REVIEW OF WORLD HERITAGE ASSESSMENTS IN GREAT BARRIER REEF OUTLOOK REPORT 2019

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Executive Summary

Released in August 2019, the 2019 Great Barrier Reef Outlook Report (OR) contains an assessment of the heritage values of the Great Barrier Reef (GBR) including World Heritage (WH) values. This assessment is required under the GBR Marine Park Regulations and has been included in the 2014 and 2019 ORs.

The Outlook Report is an important document produced by the Great Barrier Reef Marine Park Authority (GBRMPA) every five years. It provides a comprehensive overview and assessment of all aspects of the GBR Region including its natural assets, cultural significance, threats and risks. Key to the Report's value is the range of evidence used, the comprehensive approach, its independent peer review, and the assessment of the long term 'outlook' for the Region.

Our review, commissioned by the Australian Marine Conservation Society, was tasked to consider the following matters: a) The adequacy of the assessment of World Heritage values in the 2019 GBR Outlook Report; and b) Recommendations for improvement.

To provide a basis for our assessment, we examined the legislative requirements in the GBR Marine Park Act and Regulations, the approved Statement of Outstanding Universal Value (SoOUV) for the GBR, and relevant parts of the Operational Guidelines for Implementation of the World Heritage Convention, the International Union for the Conservation of Nature (IUCN) World Heritage Outlook assessments and the 2013 GBR Strategic Assessment.

We consider that the WH assessments in future GBR Outlook Reports should be undertaken to better meet the legislative requirements of the GBR Marine Park Regulations and the guidelines provided by the World Heritage Centre and IUCN. This would be achieved by including a specific section in the Outlook Report that explicitly links the assessment of the relevant key values identified in the SoOUV to the overall assessment of the property's WH values.

We are proposing a revised approach (section 3) to assess the GBR's WH values. This draws on the experience of the past two reports and the work of IUCN's World Heritage Program. It follows four steps:

(i) assessing key indicator values as has already been done in the OR;

(ii) collating these values into broad groupings within the relevant WH criteria and akin to the approach adopted by IUCN for their World Heritage Outlook Reports;

(iii) assessing the level of concern and trend for each grouping; and

(iv) determining an overall status for those broad groupings based on a four-point scale consistent with the OR.

Any assessment of the key values of a WH property must be strongly linked to the property's SoOUV. We show how utilising the assessments within the OR can form the building blocks for a logical stepped method to determine and assess the key values under the four criteria for which the GBR was WH-listed as well as its integrity.

We have identified the strengths of the OR and areas for improvement that will strengthen the ongoing value of the Report.

Our key **conclusions** relating to the assessment of WH in particular and the Report more generally are:

- Among the key purposes of a SoOUV is the "basis for the future protection and management of the property" and the benchmark against which the state of conservation of a WH property is assessed.
- Recognising that many of the 'elements' of the SoOUV are very broad, an indicative value or attribute should be chosen as a surrogate for the elements within each criterion.
- A four-point grading system, along with the borderline concept, should be applied given that it mirrors that used already in Outlook and is similar to that used by IUCN to assess natural World Heritage properties. The existing wording for the grading statements in the OR should be retained.
- Inclusion of the "borderline" assessment score is good. However, it has been used only a very limited number of times in the 2019 OR. Given the inherent uncertainties underpinning a number of the assessments and the relatively coarse 4-grade ranking system, the judicious use of "borderline" would be appropriate.
- The trend of the values is an essential and complementary part of any assessment of values.
- Given the profile accorded to WH-listing, the assessment of WH warrants a specific section in its own right that includes the assessment of individual values combined to provide a set of values for each WH criteria which are then grouped to provide more useful assessments of all the elements of the SoOUV.
- The Indigenous Heritage assessments within the 2019 OR need to be improved, including addressing the concerns raised in this review (see pp.3-36 and Appendix 3).
- The scale of the GBR Region means that some assessments would be better presented at the appropriate regional scale. Section 1.6 of the 2019 OR notes, *there is no standard way of dividing up the Region when interpreting the data.* (p. 11). Agreed regions should be defined before the 2024 OR.
- Even after 15 years and three ORs, we note that a number of the assessments show low confidence and only limited data (e.g. *Halimeda* banks, shorebirds, seabirds). We consider that priority should be given to either collecting relevant data or determining whether or not to continue including such assessments in future ORs.
- The GBR OR provides a good template for the assessment of other WH properties and the status of their natural and cultural WH values.

Recommendations

1. Any future assessment of OUV for the GBRWHA should comply with the legislative requirement to assess the WH values, not the WH criteria as has been done in the 2014 and 2019 Outlook Reports.
2. Building on the individual values currently assessed in the OR, determine and assess broad groupings of values within the relevant WH criteria similar to those assessed by IUCN. This should be included in a separate section of the Report.
3. An assessment of the actual trend (similar to that assessed in the OR or the IUCN assessments) is essential and must be included. A key question is whether this should be benchmarked against the previous assessment or back to the date of inscription. We recommend the latter given the SoOUV is meant to be the benchmark against which the

state of conservation of a WH property is assessed. There is also the potential for a problem of 'shifting baselines' if the baseline is reset at every OR.

4. To enable clear trends to be assessed, measurable indicators that are indicative of these broad grouping should be chosen. Such indicators need to be aligned to the four WH criteria, and also include "Integrity" as well as "Protection and Management" (i.e. all components of OUV).

5. To achieve the above recommendations, the chosen indicators for OUV need to:
    a. be measurable and repeatable;
    b. build on the existing assessments of values currently undertaken within the Outlook Report;
    c. be indicative of the entire WH property (unless relating to a specific location), but also be able to be assessed at a subregional level:
        i. north, central, southern
        ii. inshore, offshore
    d. as far as practicable, be able to be hindcast (back to 1981, the date of WH listing).

6. Agreed subregions should be defined before the 2024 OR to allow the inclusion of subregional scale assessments where appropriate.

7. Continue to utilise the borderline category in future Outlook assessments.

8. The component of Criterion (ix) that relates to *'Human interaction with the natural environment'* also needs to be included, but as a separate line (i.e. grouping).

9. A finer level of assessment of Indigenous Heritage that is more representative of the seventy Traditional Owner groups should be considered for future ORs.

10. In all assessments, the Management Effectiveness sloping trend icons should be used when there has been an improvement or deterioration, but this grade has not changed between five-yearly assessments (as shown on p. 222 of 2019 OR).

11. Provide the time-frame of future trends, i.e. five years, 5-10 years, >10 years in the summary assessment tables.

12. Prioritise future data collection for those key indicators currently assessed as "very good" or "good" where there are limited information and a declining trend for two consecutive assessments, for example plankton and microbes.

13. Clarify when the category of "no consistent trend" is applied. This category should not be used for data-deficient indicators; if there is insufficient data, then there needs to be a new category, and the indicator should not be given an assessment.

14. In assessing existing protection and management, it would be more appropriate to use Hockings *et al.* grading terminology of effective, moderately effective, partially effective and ineffective rather than very good, good, poor and very poor.

15. The published Outlook Report should be supported by an interactive web-based tool that allows readers to access relevant data sets and reference material.

1. Introduction

On 30th August 2019, the Commonwealth Minister for the Environment, The Hon. Sussan Ley tabled the Great Barrier Reef Marine Park Authority's third five-yearly Great Barrier Reef (GBR) Outlook Report 2019[3] in the Australian Parliament.

This review, commissioned by the Australian Marine Conservation Society, was asked to consider the following matters:

a) The adequacy of the assessment of World Heritage values in the 2019 GBR Outlook Report.

b) Recommendations for improvement.

In undertaking the review, we have scrutinised all eight assessments in the 2019 GBR OR as the assessment of WH values drew on all the assessments, namely biodiversity, ecosystem health, heritage values, commercial and non-commercial use, factors influencing the region's values, existing protection and management, resilience and risks to the Region's values.

The GBR 2019 OR provides a very comprehensive analysis of all aspects of the GBR Region covering the ecosystems and biodiversity of the Region, the social and economic benefits to local and regional communities and the nation, the effectiveness of protection and management measures, and the risks to, and resilience of the Region. For anyone interested in or associated with management of the Marine Park, the OR should be the first point of reference for understanding the condition of the GBR and its prospects for the future and determining priorities for management and investment. Our review has identified areas for improvement while acknowledging the strengths of the OR.

2. Existing methods used to assess the status and trend of WH values[4]

Overview

The term 'Outstanding Universal Value' (OUV) is a fundamental cornerstone of many aspects of World Heritage (WH) including nominations, state of conservation reports and periodic reporting. The term is used some 90 times in the *Operational Guidelines for Implementation of the World Heritage Convention*[5] (the Guidelines) and is defined in those Guidelines (para. 49).

OUV usually comprises a suite of values which collectively mean a specified area is 'outstanding' when considered at a global scale. These values are assessed against one or more of ten WH criteria, and other considerations, for eaxmple whether they have authenticity and/or integrity.

It is important to note that the term OUV is not plural (i.e. it does not refer to Outstanding Universal Values). Rather, a property is inscribed because it is of Outstanding Universal Value; furthermore, OUV is applied to the WH property as a whole. It is also important to note that not all values occurring within a WH property are necessarily 'World Heritage values' or part of its 'Outstanding Universal Value'. For example, some cultural values within a property inscribed for its natural values may be undeniably important heritage values, but they should not be regarded as being 'World

[3] Great Barrier Reef Marine Park Authority 2019, *Great Barrier Reef Outlook Report 2019*, GBRMPA, Townsville. http://elibrary.gbrmpa.gov.au/jspui/handle/11017/3474

[4] Jon Day was the primary author of sections 2 and 3.

[5] World Heritage Centre 2019, *Operational Guidelines for Implementation of the World Heritage Convention*. UNESCO http://whc.unesco.org/en/guidelines/

Heritage values'[6] or part of the OUV if the property was not inscribed for criteria that specifically mentioned those values.

The Guidelines require a 'Statement of Outstanding Universal Value' (SoOUV) be prepared for each WH property. The SoOUV is the official statement adopted by the World Heritage Committee at the time of inscription of a property on the World Heritage List or as soon as possible after inscription. These statements are set out in a standard format and aim to raise awareness on the values of the property and to guide the assessment of its state of conservation. The SoOUV identifies *"… the criteria under which the property was inscribed, including the assessments of the conditions of integrity, and, for cultural and mixed properties, authenticity. It should also include a statement on the protection and management in force and the requirements for protection and management for the future".*

Important terminology – what are 'WH values'?

World Heritage values are defined by IUCN as .. *the natural features of a site which make up the Outstanding Universal Value that led to World Heritage listing. They are directly related to the criteria for which a site was inscribed. … Note that <u>each criterion encompasses a number of values</u> and that these should be broken down as relevant. For example, criteria (x) may be broken down into 'rare and endemic birds', 'rare and endemic mammals', '.. etc. as appropriate* (IUCN, 2012, page 14).[6]

Once approved by the WH Committee, the SoOUV remains the *"basis for the future protection and management of the property"* (Guidelines, para. 155). Nearly all WH properties today have a SoOUV which remains the fundamental cornerstone for managing these properties as World Heritage and the benchmark against which the state of conservation of the WH property is assessed (" .. *the <u>key reference</u> for the future effective protection and management …*" (para 51).

Some WH properties, including the GBRWHA, were put on the WH List prior to the requirement for a SoOUV, so in such cases a Retrospective SoOUV (RSoOUV) was developed and approved by the WH Committee. One important aspect is that the RSoOUV for the GBRWHA was prepared in 2010-11, and in accordance with advice from IUCN and the WH Centre, used the criteria that were in place when the property was listed (i.e. in 1981) rather than those in place when the SoOUV was compiled and then adopted in 2012. One consequence of using the 1981 criteria for the GBR SoOUV is the specific reference to some Indigenous heritage values within the GBRWHA addressed by the words in Criterion ix:

- *Human interaction with the natural environment is illustrated by strong ongoing links between Aboriginal and Torres Strait Islanders and their sea-country and includes numerous shell deposits (middens) and fish traps, plus the application of story places and marine totems.*

Assessing OUV in the GBRWHA

Over the years, various ways have been used to assess OUV in the GBR. As outlined below, some of these are more useful than others:

2.1 2014 Strategic Assessment

The first assessment of OUV was done by the Great Barrier Reef Marine Park Authority (GBRMPA) in 2012-13 for the Strategic Assessment and was undertaken in several steps:

[6] IUCN (2012). IUCN Conservation Outlook Assessments - Guidelines for their application to natural World Heritage Sites, Version 1.3. https://www.iucn.org/sites/dev/files/import/downloads/guidelines___iucn_conservation_outlook_assessments_08_12.pdf

- Firstly, breaking down the full SoOUV text into smaller 'excerpts' or components of OUV under each of the four natural criteria and integrity.
- An assessment of the current condition and trends for each of these components of OUV involved:
    1. Consideration against four 'grading statements' to determine a grade for the current condition of each of the individual elements shown by a traffic light indicator colour;
    2. Determining the overall trend comparing the 2012 situation with a baseline of 1981 (1981 being the date of inscription of the GBRWHA on the WH list);
    3. A level of confidence determined to indicate the level of certainty with (1) and (2).

A full assessment of multiple excerpts from the SoOUV was published in the 2014 Strategic Assessment; an excerpt showing some values that contribute to criterion (vii) is shown below (Figure 1), and the full assessment is provided at Appendix 1.

Figure 1. Excerpt from 2014 Strategic Assessment's benchmarking of the GBRWHA SoOUV.

Table 7.11 Benchmarking the outstanding universal value of the Great Barrier Reef World Heritage Area

The assessments presented in this table are based on the same information used to assess current condition and trend in Sections 7.1 to 7.5. The references listed there also apply to this assessment.

Understanding the table

Very good	Good	Poor	Very poor
Very good: All elements necessary to maintain the outstanding universal value are essentially intact, and their overall condition is stable or improving. Available evidence indicates only minor, if any, disturbance to this element of outstanding universal value.	**Good:** Some loss or alteration of the elements necessary to maintain the outstanding universal value has occurred, but their overall condition is not causing persistent or substantial effects on this element of outstanding universal value.	**Poor:** Loss or alteration of many elements necessary to maintain outstanding universal value has occurred, which is leading to a significant reduction in this element of the outstanding universal value.	**Very poor:** Loss or alteration of most elements necessary to maintain the outstanding universal value has occurred, causing a major loss of the outstanding universal value.

Area (See Chapter 1, Figure 1.1)

GBR Great Barrier Reef Region

Trends

↑ Improving
↔ Stable
↓ Deteriorating
— No clear trend

Confidence in condition and trend

● Adequate high-quality evidence and high level of consensus
◐ Limited evidence or limited consensus
○ Very limited evidence, assessment based on anecdotal information

Excerpt from statement	Comment	Area	Very good	Good	Poor	Very poor	Confidence
One of the richest and most complex natural ecosystems on Earth, and one of the most significant for biodiversity conservation	The Great Barrier Reef remains a complex ecosystem, rich in biodiversity. Some key habitats are under pressure, especially in southern inshore areas.	GBR		↓			◐
Tens of thousands of marine and terrestrial species, many of which are of global conservation significance	Some populations (dugong, sharks, seabirds and marine turtles) are known to have declined. Others such as humpback whales, loggerhead turtles and estuarine crocodiles are increasing.	GBR		↓			●
The world's most complex expanse of coral reefs...Contain some 400 species of corals in 60 genera	Although there is no published evidence of loss of species associated with coral reefs, there has been a serious decline in hard coral cover and deterioration of coral reef habitats in the southern two-thirds of the Region.	GBR			↓		●
Large ecologically important interreefal areas. The shallower marine areas support half the world's diversity of	The Region's mangrove forests remain very diverse with at least 39 mangrove	GBR		↔			●

The key excerpts extracted from the SoOUV effectively encompassed the key WH values and were assessed within each criterion and within integrity:

Criterion vii – 13 components addressing the key WH values

Criterion viii – 6 components addressing the key WH values

Criterion ix – 8 components addressing the key WH values

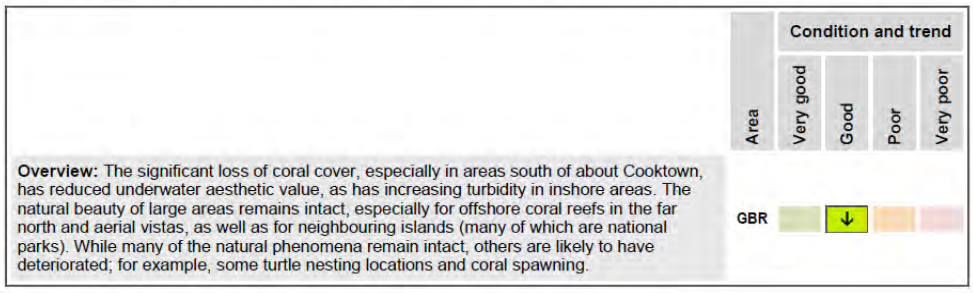
Criterion x – 11 components addressing the key WH values

Integrity - 3 components

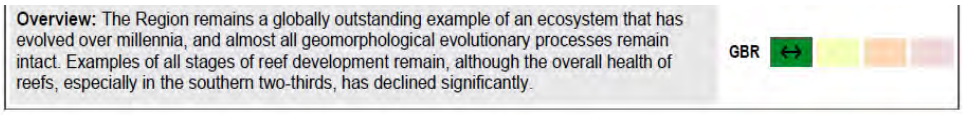
In total, the 2014 Strategic Assessment made 41 different assessments of WH values.

It is also interesting to compare the summary or overview assessments for the four criteria and integrity in the 2014 Strategic Assessment (as shown below) with those assessed in the 2014 Outlook Report (shown on page 10, Figure 2), noting especially Criterion (x):

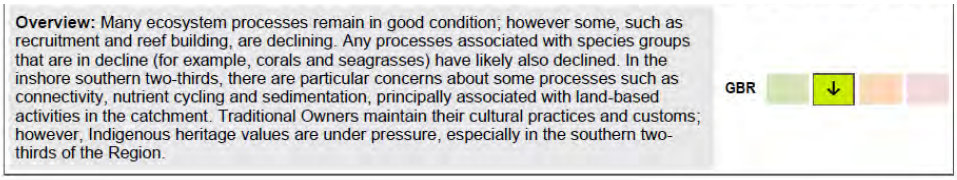
- **Natural beauty and phenomena** (previously criterion (iii) now criterion (vii)): contains unique, rare or superlative natural phenomena, formations or features or areas of exceptional natural beauty, such as superlative examples of the most important ecosystems to man.



- **Major stages of the Earth's evolutionary history** (previously criterion (i) now criterion (viii)): outstanding examples representing the major stages of the Earth's evolutionary history



- **Ecological and biological processes** (previously criterion (ii) now criterion (ix)): outstanding examples representing significant ongoing geological processes, biological evolution and man's interaction with his natural environment



- **Habitats for conservation of biodiversity** (previously criterion (iv) now criterion (x)): habitats where populations of rare or endangered species of plants and animals still survive

Overview: There are significant concerns about some key habitats, particularly coral reefs and seagrass meadows, the latter of which is significant for species such as dugong and turtles. Many of the key habitats and species, for which the Great Barrier Reef was inscribed on the World Heritage List (coral reefs, seagrasses, islands, open waters, dugongs, turtles, whales, dolphins and seabirds) are in poor and declining condition, especially in the southern two-thirds of the property. The concerns are not as great in far northern areas, which remain relatively intact. Populations of humpback whales, estuarine crocodiles, loggerhead turtles and green turtles (southern stock) are recovering from historical declines. There have been no records of species extinction, although there is concern that speartooth shark has not been recorded in or near the Region since 1982.	GBR ↓

- **Integrity**

Overview: The Great Barrier Reef is the world's third largest World Heritage Area and encompasses all but the most northerly part of the Great Barrier Reef ecosystem. Except for small exclusions, it is all within a marine protected area and is, therefore, afforded a high level of direct protection and management. External pressures such as climate change, catchment run-off and coastal development are affecting its overall integrity.	GBR ↓

2.2 2014 Outlook Report

In 2008, the GBR Marine Park Regulations were amended to require an assessment of the heritage values of the GBR Region as part of the five-yearly OR (see Appendix 2 for more detail on the Regulations and subsequent amendments).

The 2014 GBR OR did not follow the format of the 2014 GBR Strategic Assessment but instead assessed the four World Heritage criteria and integrity. The assessment in the 2014 OR is shown below (Figure 2).

Figure 2. Assessment of World Heritage Values in 2014 GBR Outlook Report

4.8.4 World heritage values and national heritage values

Outlook Report 2009: Not assessed

2009 Grade	Current summary and assessment components	Assessment grade: Very good	Good	Poor	Very poor	Confidence: Grade
Not assessed	**World heritage values and national heritage values:** The outstanding universal value of the world heritage property remains in good condition, however the overall condition of some key attributes is poor and many have deteriorated since the property's listing in 1981. Those related to coral reef and seagrass meadow habitats, marine turtles, seabirds and dugongs are assessed as being in poor condition overall. The Region remains a globally outstanding example of an ecosystem that has evolved over the millennia. The natural beauty of most of the Region remains, however its underwater aesthetic value has declined in central and southern inshore areas. External pressures are affecting the property's integrity.		■			
Not assessed	**Natural beauty and natural phenomena:** The Region retains its spectacular natural beauty; aesthetic values are diminished in some areas. Many natural phenomena remain intact; declines in species have affected some phenomena.		■			●
Not assessed	**Major stages of the Earth's evolutionary history:** The Region remains an outstanding example of evolutionary history; coral reef health has declined in some areas.	■				◐
Not assessed	**Ecological and biological processes:** Many ecosystem processes remain in good condition; some, such as sedimentation, nutrient cycling and recruitment have deteriorated. Traditional Owners with connections to the Great Barrier Reef maintain their ongoing links to sea country.		■			◐
Not assessed	**Habitats for conservation of biodiversity:** The Reef remains a mosaic of habitats; some are under pressure. Habitat declines, especially in central and southern inshore areas, are affecting their ability to support dependent species, including those of conservation concern.		■			◐
Not assessed	**Integrity:** The property is large enough to ensure the representation of its world heritage values. External factors are affecting the resilience of the ecosystem in some areas. The property is comprehensively managed.		■			◐

Grading statements

- **Very good** – All elements necessary to maintain the outstanding universal value are essentially intact, and their overall condition is stable or improving. Available evidence indicates only minor, if any, disturbance to this element of outstanding universal value.
- **Good** – Some loss or alteration of the elements necessary to maintain the outstanding universal value has occurred, but their overall condition is not causing persistent or substantial effects on this element of outstanding universal value.
- **Poor** – Loss or alteration of many elements necessary to maintain outstanding universal value has occurred, which is leading to a significant reduction in this element of the outstanding universal value.
- **Very poor** – Loss or alteration of most elements necessary to maintain the outstanding universal value has occurred, causing a major loss of the outstanding universal value.

Trend since 2009

New assessment for this report; no trend provided

Confidence

- ● Adequate high-quality evidence and high level of consensus
- ◐ Limited evidence or limited consensus
- ○ Inferred, very limited evidence

This assessment did not strictly comply with the requirements of the legislation in that, while the title of the table reads 'World heritage values', the assessment did not assess any WH values as such but assessed the four WH criteria and integrity.

Note also that the assessment for **Habitats for conservation of biodiversity** (Criterion x) in the 2014 Outlook Report has a rating of 'Good' compared with the 'Poor' rating in the 2014 Strategic Assessment.

2.3 2014 and 2017 IUCN World Heritage Outlook

The International Union for the Conservation of Nature (IUCN) is an independent NGO that advises the WH Committee and UNESCO. IUCN produces the IUCN World Heritage Outlook *(A conservation assessment of all natural World Heritage sites*)[7], and assessments have been undertaken in 2014 and 2017. This is a desk-based assessment which includes assessing the current state and trend of values and the threats affecting those values. The aim is to provide a projection of whether a natural World Heritage site is likely to conserve its values over time.

The full 2017 assessment is available online at https://www.worldheritageoutlook.iucn.org/explore-sites/wdpaid/2571. In this particular assessment, the WH values are grouped into ten broad groupings, and the level of concern and trend are then assessed for each grouping (see Table 1 below showing IUCN's ten groupings and their assessments).

Table 1. IUCN's 2017 GBRWHA Assessment

World Heritage Values	Criterion	Level of concern	Trend
Spectacular species assemblages	(vii)	High Concern	Deteriorating
Superlative natural beauty above and below the water	(vii)	High Concern	Deteriorating
Exceptional geological formations and processes linking reefs, coral cays and continental islands.	(viii)	High Concern	Deteriorating
Outstanding on-going ecological and biological processes in the evolution and development of coastal and marine ecosystems and communities of plants and animals.	(ix)	High Concern	Deteriorating
Outstanding diversity of plants including mangroves and seagrass	(x)	Low concern	Stable
Outstanding diversity of invertebrate species, including hard and soft corals	(x)	Critical	Deteriorating
Outstanding diversity of fish including threatened species	(x)	Critical	Deteriorating
Threatened reptiles	(x)	High Concern	Deteriorating
Bird diversity	(x)	Critical	Deteriorating
Threatened mammals	(x)	High Concern	Stable
Summary: Assessment of the current state and trend of World Heritage values		**High Concern**	**Deteriorating**

[7] Osipova, Shadie, Zwahlen, et al. (2017). *IUCN World Heritage Outlook 2: A conservation assessment of all natural World Heritage sites.* Gland, Switzerland: IUCN. 92pp.

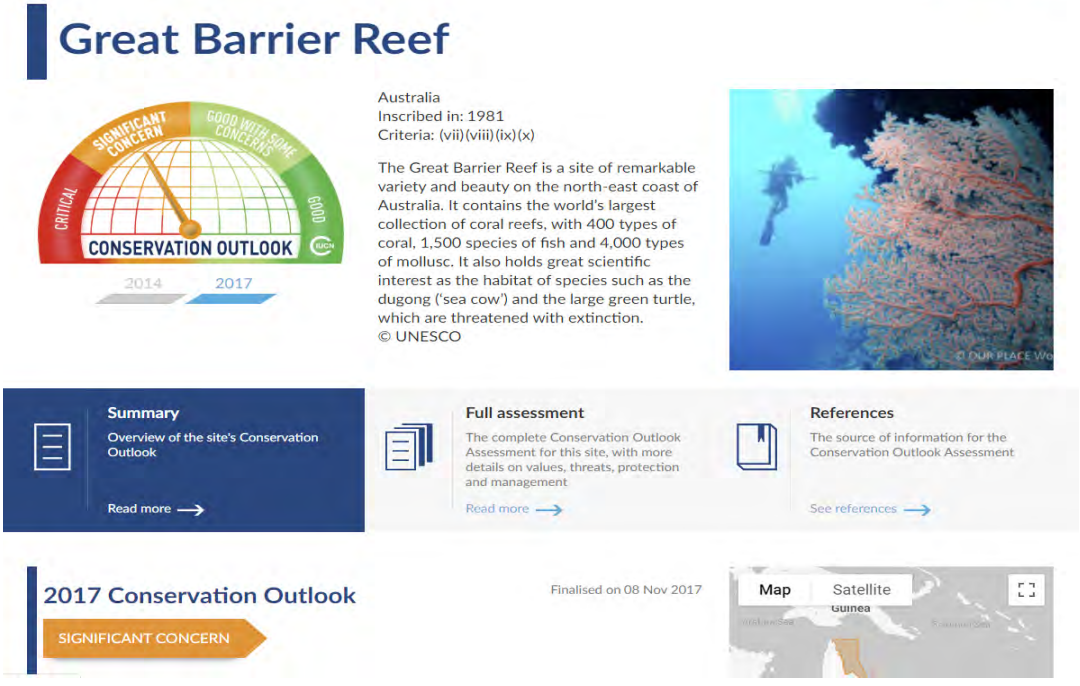
An example of one of the ten groupings encompassing the underlying values for the GBR is shown below:

> **Outstanding diversity of plants including mangroves and seagrass** (Criterion (x))
> The continental islands within the property support thousands of plant species, while the coral cays have their own distinct flora including threatened species. The shallower marine areas support 37 species of mangroves (54% of the world diversity) and 15 seagrass species covering over 6,000 km2 (23% of the world diversity). A further 40,000 km2 of deep-water seagrasses is also estimated. There is also a high diversity of macroalgae and benthic microalgae *(World Heritage Committee, 2012; State Party of Australia, 1981; 2013a; IUCN, 1981; Lucas et al., 1997; GBRMPA, 2009; Coles et al., 2009).*

The text for the other nine groupings and the relevant values are available online along with:

- the current state and trend of the values;
- the threats affecting those values; and
- the effectiveness of protection and management

Both the 2014 and 2017 versions of the IUCN World Heritage Outlook have rated the GBR overall as of **'Significant concern'** (see the four-point scale shown below). This is as a result of the above assessment of values and considers, in particular, the overall trend and the level of concern.



2.4 2019 Outlook Report

In 2019, GBRMPA again assessed the heritage values of the GBR Region as part of the five-yearly Outlook Report. The GBR Marine Park Regulations (see Appendix 2) were slightly amended in 2019. These changes came into effect 1 April 2019 but were not correctly identified in the 2019 Outlook Report[8].

The rating scale in the 2019 Outlook Report is shown below, followed by the actual assessment. Interestingly, in the 2019 assessment, GBRMPA introduced a 'borderline' assessment where a criterion *.. is considered close to satisfying the adjacent grading statement.* Three of the assessments of the criteria in the 2019 report are borderline; when compared with the 2014 assessments, the table below shows a decline in the assessments for all four criteria and integrity.

Figure 3. World Heritage assessment in GBR Outlook Report 2019

4.6.1 Natural heritage values — world heritage value and national heritage value

The assessment statements for Section 4.6.1 regarding natural heritage values are standalone and relevant to the assessment of the world heritage and national heritage values only.

Grading statements — natural heritage values

Very good
All elements necessary to maintain the outstanding universal value are essentially intact and their overall condition is stable or improving. Available evidence

Good
Some loss or alteration of the elements necessary to maintain the outstanding universal value has occurred, but their overall condition is not causing persistent or substantial effects

Poor
Loss or alteration of many elements necessary to maintain outstanding universal value has occurred, which is leading to a significant reduction in this element of outstanding universal

Very poor
Loss or alteration of most elements necessary to maintain the outstanding universal value has occurred, causing a major loss of outstanding universal value.

Borderline
Indicates where a component or criterion is considered close to satisfying the adjacent grading statement.

Trend since last report

↑ Improved
↔ Stable
↓ Deteriorated
– No consistent trend

Confidence

● Adequate high-quality evidence and high level of consensus
◐ Limited evidence or limited consensus

Grade and trend			Confidence		Criterion and component summaries
2009	2014	2019	Grade	Trend	
		↓			**Natural heritage values – world heritage value and national heritage value** The Reef's world heritage and national heritage value represents the outstanding universal value of the Region. Outstanding universal value remains, however, the grade is borderline with poor because the condition of the property has deteriorated to varying extents with respect to criteria vii, viii, ix and x. While the property remains whole and intact, ecosystem resilience is deteriorating and the property's size is becoming less effective as a buffer against these disturbances.
		↓	◐	◐	**Natural beauty and natural phenomena:** At a broad scale, the Region retains much of its spectacular scenery. However, its natural beauty is being affected in some areas (for example, by poor inshore water quality). Components of natural phenomena, such as turtle breeding, whale migration and coral spawning, continue but these elements (criterion vii) are being increasingly challenged by climate change, resulting in the condition being good borderline poor. Much of the evidence is inferred from the assessments in Chapters 2 and 3.
		↓	◐	◐	**Major stages of the Earth's evolutionary history:** The Reef's ability to regenerate and grow over millennia following periods of climatic and sea-level change is well documented. However, new evidence has identified that some alteration to processes that influence reef formation, and maintain sediment accumulation on reefs and islands has occurred. This alteration is intensifying in a negative way due to climate change (criterion viii).
		↓	◐	◐	**Ecological and biological processes:** Overall, some ecological and biological processes (criterion ix) remain in good condition. However, many ecological processes have deteriorated since 2014 due to the combined effects of climate change and inshore land-based run-off. As a result, the condition is considered good borderline poor.
		↓	◐	◐	**Habitats for conservation of biodiversity:** The property contains a diverse range of habitats (criterion x), many of which are under pressure. Overall, significant habitat reduction and alteration in a number of areas has led to persistent and substantial effects on populations of some dependent species.
		↓	◐	◐	**Integrity:** While the property remains whole and intact, its integrity is deteriorating. An altered disturbance regime due to climate change has impaired the resilience of the ecosystem resulting in the condition being good borderline poor. The property's size is becoming less effective as a buffer against Reef-wide disturbances.
					Natural heritage values: This component has been absorbed into the assessment of the processes and habitats criteria.

[8] The excerpt from the GBR Regulations quoted on p. 85 of the OR refers to paragraph 116A(2)(a) of the 1983 Regulations; whereas the correct reference should be to paragraph 176 of the 2019 Regulations. Similarly, Appendix 1 refers to the (repealed) 1983 Regulations but does not quote the correct wording from the 2019 Regulations (this is explained in Appendix 2 of this review).

Again, this specific assessment does not assess the WH values (as required by the legislation) but rather assesses the four World Heritage criteria and integrity. How these assessment levels were derived is not clear.

2.5 Linking the 2019 Outlook Report to the GBR's Outstanding Universal Value

The 2019 OR assesses around 140 components within a broad analysis of the GBR's natural, Indigenous and historic heritage values.

Appendix 3 of the 2019 OR was an attempt to 'map' many of these components against the Reef's OUV. In doing so, it highlights the current World Heritage criteria (*italic text in parentheses*) as well as the original WH criteria applied at the time of inscription [*italic text in square brackets*]. The latter has been endorsed by IUCN and approved by the WH Committee as the correct application of a Retrospective SoOUV for the GBR (hereafter referred to as the SoOUV).

It is important to note the approved SoOUV for the Great Barrier Reef World Heritage Area did use the wording of criteria at the time of inscription (i.e. text in square brackets) - but also used the contemporary numbering of the criteria, i.e. (vii)-(x)) as was advised by IUCN. Today the SoOUV wording remains the official statement adopted by the WH Committee as the baseline for assessing whether the values that together make up the OUV are being maintained.

This effectively means the original wording for the criteria should be the basis for determining whether the WH values that make up the SoOUV are being maintained. Similarly, the date of inscription on the WH List (i.e. 1981) is the correct baseline against which assessments should be made (to negate the issue of 'shifting baselines'[9] if a new baseline is reset with every new Outlook Report).

[9] In 1995, Daniel Pauly identified a **shifting baselines** syndrome (SBS), where "each generation of fisheries scientists accepts as a **baseline** the stock size and species composition that occurred at the beginning of their careers, and uses this to evaluate changes" (Pauly 1995: 430). **Beyond Baselines: Rethinking Priorities for Ocean Conservation** https://www.ecologyandsociety.org/vol14/iss1/art14/main.html

Appendix 3 in the OR lists the relevant components in the Outlook Report against the relevant WH criteria (see Figure 4). The Great Barrier Reef Region Strategic Assessment (2014) introduced an assessment of the Reef's OUV based on 41 attributes (shown by the numbers in parentheses below and discussed on pp. 7-10 above).

Figure 4. Screen shot of part of Appendix 3, GBR Outlook Report 2019 (pp 276-278).

Outlook Report 2019 Components	**World Heritage Area** Great Barrier Reef World Heritage Area
	Statement of outstanding universal value: 38 attributes *(vii) contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance* *[iii] unique, rare or superlative natural phenomena, formations or features or areas of exceptional natural beauty, such as superlative examples of the most important ecosystems to man*
2.3.5 Coral reefs 2.4.4 Corals 2.4.7 Bony fishes 4.5.1 Social heritage values 4.5.2 Aesthetic heritage values 8.3.1 Coral reef case study	(1) Superlative natural **beauty** above and below the water (2) Some of the most spectacular **scenery** on Earth (3) One of a few living structures **visible** from space (4) A complex string of reefal structures along Australia's north-east coast (5) Unparalleled aerial panorama of **seascapes** comprising diverse shapes and sizes (10) Beneath the ocean surface, there is an abundance and diversity of shapes, sizes and **colours** ... Spectacular coral assemblages of hard and soft corals (11) Thousands of species of reef fish provide a myriad of **brilliant colours**, shapes and sizes (12) The internationally renowned **Cod Hole** is one of many significant **tourist** attractions
2.3.1 Islands 2.3.2 Beaches and coastlines 2.4.10 Marine turtles 2.4.12 Seabirds 4.2.2 Natural beauty and phenomena 8.3.5 Loggerhead turtles case study	(6) Whitsunday islands provide a magnificent vista of green vegetated **islands** and white sandy beaches spread over azure waters (8) On many of the cays there are spectacular and globally important breeding colonies of **seabirds** and marine **turtles** (9) Raine Island is the world's largest green **turtle** breeding area
2.3.3 Mangrove forests 2.3.2 Beaches and coastlines 2.4.1 Mangroves 3.5.1 Saltmarshes 3.5.2 Freshwater wetlands 3.5.3 Forested floodplain 3.5.4 Heath and shrublands 3.5.5 Grass and sedgelands 3.5.6 Woodlands and forests 3.5.7 Rainforests	(7) Vast **mangrove** forests in Hinchinbrook Channel, or the rugged vegetated mountains and lush **rainforest** gullies
2.3.5 Coral reefs 2.4.3 Corals 2.4.10 Marine turtles 2.4.14 Whales 8.3.1 Coral reef case study 8.3.5 Loggerhead turtles case study 8.3.7 Humpback whales case study	(13) Superlative natural phenomena include the annual **coral** spawning, migrating **whales**, nesting **turtles**, and significant **spawning aggregations** of many fish species

While Appendix 3 lists key values and attributes that have been assessed in the OR, it provides no assessment of them nor any indication of their current condition or trend. While Appendix 3 is of some interest, neither it nor Table 4.6.1 (on p. 103 of OR) fulfil the legislative requirement, i.e. provide an assessment of the relevant heritage values (noting 'heritage values' includes the WH values).

The 2019 OR, however, does assess many values or attributes that collectively do contribute to each of the four WH criteria. For example, examining each of the criterion in turn:

Criterion (vii): superlative natural phenomena or exceptional natural beauty

(vii) contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance [iii] unique, rare or superlative natural phenomena, formations or features or areas of exceptional natural beauty, such as superlative examples of the most important ecosystems to man.

The wording from the SoOUV for this criterion is:

The GBR is of superlative natural beauty above and below the water and provides some of the most spectacular scenery on earth. It is one of a few living structures visible from space, appearing as a complex string of reefal structures along Australia's northeast coast. From the air, the vast mosaic patterns of reefs, islands and coral cays produce an unparalleled aerial panorama of seascapes comprising diverse shapes and sizes. The Whitsunday Islands provide a magnificent vista of green vegetated islands and spectacular sandy beaches spread over azure waters. This contrasts with the vast mangrove forests in

Hinchinbrook Channel, and the rugged vegetated mountains and lush rainforest gullies that are periodically cloud-covered on Hinchinbrook Island. On many of the cays there are spectacular and globally important breeding colonies of seabirds and marine turtles, and Raine Island is the world's largest green turtle breeding area. On some continental islands, large aggregations of over-wintering butterflies periodically occur. Beneath the ocean surface, there is an abundance and diversity of shapes, sizes and colours; for example, spectacular coral assemblages of hard and soft corals, and thousands of species of reef fish provide a myriad of brilliant colours, shapes and sizes. The internationally renowned Cod Hole near Lizard Island is one of many significant tourist attractions. Other superlative natural phenomena include the annual coral spawning, migrating whales, nesting turtles, and significant spawning aggregations of many fish species.

The 12 values shown in Figure 5 below are highlighted above in the relevant SoOUV wording; these key values have been assessed in the 2019 OR and are effectively 'indicators' for parts of criterion (vii). How they have been assessed in the 2019 OR is shown below:

Figure 5. Values assessed in GBR Outlook Report 2019 relevant to criteria (vii)

Grade and trend			Confidence		Criterion and component summaries
2009	2014	2019	Grade	Trend	
	↓	↔	◐	◐	**Islands:** Localised damage to some islands has occurred from severe weather, temperature extremes and pests. Recovery from past impacts is occurring and monitoring of island condition is increasing.
	↔	↔	◐	◐	**Mainland beaches and coastlines:** Some beaches and coastlines have been modified as a result of natural processes, coastal development and climate change. However, most remain in a relatively natural state.
	↔	↔	◐	◐	**Mangrove forests:** Cyclones have caused localised habitat loss and degradation; recovery is occurring.
	↓	–	●	●	**Seagrass meadows:** Degradation of inshore seagrass meadows has occurred in a number of areas and recovery has been slowed by a number of disturbances. The absence of seed banks and low reproductive effort have resulted in many seagrass meadows being vulnerable.
	↓	↓	●	●	**Coral reefs:** Multiple severe disturbances have caused widespread damage and loss of coral reef habitat in a number of areas. Coral recruitment has declined significantly. Evidence of cascading effects on coral dependent species, such as fish and invertebrates is emerging.
	↓	↓	◐	◐	**Bony fishes:** Little is known about the condition of most bony fish species on a Region-wide scale given it is a highly diverse group. Some coral-dependent fishes have decreased in areas affected by mass bleaching events. Some herbivore populations have remained stable or increased in some areas. Current extraction rates for some fished bony fish species are considered sustainable, however, there are concerns for other species. There is likely to be a lag in detecting effects on bony fishes following multiple impacts on their habitat. Upd
	–	–	●	◐	**Marine turtles:** Heightened concerns exist for the future of loggerhead, hawksbill and northern green turtle populations. The southern green turtle population continues to recover. The trend for flatback turtles is not clear.
	–	–	◐	◐	**Seabirds:** Limited information is available on the condition and trend of seabirds. Reef-wide trends indicate slight declines in six seabird populations between 1980 and 2017. The population of one species is increasing.
		–	○	○	**Shorebirds:** Population estimates for the Region's shorebirds are not differentiated from the national level analyses, making condition assessments difficult for the Region. Large numbers of multiple shorebird species have declined in the Mackay area, whereas other areas have retained populations of shorebird species.
	↑	↔	◐	◐	**Whales:** Populations of whale species within the Region are believed to be currently stable. Humpback whales have recovered strongly. Climate change is the greatest threat to baleen whale populations and the related effect on their food sources outside the Region.
		↔	◐	◐	**Rainforests:** Extent in the catchment remains stable. Although little is known about the condition of this ecosystem, the inferred protection of rainforests in protected areas increases the confidence in this grade.
		↓	◐	○	**Aesthetic heritage values:** Aesthetic beauty is closely aligned to the condition of the ecosystem. Strong evidence has established that several disturbances have damaged parts of the Reef's naturalness. Widespread and localised impacts are also inferred to have diminished some of the Region's aesthetic heritage values.

Summation: In the 2019 OR, a single assessment is given for Criterion (vii) as shown below (i.e. Good, borderline poor, with a deteriorating trend). The wording in the right-hand column (below) provides some justification, but just how each of these single high-level assessments at the criterion level was derived is not clear in the OR.

Grade and trend			Confidence		Criterion and component summaries
2009	2014	2019	Grade	Trend	
		↓	◐	◐	**Natural beauty and natural phenomena:** At a broad scale, the Region retains much of its spectacular scenery. However, its natural beauty is being affected in some areas (for example, by poor inshore water quality). Components of natural phenomena, such as turtle breeding, whale migration and coral spawning, continue but these elements (criterion vii) are being increasingly challenged by climate change, resulting in the condition being good borderline poor. Much of the evidence is inferred from the assessments in Chapters 2 and 3.

Recommendation:

It is therefore proposed that an assessment of WH values (as required by the legislation) follows the step-wise process outlined above (i.e. building up from key component values/attributes that are indicators of parts of the relevant criterion in the SoOUV). As outlined further below, a single overall assessment at the broad criterion level is not actually recommended, but if it were to be applied, how such an assessment was derived can still be justified. The important point, however, is that an assessment of the heritage values (rather than assessing the WH criteria) complies with the legislated requirement and needs to be clearly demonstrated in the OR (e.g. by assessing the 12 values as shown in Figure 5).

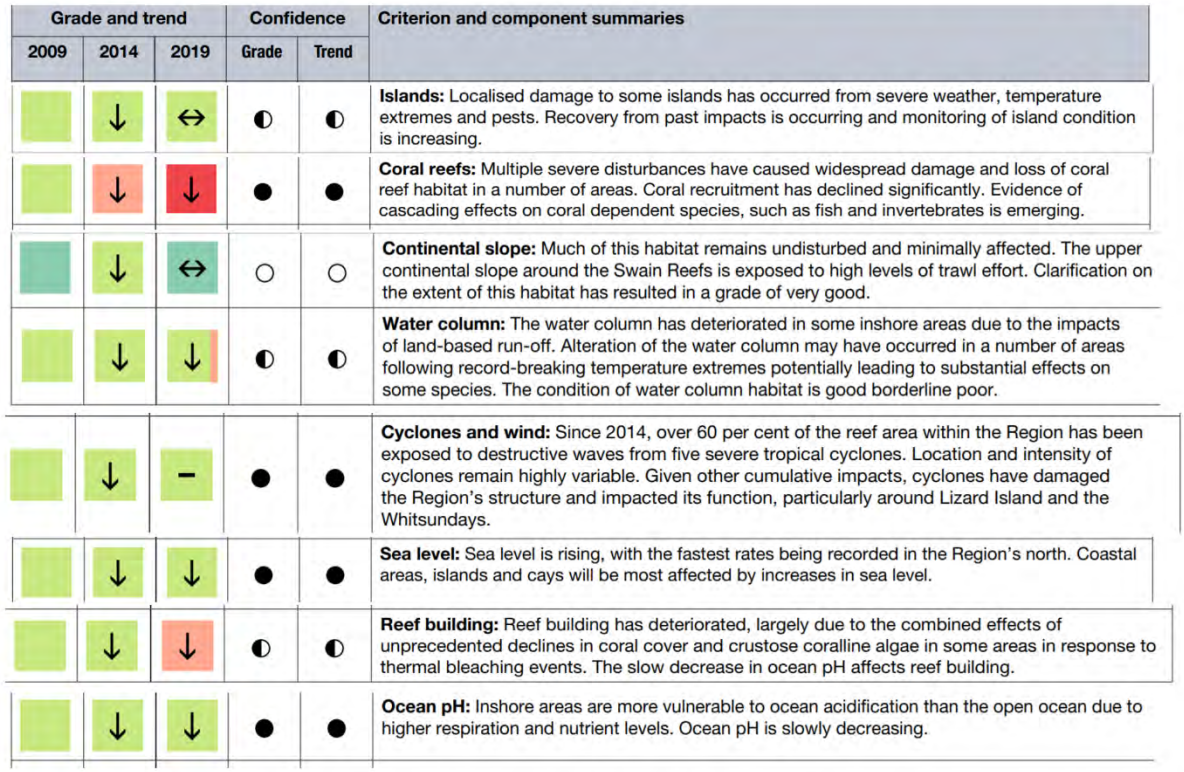
Criterion (viii): Major stages of the Earth's evolutionary history

(viii) be outstanding examples representing major stages of Earth's history, including the record of life, significant ongoing geological processes in the development of landforms, or significant geomorphic or physiographic features [i] outstanding examples representing the major stages of the Earth's evolutionary history.

The wording from the SoOUV for this criterion:

The GBR, extending 2,000 kilometres along Queensland's coast, is a globally outstanding example of an ecosystem that has evolved over millennia. The area has been exposed and flooded by at least four glacial and interglacial cycles, and over the past 15,000 years reefs have grown on the continental shelf. During glacial periods, sea levels dropped, exposing the reefs as flat-topped hills of eroded limestone. Large rivers meandered between these hills and the coastline extended further east. During interglacial periods, rising sea levels caused the formation of continental islands, coral cays and new phases of coral growth. This environmental history can be seen in cores of old massive corals. Today the GBR forms the world's largest coral reef ecosystem, ranging from inshore fringing reefs to mid-shelf reefs, and exposed outer reefs, including examples of all stages of reef development. The processes of geological and geomorphological evolution are well represented, linking continental islands, coral cays and reefs. The varied seascapes and landscapes that occur today have been moulded by changing climates and sea levels, and the erosive power of wind and water, over long time periods. One-third of the GBR lies beyond the seaward edge of the shallower reefs; this area comprises continental slope and deep oceanic waters and abyssal plains.

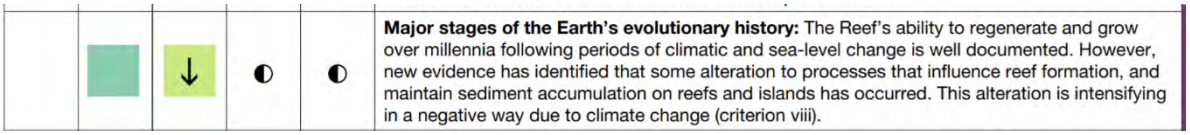
Figure 6. Values assessed in GBR Outlook Report 2019 relevant to criteria (viii)



Grade and trend			Confidence		Criterion and component summaries
2009	2014	2019	Grade	Trend	
	↓	↔	◐	◐	**Islands:** Localised damage to some islands has occurred from severe weather, temperature extremes and pests. Recovery from past impacts is occurring and monitoring of island condition is increasing.
	↓	↓	●	●	**Coral reefs:** Multiple severe disturbances have caused widespread damage and loss of coral reef habitat in a number of areas. Coral recruitment has declined significantly. Evidence of cascading effects on coral dependent species, such as fish and invertebrates is emerging.
	↓	↔	○	○	**Continental slope:** Much of this habitat remains undisturbed and minimally affected. The upper continental slope around the Swain Reefs is exposed to high levels of trawl effort. Clarification on the extent of this habitat has resulted in a grade of very good.
	↓	↓	◐	◐	**Water column:** The water column has deteriorated in some inshore areas due to the impacts of land-based run-off. Alteration of the water column may have occurred in a number of areas following record-breaking temperature extremes potentially leading to substantial effects on some species. The condition of water column habitat is good borderline poor.
	↓	–	●	●	**Cyclones and wind:** Since 2014, over 60 per cent of the reef area within the Region has been exposed to destructive waves from five severe tropical cyclones. Location and intensity of cyclones remain highly variable. Given other cumulative impacts, cyclones have damaged the Region's structure and impacted its function, particularly around Lizard Island and the Whitsundays.
	↓	↓	●	●	**Sea level:** Sea level is rising, with the fastest rates being recorded in the Region's north. Coastal areas, islands and cays will be most affected by increases in sea level.
	↓	↓	◐	◐	**Reef building:** Reef building has deteriorated, largely due to the combined effects of unprecedented declines in coral cover and crustose coralline algae in some areas in response to thermal bleaching events. The slow decrease in ocean pH affects reef building.
	↓	↓	●	●	**Ocean pH:** Inshore areas are more vulnerable to ocean acidification than the open ocean due to higher respiration and nutrient levels. Ocean pH is slowly decreasing.

The above eight assessments of key values/attributes address some of the parts that collectively contribute to criterion (viii); these eight are highlighted in the SoOUV wording above.

In the 2019 OR, the single assessment for Criterion (viii) is shown below (i.e. Good, with a deteriorating trend). However, similar to the other criterion-level assessments, how that overall summation was derived is not clear in the 2019 OR. Again, a step-wise process similar to that shown above is recommended.



		↓	◐	◐	**Major stages of the Earth's evolutionary history:** The Reef's ability to regenerate and grow over millennia following periods of climatic and sea-level change is well documented. However, new evidence has identified that some alteration to processes that influence reef formation, and maintain sediment accumulation on reefs and islands has occurred. This alteration is intensifying in a negative way due to climate change (criterion viii).

Criterion (ix): Ecological and biological processes

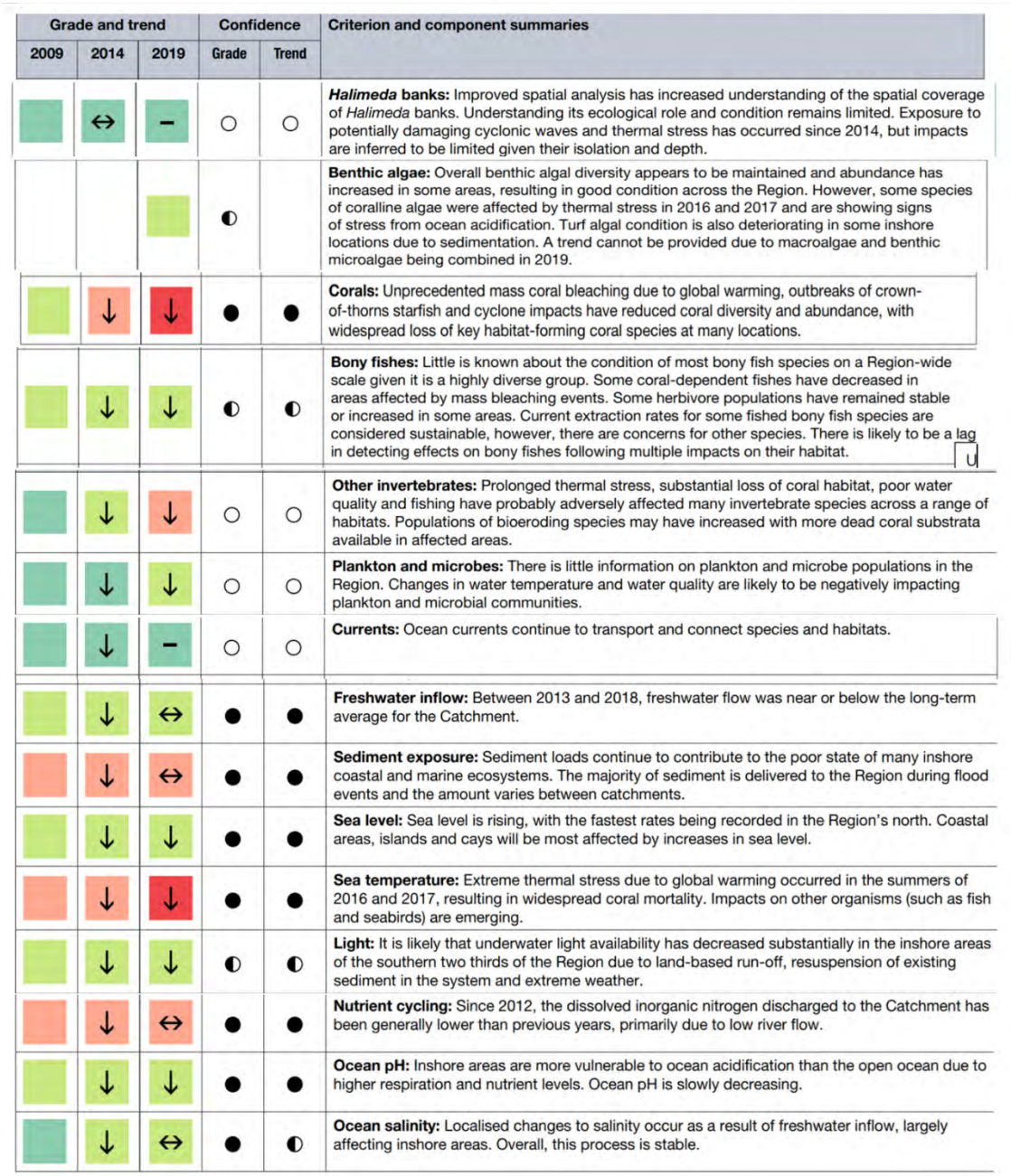
(ix) be outstanding examples representing significant ongoing ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals [ii] outstanding examples representing significant ongoing geological processes, biological evolution and man's interaction with his natural environment.

The wording from the SoOUV for this criterion:

The globally significant diversity of reef and island morphologies reflects ongoing geomorphic, oceanographic and environmental processes. The complex cross-shelf, longshore and vertical connectivity is influenced by dynamic oceanic currents and ongoing ecological processes such as upwellings, larval dispersal and migration. Ongoing erosion and accretion of coral reefs, sand banks and coral cays combine with similar processes along the coast and around continental islands. Extensive beds of Halimeda algae represent active calcification and accretion over thousands of years. Biologically the unique diversity of the GBR reflects the maturity of an ecosystem that has evolved over millennia; evidence exists for the evolution of hard corals and other fauna. Globally significant marine faunal groups include over 4,000 species of molluscs, over 1,500

species of fish, plus a great diversity of sponges, anemones, marine worms, crustaceans, and many others. The establishment of vegetation on the cays and continental islands exemplifies the important role of birds, such as the Pied Imperial Pigeon, in processes such as seed dispersal and plant colonisation.
Human interaction with the natural environment is illustrated by strong ongoing links between Aboriginal and Torres Strait Islanders and their sea-country and includes numerous shell deposits (middens) and fish traps, plus the application of story places and marine totems.

Figure 7. Values assessed in GBR Outlook Report 2019 relevant to criteria (ix)



Grade and trend			Confidence		Criterion and component summaries
2009	2014	2019	Grade	Trend	
	↔	–	○	○	***Halimeda* banks:** Improved spatial analysis has increased understanding of the spatial coverage of *Halimeda* banks. Understanding its ecological role and condition remains limited. Exposure to potentially damaging cyclonic waves and thermal stress has occurred since 2014, but impacts are inferred to be limited given their isolation and depth.
			◐		**Benthic algae:** Overall benthic algal diversity appears to be maintained and abundance has increased in some areas, resulting in good condition across the Region. However, some species of coralline algae were affected by thermal stress in 2016 and 2017 and are showing signs of stress from ocean acidification. Turf algal condition is also deteriorating in some inshore locations due to sedimentation. A trend cannot be provided due to macroalgae and benthic microalgae being combined in 2019.
	↓	↓	●	●	**Corals:** Unprecedented mass coral bleaching due to global warming, outbreaks of crown-of-thorns starfish and cyclone impacts have reduced coral diversity and abundance, with widespread loss of key habitat-forming coral species at many locations.
	↓	↓	◐	◐	**Bony fishes:** Little is known about the condition of most bony fish species on a Region-wide scale given it is a highly diverse group. Some coral-dependent fishes have decreased in areas affected by mass bleaching events. Some herbivore populations have remained stable or increased in some areas. Current extraction rates for some fished bony fish species are considered sustainable, however, there are concerns for other species. There is likely to be a lag in detecting effects on bony fishes following multiple impacts on their habitat.
	↓	↓	○	○	**Other invertebrates:** Prolonged thermal stress, substantial loss of coral habitat, poor water quality and fishing have probably adversely affected many invertebrate species across a range of habitats. Populations of bioeroding species may have increased with more dead coral substrata available in affected areas.
	↓	↓	○	○	**Plankton and microbes:** There is little information on plankton and microbe populations in the Region. Changes in water temperature and water quality are likely to be negatively impacting plankton and microbial communities.
	↓	–	○	○	**Currents:** Ocean currents continue to transport and connect species and habitats.
	↓	↔	●	●	**Freshwater inflow:** Between 2013 and 2018, freshwater flow was near or below the long-term average for the Catchment.
	↓	↔	●	●	**Sediment exposure:** Sediment loads continue to contribute to the poor state of many inshore coastal and marine ecosystems. The majority of sediment is delivered to the Region during flood events and the amount varies between catchments.
	↓	↓	●	●	**Sea level:** Sea level is rising, with the fastest rates being recorded in the Region's north. Coastal areas, islands and cays will be most affected by increases in sea level.
	↓	↓	●	●	**Sea temperature:** Extreme thermal stress due to global warming occurred in the summers of 2016 and 2017, resulting in widespread coral mortality. Impacts on other organisms (such as fish and seabirds) are emerging.
	↓	↓	◐	◐	**Light:** It is likely that underwater light availability has decreased substantially in the inshore areas of the southern two thirds of the Region due to land-based run-off, resuspension of existing sediment in the system and extreme weather.
	↓	↔	●	●	**Nutrient cycling:** Since 2012, the dissolved inorganic nitrogen discharged to the Catchment has been generally lower than previous years, primarily due to low river flow.
	↓	↓	●	●	**Ocean pH:** Inshore areas are more vulnerable to ocean acidification than the open ocean due to higher respiration and nutrient levels. Ocean pH is slowly decreasing.
	↓	↔	●	◐	**Ocean salinity:** Localised changes to salinity occur as a result of freshwater inflow, largely affecting inshore areas. Overall, this process is stable.

Figure 7 contd.

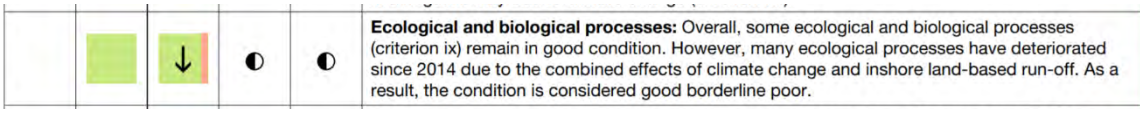
	↔	–	○	○	**Microbial processes:** Microbial processes are central to the flow of carbon through the ecosystem and are sensitive to changes in environmental conditions. Environmental stressors associated with a warming climate have disrupted microbial processes in corals and other organisms, lowering their ability to resist bleaching and disease. Very little information exists on microbial processes across the Region.
	↓	↓	◐	◐	**Particle feeding:** Particle feeding is undertaken by a broad range of species, including echinoderms, molluscs, sponges and corals. High nutrient levels have affected some particle feeders. Following two thermal stress events, there have been significant declines in particle-feeding corals in some areas. It is also likely that particle-feeding fish, which rely heavily on coral habitats for shelter, have also decreased.
	–	–	◐	◐	**Primary production:** Some seafloor primary producers, such as seagrasses and benthic algae, have increased in some areas. However, high levels of nutrients, sediment and temperature are causing negative impacts. Corals have declined sharply. Phytoplankton is variable across the Region and depends on a combination of freshwater inflow and nutrients.
	↓	↔	◐	◐	**Herbivory:** The process of herbivory supports nutrient cycling, is important for reinforcing a coral-dominated state through the removal of competing algae, and increases the productivity of seagrass meadows. Fish herbivore abundance has generally remained stable across the Region, with some changes in offshore locations. In high-sediment areas, and where macroalgae are dense, herbivory is reduced. The condition of herbivory as a process across the Region and the mechanisms that affect it are not well understood.
	–	–	◐	◐	**Predation:** Generally, changes in the abundance of reef-associated predators across the Region have been variable. A large group of predators, the sharks and rays, has been assessed as being in poor condition.
	↓	↓	◐	●	**Symbiosis:** Based on the unprecedented decline of coral cover and the changes in coral community composition, the majority of symbioses involving coral have been significantly affected since 2016. Many symbiotic relationships between small benthic invertebrates remain data deficient.
		↓	◐	◐	**Recruitment:** Recruitment is reduced for many key species, in particular, corals, fishes and some marine turtles and seabirds, largely due to chronic and acute disturbances.
	↓	↓	◐	◐	**Reef building:** Reef building has deteriorated, largely due to the combined effects of unprecedented declines in coral cover and crustose coralline algae in some areas in response to thermal bleaching events. The slow decrease in ocean pH affects reef building.
	↔	↓	○	○	**Competition:** Habitat loss and population declines are changing competition on a broad scale, which is likely to have flow-on effects on the fitness of organisms. It is likely that coral–algal competition has increased.
	↓	↓	◐	◐	**Connectivity:** Marine species and habitats remain connected. However, effects of climate change have altered connectivity patterns. Connectivity with some coastal ecosystems remains disrupted.

It is important to note that Criterion (ix) includes wording relevant *to 'Man's interaction with the natural environment'*, so an assessment of values for this criterion also needs to include the following values. We note that this component regrettably is mistakenly identified in Appendix 3 (p. 278 of OR) as being "Broader than OUV" whereas it is clearly part of the SoOUV (this is further discussed on pp. 36 of this report).

Figure 8. Cultural values to be included in criteria (ix) assessment

		↔	○	○	**Cultural practices, observances, customs and lore:** Loss of Indigenous knowledge is a threat to this component. It is assumed that knowledge transfer is being maintained across the Region, supported by the expansion in land and sea management and cultural activities.
		↔	○	○	**Sacred sites, sites of particular significance and places important for cultural tradition:** The locations of sacred sites are not widely known outside Traditional Owner groups, but the Keppel island region is well documented. Only a very small portion of the Region has dated archaeological sites, contributing to a lack of understanding and recognition of these important areas in management frameworks.
		↔	○	○	**Stories, songlines, totems and languages:** The location-based importance of this component, which can span land and sea, means other uses and pressures can break, damage or displace these values. This value is reliant on healthy populations of totemic species, some of which are in poor condition. The condition of this component is not well understood by managers and is inferred to be poor.
		↔	○	○	**Indigenous structures, technology, tools and archaeology:** The location-based importance of this component, which can span land and sea, means other uses and pressures can break, damage or displace these values. Some heritage components have been documented on and around islands, but limited monitoring of their condition occurs.

In the 2019 OR, the single assessment for Criterion (ix) is shown below (i.e. Good, borderline poor, with a deteriorating trend). However, similar to the other criterion-level assessments, how that overall summation was derived is not clear in the OR. A process similar to that outlined above is recommended.



We note that the text in the 2019 Outlook Report (4.2.4, p. 89) gives a more pessimistic assessment of **Ecological and biological processes**: *At a Region-wide scale, ecosystem processes have not ceased to operate. However, ecological and biological processes that are fundamental to a functioning ecosystem (for example, reef building, recruitment and symbiosis) are considered to be in poor condition.*

Criterion (x): Habitats for conservation of biodiversity

(x) contain the most important and significant natural habitats for in situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation [iv] habitats where populations of rare or endangered species of plants and animals still survive.

The wording from the SoOUV for this criterion:

The enormous size and diversity of the GBR means it is one of the richest and most complex natural ecosystems on earth, and one of the most significant for biodiversity conservation. The amazing diversity supports tens of thousands of marine and terrestrial species, many of which are of global conservation significance. As the world's most complex expanse of coral reefs, the reefs contain some 400 species of corals in 60 genera. There are also large ecologically important inter-reefal areas. The shallower marine areas support half the world's diversity of mangroves and many seagrass species. The waters also provide major feeding grounds for one of the world's largest populations of the threatened dugong. At least 30 species of whales and dolphins occur here, and it is a significant area for humpback whale calving. Six of the world's seven species of marine turtle occur in the GBR. As well as the world's largest green turtle breeding site at Raine Island, the GBR also includes many regionally important marine turtle rookeries. Some 242 species of birds have been recorded in the GBR. Twenty-two seabird species breed on cays and some continental islands, and some of these breeding sites are globally significant; other seabird species also utilize the area. The continental islands support thousands of plant species, while the coral cays also have their own distinct flora and fauna.

Figure 9. Values assessed in GBR Outlook Report 2019 relevant to criteria (x)

Grade and trend			Confidence		Criterion and component summaries
2009	2014	2019	Grade	Trend	
	↓	↓	●	●	**Coral reefs:** Multiple severe disturbances have caused widespread damage and loss of coral reef habitat in a number of areas. Coral recruitment has declined significantly. Evidence of cascading effects on coral dependent species, such as fish and invertebrates is emerging.
	↔	↓	◐	○	**Lagoon floor:** Some areas of the lagoon floor have been exposed to prolonged thermal stress, impacts associated with dredging and disposal, bottom trawling, shipping and potentially damaging cyclonic waves.
	↔	↓	◐	○	**Shoals:** Underwater mapping has increased understanding of shoal extent but not condition. Since 2014, over 10 per cent of shoals have been exposed to potentially damaging cyclonic waves and many have been exposed to prolonged thermal stress.
	↔	↔	◐	◐	**Mangroves:** The diversity and abundance of mangrove species are being maintained, with several new species being recorded in the Region.
	↓	↔	◐	◐	**Seagrasses:** Inshore seagrass community composition continues to change in many inshore meadows as the habitat recovers from past disturbances.
	↓	↔	◐	◐	**Islands:** Localised damage to some islands has occurred from severe weather, temperature extremes and pests. Recovery from past impacts is occurring and monitoring of island condition is increasing.
	–	–	●	◐	**Marine turtles:** Heightened concerns exist for the future of loggerhead, hawksbill and northern green turtle populations. The southern green turtle population continues to recover. The trend for flatback turtles is not clear.
	–	–	◐	◐	**Seabirds:** Limited information is available on the condition and trend of seabirds. Reef-wide trends indicate slight declines in six seabird populations between 1980 and 2017. The population of one species is increasing.
		–	○	○	**Shorebirds:** Population estimates for the Region's shorebirds are not differentiated from the national level analyses, making condition assessments difficult for the Region. Large numbers of multiple shorebird species have declined in the Mackay area, whereas other areas have retained populations of shorebird species.
	↑	↔	◐	◐	**Whales:** Populations of whale species within the Region are believed to be currently stable. Humpback whales have recovered strongly. Climate change is the greatest threat to baleen whale populations and the related effect on their food sources outside the Region.
	↓	↓	○	○	**Dolphins:** Data on the Region's dolphins are very limited. Offshore dolphin species are considered more stable as they are less likely to be exposed to human-related threats than inshore dolphin species. Concerns continue for the condition of Australian humpback and snubfin dolphins (both inshore species), which may be in decline due to human-related mortality.
	↓	↑	●	●	**Dugongs:** The Region is home to globally significant populations of dugongs. Over the entire Region there is a high probability that the dugong population declined between 2005 and 2016. Along the urban coast, from Hinchinbrook south, the breeding rate has improved since the impacts of cyclone Yasi and widespread flooding in 2011.

In the 2019 OR, the single assessment for Criterion (x) is shown below (i.e. Poor, with a deteriorating trend). However, similar to the other criterion-level assessments, how that overall summation was derived is not clear in the OR.

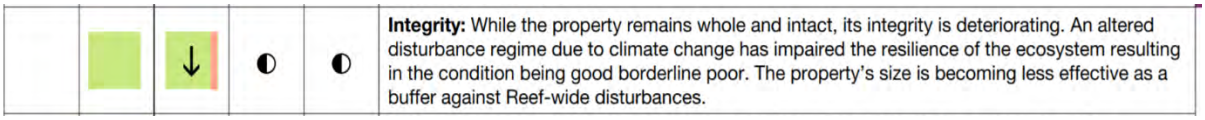
		↓	◐	◐	**Habitats for conservation of biodiversity:** The property contains a diverse range of habitats (criterion x), many of which are under pressure. Overall, significant habitat reduction and alteration in a number of areas has led to persistent and substantial effects on populations of some dependent species.

Integrity

Integrity relates to 'wholeness and intactness' of the heritage property and how it conveys the values it holds. Integrity can also relate to the size of the property (*Is it of sufficient size to continue to represent the values?*) and to any threats affecting the property (*Is it likely that the values will be degraded?*).

For the GBRWHA to adequately meet the condition of integrity, its natural attributes should be considered to be whole and intact. That is, the property includes all elements necessary to express its OUV, is of adequate size to ensure the complete representation of the features and processes which convey the property's significance, and it is appropriately protected from threats.

Appendix 4 (p.103) of the 2019 OR provides an assessment of integrity (see below) and does so by using the four 'rolled-up' assessments of each of the four WH criteria. For the reasons stated above, we do not consider that this approach provides an adequate assessment of the elements of integrity. In Section 3, we recommend an alternative approach.



IMPORTANT NOTE:
It is also important to note that we query a number of the assessment scores as shown in the 2019 OR, and then reproduced above, because the assessment grade is not necessarily supported by the evidence provided in the OR (see section 4, p. 32).

3. A new recommended approach for assessing WH values

As outlined below, it is recommended that GBRMPA consider a new way of assessing WH values for future ORs.

The recommended approach builds upon the methodology outlined above (i.e. assessing key indicator values as has already been done in previous ORs) but also utilises a collation of these values into broad groupings akin to the approach adopted by IUCN for their World Heritage ORs (see pp. 10-12 of this report). Importantly, this will meet the legislated requirements to assess the relevant heritage values of the GBR and in doing so, will be more useful for IUCN and the World Heritage Centre than a single rolled-up assessment at the criterion level.

The recommended broad groupings are set out in the left-hand column of the tables on the following pages (pages 25-29). Table 3 below shows the recommended groupings, relevant WH criterion and proposed values to be assessed.

Table 2. Recommended groupings and values for future GBR WH assessments.

Key WH Value groupings (i.e. groupings of values)	**Criterion**	**Number of values recommended to be assessed** (as per tables following)
Unique, rare or superlative natural phenomena	(vii)	8
Formations or features or areas of exceptional natural beauty	(vii)	6
Outstanding examples of an evolving Reef ecosystem	(viii)	5
Examples representing the major stages of Earth's evolutionary history	(viii)	5
Outstanding ongoing geomorphic and oceanographic processes developing marine and coastal ecosystems	(ix)	10
Outstanding ongoing ecological processes	(ix)	9
Human interaction with the natural environment	(ix)	5
Outstanding diversity of invertebrate species	(x)	5
Outstanding diversity of vertebrate marine species including threatened species	(x)	6
Outstanding bird diversity	(x)	3
Outstanding diversity of plants including mangroves and seagrass	(x)	4
Includes all elements to express its OUV and exhibit 'wholeness and intactness'	Integrity	2
Is sufficient size	Integrity	2
Is protected from adverse effects	Integrity	4
	TOTAL	**74**

In future ORs, it is recommended that both the values and the key groupings be clearly assessed and shown in the report.

It is also recommended that a similar process be adopted for other Australian WH properties.

GREAT BARRIER REEF – Values that contribute to the Outstanding Universal Value (from the Statement of OUV*)

Criterion (vii): superlative natural phenomena or exceptional natural beauty

Key values	Excerpts taken directly from Statement of OUV*	Existing assessment in Outlook Rpt	New assessment recommended
Unique, rare or superlative natural phenomena Criterion (vii)	world's most extensive **coral reef** ecosystem; a globally outstanding and significant entity; some 2,500 individual reefs of varying sizes and shapes	Coral Reefs	
	one of the richest and most complex natural ecosystems on earth (criteria x); a globally unique array of ecological communities, habitats and species; no other World Heritage property contains such biodiversity	Habitats to support species	
		Populations of species and groups of species	
	spectacular and globally important breeding colonies of **seabirds**	Seabirds	
	Raine Island is the world's largest **green turtle** breeding area	Turtles	
	annual coral spawning	Corals	Coral spawning/recruitment success
	migrating **whales**	Whales	
	significant spawning aggregations of many **fish** species	Bony Fish	
Formations or features or areas of exceptional natural beauty Criterion (vii)	some of the most spectacular maritime scenery in the world; superlative natural beauty above and below the water; a complex string of reefal structures along Australia's northeast coast; unparalleled aerial panorama of seascapes comprising diverse shapes and sizes; vast mosaic patterns of reefs, islands and coral cays	Aesthetics	Above water (i.e. aerial) aesthetics; and Underwater aesthetics
	a magnificent vista of green vegetated islands and spectacular sandy beaches spread over azure waters	Mainland beaches	Beaches on islands
	vast mangrove forests in Hinchinbrook Channel	Mangroves	
	rugged vegetated mountains and lush rainforest gullies that are periodically cloud-covered	Rainforests	
	thousands of species of reef fish provide a myriad of brilliant colours, shapes and sizes; abundance and diversity of shapes, sizes and colours	Bony fish	Fish diversity
	spectacular coral assemblages of hard and soft corals	Coral reefs	

- *The full SoOUV is shown on page 28; the excerpts highlighted in that version of the SoOUV (page 28) were used to compile these tables (i.e. the column 2nd from the LH side)

- For Criterion (vii), the above **14 assessments of WH values** (as shown in the column marked '**Existing assessments in OR'**) are recommended. While appropriate assessments are currently undertaken in the current OR process for all 14 values, it is recommended that four of these be further investigated and potentially modified as shown in the RH column (i.e. new assessment recommended) to better assess that specific WH value. For example, one existing assessment is mainland beaches but they do not occur within the GBRWHA; whereas beaches on islands are within the WHA.

Criterion (viii): Major stages of the Earth's evolutionary history

Key values	Excerpts taken directly from Statement of OUV	Existing assessment in Outlook Rpt	New assessment recommended
Outstanding examples of an evolving Reef ecosystem Criterion (viii)	continental islands	Islands	Continental islands
	coral cays	Islands	Coral cays
	the world's largest coral reef ecosystem, ranging from inshore fringing reefs to mid-shelf reefs, and exposed outer reefs	Coral Reefs	
	deep oceanic waters	Water column	
	Biologically the unique diversity of the GBR reflects the maturity of an ecosystem that has evolved over millennia (Criterion ix); evolution of hard corals and other fauna (Criterion ix)	Habitats to support species	
Examples representing the major stages of Earth's evolutionary history Criterion (viii)	new phases of coral growth	Corals	
		Reef Building	
	old massive corals	--	Massive corals
	continental slope	Continental slope	
	abyssal plains	--	Abyssal plains

For Criterion (viii), the above **10 assessments of WH values** are recommended. While appropriate assessments are currently undertaken in the OR process for eight of these values, it is recommended that four of these be further investigated and potentially modified as shown in the RH column (i.e. new assessment recommended) to better assess that specific WH value. For example, coral cays and contental islands are quite distinct and need to be assessed separately given that they are influenced differently by pressures such as cyclones; cores of massive corals do provide an excellent record of changes over time so are ideal for this assessment.

Criterion (ix): Ecological and biological processes

Key values	Excerpts taken directly from Statement of OUV	Existing assessment in Outlook Rpt	New assessment recommended
Outstanding ongoing geomorphic and oceanographic processes developing marine and coastal ecosystems Criterion (ix)	Geomorphological evolution	Freshwater inflow	
		Sediment exposure	
		Reef Building	
	Sand banks and shoals	Shoals	
	changing climates	Sea temperatures	
		Ocean pH	
	erosive power of wind and water	cyclones and winds	
	changing sea levels	Sea level	
	cross-shelf, longshore and vertical connectivity	Connectivity	
	Extensive beds of Halimeda algae	Halimeda	
Outstanding ongoing ecological processes Criterion (ix)	upwellings	--	Upwellings
	larval dispersal; connectivity	Currents	
		Connectivity	
	migration	Turtles	
	Predation	Predation	
	Symbiosis	Symbiosis	
	Herbivory	Herbivory	
	Connectivity	Connectivity	
	Outbreaks of COTs	Outbreaks of COTs	
Human interaction with the natural environment Criterion (ix)	strong ongoing links between Aboriginal and Torres Strait Islanders and their country	Cultural practices, observances, customs and lore	
		Sacred sites, sites of particular significance; places important for cultural tradition	
	the application of story places and marine totems	Stories, songlines, totems and languages	
	numerous shell deposits (middens) and fish traps	Indigenous structures, technology, tools and archaeology	
	enormous scientific and intrinsic importance	--	No. of published scientific papers in last five years

For Criterion (ix), the above **24 assessments of WH values** are recommended. While appropriate assessments are currently undertaken in the OR process for 22 of these values, it is recommended that two of these be further investigated as shown in the RH column (i.e. new assessments recommended). For example, a metric of scientific papers could be readily tracked using some standard keywords in major citation/abstract databases e.g. Scopus.

Criterion (x): Habitats for conservation of biodiversity

Key values	Excerpts taken directly from Statement of OUV	Existing assessment in Outlook Rpt	New assessment recommended
Outstanding diversity of invertebrate species Criterion (x)	the world's most complex expanse of coral reefs	Coral reefs	
	400 species of coral in 60 genera	Corals	
	4,000 species of mollusc; a great diversity of sponges, anemones, marine worms, crustaceans, and other species	Other invertebrates	
	ecologically important inter-reefal areas	Lagoon floor	
	Endemic species	--	Endemic species
Outstanding diversity of vertebrate marine species including threatened species Criterion (x)	1,500 species of fish	Bony fish	
	sharks and Rays	Sharks and rays	
	Six of the world's seven species of marine turtle; world's largest green turtle breeding site at Raine Island; many regionally important marine turtle rookeries.	Turtles	
	migrating whales; significant area for humpback whale calving	Whales	
	one of the world's largest populations of the threatened dugong; 30 species of whales and dolphins;	Dugong	
		Dolphins	
Outstanding bird diversity Criterion (x)	242 species of birds	Seabird	
		Shorebirds	
	Twenty-two seabird species; some of these breeding sites are globally significant	Seabirds	
Outstanding diversity of plants including mangroves and seagrass Criterion (x)	half the world's diversity of mangroves	Mangroves	
	seagrass species	Seagrass	
	continental islands support thousands of plant species	Rainforests	
	coral cays also have their own distinct flora	--	Coral cay flora

For Criterion (x), the above **18 assessments of WH values** are recommended. While appropriate assessments are currently undertaken in the OR process for 16 of these values, it is recommended that two of these be further investigated as shown in the RH column (i.e. new assessments recommended).

Integrity

	Dot points are taken directly from Statement of OUV	Existing assessments in Outlook Rpt	New assessment recommended
Integrity	**Property includes all elements to express its OUV and exhibit 'wholeness and intactness':** • includes virtually the entire Great Barrier Reef within the property • most habitats or species groups have the capacity to recover from disturbance or withstand ongoing pressures	--	The extent of the GBR ecosystem within the property
		--	Changes to the property boundaries
	Is sufficient size: • enhanced by the unparalleled size; • includes the fullest possible representation of marine ecological, physical and chemical processes	Size of property	
		Level of ecological representation	
	I**s protected from adverse effects** impacting the property • considers the adjoining catchments, marine and coastal zones • range of human uses such as tourism, shipping and coastal developments including ports • natural pressures also occur, including cyclones, crown-of-thorns starfish outbreaks, and sudden large influxes of freshwater from extreme weather events • some key ecological, physical and chemical processes that are essential for the long-term conservation of the marine and island ecosystems and their associated biodiversity occur outside the boundaries	Activities to limit adverse impacts from adjoining catchments, marine & coastal zones	
		Status of key anthropogenic threats inside the property (e.g. fishing, shipping, tourism)	
		Status of key anthropogenic threats originating outside the property (e.g. water quality)	
		Status of natural processes adversely impacting the property (e.g. extreme weather events, rising sea temps)	

For Integrity, the above **eight assessments** are recommended in three broad groupings, as shown in the second column. While appropriate assessments are currently undertaken in the OR process for six of these eight assessments, it is recommended that two further (easily determined) assessments be added as shown in the RH column (i.e. new assessments recommended).

Approved Statement of OUV for GBRWHA

(Highlighted excepts have been utilised in the above tables in the column 2nd from LH side)

As the world's most extensive coral reef ecosystem, the Great Barrier Reef is a globally outstanding and significant entity. Practically the entire ecosystem was inscribed as World Heritage in 1981, covering an area of 348,000 square kilometres and extending across a contiguous latitudinal range of 14° (10°S to 24°S). The Great Barrier Reef (hereafter referred to as GBR) includes extensive cross-shelf diversity, stretching from the low water mark along the mainland coast up to 250 kilometres offshore. This wide depth range includes vast shallow inshore areas, mid-shelf and outer reefs, and beyond the continental shelf to oceanic waters over 2,000 metres deep.
Within the GBR there are some 2,500 individual reefs of varying sizes and shapes, and over 900 islands, ranging from small sandy cays and larger vegetated cays, to large rugged continental islands rising, in one instance, over 1,100 metres above sea level. Collectively these landscapes and seascapes provide some of the most spectacular maritime scenery in the world.
The latitudinal and cross-shelf diversity, combined with diversity through the depths of the water column, encompasses a globally unique array of ecological communities, habitats and species. This diversity of species and habitats, and their interconnectivity, make the GBR one of the richest and most complex natural ecosystems on earth. There are over 1,500 species of fish, about 400 species of coral, 4,000 species of mollusc, and some 240 species of birds, plus a great diversity of sponges, anemones, marine worms, crustaceans, and other species. No other World Heritage property contains such biodiversity. This diversity, especially the endemic species, means the GBR is of enormous scientific and intrinsic importance, and it also contains a significant number of threatened species. At the time of inscription, the IUCN evaluation stated "… if only one coral reef site in the world were to be chosen for the World Heritage List, the Great Barrier Reef is the site to be chosen".

Criterion (vii) The GBR is of superlative natural beauty above and below the water and provides some of the most spectacular scenery on earth. It is one of a few living structures visible from space, appearing as a complex string of reefal structures along Australia's northeast coast. From the air, the vast mosaic patterns of reefs, islands and coral cays produce an unparalleled aerial panorama of seascapes comprising diverse shapes and sizes. The Whitsunday Islands provide a magnificent vista of green vegetated islands and spectacular sandy beaches spread over azure waters. This contrasts with the vast mangrove forests in Hinchinbrook Channel, and the rugged vegetated mountains and lush rainforest gullies that are periodically cloud-covered on Hinchinbrook Island. On many of the cays there are spectacular and globally important breeding colonies of seabirds and marine turtles, and Raine Island is the world's largest green turtle breeding area. On some continental islands, large aggregations of over-wintering butterflies periodically occur. Beneath the ocean surface, there is an abundance and diversity of shapes, sizes and colours; for example, spectacular coral assemblages of hard and soft corals, and thousands of species of reef fish provide a myriad of brilliant colours, shapes and sizes. The internationally renowned Cod Hole near Lizard Island is one of many significant tourist attractions. Other superlative natural phenomena include the annual coral spawning, migrating whales, nesting turtles, and significant spawning aggregations of many fish species.

Criterion (viii): The GBR, extending 2,000 kilometres along Queensland's coast, is a globally outstanding example of an ecosystem that has evolved over millennia. The area has been exposed and flooded by at least four glacial and interglacial cycles, and over the past 15,000 years reefs have grown on the continental shelf. During glacial periods, sea levels dropped, exposing the reefs as flat-topped hills of eroded limestone. Large rivers meandered between these hills and the coastline extended further east. During interglacial periods, rising sea levels caused the formation of continental islands, coral cays and new phases of coral growth. This environmental history can be seen in cores of old massive corals. Today the GBR forms the world's largest coral reef ecosystem, ranging from inshore fringing reefs to mid-shelf reefs, and exposed outer reefs, including examples of all stages of reef development. The processes of geological and geomorphological evolution are well represented, linking continental islands, coral cays and reefs. The varied seascapes and landscapes that occur today have been moulded by changing climates and sea levels, and the erosive power of wind and water, over long time periods. One-third of the GBR lies beyond the seaward edge of the shallower reefs; this area comprises continental slope and deep oceanic waters and abyssal plains.

Criterion (ix): The globally significant diversity of reef and island morphologies reflects ongoing geomorphic, oceanographic and environmental processes. The complex cross-shelf, longshore and vertical connectivity is influenced by dynamic oceanic currents and ongoing ecological processes such as upwellings, larval dispersal and migration. Ongoing erosion and accretion of coral reefs, sand banks and coral cays combine with similar processes along the coast and around continental islands. Extensive beds of Halimeda algae represent active calcification and accretion over thousands of years. Biologically the unique diversity of the GBR reflects the maturity of an ecosystem that has evolved over millennia; evidence exists for the evolution of hard corals and other fauna. Globally significant marine faunal groups include over 4,000 species of molluscs, over 1,500 species of fish, plus a great diversity of sponges, anemones, marine worms, crustaceans, and many others. The establishment of vegetation on the cays and continental islands exemplifies the important role of birds, such as the Pied Imperial Pigeon, in processes such as seed dispersal and plant colonisation. Human interaction with the natural environment is illustrated by strong ongoing links between Aboriginal and Torres Strait Islanders and their sea-country, and includes numerous shell deposits (middens) and fish traps, plus the application of story places and marine totems.

Criterion (x): The enormous size and diversity of the GBR means it is one of the richest and most complex natural ecosystems on earth, and one of the most significant for biodiversity conservation. The amazing diversity supports tens of thousands of marine and terrestrial species, many of which are of global conservation significance. As the world's most complex expanse of coral reefs, the reefs contain some 400 species of corals in 60 genera. There are also large ecologically important inter-reefal areas. The shallower marine areas support half the world's diversity of mangroves and many seagrass species. The waters also provide major feeding grounds for one of the world's largest populations of the threatened dugong. At least 30 species of whales and dolphins occur here, and it is a significant area for humpback whale calving.
Six of the world's seven species of marine turtle occur in the GBR. As well as the world's largest green turtle breeding site at Raine Island, the GBR also includes many regionally important marine turtle rookeries. Some 242 species of birds have been recorded in the GBR. Twenty-two seabird species breed on cays and some continental islands, and some of these breeding sites are globally significant; other seabird species also utilize the area. The continental islands support thousands of plant species, while the coral cays also have their own distinct flora and fauna.

Integrity

The ecological integrity of the GBR is enhanced by the unparalleled size and current good state of conservation across the property. At the time of inscription it was felt that to include virtually the entire Great Barrier Reef within the property was the only way to ensure the integrity of the coral reef ecosystems in all their diversity. A number of natural pressures occur, including cyclones, crown-of-thorns starfish outbreaks, and sudden large influxes of freshwater from extreme weather events. As well there is a range of human uses such as tourism, shipping and coastal developments including ports. There are also some disturbances facing the GBR that are legacies of past actions prior to the inscription of the property on the World Heritage list.
At the scale of the GBR ecosystem, most habitats or species groups have the capacity to recover from disturbance or withstand ongoing pressures. The property is largely intact and includes the fullest possible representation of marine ecological, physical and chemical processes from the coast to the deep abyssal waters enabling the key interdependent elements to exist in their natural relationships. Some of the key ecological, physical and chemical processes that are essential for the long-term conservation of the marine and island ecosystems and their associated biodiversity occur outside the boundaries of the property and thus effective conservation programs are essential across the adjoining catchments, marine and coastal zones.

The following conclusions and recommendations draw on our assessment of how the 2019 and 2014 Outlook Reports assessed heritage values (including WH values) and our proposals for a more explicit approach to undertaking future assessments.

Conclusions

- Among the key purposes of a SoOUV is the "basis for the future protection and management of the property" and the benchmark against which the state of conservation of a WH property is assessed.
- Recognising that many of the 'elements' of the SoOUV are very broad, an indicative value or attribute should be chosen as a surrogate for the elements within each criterion.
- A four-point grading system, along with the borderline concept, should be applied given that it mirrors that used already in Outlook and is not dissimilar to that used by IUCN to assess natural WH properties.
- The trend of the values is an essential and complementary part of any assessment of values.
- The existing wording for the grading statements in the Outlook Report should be retained.
- Given the profile accorded to World Heritage listing, the assessment of WH warrants a specific section in its own right that includes the assessment of individual values combined to provide a set of values for each WH criteria which are then grouped to provide more useful assessments of all the elements of the SoOUV.

Recommendations for assessing OUV

Based on the pros and cons of the various approaches outlined above, it is recommended that:

1. Any future assessment of OUV for the GBRWHA should comply with the legislative requirement to assess the World Heritage values, not the WH criteria as has been done in the 2014 and 2019 Outlook Reports.
2. Building on the individual values currently assessed in the Outlook Report, determine and assess broad groupings of values within the relevant WH criteria similar to those assessed by IUCN. This should be included in a separate section of the OR.
3. An assessment of the actual trend (similar to that assessed in the OR or the IUCN assessments) is essential and must be included – a key question is whether this should be benchmarked against the previous assessment or back to the date of inscription. We recommend the latter given the SoOUV is meant to be the benchmark against which the state of conservation of a WH property is assessed. There is also the potential for a problem of 'shifting baselines' if the baseline is reset at every OR.
4. To enable clear trends to be assessed, measurable indicators that are indicative of these broad grouping should be chosen; such indicators need to be clearly aligned to the four WH criteria, but also of Integrity as well as Protection and Management (i.e. all components of OUV)
5. To achieve the above recommendations, the chosen indicators for OUV need to be:
    a. measurable and repeatable
    b. drawn from the OR if possible
    c. be indicative of the entire WH property (unless relating to a specific location), but also be able to be assessed at a subregional level:

i. north, central, southern

ii. inshore, offshore

d. as far as practicable, be able to be hindcast (back to 1981 as the year of inscription on the WH list).

6. The component of Criterion (ix) that relates to *'Human interaction with the natural environment'* also needs to be included, but as a separate line (i.e. grouping).

4. Outlook 2019 assessments

The GBR 2019 OR provides a very comprehensive analysis of all aspects of the GBR Region covering the critical ecosystems and biodiversity of the Region, the social and economic benefits to local and regional communities and the nation, the effectiveness of protection and management measures, and the risks to, and resilience of the Region. For anyone interested in or associated with management of the Marine Park, it should be the first point of reference for understanding its condition and its prospects for the future and determining priorities for management and investment.

Strengths

The OR's major strength is a comprehensive analysis drawing on contemporary literature and expert elicitation. The analyses are supported by detailed reference lists allowing the reader to interrogate specific topics. Ideally the published report would be supported by an interactive web-based tool similar to the 2009 OR, allowing readers to access relevant data sets and reference material. While requiring significant upfront investment and ongoing maintenance, such a web interface would become an invaluable decision support tool for managers, key stakeholders, researchers and the public. It should also help streamline the preparation of future editions of the OR. A web-based platform should draw on the work underway by the Reef 2050 Integrated Monitoring and Reporting Program (RIMREP) on the development of a GBR-wide visualisation tool.

Since the first 2009 OR, each assessment is summarised using a traffic light report card four-grade scoring system to indicate the status and trend of the multiple criteria considered under each assessment as well as the confidence of the rankings[10].

In 2019 a "borderline" ranking was introduced. This is a good initiative as the four-grade system is very coarse. For example, on a simplistic four-grade ranking from 1-100, very good is 75-100, good is 50-75, poor is 25-50, and very poor is 0-25. The grading for some criteria is very likely to be borderline within these bands. Given that the grade is confirmed through an expert elicitation process, inevitably some level of subjectivity is inherent. The "borderline" rank also indicates the proximity of the criterion's grade to the upper or lower cut-off for the relevant grade band (i.e. close to upper cut-off of the band or lower cut-off); this is particularly useful for those criteria that have been ranked the same grade with the same trend in two or more successive reporting periods.

[10] Figure 1.5, p. 10 of the 2019 OR.

Proposed improvements

Judicious use of borderline ranking:

The 2019 OR contains around 140 assessments of criterion covering eight assessment topics. These are summarised under 27 summaries and two "outlook" assessments for the Region. The "borderline" ranking option is only used five times across all these assessments. We consider this a very limited use of an otherwise helpful addition to the Outlook ranking method. In our opinion, the borderline ranking should be used for an additional 21 criterion. Examples include:

Criterion	2019 assessment grade & trend	Revised rating	Justification for revision
Section 2.5.2 Populations of species and groups of species (p.43)			
Dolphins	Good, deteriorated	Good borderline poor	*Overall, due to multiple and cumulative threats, populations of dolphin species within the Region have probably deteriorated since 2014*. (OR, p.40)
3.7.5 Outbreaks of disease (p.81)			
Outbreaks of disease	Good, stable	Good borderline poor, deteriorated	The summary comment (p.81) and text on pp. 73-74 indicate a lower assessment of condition and trend
8.6.1 Ecosystem resilience (p.240)			
Coral trout	Good, deteriorated	Good borderline poor	The assessment was not consistent with summary text (p.240) and discussion (8.3.4, pp.231-233).

Additionally, we consider that two of the borderline rankings should be adjusted and one dropped to a lower rank. All three are under section 4.6.1 Natural heritage values (p.102) and are detailed below.

Criterion	2019 assessment grade & trend	Revised rating	Justification for revision
Overall	Good borderline poor, deteriorated	Poor borderline good, deteriorated	Lower assessment because of lower assessment for Ecological and biological processes and Integrity
Ecological and biological processes	Good borderline poor, deteriorated	Poor, deteriorated	Based on summary and text (4.2.4, p.89) - *At a Region-wide scale, ecosystem processes have not ceased to operate. However, ecological and biological processes that are fundamental to a functioning ecosystem (for example, reef building, recruitment and symbiosis) are considered to be in poor condition.* And, *the condition of one of the most critical physical processes, sea temperature, has deteriorated to very poor condition across a wide area as a result of climate change*

Integrity	Good borderline poor, deteriorated	Poor borderline good, deteriorated	The extent of impacts on biodiversity and ecosystem health, in particular, coral reefs, has seriously affected the site's integrity.

Clear correlation between evidence and published grade:

In scrutinising the assessments of criteria included in the eight assessment topics, we consider that in a number of instances there was a limited correlation between criteria assessment grades and the supporting evidence. Examples are included in the table below. While a number of our examples relate to the actual score attributed to the criterion, many relate to the trend, either the trend for the past five years, or the projected trend, or both.

Criterion	**2019 assessment grade & trend**	**Revised rating**	**Justification for revision**
Section 2.5.2 Populations of species and groups of species (p.43)			
Mangroves	Very good; stable	Good; stable	Inconsistent with 2.5.1, Mangrove forests assessed as good, stable
Dugongs	Poor; improved	Poor; stable, or partial improvement	Population decline to 2016, calving rate improvement along the urban coast, so overall situation only minor improvement.
3.7.4 Coastal ecosystems that support the GBR (p.80)			
Rainforests	Good; stable	Good borderline poor; trend deteriorated	Summary states, *little is known about the condition of this ecosystem* (p.80), yet there is long-term research based in the Wet Tropics and recent publications citing serious risks from climate change both present and future.
4.6.4 Historic heritage values – other (p.105)			
World War II features	Poor, stable	Poor, deteriorated	These are predominantly underwater wrecks that are slowing degrading through natural processes and inadvertent fishing impacts, so "stable" trend is not accurate.
9.4.1 Risks to the Region's ecosystem and heritage values (p.255)			
Land-based run-off	Very high, stable, future decreasing	Future stable	Depending on time-frame of "future", then trend closer to stable than decreasing for the next five years.

Additionally, five of the summary assessments should also be adjusted. Of particular concern is the score of "poor" given for the outlook of heritage values. Given that the overall outlook for the region's ecosystems is scored as "very poor", it is inexplicable that the outlook for the region's heritage values are ascribed a higher score given that the heritage values are underpinned by the

ecosystems of this natural World Heritage Area. The summary assessments that should be revised include:

Criterion	2019 assessment grade & trend	Revised rating	Justification for revision
3.7.3 Ecological processes (p.79)			
Overall	Good, deteriorated	Good borderline poor	Evidence provided across assessments of 10 criteria plus deteriorated trend for two consecutive assessments.
4.6 Heritage values 4.6.1 Natural heritage values (p.102)			
Overall	Good borderline poor, deteriorated	Poor borderline good, deteriorated	Lower assessment because of lower assessment for Ecological and biological processes and Integrity
6.8.2 Impacts on heritage values (p.187)			
Overall	High	High borderline very high	Result of revising Direct use impacts to high
6.8.4 Impacts on social values (p.188)			
Overall	High	High borderline very high	Result of revising Direct use impacts to high
10.4.2 Outlook for the Region's heritage values			
Overall	Poor, deteriorated, deteriorating	Very poor	This assessment should be consistent with the assessment for the Region's ecosystems (very poor) given that the heritage values are underpinned by the ecosystem values of the Region.

We note that the assessment of existing protection and management was done by independent consultants, although the translation of their report into an assessment summary in the OR was done by GBRMPA. We have reviewed Table 7.4 (p.222 of OR) and consider that a number of the assessments, particularly relating to outputs and outcomes (e.g. coastal development (outputs); land-based run-off (outputs); heritage values (outputs and outcomes); recreation (outcomes); shipping (outcomes)) appear overly optimistic in their gradings in light of a range of residual management issues still needing to be addressed. We also consider that it is more appropriate for the summary assessments in the OR to use the grading language developed by the consultants, namely 'effective', 'moderately effective', 'partially effective' and 'ineffective', rather than the terms 'very good', 'good', 'poor' and 'very poor'.

Assessment of Indigenous Heritage Values:

The assessments of Indigenous Heritage values on pp. 103-104 of the 2019 OR shows four single line assessments against four broad groupings relevant to Indigenous heritage. There is no obvious process as to how these assessments were derived, and this raises various questions; for example:

1. How representative of seventy Traditional Owner groups along the GBR Coast are these four single-line assessments? Given the broad diversity of those seventy TO groups, it is unlikely they would all have the same view or perspective, so it is not clear how the disparate views of those 70 TO groups were combined into the four single line assessments in the 2019 report?
2. The confidence in the condition and trend of all four aspects is shown as *'Inferred with very limited evidence"* yet clearly GBRMPA has information for at least the areas within TUMRAs (Traditional Use Marine Use Agreements) or ILUAs (Indigenous Land Use Agreements). It is unclear in the supporting text if the information in those TUMRAs or ILUAs were used?
3. It is not clear how the overall grades were allocated (i.e. 'Poor' for three assessments and 'Good' for one). We note that there has been no change in the grades between 2014 and 2019.
4. The 'trend' arrows shown against all four assessments indicate that the trend for all these values since 2014 is 'stable' which seems to conflict with other statements elsewhere in the OR (e.g. in the assessment for stories, totems etc., it states *This value is reliant on healthy populations of totemic species …,* yet various species which are totems are clearly shown as a deteriorating trend elsewhere in the OR).

For all the above reasons, a finer level of assessment of Indigenous Heritage that is more representative of the seventy TO groups should be considered for future ORs.

Omitting part of the SoOUV

The approved SoOUV for the GBR on the UNESCO website[11] includes the following words at the end of Criterion (ix):

> *Human interaction with the natural environment is illustrated by strong ongoing links between Aboriginal and Torres Strait Islanders and their sea-country, and includes numerous shell deposits (middens) and fish traps, plus the application of story places and marine totems.*

Of concern, therefore, is the omission in several parts of the 2019 Outlook Report of this part of the approved SoOUV or an apparent belief that *man's interaction with the natural environment* is not part of the approved SoOUV. This occurs in two parts of the 2019 OR, namely:

- Sections 4.2.1 (p. 87) – this page refers only to the current WH criteria but makes no attempt to refer to the relevant wording in the approved SoOUV as outlined above;
- Appendix 3 (p. 278) also makes the incorrect assumption that this specific wording is *Broader than outstanding universal value* (sic).

It is assumed this belief may be due to a misunderstanding of the history of the SoOUV and how it was derived, so Appendix 3 provides some background.

***GBR Region-wide assessment only**:*

All assessments are provided at the GBR Region-wide scale. However, the data presented often provides regional-based status overviews. This is important for managers when the WH property is as large as the GBR Region. Thus, where data is available it would be preferable to provide information and assessments at the appropriate scale. For example, seagrasses have distinct distribution patterns inshore compared with offshore, i.e. west to east pattern as well as water depth. For coral reefs, recruitment and reef-building indicators frequently follow a north-south

[11] https://whc.unesco.org/en/list/154

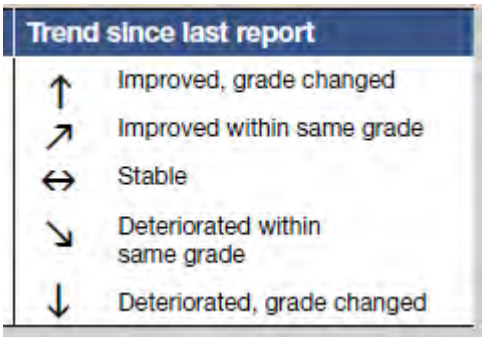
pattern and so regional assessments reflecting north, central and southern regions of the Reef would be useful.

Limited data for many indicators:

Throughout the OR reference is made to limited data availability (e.g. heath and shrublands (section 3.7.4), lagoonal floor (4.2.5), historic values generally (section 4.6), various social and economic benefits data (section 5.10.1), impacts of use (section 5.10.2)). This is not surprising given the scale of the GBR, the number of assessments undertaken, and the strong focus to date on gathering ecological and biological data. However, continuing to include assessments based on limited data for more than 15 years raises the issue as to whether or not sufficient data will ever be collected. Following finalisation of the RIMREP road map, it would be appropriate to assess whether all the assessments currently included should be repeated in future ORs. This would require an expert review to determine the critical assessments needed to provide an evidence-based OR in future years. Central to ongoing data collection will be the requirement to adequately assess the status of the values underpinning the GBR's SoOUV (see section 3, recommended new approach for assessing the status of WH values).

Trend icons can be improved:

The inclusion of trend icons (improved, stable, deteriorated or no consistent trend) since the last Outlook Report is important. We recommend introducing the approach used in the assessment of management effectiveness as this is likely to be more helpful for the reader. This would result in an additional three icons, namely:



- *improved within the same grade*
- *deteriorated within the same grade; and*
- an icon for *no consistent trend* (**-**).

At times in the OR, it seems that the icon *no consistent trend* has been used, when in fact there is insufficient data to determine a trend, e.g. sea snakes (2.5.2). It is important to be clear which of these two situations apply.

The other challenge is that the trend icon provides no indication of the scale of change. For example, where there's been a very limited improvement (e.g. dugongs) compared with potentially large-scale improvement for another criterion (e.g. Humpback whales, *recovery trend continues to increase exponentially* p.241). Clear rules as to when an improving or decreasing trend is indicated should be included in the OR or accompanying methods document, and the scale of the trend should at least be included in the discussion section for each criterion.

For the assessments of risks and long-term outlook, it is important to understand the time-frames of future trends. While time-frames are included in Figure 9.2 for risks, they are not included in the risks assessment summary, section 9.4.1 p.255. This is an oversight.

Conclusions

- Inclusion of the "borderline" assessment score is good. However, it has been used only a very limited number of times in the 2019 OR. Given the inherent uncertainties underpinning a number of the assessments and the coarse four-grade ranking system, the judicious use of "borderline" would be appropriate.

- We have identified a number of instances where the evidence provided does not appear to support the published grade. In some instances, we have found internal inconsistencies.
- The Indigenous Heritage assessments within the 2019 OR need to be improved, including addressing the questions raised in this review (see p.35-36).
- The scale of the GBR Region means that some assessments would be better presented at the appropriate subregional scale. Section 1.6 of the 2019 OR notes, *there is no standard way of dividing up the Region when interpreting the data.* (p. 11). Agreed regions should be defined prior to the 2024 OR.
- A number of improvements could be introduced to improve readers' understanding of the data presented. This would include inclusion of addition "in grade" trend indicators; and inclusion of future trends time-frames in the risks and long-term outlook assessment summaries.
- Even after 15 years and three ORs, we note that a number of the assessments show low confidence and only limited data (e.g. *Halimeda* banks, shorebirds, seabirds). We consider that priority should be given to either collecting relevant data or determining whether or not to continue including such assessments in future ORs.
- The GBR OR provides a good template for the assessment of other WH properties and the status of their natural and cultural WH values.

Recommendations.

1. Continue to utilise the borderline category in future Outlook assessments.
2. A finer level of assessment of Indigenous Heritage that is more representative of the seventy Traditional Owner groups should be considered for future ORs.
3. Agreed subregions should be defined prior to the 2024 OR to allow the inclusion of subregional scale assessments where appropriate.
4. In all assessments, the Management Effectiveness sloping trend icons should be used when there has been an improvement or deterioration, but this grade has not changed between five-yearly assessments (as shown on p.222 of 2019 OR).
5. Provide the time-frame of future trends, i.e. five years, 5-10 years, >10 years in the summary assessment tables.
6. Prioritise data collection for those key indicators currently assessed as "very good" or "good" where there are limited information and a declining trend for two consecutive assessments, for example plankton and microbes.
7. Clarify when the category of "no consistent trend" is applied. This category should not be used for data-deficient indicators; if there is insufficient data, then there needs to be a new category, and the indicator should not be given an assessment.
8. In assessing existing protection and management, it would be more appropriate to use Hockings *et al.* grading terminology of effective, moderately effective, partially effective and ineffective rather than very good, good, poor and very poor.
9. The published OR should be supported by an interactive web-based tool that allows readers to access relevant data sets and reference material.

Appendix 1. Assessment of OUV from 2014 Strategic Assessment

Table 7.11 Benchmarking the outstanding universal value of the Great Barrier Reef World Heritage Area
The assessments presented in this table are based on the same information used to assess current condition and trend in Sections 7.1 to 7.5. The references listed there also apply to this assessment.

Understanding the table

Very good: All elements necessary to maintain the outstanding universal value are essentially intact, and their overall condition is stable or improving. Available evidence indicates only minor, if any, disturbance to this element of outstanding universal value.	**Good:** Some loss or alteration of the elements necessary to maintain the outstanding universal value has occurred, but their overall condition is not causing persistent or substantial effects on this element of outstanding universal value.	**Poor:** Loss or alteration of many elements necessary to maintain outstanding universal value has occurred, which is leading to a significant reduction in this element of the outstanding universal value.	**Very poor:** Loss or alteration of most elements necessary to maintain the outstanding universal value has occurred, causing a major loss of the outstanding universal value.

Area (See Chapter 1, Figure 1.1)

GBR Great Barrier Reef Region

Trends

↑ Improving
↔ Stable
↓ Deteriorating
— No clear trend

Confidence in condition and trend

● Adequate high-quality evidence and high level of consensus
◐ Limited evidence or limited consensus
○ Very limited evidence, assessment based on anecdotal information

a) **Natural beauty and phenomena (previously criterion (iii) now criterion (vii)):** contains unique, rare or superlative natural phenomena, formations or features or areas of exceptional natural beauty, such as superlative examples of the most important ecosystems to man.

	Area	Condition and trend			
		Very good	Good	Poor	Very poor
Overview: The significant loss of coral cover, especially in areas south of about Cooktown, has reduced underwater aesthetic value, as has increasing turbidity in inshore areas. The natural beauty of large areas remains intact, especially for offshore coral reefs in the far north and aerial vistas, as well as for neighbouring islands (many of which are national parks). While many of the natural phenomena remain intact, others are likely to have deteriorated; for example, some turtle nesting locations and coral spawning.	GBR		↓		

Excerpt from statement	Comment	Area	Condition and trend: Very good	Good	Poor	Very poor	Confidence
Superlative natural beauty above and below the water	The natural beauty of most of the Region remains intact, especially for offshore coral reefs and aerial vistas, as well as for neighbouring islands. The significant loss of coral cover has reduced underwater aesthetic value.	GBR		↓			●
Some of the most spectacular scenery on Earth	Both above and below the water, the Region's scenery remains spectacular. There have been some declines in the aesthetics of inshore reefs in the southern two-thirds.	GBR		↓			●
One of a few living structures visible from space	The Reef remains visible from space and technological advances make these images more accessible.	GBR	↔				●
A complex string of reefal structures along Australia's north-east coast	Reefal structures remain intact. Recent estimates vastly increase the extent of coral with the identification of more deepwater reefs.	GBR	↔				●
Unparalleled aerial panorama of seascapes comprising diverse shapes and sizes	Aerial vistas remain spectacular, with scenic flights a popular tourism activity.	GBR	↔				●
Whitsunday Islands provide a magnificent vista of green vegetated islands and white sandy beaches spread over azure waters	The majority of the Whitsunday Islands are protected and managed as national parks. There have been some changes to island scenery, such as on resort islands.	GBR		↔			●
Vast mangrove forests in Hinchinbrook Channel, or the rugged vegetated mountains and lush rainforest gullies	All of Hinchinbrook Island is protected and managed as a national park. Patches of mangrove forests and rainforest were affected by cyclone Yasi.	GBR	↔				●
On many of the cays there are spectacular and globally important breeding colonies of seabirds and marine turtles	There have been serious declines in some populations of seabirds and some marine turtle species.	GBR			↓		●
Raine Island is the world's largest green turtle breeding area	Long-term data indicates that, since the mid-1970s, green turtle nesting on Raine Island has increased and then plateaued over the past two decades. It is thought to have declined recently.	GBR			↔		●
Beneath the ocean surface, there is an abundance and diversity of shapes, sizes and colours... Spectacular coral assemblages of hard and soft corals	Since 1988, average hard coral cover is estimated to have declined from 28 to 13.8 per cent, principally in the southern two-thirds of the Region. This is mainly due to storm damage (48 per cent), crown-of-thorns starfish (42 per cent), and bleaching (10 per cent).	GBR			↓		●

Excerpt from statement	Comment	Area	Condition and trend: Very good	Good	Poor	Very poor	Confidence
Thousands of species of reef fish provide a myriad of brilliant colours, shapes and sizes	There are about 1500 species of bony fish. Long-term monitoring of about 200 species of coral reef fish has not detected declines in the species monitored. A small number of targeted species are under significant pressure.	GBR	↔				●
The internationally renowned Cod Hole is one of many significant tourist attractions	There is anecdotal evidence of severe declines in the number and condition of potato cod at Cod Hole.	GBR			↓		◐
Superlative natural phenomena include the annual coral spawning, migrating whales, nesting turtles, and significant spawning aggregations of many fish species	The number of migrating humpback whales is increasing. Nesting numbers have declined for at least two of the six species of marine turtle. Protection for fish spawning aggregations has improved, but most sites are unknown.	GBR		–			●

b) **Major stages of the Earth's evolutionary history (previously criterion (i) now criterion (viii)):** outstanding examples representing the major stages of the Earth's evolutionary history

	Area	Condition and trend: Very good	Good	Poor	Very poor
Overview: The Region remains a globally outstanding example of an ecosystem that has evolved over millennia, and almost all geomorphological evolutionary processes remain intact. Examples of all stages of reef development remain, although the overall health of reefs, especially in the southern two-thirds, has declined significantly.	GBR	↔			

Excerpt from statement	Comment	Area	Condition and trend: Very good	Good	Poor	Very poor	Confidence
Globally outstanding example of an ecosystem that has evolved over millennia	The Reef remains an outstanding example of evolutionary history. Recent research has identified deepwater reefs that extend for hundreds of kilometres along the outer shelf at between 40 and 70 metres depth.	GBR	↔				◐
Area has been exposed and flooded by at least four glacial and interglacial cycles, and over the past 18,000 years reefs have grown on the continental shelf	The deepwater reefs are providing valuable records of past coral reef responses to climate and sea level change.	GBR	↔				●
Today, the Great Barrier Reef forms the world's largest coral reef ecosystem... Including examples of all stages of reef development	The Great Barrier Reef remains the world's largest coral reef ecosystem and, while its condition has deteriorated, it remains one of the world's most healthy reef systems, including examples of all stages of reef development.	GBR		↓			●

Excerpt from statement	Comment	Area	Condition and trend: Very good	Good	Poor	Very poor	Confidence
Processes of geological and geomorphological evolution are well represented, linking continental islands, coral cays and reefs	Geomorphological features and processes are well represented. Most remain in good condition but some processes are declining, especially in the inshore southern two-thirds.	GBR		↓			◐
The varied seascapes and landscapes that occur today have been moulded by changing climates and sea levels, and the erosive power of wind and water, over long time periods	The impacts of modern climate change are beginning to have effects on seascapes; for example, through reduced reef building.	GBR		↓			◐
One-third of the Great Barrier Reef lies beyond the seaward edge of the shallower reefs (and) comprises continental slope and deep oceanic waters and abyssal plains	Evidence of cold water coral communities has been found on deepwater knolls along the edge of the Great Barrier Reef at depths of more than 1000 metres, but these deep areas are hardly known.	GBR	—				◐

c) **Ecological and biological processes (previously criterion (ii) now criterion (ix)):** outstanding examples representing significant ongoing geological processes, biological evolution and man's interaction with his natural environment

	Area	Condition and trend: Very good	Good	Poor	Very poor
Overview: Many ecosystem processes remain in good condition; however some, such as recruitment and reef building, are declining. Any processes associated with species groups that are in decline (for example, corals and seagrasses) have likely also declined. In the inshore southern two-thirds, there are particular concerns about some processes such as connectivity, nutrient cycling and sedimentation, principally associated with land-based activities in the catchment. Traditional Owners maintain their cultural practices and customs; however, Indigenous heritage values are under pressure, especially in the southern two-thirds of the Region.	GBR		↓		

Excerpt from statement	Comment	Area	Condition and trend: Very good	Good	Poor	Very poor	Confidence
Significant diversity of reef and island morphologies reflects ongoing geomorphic, oceanographic and environmental processes	There remains a diverse range of reef and island morphologies. Most geomorphic, oceanographic and environmental processes remain in good condition, but some are declining, especially in the inshore southern two-thirds.	GBR		↓			●
Complex cross-shelf, longshore and vertical connectivity is influenced by dynamic oceanic currents	Most marine species and habitats are thought to remain well connected. There is increasing evidence of intensified flow and accelerated warming in the East Australian Current.	GBR		—			◐

Excerpt from statement	Comment	Area	Condition and trend: Very good	Good	Poor	Very poor	Confidence
Ongoing ecological processes such as upwellings, larval dispersal and migration	Ecological processes remain in good condition in northern areas. Some processes are in poor condition inshore in the southern two-thirds of the Region and are deteriorating.	GBR		↓			◐
Ongoing erosion and accretion of coral reefs, sand banks and coral cays combine with similar processes along the coast and around continental islands	Reef building is likely to be in good condition for much of the Region, especially in the north, but has been affected by cyclones and reduced coral cover, especially in the southern two-thirds of the Region.	GBR		↓			◐
Extensive beds of Halimeda algae represent active calcification and accretion over thousands of years	*Halimeda* beds are poorly studied, but are likely to be in very good condition given their isolation from land-based impacts and level of protection from trawling.	GBR	↑				◐
Biologically, the unique diversity of the Great Barrier Reef reflects the maturity of an ecosystem that has evolved over millennia; evidence exists for the evolution of hard corals and other fauna	The diversity of species remains high, but some species are in poor condition, especially inshore in the southern two-thirds of the Region.	GBR		↓			●
Vegetation on the cays and continental islands exemplifies the important role of birds…in seed dispersal and plant colonisation	Many islands are national parks or protected within the Marine Park. There are introduced plants on most islands.	GBR		↓			◐
Human interaction with the natural environment is illustrated by strong ongoing links between Aboriginal and Torres Strait Islanders and their sea country, and includes numerous shell deposits (middens) and fish traps, plus the application of story places and marine totems	Traditional Owners with connections to the Great Barrier Reef maintain their cultural practices and customs. Indigenous heritage is under pressure, especially in the southern two-thirds of the Region.	GBR			↓		◐

d) **Habitats for conservation of biodiversity (previously criterion (iv) now criterion (x)):** habitats where populations of rare or endangered species of plants and animals still survive

	Area	Condition and trend: Very good	Good	Poor	Very poor
Overview: There are significant concerns about some key habitats, particularly coral reefs and seagrass meadows, the latter of which is significant for species such as dugong and turtles. Many of the key habitats and species, for which the Great Barrier Reef was inscribed on the World Heritage List (coral reefs, seagrasses, islands, open waters, dugongs, turtles, whales, dolphins and seabirds) are in poor and declining condition, especially in the southern two-thirds of the property. The concerns are not as great in far northern areas, which remain relatively intact. Populations of humpback whales, estuarine crocodiles, loggerhead turtles and green turtles (southern stock) are recovering from historical declines. There have been no records of species extinction, although there is concern that speartooth shark has not been recorded in or near the Region since 1982.	GBR			↓	

Excerpt from statement	Comment	Area	Condition and trend: Very good	Good	Poor	Very poor	Confidence
One of the richest and most complex natural ecosystems on Earth, and one of the most significant for biodiversity conservation	The Great Barrier Reef remains a complex ecosystem, rich in biodiversity. Some key habitats are under pressure, especially in southern inshore areas.	GBR		↓			◐
Tens of thousands of marine and terrestrial species, many of which are of global conservation significance	Some populations (dugong, sharks, seabirds and marine turtles) are known to have declined. Others such as humpback whales, loggerhead turtles and estuarine crocodiles are increasing.	GBR		↓			●
The world's most complex expanse of coral reefs...Contain some 400 species of corals in 60 genera	Although there is no published evidence of loss of species associated with coral reefs, there has been a serious decline in hard coral cover and deterioration of coral reef habitats in the southern two-thirds of the Region.	GBR			↓		●
Large ecologically important interreefal areas. The shallower marine areas support half the world's diversity of mangroves	The Region's mangrove forests remain very diverse with at least 39 mangrove species and hybrids recorded.	GBR		↔			●
Large ecologically important interreefal areas. The shallower marine areas support...many seagrass species	Seagrass diversity remains; however, there have been recent severe declines in abundance and community composition in the inshore southern two-thirds of the Region.	GBR			↓		●
Waters also provide major feeding grounds for one of the world's largest populations of the threatened dugong	The dugong population in northern areas remains robust. The population in the southern two-thirds of the Region was very low at the time of listing, and remains so. Declines in the condition of seagrass meadows have had profound effects on dugongs in recent years.	GBR			↓		●
At least 30 species of whales and dolphins occur here	Little is known about the populations of most whale species. Two inshore dolphin species are known to be at risk.	GBR		—			◐
A significant area for humpback whale calving	The humpback whale population is recovering strongly after being decimated by whaling. The calving habitats are well protected.	GBR	↑				●
Six of the world's seven species of marine turtle occur in the Great Barrier Reef. As well as the world's largest green turtle breeding site at Raine Island, the Great Barrier Reef also includes many regionally important marine turtle rookeries	Of the habitats that support marine turtles, the condition of seagrass meadows and coral reefs have declined significantly. While nesting habitats are generally in good condition, sea level rise, increasing air temperature and extreme weather events are affecting their condition.	GBR		↓			●

Excerpt from statement	Comment	Area	Condition and trend: Very good	Good	Poor	Very poor	Confidence
Some 242 species of birds have been recorded in the Great Barrier Reef. Twenty-two seabird species breed on cays and some continental islands, and some of these breeding sites are globally significant	While the nesting habitats for seabirds remain in generally good condition, declines of up to 70 per cent in some nesting populations have been recorded. There is evidence this may relate to reduced availability of pelagic prey.	GBR			↓		●
The continental islands support thousands of plant species, while the coral cays also have their own distinct flora and fauna	Plant diversity is generally well protected, with about one-third of the islands contained within national parks.	GBR		↓			●

Table 7.12 Benchmarking the integrity of the Great Barrier Reef World Heritage Area
Based on the extent to which the property meets the criteria set out in the *World Heritage Convention Operational Guidelines*.[346]

	Area	Condition and trend: Very good	Good	Poor	Very poor
Overview: The Great Barrier Reef is the world's third largest World Heritage Area and encompasses all but the most northerly part of the Great Barrier Reef ecosystem. Except for small exclusions, it is all within a marine protected area and is, therefore, afforded a high level of direct protection and management. External pressures such as climate change, catchment run-off and coastal development are affecting its overall integrity.	GBR		↓		

	Area	Condition and trend: Very good	Good	Poor	Very poor	Confidence: Condition	Trend
Includes all elements necessary to express its outstanding universal value: The Great Barrier Reef meets all four natural criteria. While some ecosystems, habitats and populations are under pressure, the elements remain largely intact, particularly in the northern third of the Region.	GBR	↓				◐	◐
Is of adequate size to ensure the complete representation of the features and processes which convey the property's significance: The Great Barrier Reef Region is vast, covering 14 degrees of latitude and extending 80 to 250 kilometres from the coast. Except for some small exclusions and about 600 of the 1050 islands, almost all of the World Heritage Area is within marine or national parks and is, therefore, afforded a high level of protection and management. While it is of adequate size to ensure complete representation of features and processes, increasing pressures from outside the Region are affecting them.	GBR	↔				◐	◐
Is protected from the adverse effects of development and/or neglect: While activities within the property are comprehensively managed and use is generally sustainable, the remoteness of some of the property poses challenges for managing agencies. This, and previous assessments, have demonstrated that the most significant impacts on the property's values arise from external pressures such as climate change, catchment run-off and coastal development. In the southern two-thirds of the Region, where there are greater levels of development, the condition and trend of some values are in decline.	GBR			↓		◐	◐

Appendix 2. GBR Marine Park Regulations

In 2008, the Great Barrier Reef Marine Park Regulations were amended to require an assessment of the heritage values of the GBR Region as part of the five-yearly OR. The wording in the Regs (s 116A) at the time included:

> (2) An ***assessment of the relevant heritage values*** of the Great Barrier Reef Region includes the following:
>
> (a) an assessment of the current relevant heritage values of the region;
>
> (b) an assessment of the risks to the relevant heritage values of the region;
>
> (c) an assessment of the current resilience of the relevant heritage values of the region;
>
> (d) an assessment of the existing measures to protect and manage the relevant heritage values of the region;
>
> (e) an assessment of the factors influencing the current and projected future relevant heritage values of the region;
>
> (f) an assessment of the long-term outlook for the relevant heritage values of the region.
>
> (3) … ***heritage values*** of the Great Barrier Reef Region include the following values for the Region:
>
> (a) the Commonwealth Heritage values;
>
> (b) the heritage values;
>
> (c) the indigenous heritage values;
>
> (d) the National Heritage values
>
> (e) the World Heritage values

In 2019 the GBR Marine Park Regulations (see below) were slightly amended. This came into effect 1 April 2019 but was not correctly identified (see footnote 6, p.11) in the 2019 Outlook Report.

> (2) The relevant heritage values of the Great Barrier Reef Region include the following values to the extent that they relate to the Region:
>
> (a) the Commonwealth Heritage values;
>
> (b) the Indigenous heritage values;
>
> (c) the National Heritage values;
>
> (d) the world heritage values;
>
> (e) any other heritage values (within the ordinary meaning of the term) that the Authority considers relevant.

(3) An assessment of the relevant heritage values of the Great Barrier Reef Region includes the following:

(a) an assessment of the current relevant heritage values of the region;

(b) an assessment of the risks to the relevant heritage values of the region;

(c) an assessment of the current resilience of the relevant heritage values of the region;

(d) an assessment of the existing measures to protect and manage the relevant heritage values of the region;

(e) an assessment of the factors influencing the current and projected future relevant heritage values of the region;

(f) an assessment of the long-term outlook for the relevant heritage values of the region.

Appendix 3. GBR WHA SoOUV includes "man's interaction with his natural environment"

Why *'man's interaction with his natural environment'* is an important part of the approved SoOUV for the GBR *(Derived from a File Note prepared by Jon Day, GBRMPA in March 2012)*

1. When preparing a Retrospective SoOUV, the written guidance from IUCN and WH Centre[12] was to use the criteria in place at the time of inscription not the wording of the criteria in place today; in 1981, the wording of relevant criteria was:

   > "be outstanding examples representing significant ongoing geological processes, biological evolution and man's interaction with his natural environment "

2. The 1981 nomination document for the GBR was made under both cultural criteria and natural criteria, and the reference to " *many middens and other archaeological sites of Aboriginal or Torres Strait Islander origin"* was cited under both criteria, but it is also very clear that the justification of the nomination concluded:

   > "The GBR thus meets all four criteria set out in Article 2[13] of the WH Convention*:*
   > (i) be outstanding examples representing the major stages of the earth's evolutionary history
   > (ii) be outstanding examples representing significant ongoing geological processes, biological evolution and man's interaction with his natural environment ;….".

3. It is also important to note that none of the cultural criteria in place at the time were appropriate for dealing with "man's interaction with his natural environment"; rather in 1981 the six cultural criteria related to:

   a. Unique artistic achievement
   b. Architecture, monumental sculpture, garden or landscape design
   c. Unique, extremely rare or of great antiquity
   d. Characteristic examples of a type of structure (being important cultural, social, artistic etc. development);
   e. Characteristic examples of a significant traditional style or architecture, method of construction or human settlement
   f. Associated with ideas beliefs of outstanding historical significance

4. No concerns about this particular paragraph were raised by the WH Centre or IUCN in response to the version sent to DSEWPaC[14] on 17 Feb 2012 (although there were requests to clarify and finalise other minor parts of the draft RSoOUV before it was resubmitted).

5. During the visit of the WH mission in March 2012, the views of Tim Badman (Head of the World Heritage Program at IUCN in Switzerland) were sought; Tim was totally supportive that the paragraph should be retained and further requested the addition of a further

[12] 'Guidance on the preparation of retrospective Statements of OUV' (July 2010) specifically states (pp. 10-11) *'As the wording of criteria have changed several times since they were first defined, **care must be taken to use the wording in use at the time of inscription**, as set out in the appropriate version of the Operational Guidelines. A chart of the existing and various previous wording is provided in Annex 3.*

[13] Article 2 of the Convention does not actually refer to the four criteria as cited in the nomination, but it clearly refers to what is considered as "natural heritage".

[14] Department of Sustainability, Environment, Water, Population and Communities as the federal environment department was then called.

paragraph in the section of the SoOUV titled 'Protection and Management' specifically referring to Indigenous involvement in management through TUMRAs and ILUAs.

6. In subsequent emails, various DSEWPaC officers maintained the words should not be included in the RSoOUV; their reasoning (in italics) is below with my comments shown in **bold**:

   - *While the original nomination document did contain information in relation to the reef's history of both Indigenous and European occupation, this part of the nomination was making the case under the then cultural criteria (i) to (vi).* **(Not true, it was under both criteria – see point 2 above).**
   - *The GBR was not listed under any of the cultural criteria.* **(True)**
   - *Although the GBR was listed for the then natural criterion (ii), which amongst other things included .."..outstanding examples of … the interaction between man and his natural environment….", cultural heritage did not form part of the case for listing under this criterion* **(Not true – see point 2(ii) above).**
   - *We therefore consider that it is not appropriate to include the above reference within the values section of the SOUV.*

7. An additional view from some SEWPAC officers that removing any reference to the Indigenous wording in the values section of the SoOUV*" … would also bring the SOUV into line with our established practice of only considering natural values in relation to EPBC referrals under the World Heritage trigger"* seems erroneous in that Indigenous values need to be considered for a variety of other reasons:

   (a) The 'Great Barrier Reef Marine Park' as a matter of NES means that "the environment, biodiversity and heritage values in the Region" need to be considered in relevant EPBC decisions; and

   (b) Other National and State laws would require a proponent to consider cultural and indigenous values in any development proposal.

8. Clearly the World Heritage Centre, IUCN and the WH Committee were happy with the wording as was submitted, given the wording was then accepted as the formal Retrospective SoOUV which today is available on the UNESCO website at https://whc.unesco.org/en/list/154 [note the approved wording at the end of Criterion (ix)].