Rec. catch rate for barramundi in the Fitzroy River in 2017 was 1.2 fish/fisher/day -106% higher than 2016 & >1.0 for the first time in over 20 years due to removal of commercial net fishing & strong recruitment; 25% legal fish caught were kept; Voluntary Code of Practice (VCOP) in 2017 - limits of 2 Barra bet. 60-100cm; 97% of fisher days compliance (Infotish, 2017a). Rec. catch rate for barramundi around Gladstone were on track (i.e., downward trend) until fish spilled from Awoonga Dam & it has not been possible to assess overall effect on stocks (Infotish, 2017b). </td> <td data-bbox="1424 983 1816 1391"> <ul style="list-style-type: none"> Hard to get regionally specific data on use patterns & stewardship efforts of recreational/artisanal users. Evidence suggests that recreation fishing requires increased compliance effort, however, there is evidence that barramundi rec fishers are excellent stewards. </td> <td data-bbox="1839 983 2036 1391"> <p>3</p> <p>Limited data available but some evidence reflecting the need for improvement in this sector— especially with respect to 4WD on coastal areas.</p> </td> </tr> </table>	<ul style="list-style-type: none"> Extent & type of stewardship practices. How many people visit this section of the GBR? Where do they go? What do they do? How do they get there? 	<p>Extent & type of stewardship practices</p> <ul style="list-style-type: none"> Rec. catch rate for barramundi in the Fitzroy River in 2017 was 1.2 fish/fisher/day -106% higher than 2016 & >1.0 for the first time in over 20 years due to removal of commercial net fishing & strong recruitment; 25% legal fish caught were kept; Voluntary Code of Practice (VCOP) in 2017 - limits of 2 Barra bet. 60-100cm; 97% of fisher days compliance (Infotish, 2017a). Rec. catch rate for barramundi around Gladstone were on track (i.e., downward trend) until fish spilled from Awoonga Dam & it has not been possible to assess overall effect on stocks (Infotish, 2017b). 	<ul style="list-style-type: none"> Hard to get regionally specific data on use patterns & stewardship efforts of recreational/artisanal users. Evidence suggests that recreation fishing requires increased compliance effort, however, there is evidence that barramundi rec fishers are excellent stewards. 	<p>3</p> <p>Limited data available but some evidence reflecting the need for improvement in this sector— especially with respect to 4WD on coastal areas.</p>
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- 12 nets seized from rec./un-licenced fishers in Yeppoon, Cawarral, Keppel Sands & Rockhampton areas; 19 unmarked crab pots seized; 32 Fisheries Infringement Notices (FIN) issued for take/ possession of undersized fish & possession of commercial fishing nets (GBRMPA, 2016c).
 - Threats posed by humans to turtle nests & hatchlings are entirely preventable, predominantly caused by 4WDs & marine debris (FBA, 2017d). Extent of threats is unknown, however, Capricorn Conservation Council (CCC) has been concerned about impacts of 4WDs on the beaches, dunes & creeks of Byfield National Park, for several years (Ison, 2012).
- Number of GBR visitors**
- 95% regional residents visited the GBR for recreation at least once in the past 12 months (Marshall & Pert, 2017).
 - No. of rec. vessels in Fitzroy region rose steadily from 17,836 in 2008 to 20,332 in 2014; then declined each year since to 16,428 in 2016 (GBRMPA, 2017d).
 - In 2015-16 the region had ~1M day trippers, 4M domestic overnight visitors & 1M international visitors. Of these ~50% (3M) visited this part of the GBR (DAE, 2017).
- Where recreational visitors go**
- Very little data, but Four Wheel Drive Vehicle (4WD) & rec. fishing in inshore/coastal areas are popular (Infofish 2017a, 2017b; Ison, 2012)
- Why do they visit? What do they do?**
- 6% residents belong to a GBR-based club (Marshall & Pert, 2017).
 - 20%-25% of the region's pop'n fish at least once each year, much higher than state av. of 17% (DAF, 2015).
 - Top three activities contributing to B-M residents' use & enjoyment of the GBR (ranked using mean ratings on 1-10 scale) were sunbathing/relaxing = 7.09; sightseeing/exploration = 6.29; wildlife watching = 5.49 (Marshall & Pert, 2017).
- Declines in recreational fishing vessels suggest reduced recreational fishing effort.

<p>ACS4 Adoption of best practice systems – Agricultural & land sector. (including Aquaculture)</p>	<ul style="list-style-type: none"> • Extent & type of stewardship practices of agricultural industries. <ul style="list-style-type: none"> • Regional land uses other than agriculture such as coal mining & CSG extraction are heavily regulated (Waterhouse et al., 2015). <i>Grazing Target: 90 per cent of grazing lands are managed using best management practice systems by 2018.</i> • 3,666 graziers farm 12.7M ha land & 39,000km streambanks. • In 2016 23% grazing land was under Best Management Practice (BMP) relating to pasture (hillslope) erosion; 43% for streambank erosion & 20% for gully erosion. Overall BMP for Fitzroy region grazing is D (Queensland Government, 2016). • Fitzroy grazing water quality risk over time, by pollutant. • Pastures: In 2014 30% mod.-high risk c.w. 29% in 2016; • Streambanks: In 2014 41% mod.-high risk c.w. 39% in 2016; • Gully: 25% mod –high risk - unchanged from 2014-2016 (Queensland Government, 2016). • In 2016 FBA completed work with six landholders to address active erosion on their properties, resulting in rehabilitation of unproductive land & reduction of sediment flowing into creeks & GBR (FBA, 2017d). • Natural Resource Management Investment Programme (NRMIP) through FBA funded management improvements with 21 graziers across 5465ha & 31km streambank frontage to improve, protect & restore riparian areas & rangelands by managing pests, weeds, & end-of-catchment water quality; Through NLP funding, the FBA engaged with 21 landholders (managing 96,375ha) to develop grazing land management plans (Queensland Government, 2016). • Grazing BMP program & Qld govt. extension staff worked with 169 graziers managing 1.1M ha to assess farm management practices & identify actions to improve practices. 14 landholders achieved accreditation in the BMP process. Department of Agriculture & Fisheries (DAF) beef extension team provided BMP follow-up services & information on BMP. During the 2015–16 the DAF team engaged 35 more beef 	<p>2.5</p> <p>While there are some improvements in agricultural practice uptake, additional investment & financial incentives are required for further improvement.</p>
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	<p>businesses across 390,000ha to assist with practice changes (Queensland Government, 2016).</p> <p><i>Horticulture Target: 90 per cent of horticulture lands are managed using best management practice systems by 2018</i></p> <ul style="list-style-type: none"> • 100 horticulture producers farm 7,700ha land. • In 2016, BMP applied in 25% horticultural land for pesticides; 9% for nutrients & 61% for soil. Overall BMP for Fitzroy horticulture farmers is D (Queensland Government, 2016). 			
<p>ACS5 Adoption of best practice systems – Industry & urban sector</p>	<ul style="list-style-type: none"> • Extent & type of stewardship practices of urban councils & industries. 	<ul style="list-style-type: none"> • Urban land uses contribute <10% total regional pollutant load; but Gladstone Regional Council (GRC) & Gladstone Area Water Board (GAWB) only monitor water quality in raw water distribution & potable water supply (GAWB); & wastewater treatment & disposal (GRC) (Gunn, 2015) • State Planning Policy (SPP) (Department of Infrastructure, Local Government and Planning, 2017) states that all exposed soil areas >2500 m² must have sediment controls implemented & maintained to achieve 80% hydrologic effectiveness (50mg/L 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). 	<ul style="list-style-type: none"> • Industries with point source pollution impact are generally well regulated under the <i>Qld Environmental Protection Act 1994</i>, however diffuse urban areas are still sources of water pollution. • Across the GBR catchment, traditional sediment basins are often not designed or maintained to minimum standards & thus ineffective. Local councils are calling for an independent, dedicated compliance team that would travel the state. (S. Choudhury personal communication). 	<p>3.5</p> <p>There is a strong regulatory framework for point source pollution, however this is not always enforced. Limited land area means impacts are highly localised versus systemic.</p>
<p>ACS6 Adoption of best practice systems – Marine sector</p>	<ul style="list-style-type: none"> • Extent & type of stewardship practices of GBR-associated industries (Ports & shipping) • Arrangements to ensure GBR shipping is safe. • No. shipping accidents • Extent & type of stewardship 	<p>Ports & shipping - stewardship & safety</p> <ul style="list-style-type: none"> • Knowledge gaps: sources of Port of Gladstone (PoG) WQ impacts; pre-industrial WQ data for PoG; impacts of dredge spoil disposal. • Marine areas of Port Curtis & Curtis Is are in high & moderate risk classes from poor WQ (Waterhouse et al., 2015). • 2015-16, for PoG: ISO 14001:2004 accreditation maintained; fewer complaints & reportable incidents; active participation in Port Curtis Integrated Monitoring Program Inc. (PCIMP) & Gladstone Healthy Harbour Partnerships (GHHP); offset 	<ul style="list-style-type: none"> • Several knowledge gaps are evident in management practices of ports & shipping, although evidence would suggest that these industries strongly comply with regulations. • Relatively low up-take of eco-efficient practices by commercial fishers, compared with marine tourism operators. 	<p>3.5</p> <p>Significant progress has been made on tourism & the management of ports shipping in the GBR. Best management practices in</p>

	<p>practices of GBR-dependent industries (Fishing & Tourism)</p>	<p>commitments continue; new monitoring equipment in stormwater ponds & 3 Gladstone Harbour (GH) wharves (Gladstone Ports Corporation, 2016).</p> <ul style="list-style-type: none"> World Wildlife Fund (WWF) & Australian Maritime Safety Authority (AMSA) recognise that the NESMP provides important actions, but urgent changes are needed (e.g., compulsory pilotage for the entire GBR; use of high-standard ships in GBR waters, & improved marine biosecurity (Commonwealth of Australia, 2014). <p>GBR fishing & fisheries</p> <ul style="list-style-type: none"> Since Net Free Zones (NFZ) (1 Nov 2015), 3 patrols of Central Queensland (CQ) Cluster conducted & no commercial netting offences detected (GBRMPA, 2016b). 8% comm. fishers have fuel efficient vessels; 81% participate in BMP; 13% use emissions calculator (Marshall et al., 2013a). Several MOUs & Codes of Conduct for comm. fishers, but formal information is lacking (Tobin et al., 2014). <p>GBR-wide tourism</p> <ul style="list-style-type: none"> 67 GBR tourism operators have ECO Certification through Ecotourism Australia & 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 their operation "provides 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 best practices (e.g., codes of practice, MOUs); 45% participate in GBRMPA's Eye on the Reef monitoring program; 43% use green energy (e.g., solar); 28% use emissions calculator; 19% use carbon offsets; 8% use alternative fuels (Marshall et al., 2013a). 	<ul style="list-style-type: none"> <i>Queensland Sustainable Fisheries Strategy 2017–2027</i> should improve management practices in the commercial fishing sector (DAF, 2017a). 	<p>commercial fishing should improve with implementation of <i>Queensland Sustainable Fisheries Strategy 2017–2027</i>.</p>
<p>Rating</p>	<p style="text-align: right;">19.5</p>			
<p>Maximum for this Attribute</p>	<p style="text-align: right;">25</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 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. 	<p>Basic demographic characteristics Region</p> <ul style="list-style-type: none"> 2016 regional Estimated Resident Population (ERP) is 235,471 c.w. 991,978 for GBR catchment, & 4,778,854 for Qld (QGSO, 2017a, 2017b) Av. regional growth rate is 1.6% over 5 yrs & 1.7% over 10 (QGSO, 2017a). In 2016, 24,293 persons (11%) regional residents were born overseas, c.w. 21.6% across Qld; 12,681 persons (5.7 %) were Indigenous c.w. 4% for Qld; 11,856 persons (5.4%) speak a Language Other Than English (LOTE) (QGSO, 2017a). 58% Indigenous population is ≤24 yrs (58%), c.w. 1/3 regional population; but only 3% Indig. Pop'n is ≥65 yrs c.w 11% of regional population (Central Queensland Hospital and Health Service & Central Queensland Medicare Local [CQHHS & CQML], 2014). <p>Gladstone LGA & City</p> <ul style="list-style-type: none"> In June 2016, ERP Gladstone (LGA) was 70,875 - 69,335 residents & 1,540 (2%) (FIFO/DIDO); ERP fell by 3% bet. June 2015- June 2016 - FIFO/DIDOs of Gladstone LGA fell by 3,890 persons or -72% bet June 2015- June 2016. Most left Curtis Is (-3,765 persons or -77%), with losses in Gladstone city (-75 	<ul style="list-style-type: none"> Downturn in Gladstone LGA's population 2015-2016 reflects completion of construction for the first 5 trains of the 3 LNG processing plants & transition to production/ export phase (QGSO 2016). Further contraction of FIFO/DIDO expected in 2016–17, but offset by strong gains in resident population Rest of region is fairly demographically stable, although migration intentions are higher for this region than other parts of regional Qld & Australia. Indigenous population is distinctly younger than the overall regional population. 	<p>3</p> <p>Generally stable, with fluctuations in some populations due to mining & minerals sectors.</p>

	<p>persons –52%) & Gladstone Region (–50 persons – 12%) (QGSO, 2016).</p> <ul style="list-style-type: none"> Gladstone (LGA) was the second fastest growing LGA in Queensland in 2014–15, with a growth rate of 2.1% (QGSO, 2016). <p>Migration intentions in the next 12 months</p> <ul style="list-style-type: none"> 17.4% Fitzroy Region’s residents were likely to move in the next 12 months c.w. 10.8% for rural & regional Aust & 12.6% rural & regional Qld (University of Canberra, 2017).
<p>CV2 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"> 24.4% Fitzroy regional residents experience high financial distress c.w. 20.9% rural & reg. Aust & 22.3% rural & reg. Qld (University of Canberra, 2017). <p>Regional Crime Rates</p> <ul style="list-style-type: none"> In 2015-16 there were 10,193 per 100,000 persons reported offences c.w 9,856/100,000 for Qld); 736/100,000 against the person (c.w. 634/100,000 for Qld) & 3,595/100,000 against property (c.w. 4,250/100,000 for Qld). Rockhampton LGA had the most reported offences - 12,080 (14,398/ 100,000); Lowest was in Livingstone - 5,760/100,000 (QGSO, 2017c). <p>Perceptions of safety</p> <ul style="list-style-type: none"> 81% Fitzroy Regional residents agreed with the statement: <i>This is a safe place to live</i> c.w. rural & reg. Aust (80.7%) & 83.3% rural & reg. Qld residents (University of Canberra, 2017). <p>Housing availability & affordability</p> <ul style="list-style-type: none"> In 2001, Qld’s rental vulnerability was highest around Bundaberg, Fraser Coast & Gladstone meaning that the median rents in these areas are higher than 30% of household income (Troy & Martin, 2017). Despite cheap rents in Gladstone, is the 6th highest LGA in Qld for "rental vulnerability" (Lees, 2018). <ul style="list-style-type: none"> Levels of high financial distress are above the state & national averages, & Gladstone LGA has the 6th highest level of rental stress in the state. Housing affordability is affected by high insurance premiums compared with non-cyclone areas. Rockhampton’s crime rates are significantly higher than the rest of Qld, especially when comparing offences against people. This could have implications for resident’s feelings of personal safety & security. On the other hand, the crime rates for the Livingstone & Banana LGAs were much lower than the state average. <p style="text-align: right;">3</p>

	<ul style="list-style-type: none"> When low-income households have to spend more than 30% income on housing, they start to go without other things, e.g., meals, health care & outings. For this reason, low-income households in unaffordable housing are said to be in “housing stress” or “rental stress” (Troy & Martin, 2017). Buildings more expensive & insurance is more expensive in cyclone prone areas because buildings have to be cyclone rated (Bureau of Infrastructure, Transport and Regional Economics [BITRE], 2011). 				
CV3 Wellbeing/ happiness within the general community.	<table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top; width: 50%;"> <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) Feeling part of community; (vii) future security. Health. </td> <td style="vertical-align: top; width: 50%;"> <p>Community wellbeing</p> <ul style="list-style-type: none"> Fitzroy region residents rate community wellbeing as 5.2/7; c.w. 5.5 rural & regional Aust; 5.5 rural & regional Qld (University of Canberra, 2017). <p>Perceptions of decreasing community liveability</p> <ul style="list-style-type: none"> 24% residents perceive decreasing community liveability c.w. 20.2% rural & reg. Aust. residents; & 25.5% rural & reg. Qld residents (University of Canberra, 2017). <p>Perceptions of personal wellbeing</p> <ul style="list-style-type: none"> Fitzroy Region residents rated their personal wellbeing as 67.8./100; c.w. 73.7 rural & regional Aust; 73 rural & regional Qld (University of Canberra, 2017). <p>Health</p> <ul style="list-style-type: none"> 10.9% Fitzroy Region residents report poor health c.w. 5.2% rural & reg. Aust; 5.1% rural & reg. Qld (University of Canberra, 2017). Regional life expectancy ~1 year <Qld & 1.2 years <nat. av; 10.8 year shortfall life expectancy for Aboriginal males c.w. non-Indigenous males & 8.6 yrs for Aboriginal females (CQHHS & CQML, 2014). 1/6 pop’n smoke daily; > 50% Indig. smoke daily (CQHHS & CQML, 2014). 2/3 are overweight - 29% are obese c.w. 22.6% Qld & rising sharply. In 2011-12, 24% were hazardous drinkers c.w. 21.5% Qld. </td> </tr> <tr> <td style="vertical-align: top; width: 50%;"> <ul style="list-style-type: none"> Number of people reporting poor health is double state & national averages. Key wellbeing issues affecting the region are: <ul style="list-style-type: none"> High levels of alcohol consumption Limited access to mental health service Youth risk-taking behavior. Smoking remains the single largest cause of premature mortality & ill health but will soon be overtaken by obesity & poor nutrition. As obesity rates rise, diabetes prevalence will worsen. High rates of hospitalisation particularly for Indigenous residents. Major health disparities between Aboriginal & non- Aboriginal people. </td> <td style="vertical-align: top; width: 50%;"> <p>2.5</p> <p>Health/ wellbeing & happiness of people living in this region appears to lag behind other Australians.</p> </td> </tr> </table>	<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) Feeling part of community; (vii) future security. 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Major health disparities between Aboriginal & non- Aboriginal people. 	<p>2.5</p> <p>Health/ wellbeing & happiness of people living in this region appears to lag behind other Australians.</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) Feeling part of community; (vii) future security. Health. 	<p>Community wellbeing</p> <ul style="list-style-type: none"> Fitzroy region residents rate community wellbeing as 5.2/7; c.w. 5.5 rural & regional Aust; 5.5 rural & regional Qld (University of Canberra, 2017). <p>Perceptions of decreasing community liveability</p> <ul style="list-style-type: none"> 24% residents perceive decreasing community liveability c.w. 20.2% rural & reg. Aust. residents; & 25.5% rural & reg. Qld residents (University of Canberra, 2017). <p>Perceptions of personal wellbeing</p> <ul style="list-style-type: none"> Fitzroy Region residents rated their personal wellbeing as 67.8./100; c.w. 73.7 rural & regional Aust; 73 rural & regional Qld (University of Canberra, 2017). <p>Health</p> <ul style="list-style-type: none"> 10.9% Fitzroy Region residents report poor health c.w. 5.2% rural & reg. Aust; 5.1% rural & reg. Qld (University of Canberra, 2017). Regional life expectancy ~1 year <Qld & 1.2 years <nat. av; 10.8 year shortfall life expectancy for Aboriginal males c.w. non-Indigenous males & 8.6 yrs for Aboriginal females (CQHHS & CQML, 2014). 1/6 pop’n smoke daily; > 50% Indig. smoke daily (CQHHS & CQML, 2014). 2/3 are overweight - 29% are obese c.w. 22.6% Qld & rising sharply. In 2011-12, 24% were hazardous drinkers c.w. 21.5% Qld. 				
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	<ul style="list-style-type: none"> • Mental illness. <ul style="list-style-type: none"> • Teen birth rate (29/1,000) > Qld (24/1,000) & nat. av (16/1,000) (CQHHS & CQML, 2014). • Emergency dept use is twice state av.; Indig. hospitalisation rates 65% >non-Indig., but lower for elective conditions (CQHHS & CQML, 2014). <p>Mental illness</p> <ul style="list-style-type: none"> • 10.3% residents likely to suffer from a serious mental illness c.w. 9.6% rural & reg. Aust; 10.8% rural & reg. Qld (University of Canberra, 2017). • 11% pop'n have mental health & behavioural problems & there are high suicide rates (CQHHS & CQML, 2014).
CV4 Community health/ wellbeing/ satisfaction associated with the GBR	<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) desirable way of life & ecosystem services, e.g., fresh seafood; (iii) optimism about the future; (iv) satisfaction with GBR experiences; (v) GBR experiences (negative & positive); (vi) physical &/or mental health. <p>Net Free Zones (NFZ)</p> <ul style="list-style-type: none"> • Since introduction of NFZ in 2015, rec. fishers were more satisfied with no.& size of fish caught & overall fishing in the area (Infofish 2017a; 2017b). <p>Gladstone Harbour</p> <ul style="list-style-type: none"> • GH & its community events provide positive living experience for locals. • GH usability for locals was (0.66, rated B); access (0.65, B); & GH liveability/ wellbeing (0.66, B). GH social health increased from 0.58 (in 2014) to 0.64 (in 2015) & 0.66 in 2016. In 2016, (c.w 2015) GH residents were more satisfied with perceived barriers to GH access such as marine debris, litter, boating/shipping activity (GHHP, 2016). <p>Stress associated with decline in GBR health</p> <ul style="list-style-type: none"> • 78% Fitzroy Region residents DISAGREE that they would NOT be personally affected if GBR health declined; 60% agree that thinking about coral bleaching makes them feel depressed (Marshall & Pert, 2017). • 54% Australians would be personally affected if GBR health 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"> • Evidence suggests that the GBR plays an important role in the health & wellbeing of residents & visitors. • Gladstone community enjoy the harbour more than previous years. Both harbour access & liveability/wellbeing changed from C to a B in 2016. The strongest improvements were evident in 'perception of harbour safety for human use', 'perceptions of harbour health' & 'barriers to access' (GHHP, 2016). <p>4 High levels of wellbeing related to the GBR are reported in both regional & Australian populations.</p>

<ul style="list-style-type: none"> • Indigenous health associated with the GBR. • Commercial fishers' wellbeing. • Tourism Operators' wellbeing. 	<ul style="list-style-type: none"> • 87% Fitzroy Region residents agree that the GBR contributes to their quality of life & wellbeing; 94% value the GBR because it supports a desirable & active way of life; 56% value the GBR because it inspires artistic or thoughtful ways; 79% value the GBR for the fresh seafood it provides; 61% feel optimistic about the future of the GBR; 84% value the GBR because it makes them feel better physically &/or mentally (Marshall & Pert, 2017). <p>Indigenous wellbeing</p> <ul style="list-style-type: none"> • 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 (Hill & Lyons, 2014). <p>Coastal residents' wellbeing</p> <ul style="list-style-type: none"> • In 2013, 75% GBR coastal residents were very satisfied with GBR experiences (i.e., rating >8/10). Greatest +ive influences 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>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) (Marshall et al., 2013a). • 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 97% Fitzroy Region fishers (Tobin et al., 2014).
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	<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 (Marshall et al., 2013a). 			
<p>CV5 Regional services & service infrastructure supporting the interface between the community & GBR</p>	<ul style="list-style-type: none"> Energy/water 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"> Av. electricity bill for Qld residents will rise by 3.3% pa; & 4.1% for Qld small businesses (Queensland Competition Authority, 2017). <p>Quality of Infrastructure</p> <ul style="list-style-type: none"> Diverse range of community infrastructure servicing local needs & contributing to regional liveability, e.g., education, health, emergency services, sporting, recreation & community facilities, roads, rail, sea & air; gas & energy, telecommunications & sewerage infrastructure (Department of State Development, Infrastructure and Planning [DSDIP], 2013). Limited access to telecommunications in some places affects local businesses (DSDIP, 2013) Rockhampton is centrally placed on major intra & interstate freight & transport routes & major mining & resource activity (RPS Australia East, 2016). <p>Impacts on infrastructure</p> <ul style="list-style-type: none"> Fluctuating non-resident workforces put pressure on all infrastructure, impacting on local community liveability (DSDIP, 2013). After the 2011 floods 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 access to health, education, aged care & child care</p> <ul style="list-style-type: none"> 74.8% Fitzroy Region residents believe that they have good access c.w. 75% for both rural & regional Aust & rural & regional Qld (University of Canberra, 2017). 	<ul style="list-style-type: none"> Regional services & infrastructure are generally adequate, although under pressure from fluctuating numbers of FIFO/DIDOs. All physical & social infrastructure can be severely damaged in extreme weather, leading to adverse impacts on GBR-dependent communities & industries. 	<p>3</p> <p>Larger urban centres have good services & infrastructure for residents, however facilities in smaller centres are under pressure from influx of FIFO/DIDO workers.</p>

	<p>Perceptions of access to roads & public transport</p> <ul style="list-style-type: none"> 49.2% Fitzroy Region residents believe that they have good access c.w. 50.3% for rural & regional Aust & 53.9% rural & regional Qld (University of Canberra, 2017).
Rating	15.5
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: natural 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"> 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"> Fitzroy Region's marine & coastal habitats contain globally significant natural heritage, e.g., turtle & seabird nest & roost sites; coral spawning; migrating whales; spawning aggregations of many fish species; superlative natural beauty & has some of the most spectacular scenery on earth (e.g., Cap Bunkers; Swains Reefs; Keppel Islands; Shoalwater Bay; parts of Curtis Is.) (Context, 2013). Several marine & coastal assets are in poor or very poor condition, including inshore coral reefs, seagrass meadows, dugong, turtles, dolphins, low-lying islands & species of climate-sensitive seabirds. Declines likely to continue for some ecosystems & species due to cumulative pressures of poor water quality, Crown-of-Thorns-Starfish (COTS) outbreaks, climate change & coastal development. (Waterhouse et al., 2015). Decline in coral cover from impacts of flooding in early 2011 due to ex-Tropical Cyclone (TC) Tasha caused huge flood plume inundating reefs 12 km offshore & caused 40–100% coral mortality due to low salinity on Keppel island fringing reefs. Ex-TC Oswald (2013) caused flooding of the Fitzroy 	<ul style="list-style-type: none"> There are high levels of regional pride in the GBR's World Heritage status. Regional OUV levels are high, but impacted by recent cyclones, flooding & other extreme weather events. Climate change is predicted to increase the intensity of extreme weather events, which are significant in driving impacts to coastal & marine ecosystems (Waterhouse et al., 2017). There are also widespread concerns about impacts of port development & other industrial activities on the OUV of the GBR. Assessment & monitoring of OUV & aesthetics is a new field, 	<p>3.5</p> <p>Exceptionally high based on OUV however the natural heritage is adversely affected by recent extreme weather events & coastal development.</p>

	<p>River & was followed by a general increase in macroalgal cover, high levels of coral disease & coral loss. Acroporidae coral cover has declined since 2010 - similar to those documented after big floods 1991, (Waterhouse et al., 2015) & similar losses are expected in the wake of Severe Tropical Cyclone (STC) Debbie (2017).</p> <p>Perceptions of natural beauty & other World Heritage attributes</p> <ul style="list-style-type: none"> 88% Fitzroy Region residents value the GBR because it attracts people from all over the world & 86% value the GBR simply because it exists, even if they don't use or benefit from it. 96% 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 & corals; 73% residents like the colour/clarity of water along the beaches in their region, & 78% feel there is too much rubbish on these beaches (Marshall & Pert, 2017). <p>Impacts on GBR-Wide World Heritage values</p> <ul style="list-style-type: none"> Concerns about impacts on the GBR's OUV from Port development triggered UNESCO monitoring mission in 2012 (Context, 2013). Fitzroy Region reported the lowest inshore coral condition score betw. 2005-2016 & largest overall decline c.w. other GBR regions. Overall, hard coral cover increased across the inshore, mid-shore & outer reefs of the Fitzroy Region section, from 29.9% in 2016 to 40.5% in 2017 (ABS 2017); however the impact of Cyclone Debbie is yet unknown. 	<p>& methods are being trialled now for application in the future.</p>
<p>CH2 Indigenous (Traditional Owner) heritage</p>	<p>ID, state & trend of Indigenous heritage values</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 <p>ID, state & trend of Indigenous heritage values</p> <ul style="list-style-type: none"> Only 23% Fitzroy Region residents agree the GBR is important for Traditional or Cultural practices, yet 49% value the GBR because of its rich TO heritage (Marshall & Pert, 2017). Traditional Owners 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). 	<ul style="list-style-type: none"> Strong TO use of sea country resources remains across the region, but this is poorly qualified & quantified. There is an increasing capacity of Indigenous land & sea institutions, but much work needs to be done to progress rights & to substantively

	<p>resources incl. identification, protection & management of Indigenous cultural heritage in sea country; (ii) partnerships, institutional arrangements & agreements between TOs & all GBR stakeholders; (iii) TO-driven frameworks & participatory monitoring methods.</p> <ul style="list-style-type: none"> Levels of TO satisfaction with: (i) identification, documentation & storage of cultural information; (ii) TO led methodologies; (iii) participation in GBR management; (iv) extent to which Traditional Ecological Knowledge (TEK) is identified, maintained & transferred. 	<ul style="list-style-type: none"> GBRMPA is developing an Indigenous Heritage Strategy to improve understanding & protection of GBR Indigenous heritage values (GBRMPA, 2016a). GBRMPA's Field Management Program (FMP) manages cultural & Indig. heritage on island national parks & Comm. islands (Queensland Government, 2016). <p>TO management of GBR resources</p> <p><i>(i) TO connections</i></p> <ul style="list-style-type: none"> 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). Evidence linking Woppaburra TOs to the Keppel islands include midden sites, burial sites, a bora ring, huts, stone artefacts & campsites. Some are ~5000 years old (GBRMPA, 2017e). <p><i>(ii) Partnerships, arrangements & agreements</i></p> <ul style="list-style-type: none"> Woppaburra Traditional Use of Marine Resources Agreement (TUMRA) area covers 561km² sea country around the Keppels & has been in place since 2007, but not many Wappaburra people live I the area (GBRMPA, 2017e). 2016 – Native Title granted to Darumbal People for 2,500km² land around Rockhampton, Yeppoon & Marlborough. It recognises the Darumbal people's exclusive native title over parts of this land & non-exclusive native title rights to access, hunt, fish, gather, conduct ceremonies & teach on the land. The Fitzroy Basin Elders Committee is a voluntary coalition of Elders & member traditional owner groups who are collectively committed to improving the region's natural & cultural environment & in reinstating the knowledge & wisdom of the Elders (FBA 2018) About 8 TUMRAs cover 24.6% of the GBR, i.e., 45,200 km² - & involves 16 TO groups to address issues such as the sustainable take of culturally significant species, & supporting cultural practice in GBR conservation & management. The 	<p>progress country based planning, strategy development & implementation.</p> <ul style="list-style-type: none"> 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). Cultural heritage is broad & is expressed through spiritual & cultural affiliations with a site or area & through activities undertaken in accordance with customs & traditions (GBRMPA, 2017f). 	<p>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>
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	<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"> 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, 2016a). New GBRMPA guidelines for TO heritage impact assessment & new guidelines developed in partnership between GBRMPA & Woppaburra TOs protect Indigenous cultural heritage values in & around the Keppels (GBRMPA, 2016a, 2017e). <p><i>(iii) TO-driven frameworks & participatory monitoring methods</i></p> <ul style="list-style-type: none"> In 2016 GHHP & Gidarjil rangers established 45 monitoring stations. Data were collected at The Narrows, Facing Island, Wild Cattle Creek & Gladstone Central. Aspects relevant cultural health (e.g., knapping floor, chopper tools, signage, gravestones, monuments) were recorded at each site. 360° panoramic imagery was used to build a photographic timeline for ongoing assessment of each site. Data were transferred to an Indigenous Cultural Heritage Database (ICHHD) to store information on sites visited during annual surveys & will help track condition & trend of cultural health over time (GHHP, 2016). <p>Traditional Owner satisfaction with GBR management</p> <ul style="list-style-type: none"> Insufficient data currently exists. <p>TO use & dependency on the GBR</p> <ul style="list-style-type: none"> Woppaburra people have a lifelong physical, cultural & spiritual connection to the land & sea & have a responsibility to our ancestors to protect the TO values (GBRMPA, 2017e). 	
CH3 Contemporary culture associated with the GBR	<ul style="list-style-type: none"> Place attachment, identity. GBR as culture – levels of pride, inspiration & personal 	<p>Gladstone Harbour</p> <ul style="list-style-type: none"> Overall score for cultural health of Gladstone Harbour for 2016 was 0.62 (C) (~3), based on ‘sense of place’ 0.66 (B) & Indigenous cultural heritage 0.53 (C) (GHHP, 2016). <p>General regional place attachment</p> <p>% disagreement with: ‘I like the environment & surrounds I live in’:</p>	<ul style="list-style-type: none"> There is a strong overall cultural understanding of the importance of the GBR & many regional sub-cultures are respectful of GBR values. GBR values are deeply reflected in contemporary national culture. <p>4</p> <p>There is a high level of contemporary cultural integrity in relation to the GBR.</p>

	<ul style="list-style-type: none"> connection to the GBR. National connections to the GBR. 	<ul style="list-style-type: none"> 8.1% Fitzroy Region residents disagree 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"> 48% Fitzroy Region residents see the GBR as an important part of their culture; 94% love living beside the GBR; 95% are proud that the GBR is a World Heritage Area (WHA); 71% agree that the GBR is part of their identity; & 47% value the GBR because it is spiritually important to them (Marshall & Pert, 2017). On average, GBR catchment residents had lived in the catchment for 20.7 years. 66% indicated there are "not many other places better than the GBR for recreation activities they enjoy". 94% "feel proud that the GBR is a WHA". 64% believe "the GBR is part of my identity". 41% live in the catchment because of the GBR. Strongest GBR values for residents were: aesthetic beauty (9.1/10); biodiversity 9.1; World Heritage (WH) status, 9.0; economic values 8.9; scientific & education 8.5; & lifestyle 8.5 (Marshall et al., 2013a). <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 GBR is a WHA; 64% saw the GBR as part of their identity (Marshall et al., 2013a). 		
CH4 Historic maritime heritage (since European settlement)	<ul style="list-style-type: none"> Identification, protection & management of historic heritage in GBR environments. Cultural significance of historic heritage 	<p><i>Great Keppel Island, Keppel Bay & Boyne Island</i></p> <ul style="list-style-type: none"> Most Great Keppel Island (GKI) Wappaburra people were killed or removed by graziers in 19thC. One GKI stockkeeper established good relationships with the Wappaburra & recorded valuable anthropological data. Mt Wyndham & Wyndham Cove on GKI are named for him, & his grave on Boyne Island is Heritage Listed (Rowland, 2004). When Wappaburra people refused to work for the graziers many were chained in a tidal cave. Evidence remains as piece 	<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, Queensland Parks & Wildlife Service (QPWS), Indigenous Land & Sea Institutions, etc.). Fragmented knowledge of maritime historical heritage, but 	<p>2.5</p> <p>While there is a strong historical heritage asset across the GBR coast, & sites within the catchment are well managed, the <i>maritime</i></p>

	<p>values for the GBR.</p>	<p>of rusting iron in a coastal shelter at Little Peninsula on GKI (Rowland, 2007).</p> <ul style="list-style-type: none"> • Leeke Homestead on GKI, built bet. 1922-1924, was Heritage Listed in 2000. One of the last remaining physical evidence of white occupation through violent displacement of Wappaburra people (Queensland Government, 2000). • 14 shipwrecks in Keppel Bay sunk between 1847 & 1913 (GBRMPA, 2017c). <p><i>GBR-wide historic maritime history</i></p> <ul style="list-style-type: none"> • Across the GBR >800 historic shipwrecks, but only ~40 located & ~20 positively identified; conservation management plans exist for 6 under the <i>Historic Shipwreck Act 1976</i> (GBRMPA, 2017c; P. Illidge, personal communication). • Historic sites are under pressure from natural threats (cyclones, sediment erosion), vessel anchoring, & pilfering (GBRMPA, 2017c; P. Illidge, personal communication). • Obligations under Reef 2050 Plan, e.g., Action HA 11 not being met (P. Illidge, personal communication). • GBRMPA is developing a Heritage Strategy to better understand & protect GBR Indigenous & historic heritage values (GBRMPA, 2016a). • GBRMPA has prepared draft guidelines for Historic heritage impact assessment in the permission system (GBRMPA, 2017d, 2017g) • When sea level was much lower, Indigenous people walked across the land (now the GBR) leaving evidence of their passing. Many archaeological sites exist, both under sea & on islands, but knowledge is scattered & not well documented (P. Illidge, personal communication). 	<p>there is an important set of values & assets.</p>	<p>components remain poorly defined, planned & managed. This value is higher than other GBR catchment regions due to work of Fraser Coast Regional Council & others in managing historic assets.</p>
	Rating			13
	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, 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"> Central Qld contributed 8% (\$21.6B) to GRP in 2010-11 – 4th highest in Qld (Regional Development Australia, 2015). Rockhampton Regional Council's (RRC) GRP was \$5.10B in 2015-16, declining -1.9% since 2014-15 (RRC, 2017). Regional growth strongest in public sector (health, education) & construction activity linked to mining (RPS Australia East, 2016). <p><i>Agriculture</i></p> <ul style="list-style-type: none"> State's 2nd largest producer of ag commodities - beef, cotton, grain & fruit comprise ¼ Qld's total exports (Trade & Investment Queensland Australia [TIQA], 2016). Rockhampton -'beef capital of Australia'; 3 abattoirs; ~4M head of cattle; 1/3 Qld's beef production; 10% national value (~\$1.037B pa) (TIQA, 2016). <p><i>Mining & mineral resources</i></p>	<ul style="list-style-type: none"> Central Queensland has a resilient & stable economy, generating quality employment & business opportunities & supporting regional agricultural production. Gladstone LGA is a major industrial hub & includes Qld's largest port. LNG expands & diversifies Australian natural gas supplies & increases supply reliability & economic growth (Elgas Ltd, 2015). 	<p>3.5</p> <p>Reef-associated industries are highly profitable in the region, however Reef-dependent industries are steady (tourism) or in decline (commercial fishing).</p>

- Coal mining~\$12.6B to GRP; <1% regional land use. Mostly Upper Isaac, Mackenzie & Lower Dawson. ~70% Qld's coal mines; (Waterhouse et al., 2015).
- Magnesite mine at Kunwarara north of Rockhampton; small scale gem mining (sapphires) west of Emerald & chrysoprase near Marlborough. Limestone & nickel mines & several quarries occur in Fitzroy Basin. CSG (methane) extraction in Upper Isaac, Upper Dawson & Lower Dawson. CSG extraction sometimes involves fracking to improve gas recovery (Waterhouse et al., 2015).
- Major industries around Gladstone:
 - 3 LNG plants on Curtis Is
 - LNG enables economical transport & gas storage; efficient to transport over long distances (Elgas Ltd, 2015)
 - Queensland Alumina Ltd (QAL): one of the world's largest alumina refineries
 - Rio Tinto Alcan Yarwun: opened in 2004
 - Boyne Smelters Ltd (BSL): Aust.'s largest aluminium smelter
 - Cement Australia Gladstone: Aust.'s largest cement plant
 - Orica Australia: chlor-alkali, ammonium nitrate (500,000T pa) & sodium cyanide plants
 - NRG Gladstone Power Station: Qld's largest coal-fired power station (Waterhouse et al., 2015).

Ports & shipping

- In 2016, GH's economic performance was 0.87 (A) compared to 0.79 (B) in 2015. This reflected increased scores for shipping activity & tourism. (GHHP, 2016). PoG – world's 5th largest coal export port.
- Exports from PoG >93.4Mt in 2015–16 (Bowen Basin = 72.2Mt; Wiggins Island Coal Terminal = 8.0 M; LNG = 12.0 Mt). By June 2016, 5/6 gas trains from 3 LNG projects in production (Waterhouse et al., 2015).
- Port Alma - 3-berth shipping terminal near Rockhampton - exports mostly ammonium nitrate, salt, bulk tallow & military

	<p>equipment; main port for Class 1 explosives for eastern Aust. (Waterhouse et al., 2015).</p> <p>Energy production</p> <ul style="list-style-type: none"> • Qld's newest & most technically advanced powerhouse, Stanwell Power Station is 22km west of Rockhampton & the largest electricity generator in Qld with capacity to supply > 45% Qld's electricity (TIQA, 2016). 					
<p>EV2 Economic viability of Reef-associated industries²</p>	<table border="0"> <tr> <td data-bbox="405 438 660 587"> <ul style="list-style-type: none"> • Mining & minerals. • Ports & shipping. • Agriculture. • Urban. </td> <td data-bbox="683 438 1400 837"> <p>Regional mining, mineral & port activities</p> <ul style="list-style-type: none"> • In 2016, GH economic performance was 0.87 (A) c.w. 0.79 (B) in 2015, due to increased shipping & tourism (GHHP 2016); recent falling coal prices reduced mining profitability (Waterhouse et al., 2015). • Increased export volume due to new coal infrastructure & LNG facilities; but 2014 - 15 saw reduced demand from China for coal, decline in oil prices (LNG spot prices are closely linked) & growth of US shale oil & gas production reduced spot prices (RPS Australia East, 2016). • Port & industry expansion triggered international concerns about GBR health (GBRMPA, 2014a; Context, 2013). </td> <td data-bbox="1422 438 1825 965"> <ul style="list-style-type: none"> • Prosperous regional economy driven by location along major transport & freight infrastructure routes, & proximity to mines. • While agricultural production continues to grow, access to water may have ecological limits. • Global demands for beef, fruit & veggies are driving expansion of grazing & crop production in the catchment & this may have adverse impacts on GBR WQ. • Urban expansion along the coast may have adverse impacts on GBR WQ. </td> <td data-bbox="1848 438 2033 893"> <p>3.5</p> <p>Agriculture & mining & minerals sectors remain vulnerable to global market forces & extreme weather events which are expected to influence future performance.</p> </td> </tr> <tr> <td data-bbox="683 837 1400 1252"> <p>Regional Agriculture</p> <ul style="list-style-type: none"> • CQ has advanced capability in beef production in breeding, backgrounding, feed lotting & processing (TIQA, 2016). • New investment sought to extend capacity & productivity of CQ beef sector due to increased global demand (TIQA, 2016). • Plans to increase coarse grain production for feedlots for growing livestock production capacity (TIQA, 2016). • Fitzroy River & other CQ water bodies provide water security for ag. expansion including intensive horticulture (TIQA, 2016). • Planned expansion of grazing & crop production in the catchment will likely have adverse impacts on GBR water quality (GBRMPA, 2014a). </td> </tr> </table>	<ul style="list-style-type: none"> • Mining & minerals. • Ports & shipping. • Agriculture. • Urban. 	<p>Regional mining, mineral & port activities</p> <ul style="list-style-type: none"> • In 2016, GH economic performance was 0.87 (A) c.w. 0.79 (B) in 2015, due to increased shipping & tourism (GHHP 2016); recent falling coal prices reduced mining profitability (Waterhouse et al., 2015). • Increased export volume due to new coal infrastructure & LNG facilities; but 2014 - 15 saw reduced demand from China for coal, decline in oil prices (LNG spot prices are closely linked) & growth of US shale oil & gas production reduced spot prices (RPS Australia East, 2016). • Port & industry expansion triggered international concerns about GBR health (GBRMPA, 2014a; Context, 2013). 	<ul style="list-style-type: none"> • Prosperous regional economy driven by location along major transport & freight infrastructure routes, & proximity to mines. • While agricultural production continues to grow, access to water may have ecological limits. • Global demands for beef, fruit & veggies are driving expansion of grazing & crop production in the catchment & this may have adverse impacts on GBR WQ. • Urban expansion along the coast may have adverse impacts on GBR WQ. 	<p>3.5</p> <p>Agriculture & mining & minerals sectors remain vulnerable to global market forces & extreme weather events which are expected to influence future performance.</p>	<p>Regional Agriculture</p> <ul style="list-style-type: none"> • CQ has advanced capability in beef production in breeding, backgrounding, feed lotting & processing (TIQA, 2016). • New investment sought to extend capacity & productivity of CQ beef sector due to increased global demand (TIQA, 2016). • Plans to increase coarse grain production for feedlots for growing livestock production capacity (TIQA, 2016). • Fitzroy River & other CQ water bodies provide water security for ag. expansion including intensive horticulture (TIQA, 2016). • Planned expansion of grazing & crop production in the catchment will likely have adverse impacts on GBR water quality (GBRMPA, 2014a).
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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).

	<p>Urban</p> <ul style="list-style-type: none"> • Urban expansion from Yeppoon to Emu Park & around Rockhampton & Gladstone (Waterhouse et al., 2015). • Impacts associated with land clearing for urban expansion are likely to include increased sediment loads which affect GBR water quality (GBRMPA, 2014a). • Although highly regulated, Sewage Treatment Plants (STPs) in the region are not always compliant, reducing GBR WQ (Waterhouse et al., 2015).
<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% Fitzroy regional residents feel the GBR is a valuable asset for the regional economy (Marshall & Pert, 2017).however, GBR tourism, recreation & fishing industries remain specifically vulnerable to the impacts of the Global Financial Crisis (GFC) & repeated large weather events (Marshall et al., 2013a, 2013b). In particular, fishers & tourism operators are sensitive to changes in GBR condition (Marshall et al., 2013a, 2013b). • 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). • 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). <p>Levels of economic activity</p> <ul style="list-style-type: none"> • 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). • Value of GBR tourism in the region has remained steady, slightly increasing since 2011-12; however recent changes in resort activity & GBR health may affect stability. <p>2.5 Repeated extreme weather events means many corals do not have time to recover & even pristine reefs are not immune. This then adversely affects GBR commercial fishing & tourism.</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 Traditional Owner use of GBR resources.

		<p><i>Tourism</i></p> <ul style="list-style-type: none"> In 2015-16 the Fitzroy Region generated some \$532M in tourism revenue (c.w. \$478M in 2011-12) & \$68M in recreation (c.w. \$54.8M in 2011-12 (DAE 2013, 2017). Wilson Island Resort (next to Heron Is) temporarily closed. Heron Is ferry timetable changed affecting overnight stay. Iwasakis Resort (near Yeppoon) closed. Keppel Is Resort – closed but expected to be re-developed. Ferry to Keppel is back in business. Approved resort for Curtis Is, Hummocky Is. New Cruise Ship terminal in Gladstone. <p><i>Fishing</i></p> <ul style="list-style-type: none"> Fitzroy Region has 178/1060 GBR commercial fishing licences; 107 active; 92% owner-operators; 39% travel > 100km from port. Household financial dependency on fishing is high. It is an aging industry. Most operate in one fishery type only (Tobin et al., 2014). Since 1 Nov 2015, commercial net fishing has been banned in the Fitzroy River & Capricorn Coast (Waterhouse et al., 2015). Value of GBR commercial fishing in the Region declined from \$35.3M in 2011-12 to \$19M in 2015-16 (DAE, 2013, 2017). 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 1716T to 1123T – 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 have declined (Tobin, Lewis, & Tobin, 2016). 	<ul style="list-style-type: none"> 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 NFZs).
EV4 Inclusiveness & economic fairness/ equity	<ul style="list-style-type: none"> Income – personal & household. Opportunities for GBR Traditional Owners. 	<p>Regional Income</p> <ul style="list-style-type: none"> In 2016, 19.8% of Fitzroy Region residents were in the in most disadvantaged quintile; median personal income was \$34,520pa, & median total family income was \$90,538 pa. (\$86,372 state-wide). 9.4% people earned <\$33,800pa; 30.9% earned bet. \$33,800 - \$77,999 (QGSO, 2017a). 	<ul style="list-style-type: none"> Some evidence reflecting inequities between commercial fishers' & recreational fishers' access to commercially viable fish species. <p>3 Continues to be significant inequity issues between sectors & between high</p>

	<ul style="list-style-type: none"> Equity between & within industries/ activities. In 2016, Rockhampton had 14.5% of families dependent on welfare c.w. 9.8% nationally (RPS Australia East, 2016). Opportunities for GBR Traditional Owners Not enough evidence to comment. Equity between/within industries/activities <i>Reef-associated industries/activities</i> The threat of compulsory acquisition of agricultural land for military training exercises has caused some anxiety among farmers & graziers in the region & a sense of inequity in decision-making (KPMG, 2017). <i>Harvest labour</i> 3 types harvest workers: <ul style="list-style-type: none"> itinerant Australians – repeat workers; award rates backpackers – rarely repeat workers; race against time to record 88 days’ work in one year to gain visa renewal; most need multiple jobs to reach 88 day target. More vulnerable than Australians - lack of labour market knowledge exposes them to greater exploitation – below award conditions undocumented workers – more like bonded servitude – most vulnerable - liability to deportation, depend on a single contractor, poor language skills, exclusion from unions & regulatory protection, & social isolation (Iaquinto, 2017; Underhill & Rimmer, 2016). Backpackers - 25% Australia's ag. workforce & up to 85% for some seasonal harvests - few career paths for permanent residents; sudden decrease in backpackers could adversely affect ag production in GBR catchment & elsewhere (Iaquinto, 2017). <i>Reef-dependent industries/activities</i> 62% commercial fishers in the Fitzroy Region believe they have fair access to GBR resources (Tobin et al, 2014). Commercial fishers feel they 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). 	<ul style="list-style-type: none"> Disparities between high income earners in mining & minerals sector & families dependent on welfare in some areas. Transient & ‘backpacker’ populations skew workforce participation figures & creates problems in building a diversified & stable workforce in GBR related industries. Equity issues could be improved through higher education/training opportunities for youth. <p>income earners & welfare-dependent families.</p>
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	<p>Queensland Department of Agriculture & Fisheries (QDAF) introduced a harvest strategy in 2014 to allow coral trout stock recovery, reducing commercial quota unit value & annual commercial catch. It seems, however, that catch taken by recreational fishers is hindering stock recovery (Tobin et al., 2016).</p>
<p>EV5 Workforce participation & employment</p>	<ul style="list-style-type: none"> • Regional employment participation rates & trends. • GBR-related employment. <p>Regional</p> <ul style="list-style-type: none"> • Top 5 employment areas (2011): Coal Mining (6.7%); Preschool & School Education (5.6%); Construction (5.1%); Other Retail (4.8%); Food & Beverage (4.5%) (QGSO, 2017a). • March 2017 unemployment in the Fitzroy Region was 6.7% c.w. 6.2% across Qld. Within the region, Rockhampton had the highest unemployment rate of 8.3%; Banana had the lowest unemployment rate of 4.0% (QGSO, 2017a). • In 2016, ~5,700 workers in Gladstone were engaged in local resource-related industries (alumina refining, aluminium smelting, power generation, cement, chemicals & LNG production, rail transport & coal handling). • Gladstone residents include large numbers of contractors providing construction, mining & engineering services throughout regional Qld (Waterhouse et al., 2015). • In 2016, GH economic stimulus was 0.74 (B) compared to 0.82 (B) in 2015 - based on two indicators: employment & socio-economic status. Employment scored 0.62 (C) – c.w. 0.64 (C) in 2015. Socio-economic status received a score of 0.80 (B) c.w. 0.95 (A) in 2015 (GHHP, 2016). <p>GBR- Related Employment</p> <ul style="list-style-type: none"> • In 2015-16 there were 106 people directly employed in GBR commercial fishing (c.w 98 in 2011-12) & 5,926 employed in tourism in the Fitzroy Region (c.w 7,395 in 2011-12) (DAE, 2013, 2017). <ul style="list-style-type: none"> • Regional unemployment is > Qld av. • Contraction of FIFO/DIDO Gladstone workers expected to be offset by gains in local population, but employment opportunities may be limited. • No. people employed in GBR commercial fishing rose slightly from 98 in 2011-12 to 109 in 2015-16, but value of commercial fishing declined. • Trend is reversed for GBR tourism which saw a decline in numbers of people employed over the same period (from 7,395 to 5,926). <p>3</p> <p>Structural regional unemployment could be expected to increase after construction phase of LNG plants wind down.</p> <p>Continuing decline in rural towns is possible, though not necessarily reflected in employment figures.</p>

<p>EV6 Economic confidence in the Region</p>	<ul style="list-style-type: none"> Regional economic confidence. Confidence in GBR industries. 	<p>Regional Economic Confidence</p> <ul style="list-style-type: none"> In 2013, Rockhampton’s business intensity was well below state & nat. av. (i.e., 60 locally registered businesses per 1,000 residents, c.w 90 for Australia) & its Regional Index of Retail Prices was also below the national av. - 99.1 c.w.100.0 (RPS Australia East, 2016). Size & scale of energy reserves & existing critical mass of coal & LNG production suggests these sectors will continue to generate economic opportunities for regional communities in the medium term (RPS Australia East, 2016). No. new residential building approvals fell from ~500 in May 2012 to ~50 in May 2017; In the same period, Qld’s new residential building approvals went from ~2800 to ~3700 – a reverse trend (QGSO, 2017c). Sth Gladstone Median house price: \$335,000 in 2009; \$440,000 in 2013; \$230,000 in 2017; Unit prices went from \$280,000 in 2009; \$341,000 in 2011; \$110,000 in 2017 (REA Group Ltd, 2017a). Rockhampton Median House price \$228,000 in 2009; \$230,000 in 2011; \$167,000 in 2017. Median Unit price - \$515,000 in 2009; \$439,500 in 2014; \$404,338 in 2017 (REA Group Ltd, 2017b). Emerald Median house price: \$360,000 in 2009; \$435,000 in 2012; \$237,500 in 2017 (REA Group Ltd, 2017c). Mt Morgan \$140,000 2009; \$138,500 in 2013; \$100,000 in 2017 (REA Group Ltd, 2017d). Moranbah \$176,435 in 2009; \$706,000 in 2012; \$170,000 in 2017 (REA Group Ltd, 2017e). <p>Confidence in GBR-Tourism</p> <ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> The housing market slumped across the region at the end of the mining boom, but showing signs of gradual recovery. Rockhampton’s economic outlook is less positive than national outlook, however regional mining & minerals sectors are expected to remain strong in medium term. Rockhampton’s economic potential is not being realised due to high unemployment; poorly skilled workforce; economy dominated by public sectors (health, education, public admin); below average & slowing economic activity per resident. Rockhampton lacks a large, dynamic & entrepreneurial business community, with below average numbers of local businesses & slow business formation (RPS Australia East, 2016). Reef-dependent industries are optimistic about the future of the GBR, but this does not always extend to confidence in the viability of their own businesses. 	<p>3</p> <p>Current decline in resources may be contributing to lower economic confidence.</p> <p>Consumer confidence is generally low compared with other parts of Qld & Australia.</p>
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	<p>the GBR” but 59% have planned for their financial security (Marshall et al., 2013a).</p> <p>Confidence in GBR-Fisheries</p> <ul style="list-style-type: none"> • 74% Fitzroy Region GBR comm. fishers are optimistic about the GBR’s future, but only 51% are optimistic about the future of their business in the GBR (Tobin et al., 2014). • Across the whole marine park, 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).
Rating	18.5
Maximum for this Cluster	30

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 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). This Plan 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, WQIPs, Land Use Plans, Property Management Plan (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 reporting presents a five year formalised opportunity for review (Dale et al, 2016c; Gooch et al., 2017). <p>Fitzroy Specific Context</p>	<ul style="list-style-type: none"> Clear strategic planning & coordination frameworks for planning & action in relation to management of the Marine Park & water quality improvement are emerging at GBR, regional 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. There is a lack, however, of a clear future strategic land use framework (& associated focus on management actions). There is no cohesive framework for managing future land use & associated management actions in the Fitzroy context. 	<p>3.5</p> <p>Basic GBR-wide & bilateral strategic planning framework is in place via the <i>Reef 2050 Plan</i> & possible implementation strategies & institutional arrangements exist at all required scales for delivery.</p>

	<ul style="list-style-type: none"> • More effective planning from the property to the regional scale will help us achieve better outcomes for GBR WQ (Waterhouse et al., 2015).
<p>G2 Connectivity within & between key decision making institutions & sectors.</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"> • Only 37% Fitzroy region 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 27% regional residents agree that they have fair access to the GBR compared to other user groups (Marshall & Pert, 2017); while 62% Fitzroy Region commercial fishers believe they have fair access to GBR resources (Tobin et al., 2014). <ul style="list-style-type: none"> • There is a significant ongoing likelihood of decline in GBR health as a result of poor connectivity among key governance subdomains affecting GBR outcomes (e.g., greenhouse gas abatement) & the risk of implementation failure related to the catchment-based delivery of Fitzroy Region actions envisaged under the <i>Reef 2050 Plan</i>. However proximity to South East Queensland (SEQ) results in stronger connectivity between regional & state-wide decision-makers. <p>2</p> <p>There is a significant ongoing likelihood of decline in GBR health as a result of poor connectivity among key governance subdomains affecting GBR outcomes (e.g., greenhouse gas abatement) & the risk of implementation failure related to the catchment-based delivery of Fitzroy Region actions envisaged under the <i>Reef 2050 Plan</i>.</p>

<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"> 79% regional residents support current rules & regulations that affect GBR access & use; 82% 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 32% Fitzroy Region residents think enough is being done to effectively manage the GBR & 67% are confident that the GBR is well managed; 67% are confident that local freshwater areas are well managed (Marshall & Pert, 2017). Sectoral/community contributions to decision-making Traditional Owners are routinely marginalised in development of policy & delivery systems (Dale et al., 2016a). Only 44% regional residents feel like they can contribute to GBR management (Marshall & Pert, 2017). 	<ul style="list-style-type: none"> 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 actors play an important role 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. Management of integrated knowledge sets. 	<ul style="list-style-type: none"> Despite some progress, recognition of Traditional Knowledge, as opposed to working within a western scientific framework needs to be embedded in GBR management agencies (Grant, 2012). Core biophysical knowledges concerning marine & catchment science are strong. Across the GBR, traditional & historical knowledge sets remain strong but in decline. Decision support models & prioritisation tools are relatively advanced in the GBR. 	<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. Declining health in historical & traditional knowledge sets, in part because of resource 	<p>3.5</p> <p>Biophysical knowledges are generally strong across the marine & catchment space, though social & economic sciences are not developed</p>

	<ul style="list-style-type: none"> Funding through Reef & Rainforest Research Centre (RRRC) has returned to regional design & implementation but remains poorly linked to state-based scientific investment & effort (Dale et al., 2016c). 	<p>limitations facing TO land & sea institutions.</p>	<p>enough to deliver truly integrated knowledge to make sound decisions.</p>
Rating			11.5
Maximum for this Attribute			20

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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.

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.

Personal connection refers to people's aspirations, spiritual connections, cultural ties, employment, stewardship activities, places of residence and recreational activities that are

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

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 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

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>

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.

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

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 settlement.