



Australian Government

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Reef 2050 Plan



CUMULATIVE IMPACT MANAGEMENT POLICY



DRAFT

for public consultation

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Cumulative Impact Management Policy

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Purpose

To provide a systematic and consistent approach to managing and reducing cumulative impacts on the Great Barrier Reef.

Cumulative impacts are defined as the interaction of effects between one or more impacts and past, present and reasonably foreseeable future pressures.

Target audience

The target audience for this policy is the Great Barrier Reef Marine Park Authority and other Australian and Queensland government agencies making decisions that may affect the values of the Great Barrier Reef environment (refer to [Definitions](#) for 'environment', 'Great Barrier Reef' and 'values').

Government agencies and authorities should apply this policy when:

- revising or preparing relevant agreements, policies, plans, strategies and programs when they are likely to interact with Great Barrier Reef values
- making a decision likely to interact with Great Barrier Reef values

Proponents should apply this policy when seeking approvals – under the *Environment Protection and Biodiversity Conservation Act 1999*, the *Great Barrier Reef Marine Park Act 1975* or relevant Queensland legislation – for actions that are likely to adversely affect attainment of the desired outcomes for Great Barrier Reef values.

Local government, businesses, industry, community groups and other people are encouraged to use this policy to better understand the different types of pressures and impacts affecting the Great Barrier Reef, and to provide guidance on actions to reduce impacts either through taking direct action, partnering or influencing others. Small positive actions can have a cumulative positive impact for the Reef.

Community attitudes can directly affect decisions that are made about the Great Barrier Reef's health by governments, communities, industry and others.

Opportunities to apply this influence include:

- *using networks and partnerships to build understanding of the social, economic and environmental factors influencing the health of the Great Barrier Reef*
- *showcasing activities that reduce pressures on the Great Barrier Reef*
- *showcasing activities that improve the resilience of the Great Barrier Reef*

Context

Impacts on the Great Barrier Reef rarely occur in isolation but often overlap and may interact with each other. Where impacts accumulate over time and space, they can lower the resilience of the ecosystem and its ability to recover from disturbance.

The Great Barrier Reef Outlook Report 2014 (Outlook Report) identified the four main pressures on the Great Barrier Reef as:

- climate change (global scale)
- coastal land-use change (Great Barrier Reef catchment scale)
- poor water quality from land-based run-off (Great Barrier Reef catchment scale)
- some remaining impacts of fishing (Great Barrier Reef Region scale).



Example of multiple impacts within an area – multiple impacts, including those presenting high and very high risks to the Reef's values, can overlap and interact within an area. They can combine to present a serious cumulative risk to local habitats and species, and the community and economic benefits they support.

Existing management measures have not been sufficient to reverse the decline in the health of the Great Barrier Reef. Greater reductions in threats at all levels are required to improve the condition of the values and build resilience.

Pressures can originate at the local, Marine Park, catchment and global scales. This underscores the need for integrated actions at different spatial and time scales to mitigate and manage their impacts on the Great Barrier Reef. Attachment 1 lists drivers and pressures affecting the Great Barrier Reef.

The impact is not just on the Great Barrier Reef ecosystem, but also impacts on the cultural values of Traditional Owners; economic values to the tourism and fishing industries which rely on a healthy Reef; social values for communities along the coast for whom the Reef is part of their daily life; together with the broader Australian and international community who consider it to be an irreplaceable icon – belonging to the global community.

It is critical for reefs worldwide, including the Great Barrier Reef, that global scale efforts to reduce climate change pressures are effective. While international action to reduce greenhouse gas emissions is underway through the Paris Climate Agreement, this needs to be supported by improving the Reef's resilience to climate change through reducing local pressures.

The Outlook Report found that understanding of the Reef's values and impacts on it has significantly improved; however, knowledge of cumulative impacts, and how they are best managed, is limited.

Improving management of cumulative impacts to reduce pressures, together with delivering decisions which result in an improvement in the condition of values, is critical to the future health and resilience of the Great Barrier Reef.

The Reef 2050 Plan provides an overarching strategy for long-term management of the Great Barrier Reef, including cumulative impacts. It brings together actions across government, Traditional Owners, industry, researchers and the community. The Plan provides an agreed outcomes-based, target-driven framework for protecting the Great Barrier Reef's health and resilience while allowing for ecologically sustainable use.

The Plan details primary principles to consider in all decision-making that affects the Great Barrier Reef which are:

- maintaining and enhancing outstanding universal value in every action
- basing decisions on the best available science
- delivering a net benefit to the ecosystem
- adopting a partnership approach to management.

Practical approaches for addressing these principles are contained in the Reef 2050 Policy Guideline for Decision Makers.



Foundational policy statements

These foundational policy statements also apply to the draft Net Benefit Policy.

Maximising avoidance of impacts - the highest priority is to avoid impacts. Measures to avoid impacts should be documented and consider prudent and feasible alternatives, including the alternative of not carrying out the proposed action. Measures to mitigate impacts to reduce the likely significance of any residual effects should be clearly documented as part of the avoid-mitigate-offset hierarchy.

Focusing on outcomes - adopting an outcomes-based approach was a key recommendation of the Great Barrier Reef Region Strategic Assessment, and underpins the Reef 2050 Plan's delivery. The condition and trend of the Great Barrier Reef's values are reported every five years in the Outlook Report and provide an assessment of 'very good', 'good', 'poor' or 'very poor' for each of the values. Desired outcomes for the Great Barrier Reef seek to restore the condition of values assessed as 'poor' or 'very poor', and to maintain and enhance where condition is assessed as 'good' or 'very good'. This is set out below (Table 1).

Current condition	Desired outcome
Very good	The condition is maintained
Good	The condition is maintained and enhanced
Poor	The condition is restored to good
Very poor	The condition is restored to good
Trend in condition	Desired outcome
Improving	The trend is maintained
Stable	The trend is maintained and improved
Deteriorating	The decline is halted and reversed

Table 1: Desired outcomes for Great Barrier Reef values

Decisions should align with the desired outcomes (Table 1) for the condition and trend of Great Barrier Reef values, including its outstanding universal value. Management options should be compared with appropriate standards and guidelines, including desired outcomes for the state of the Great Barrier Reef's values, to inform the acceptability of the proposed action. This includes considering the principles of ecologically sustainable use.

Taking a systems perspective - healthy and resilient ecosystems are fundamental to protect Great Barrier Reef values, and the community and economic benefits they support. The Driver, Pressure, State, Impact, Response (DPSIR) framework (Figure 2) should be used to understand links between drivers of, activities in and pressures on the state of the environment, and the impacts on the benefits it provides. Adopting a systems perspective focused on affected Great Barrier Reef values provides a strong basis to design and deliver net benefits, reduce cumulative impacts, maintain the integrity of the Great Barrier Reef World Heritage Area and provide adequate offsets. Decisions should clearly:

- specify the space and time scales in which the drivers, pressures and impacts affect Great Barrier Reef values, including its outstanding universal value
- specify the space and time scales, including relevant animal and plant life-history traits, at which affected values operate
- identify cause and effect relationships between drivers, pressures and impacts on the environment's constituent parts
- consider connections between land and sea, and within the marine environment.

Using the best available information - the best available information from the most appropriate sources should be used. This includes historical information, monitoring data, Traditional Owner and stakeholder knowledge, observation, modelling, forecasts, expert judgement, peer-reviewed literature and science. Information should specify possible limitations of data and modelling; divergence in expert judgement, or uncertainty, availability, quality, quantity and ongoing relevance of information.

Understanding and managing risk - risk-management processes should be integrated into decision-making and demonstrate consistency with the Australian/New Zealand/International Standard, AS/NZS ISO 31000:2009 Risk management – Principles and guidelines. When identifying and analysing risks, the following factors should be considered:

- time lags which may exist between cause and effect
- diversity, complexity and connectivity between environmental components and processes, including cumulative or synergistic effects
- effects that are prone to change if the context changes
- lack of reliable data
- possibility of human error
- natural variation, where the likelihood of an outcome may depend on a variety of factors and the vulnerability of components of a system under study
- uncertainties likely to have a material impact on decision-making.

The Outlook Report should be used as a guide to the types and level of risks to the Great Barrier Reef from drivers, pressures and activities (refer Attachments 1 and 2).

Assessing vulnerability and resilience - the vulnerability and resilience of the overall ecosystem and its values (Figure 1) should be assessed. Consider whether exposure of a value or process to impacts – including the interaction of effects between impacts and past, present and reasonably foreseeable future pressures – is material, by assessing:

- the sensitivity of the value:
 - the life histories/processes that are impacted
 - the dependency on impacted resources
 - the current condition and trend
 - health thresholds
 - risk and uncertainty around assumptions
- the adaptive capacity of the value:
 - rate of recovery between disturbances, based on current condition
 - rate of change and reorganising of a system to a desirable functioning state
 - risk and uncertainty around assumptions.

Vulnerability and resilience should be considered when assessing the level of risk, identifying strategies for building resilience, assessing the urgency of action, evaluating the efficacy and cost-effectiveness of options, and for engaging and empowering stakeholders in adaptation processes.

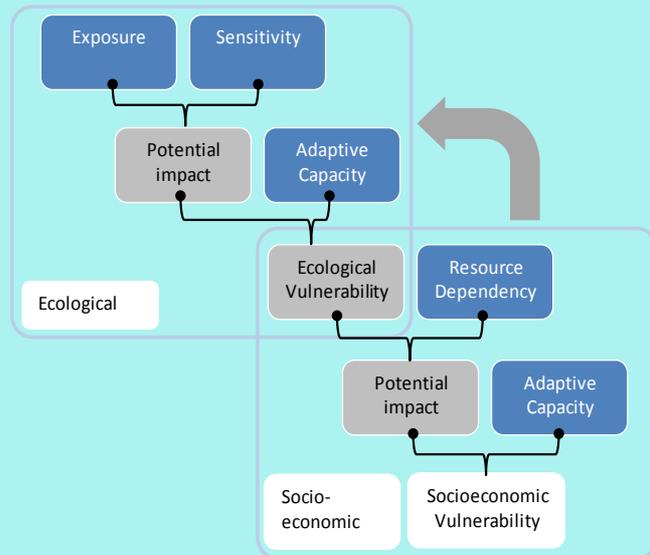


Figure 1: Illustrating system vulnerability and resilience (Marshall, Tobin, Marshall, Gooch and Hobday, 2013).

Monitoring and review - the Reef 2050 Integrated Monitoring and Reporting Program is establishing standard protocols for collecting, storing, accessing and reporting information. Monitoring and reporting should be consistent with these protocols and appropriate to the nature and level of risk. Reporting should not only focus on implementation of actions but achievements towards outcomes. Monitoring and review should be systematically integrated into decisions and implementation concerned with net benefits, offsetting and cumulative impact assessment and management. It is then possible to detect change, maintain currency and evaluate the effectiveness of management interventions.

Adaptively manage - the results of targeted research, modelling and monitoring should be used to evaluate the performance of actions and drive continuous improvement.

Actions may need to be modified in response to new information, emerging issues or changing circumstances.

The Reef 2050 Plan and the Reef 2050 Integrated Monitoring and Reporting Program provide an adaptive management framework to assess progress towards outcomes and targets, and reduce impacts, using the Driver Pressure State Impact Response framework.

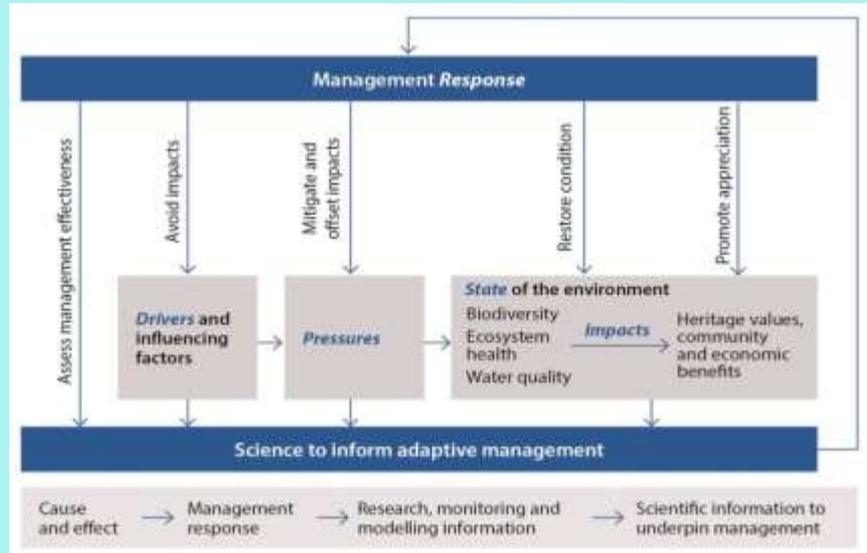


Figure 2: Reef 2050 Plan adaptive management framework.

Ensuring transparent governance - implementation should be supported by effective and transparent governance measures focused on ensuring specified outcomes are delivered to maintain Great Barrier Reef values. Clear governance arrangements are required to promote alignment, maximise efficient use of resources and reduce duplication of effort. Methods of communicating information and consulting with relevant stakeholders should facilitate accurate and understandable exchanges of information, while considering relevant information security requirements (such as privacy and confidentiality). Accountability for achieving outcomes will occur through the Reef 2050 Integrated Monitoring and Reporting Program, the Outlook Report and review of the Reef 2050 Plan. Where relevant, regulatory compliance and enforcement programs may contribute to transparent and accountable governance by aligning and supporting the Reef 2050 Integrated Monitoring and Reporting Program.

Cumulative impact management policy statements

Reducing pressures on the Reef's values

Management of cumulative impacts should aim to reduce pressures from multiple sources (refer Attachment 1) to attain the desired outcomes for the condition and trend of Great Barrier Reef values and to protect its outstanding universal value (refer Table 1).

Cumulative impact management should be based on rigorous decision-making that demonstrably identifies past, present and reasonably foreseeable pressures, and examines their combined effect on Great Barrier Reef values.

The Great Barrier Reef Strategic Assessment provides a comprehensive list and description of drivers, pressures and impacts affecting the Great Barrier Reef values. The risk of these pressures and impacts is updated five yearly in the Great Barrier Reef Outlook Report (refer Attachment 2).

Promoting participatory and collaborative approaches

Participatory approaches based on international best practice should be adopted to facilitate effective stakeholder input and consultation throughout the assessment and management process. This is of particular importance where decisions affect community and economic benefits derived from the Great Barrier Reef.

Adopting a systematic and consistent approach to cumulative impact assessment terminology and methods

Terms used in the Great Barrier Reef Region Strategic Assessment Report and 2014 Outlook Report should be adopted to facilitate a consistent approach to assessing, monitoring and reporting on cumulative impacts at regional and Great Barrier Reef-wide scales.

Methods used to assess cumulative impacts should build on approaches used in the Great Barrier Reef Region Strategic Assessment Report. Methods should be updated as new science and information becomes available, including standards and protocols being established as part of the Reef 2050 Integrated Monitoring and Reporting Program.

Understanding issues of scale, and cause and effect

Assessment of cumulative impacts should specify:

- the space and time scales at which drivers, pressures and impacts – including direct, indirect and consequential impacts – are operating (zone of influence – Figure 3) and the interactions or 'overlaps' between impacts (see Figure 4)
- the space and time scales of affected values, and the relationships between values.

Assessment of cumulative impacts should establish cause and effect relationships between drivers, pressures and impacts and their effects on values to guide management interventions. Project-based, regional or strategic assessment of cumulative impacts may be required to manage the drivers and activities leading to pressures and consequential impacts within the zone of influence. Consideration also needs to be given to consequential impacts outside the example downstream consequences of altered connectivity.



Figure 3: The zone of influence is the area in which an activity or pressure could directly or indirectly impact part of the environment. Source: Anthony et al. (2013)

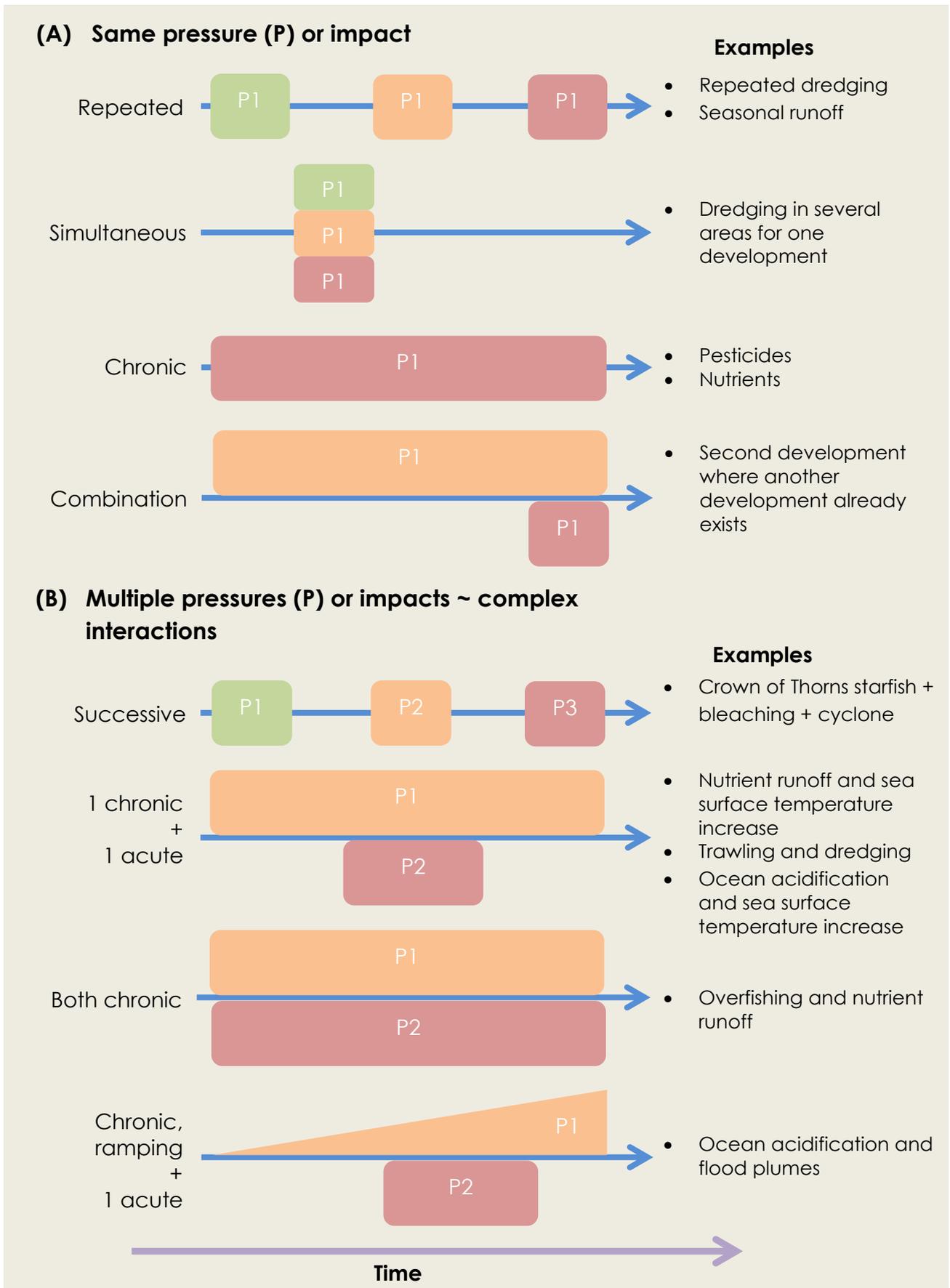


Figure 4: Different types of cumulative pressures on marine ecosystems. Adapted from page 10 of Uthicke, S., Fabricius, K., De'ath, G., Negri, A., Warne, M., Smith, R., Noonan, S., Johansson, C., Gorsuch, H. and Anthony, K. (2016). *Multiple and cumulative impacts on the GBR: assessment of current status and development of improved approaches for management: Final Report Project 1.6*. Report to the National Environmental Science Programme. Reef and Rainforest Research Centre Limited, Cairns (144pp.).

Using integrated approaches and a range of management mechanisms

Considering cumulative impacts should be done at all scales of decision making and applied proportionately to the nature and scale and risk of likely impacts.

Managing cumulative impacts should take into consideration how decisions about planning, assessment and on-ground actions within the Great Barrier Reef, along the coast, in coastal catchments and globally will impact Great Barrier Reef values.

The Drivers Pressures State Impacts Response framework (Figure 2) should be used to identify the broadest range of opportunities to reduce cumulative impacts. Management interventions to reduce risks from drivers, pressures and impacts should be explicitly mapped to this framework.

Management should be guided by risk assessment processes using scenarios (e.g. climate and global economy) and alternative strategies for intervention and planning. Those strategies should be integrated with strategic, regional and local management mechanisms.

A systems perspective should be adopted when developing plans at a regional or catchment scale to test existing and preferred land and sea use scenarios, and reflect constraints and opportunities associated with cumulative impacts.

For example – under the Queensland Government's planning framework – when local governments develop planning schemes, they may be encouraged to consider the preferred land uses for an area in the context of their potential cumulative impacts when taken as a whole. Should any development applications propose to vary from the preferred land uses set out in the planning scheme, the decision makers will be able to take an informed view on how this would contribute to cumulative impacts.

Project-based cumulative assessments should align with strategic and regional assessments and plans. Where an action is likely to have a significant impact on Great Barrier Reef values, environmental impact assessment processes should evaluate project-specific impact contributions on values in the context of cumulative impacts from other sources to determine their acceptability.

Transparent analyses of risks and consequences (including estimates of costs and net benefit) under alternative scenarios and options can help identify the most sustainable and effective options for managing cumulative impacts.

Assessing against desired state, current condition, thresholds and standards

Cumulative impact assessments should establish the current condition and trend of affected values within the zone of influence. This provides the reference point and context for assessing and managing cumulative impacts.

- The Outlook Report identifies the condition and trend for values that contribute to the outstanding universal value of the Great Barrier Reef and that underpin Reef-related matters of national environmental significance (see Attachment 3).
- The Great Barrier Reef Strategic Assessment Program Report established the desired state of these values by linking their current condition and trend to international and national obligations for protecting the Great Barrier Reef.
- The Outlook Report assesses the condition and trend of the Reef's values every five years.

The desired outcomes for Great Barrier Reef values are outlined in Table 1. At a minimum, it should be considered whether cumulative impacts associated with any proposed decision will facilitate or restrict delivery of the desired outcome for specified values.

Relevant standards, guidelines and thresholds for affected values should be considered. Currently there are standards for water quality, ecosystem health and limits of acceptable change for Ramsar wetlands.



Process

The steps in cumulative impact assessment and management for the Great Barrier Reef are similar to best practice environmental impact assessment, with a broader focus on understanding the context and underlying pressures on the system, its values and desired outcomes. The steps should be used when:

- scoping, with analysis based on a desktop assessment
or
- undertaking a detailed assessment to improve information or reduce uncertainty in decision-making.

The following steps to undertake a cumulative impact assessment also include references to critical resources to be consulted for information about the Great Barrier Reef.



Steps in applying this policy

- 1 Determine the program, plan or project area boundaries based on an understanding of likely direct, indirect and consequential impacts of the decision.** The boundary area should be refined to align with the space and time boundaries (zone of influence) of relevant drivers, pressures, impacts, and affected values.
 - 1a Identify the relevant drivers, pressures and impacts; the space and time scale at which they occur; and any planning or project-specific contributions.** Identify any other current and/or reasonably foreseeable plans or projects and their contributions.

Use Attachments 1 & 3 to identify drivers and pressures affecting values and leading to cumulative impacts. Refer to the Great Barrier Reef Region Strategic Assessment and Great Barrier Reef Outlook Report.
 - 1b Identify affected values, the space and time scale at which they occur, and consider connectivity between values.** Temporal connections may occur over short periods, over seasons or in cycles (for example, many species migrate as part of their life history). Spatial connections may occur between values and/or across local, regional or Reef-wide scales.

Use Attachment 3 to identify the values that may be affected by the decision. Refer to the Strategic Assessment and Outlook Report for information.

repeat if needed
- 2 Establish the current condition of affected values, and their desired state.** The Outlook Report provides a cumulative impact assessment of values at a whole-of-Reef scale. Individual cumulative impact assessments should determine where current condition of affected values within the zone of influence (see Step 1) differs from the Outlook Report.

Refer to the Strategic Assessment; the Outlook Report, which assesses the condition and trend of the Reef's values every five years; and the Reef 2050 Integrated Monitoring and Reporting Program, which provides the latest condition and trend data.
- 3 Examine the cause and effect of planning, program or project-specific impact contributions.** A range of tools is available to understand cause and effect relationships, for different levels of complexity.

Refer to Table 2.1 of the Strategic Assessment for a list of tools to help identify and understand cause and effect relationships.
- 4 Use resilience and vulnerability analyses as a basis for understanding how ecosystem values are affected by multiple drivers and pressures in space and time.**

Where processes that ensure recovery and resistance to pressures can be influenced by management they are likely to help build resilience to cumulative impacts.
- 5 Undertake a risk assessment.** To identify and understand the likely scale and magnitude of any risks to Great Barrier Reef values, highlight uncertainties and the risk of any potentially irreversible impacts.

Refer to Australian/New Zealand/International Standard, AS/NZS ISO 31000:2009 Risk management – Principles and guidelines, and risk assessments in the Strategic Assessment and Outlook Report.
- 6 Determine acceptability of impacts by comparing the outcome of the assessment with the desired outcome for the state of the value or process and relevant standards and guidelines.**

Refer to the Strategic Assessment and Outlook Report for information on how to assess resilience and vulnerability, and the Reef 2050 Integrated Monitoring and Reporting Program for relevant standards and guidelines.
- 7 Design and apply management measures based on the mitigation hierarchy.** Identify how any likely impacts may be avoided, such as through re-scoping, relocating or altering the timeframe. Identify potential alternatives to your proposed decision that mitigate impacts and reduce risk to acceptable levels for the desired outcomes for the Reef's values.
- 8 Monitor, evaluate and report.**

Design targeted monitoring and reporting – consistent with the Reef 2050 Integrated Monitoring and Reporting Program – to evaluate effectiveness and meet legislative obligations.
- 9 Drive continuous improvement by adapting actions in response to new information, emerging issues and changing circumstances.**

Refer to the Reef 2050 Integrated Monitoring and Reporting Program for review, monitoring and reporting processes. The program will inform adaptive management by considering the effect of decisions in managing cumulative impacts.

Implementation

Implementation will be staged, recognising the need to develop specific guidance for relevant agencies and sectors.

Cumulative impacts will be considered to the extent permissible under legislation with respect to planning, assessment and approval processes operating within and adjacent to the Great Barrier Reef.

The assessment of cumulative impacts is not required for individual decisions where the cumulative impacts have been considered in plans, governing arrangements or class assessments, and decisions are consistent with these plans or arrangements.

Review and evaluation

The effectiveness of this policy will be reviewed and evaluated in line with the assessment of risks to the Reef's values through the five yearly Outlook Report. Effective management of cumulative impacts should translate to a decrease in pressures, or risks, to the Reef.

Related legislation / policy

Australian Government, including:

- Environment Protection and Biodiversity Conservation Act (EPBC Act)
- Great Barrier Reef Marine Park Act (GBRMP Act)

Queensland Government, including:

- *Environmental Offsets Act 2014*
- *Environmental Protection Act 1994*
- *Fisheries Act 1994*
- *Marine Parks Act 2004*
- *Nature Conservation Act 1992*
- *Planning Act 2016*
- *Sustainable Planning Act 2009*
- *State Development and Public Works Organisation Act 1971*
- *Sustainable Ports Development Act 2015*
- *Vegetation Management Act 1999*

This policy is to be read in conjunction with the Reef 2050 Policy Guideline for Decision Makers which outlines a range of decisions designed to manage pressures on the Great Barrier Reef.

The Cumulative Impact Management Policy has been developed in parallel with the Reef 2050 Plan Net Benefit Policy.

Definitions

Action

Actions and activities are used to describe projects and project parts under the EPBC Act and GBRMP Act. For this policy actions are used, assuming activities comprise action, or a subset of an action. Also includes development proposals and/or planning actions.

Adaptive capacity

The ability for a component of the environment to adapt to impacts to maintain or improve its condition. Includes the environmental component's ability to recover, reorganise or build capacity to learn and adapt in between events.

Adaptive management

A systematic process for continually improving management practices through learning from the outcomes of previous management. It includes a monitoring, evaluation, reporting and improvement cycle.

Avoid-mitigate-offset hierarchy

Is used to guide assessment of actions and inform decision-making. The highest priority is given to avoiding impacts on the environment. Avoidance measures must consider prudent and feasible alternatives to a proposed action. Potential impacts that cannot be avoided must be minimised. Mitigation measures must consider direct, indirect and cumulative impacts, and account for the likely spatial and temporal scales of impacts across the duration of the proposed activity. Offsets compensate for the residual adverse impacts of an action on the environment.

Baseline condition

A description of existing conditions to provide a starting point (e.g. pre-project condition of biodiversity) against which comparisons can be made (e.g. post-impact condition of biodiversity), allowing the change to be quantified. Baseline conditions for the Marine Park are measured from its World Heritage Declaration in 1981.

Biodiversity elements

Biodiversity is the variety of life on Earth. It includes all living things and the way they interact with each other and their environment. The Region's biodiversity values which underpin matters of national environmental significance include:

- Great Barrier Reef habitats
- terrestrial habitats that support the Great Barrier Reef
- species

Community benefit

The interconnectedness of people and their environment as reflected in the definition of 'environment' under the EPBC Act and GBRMP Act and as defined in this document.

Consequential impacts

Are a form of 'indirect' impact resulting from further actions (including actions by third parties) that are made possible or are facilitated by implementation of the activity. For example, a port expansion may result in an increase in shipping activity which may bring with it a suite of consequential impacts (e.g. anchoring impacts, displacement of uses).

Cumulative impacts

Cumulative impacts are defined as the interaction of effects between one or more impacts and past, present, and reasonably foreseeable future pressures.

Cumulative impact assessment

Takes into account direct, indirect and consequential impacts and the incremental and compounding effects of these impacts over time, including past, present and reasonably foreseeable future pressures.

Decision

Decisions are not limited to regulatory decision-making. Decisions include developing, revising or implementing relevant agreements, policies, plans, strategies and programs; implementing legislation as part of the Great Barrier Reef planning and assessment processes; prioritising and undertaking on-ground actions.

Drivers

An overarching cause that can drive change in the environment. It can affect the environment indirectly by changing the way people undertake activities that affect the environment (indirect drivers) or by directing changing conditions in the environment itself (direct drivers). Examples include climate change, economic growth and population growth.

Ecologically sustainable use

The principles of ecologically sustainable use are defined in section 3AA of the GBRMP Act as:

- a. decision-making processes should effectively integrate both long-term and short-term environmental, economic, social and equitable considerations
- b. the precautionary principle
- c. the principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations
- d. the conservation of biodiversity and ecological integrity should be a fundamental consideration in decision-making
- e. improved valuation, pricing and incentive mechanisms should be promoted

Effect

Is a deviation from the expected (positive or negative).

Environment

Includes ecosystems and their constituent parts, including people and communities; natural and physical resources; the qualities and characteristics of locations, places and areas; heritage values of places; and the social, economic and cultural aspects of the above. (EPBC Act and GBRMP Act).

Event

A change in situation; something happening or not happening (when it was expected); an incident or occurrence that exposes a value to a hazard.

Exposure

The magnitude, frequency and duration of an environmental component's contact with a hazard.

Great Barrier Reef

Refers to the Great Barrier Reef World Heritage Area, Great Barrier Reef Marine Park and Great Barrier Reef Region areas relevant to the decision-making or action.

Hazard

A source of potential harm; a situation, action or behaviour that may negatively impact on an environmental component, whether intentionally or unintentionally.

Heritage values

The Region's heritage values, which underpin matters of national environmental significance, are grouped into five broad categories:

- **Indigenous heritage values:** the heritage values of a place that are of significance to Aboriginal and Torres Strait Islander persons in accordance with their practices, observances, customs, traditions, beliefs or history
- **other heritage values:** a place's natural and cultural environment having aesthetic, historic, scientific or social significance, or other significance, for current and future generations of Australians
- **world heritage values:** the natural heritage and cultural heritage of a property that is internationally recognised as being of outstanding universal value
- **national heritage values:** the values of a place that are of national significance as recognised through placement on the National Heritage List
- **Commonwealth heritage values:** the values of a place that are specified in its placement on the Commonwealth Heritage List.

Integrity

Relates to 'wholeness and intactness' of the World Heritage property and how it conveys the values it holds. Integrity can also relate to the size of the property (sufficient size to continue to represent the values) and to any threats affecting the property.

Impact

The result or effect that happens when an environmental component is exposed to a hazard; may be positive or negative.

Matters of national environmental significance

Those matters as defined in the Environment Protection and Biodiversity Conservation Act.

Net benefit

A decision or action which results in a net improvement to the condition and/or trend of a Great Barrier Reef environmental value or process as described in Attachment 3 – Tables A3.2 and A3.3.

Outstanding universal value

Cultural and/or natural significance which is so exceptional as to transcend national boundaries and to be of common importance for present and future generations of all humanity. Outstanding universal value is distributed throughout the entire Great Barrier Reef World Heritage Area. The relationship between outstanding universal value and Great Barrier Reef values is described in Attachment 3.

Pressure (Threats)

An activity or group of activities that cause an impact on a value.

Program

Includes programs, plans, decisions and on-ground actions.

Reference condition

Assessment of the reference condition and trend of Great Barrier Reef values (taking into account past and present effects) is described in Attachment 3 and values are benchmarked and graded every five years through the Outlook Report.

Reference scenario

What is likely to have occurred in the absence of management response. The reference scenario is based on the current condition and trend, taking into account reasonably foreseeable future pressures. Grading statements for condition are described in Attachment 3 – Table A3.1.

Resilience

The ability of an environmental component to cope with change or exposure and remain in a desirable functioning state. It includes the ability to absorb impacts and continue functioning, and recover, reorganise or build capacity to learn and adapt in between events.

Risk

Defined by the Australia/New Zealand Standard for Risk Management (AS/NZS 31000:2009) as "effect of uncertainty on objectives." For this policy/guideline, risk relates to uncertainty as to whether the objectives of the policy can be achieved i.e. achieving desired states for Great Barrier Reef values.

Sensitivity

The degree to which a component of the environment is responsive to a specific impact.

Severity

How serious a consequence would be if it occurred; the degree of degradation that would occur to the value if that consequence occurred.

Values

Refers to values and processes as described in Attachment 3. Foremost, healthy and resilient ecosystems are fundamental to the protection of biodiversity and heritage values and the community benefits they support.

Vulnerability

The susceptibility of environmental components to degradation from impacts. Vulnerability is a function of the environmental component's exposure, sensitivity and adaptive capacity.

Zone of influence

The area or spatial extent in which an activity or pressure has the potential to impact a component of the environment. The 'zone of influence' is used to describe the scale of effect at which impacts (such as from an action, project, plan or program) are occurring and the scope of response available to manage impacts. The zone of influence includes the assessment of the boundaries to biological and life processes needed to encompass the spatial and temporal extent of impacts that influence the condition of environmental values, ecosystem processes and socio-ecological systems throughout the period during which impacts of the decision will occur. The zone of influence can be described in three parts:

- zone of ecological influence - the area or spatial extent in which an activity or pressure directly impacts a component of the environment
- zone of system influence - the area or spatial extent in which an activity or pressure has an indirect or consequential impact on a component of the environment, recognising the boundaries to biological and life processes extend beyond the direct impact of the activity
- zone of management influence – which includes the scope of response encompassing direct and indirect impacts and other past, present pressures and threats affecting values and processes.

Further information

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Attachment 1: Drivers of change, pressures and impacts on the Great Barrier Reef

Drivers are overarching causes that can drive change in the environment (State of the Environment, 2011; Strategic Assessment Report, 2014) and have also been referred to as underlying causes of change in the environment (Outlook Report, 2014). For the purposes of this Policy and the Reef 2050 Integrated Monitoring and Reporting Program, it is proposed to adopt six drivers of change for the Great Barrier Reef system:

1. Climate change
2. Population growth
3. Economic growth
4. Technological developments
5. Societal attitudes
6. Governance systems

Pressures and impacts are mechanisms that exert a change force (either positive or negative) on a value. Put another way, pressures and impacts are the change mechanisms (e.g. processes or activities) that result from drivers. For the purposes of this policy, pressures are defined consistent with the Outlook Report 'threats' (2014) and the Strategic Assessment Report 'impacts' (2014).

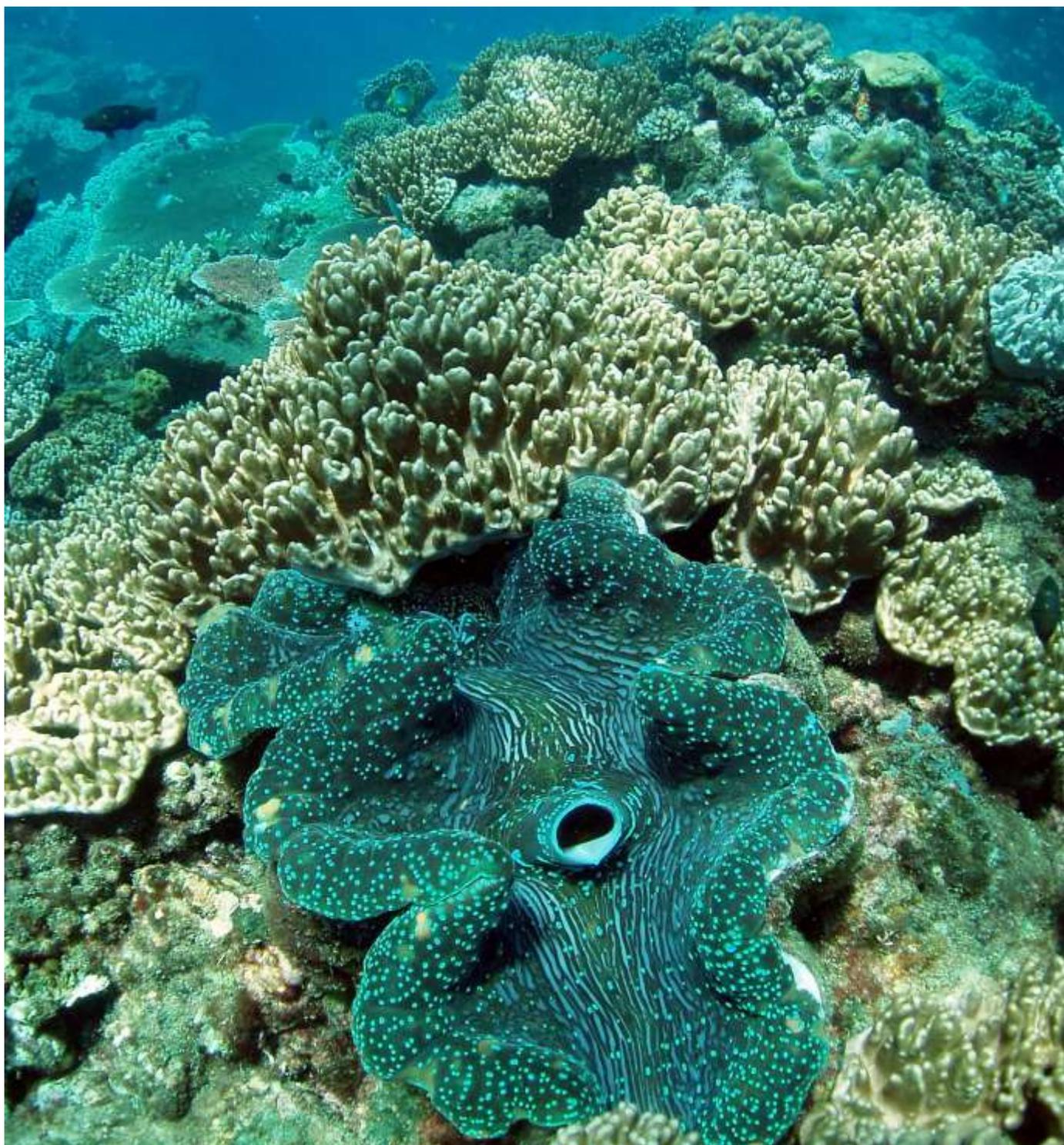
Table A1.1 – Pressures and impacts, their definition and associated source

Pressures and impacts	Definitions
Acid sulphate soils	Exposure and subsequent oxidation of potential acid sulphate soils.
Altered ocean currents	Altered ocean currents due to climate change or anomalies related to the El Niño-Southern Oscillation, and altered coastal water movement at a local scale.
Artificial light	Artificial lighting including from resorts, industrial infrastructure, mainland beaches and coastlines, vessels and ships.
Atmospheric pollution	Pollution of the atmosphere related to domestic, industrial and business activities in both the Region and adjacent areas. The contribution of gases such as carbon dioxide to climate change is not included as this is encompassed under threats such as sea temperature increase and ocean acidification.
Artificial barriers to flow	Artificial barriers to riverine and estuarine flow including breakwalls, weirs, dams, gates, ponded pastures, and weeds causing changes to hydrology, groundwater and ecological connectivity.
Coastal reclamation	Coastal land reclamation, including for ports and groynes.
Cyclone activity	Cyclone activity.
Damage to reef structure	Physical damage to reef benthos (reef structure) through actions such as snorkelling, diving, anchoring and fishing, but not vessel grounding.
Damage to seafloor	Physical damage to non-reef benthos (seafloor) through actions such as trawling and anchoring, but not vessel grounding.
Disposal and resuspension of dredge material	Sea dumping of dredge material including smothering, loss and modification of seabed habitats and resuspension.
Dredging	Dredging of the seafloor.
Exotic species and diseases	Introduction of exotic species and diseases from aquaculture operations, hull fouling, ballast release, imported bait and release of aquarium specimens to the Region, plus the introduction of weeds and feral animals to islands.
Extraction – discarded catch	Immediate or post-release effects (such as death, injury, reduced reproductive success) on discarded species as a result of interactions with fishing gear. Does not include species of conservation concern.
Extraction — fishing in	Retained take (extraction) of fish from unidentified or unprotected spawning

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Pressures and impacts	Definitions
spawning aggregations	aggregations.
Extraction – herbivores	Retained take (extraction) of herbivores (e.g. some fish, molluscs, dugongs, green turtles) through commercial and non-commercial uses.
Extraction – incidental catch of species of conservation concern	Immediate or post-release effects (such as death, injury, reduced reproductive success) of interactions of species of conservation concern with fishing gear.
Extraction — lower order predators	Retained take (extraction) of lower order predators (e.g. coral trout and snapper) through commercial, recreational and traditional fishing.
Extraction — lower trophic orders	Retained take (extraction) of lower trophic orders (e.g. scallops, sea cucumbers and prawns) through commercial, recreational and traditional fishing.
Extraction — top order predators	Retained take (extraction) of top order predators (e.g. sharks) through commercial, recreational and traditional fishing and the Queensland Shark Control Program.
Grounding large vessel	Grounding of large vessels (>50m) including physical damage and the dislodging of antifoulants.
Grounding small vessel	Grounding of small vessels (<50m) including physical damage and the dislodging of antifoulants.
Illegal activities — other	Illegal activities such as entering a protected or restricted area, illegal release of industrial discharge, shipping outside of designated shipping areas.
Illegal fishing and poaching	Illegal fishing, collecting and poaching (foreign or domestic) including of species of conservation concern.
Incompatible uses	Activities undertaken within the Region that disturb or exclude other users, such as recreational use in areas important for cultural activities.
Increased freshwater inflow	Increased freshwater inflow from prolonged or heavy rainfall including flood events, and from changes to catchment ecosystems; resulting in reduced salinity.
Marine debris	Manufactured material discarded, disposed of or abandoned in the marine and coastal environment (including discarded fishing gear and plastics).
Modifying supporting terrestrial habitats	Clearing or modifying supporting terrestrial habitats such as wetlands, saltmarshes, mangroves and sand dunes — this also includes trampling and damage from recreational vehicle use.
Noise pollution	Noise from human activities, both below and above water.
Nutrients from catchment run-off	Nutrients entering the Region in run-off from the catchment.
Ocean acidification	Increasing acidity of the Region's waters.
Outbreak or bloom of other species	Outbreak of naturally occurring or native species, excluding crown-of-thorns starfish.
Outbreak of crown-of-thorns starfish	Outbreak of crown-of-thorns starfish (i.e. when the density exceeds about 30 starfish per hectare).
Outbreak of disease	Outbreak of disease, both naturally occurring and introduced.
Pesticides from catchment run-off	Pesticides (including herbicides, insecticides, fungicides) entering the Region in run-off from the catchment.
Rising sea level	Rising sea level.
Sea temperature increase	Increasing sea temperature.
Sediments from catchment run-off	Sediments entering the Region in run-off from the catchment.
Spill — large chemical	Chemical spill that triggers a national or regional response or is more than 10 tonnes.
Spill — large oil	Oil spill that triggers a national or regional response or is more than 10 tonnes.
Spill — small chemical and oil	Chemical or oil spill that does not trigger a national or regional response and is less than 10 tonnes

Pressures and impacts	Definitions
Urban and industrial discharge	Point and diffuse-source land-based discharge of pollutants from urban and industrial land use and mining, including polluted water, sewage, wastewater and stormwater.
Vessel strike on wildlife	Death or injury to wildlife as a result of being struck by a vessel of any type or size.
Waste discharge from a vessel	Waste discharged from a vessel into the marine environment.
Wildlife disturbance	Disturbance to wildlife including from snorkelling, diving, fish feeding, walking on islands and beaches, and the presence of boats; not including noise pollution.



Attachment 2: Risks to Great Barrier Reef values as reported in the Great Barrier Reef Outlook Report

The Great Barrier Reef Outlook Report provides a full description of threats and risks. The Outlook Report has a standard set of criteria to allow the comparison of different types of threats within the one risk assessment, based on the likelihood and consequence of each threat. The likelihood and consequence of each predicted threat are ranked on five-point scales, as described below.

Figure A2.1 - Likelihood scale

Likelihood	Expected frequency of a given threat
Almost certain	Expected to occur more or less continuously throughout a year
Likely	Not expected to be continuous but expected to occur one or more times a year
Possible	Not expected to occur annually but expected to occur within a 10-year period
Unlikely	Not expected to occur in a 10-year period but expected to occur in a 100-year period
Rare	Not expected to occur within the next 100 years

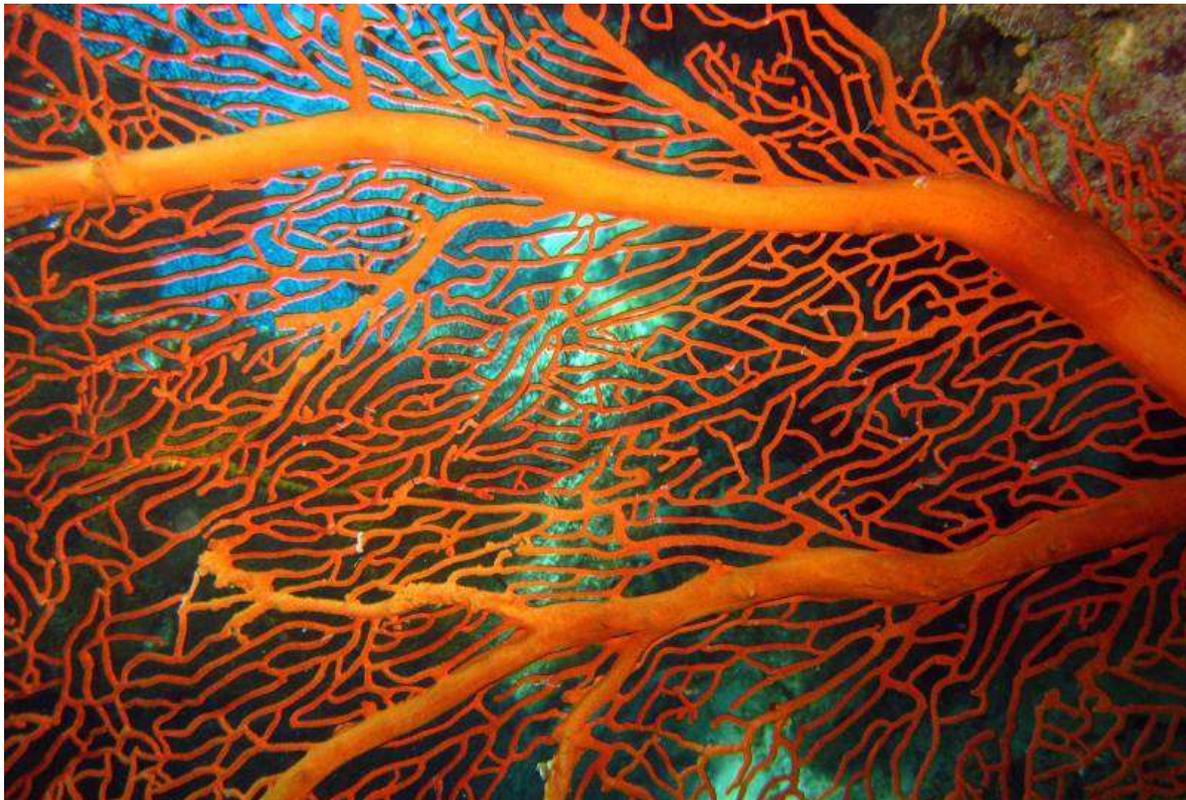
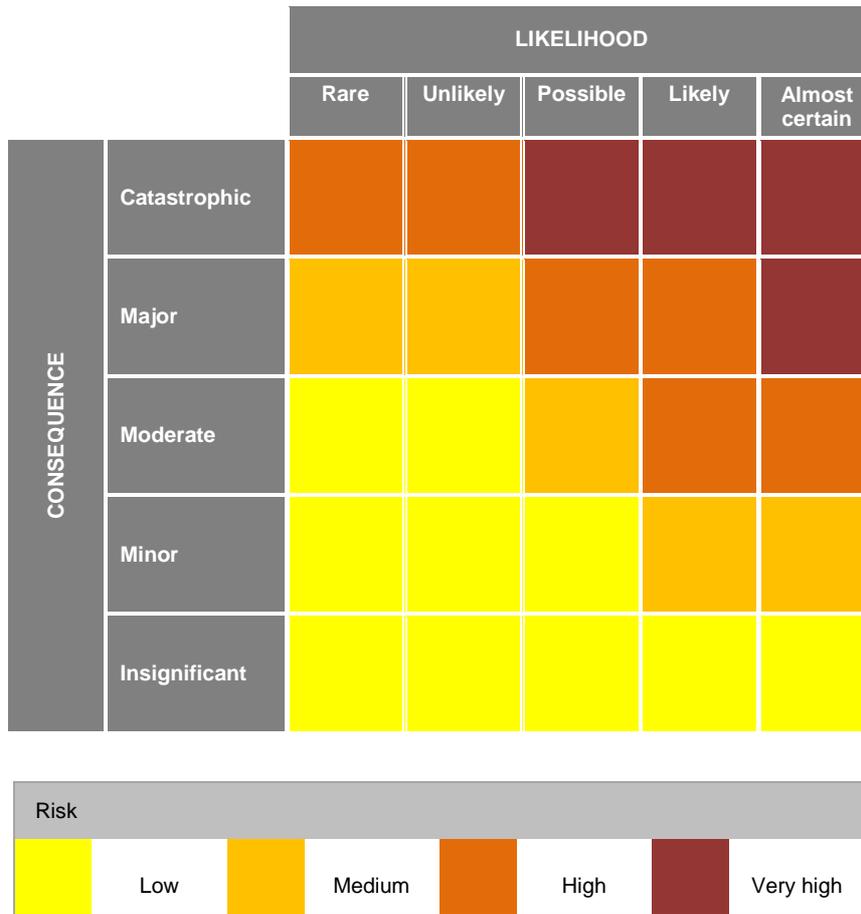
Figure A2.2 - Consequence scale

Based on current management

Consequence	Ecosystem		Heritage
	Broad scale	Local scale	
Catastrophic	Impact is clearly affecting, or would clearly affect, the nature of the ecosystem over a wide area. Recovery periods greater than 20 years likely		Impact is or has the potential to destroy a class or collection of heritage places on a large scale; or is clearly affecting, or would clearly affect, a range of heritage values over a wide area.
Major	Impact is, or would be, significant as a wider scale. Recovery periods of 10 to 20 years likely.	Impact is, or would be, extremely serious and possibly irreversible to a sensitive population or community. Condition of an affected part of the ecosystem possibly irretrievably compromised.	Impact is, or would be, adversely affect the heritage values of a number of places; destroy individual heritage places of great significance; or significantly affect the heritage values over a wide area.
Moderate	Impact is, or would be, present at a wider scale, affecting some components of the ecosystem. Recovery periods of five to 10 years likely.	Impact is, or would be, serious and possibly irreversible over a small area. Recovery periods of 10 to 20 years likely.	Impact is, or would, affect individual heritage places or values of significance; or affect to some extent the heritage values at a wider scale.
Minor	Impact is, or would be, not discernible at a wider scale. Impact would not impair the overall condition of the ecosystem, or a sensitive population or community, over a wider level.	Impact is, or would be, significant to a sensitive population or community at a local level. Recovery periods of five to 10 years likely.	Impact is, or would, affect heritage places or values of local significance, but not at a wider scale. Impact would not impair the overall condition of the heritage values.
Insignificant	No impact; or if impact is, or would be, present then only to the extent that it has no discernible effect on the overall condition of the ecosystem.	No impact; or if impact is, or would be, present then only to the extent that it has no discernible effect on the overall condition of the ecosystem.	No impact; or if impact is, or would be, present then only to the extent that it has no discernible effect on the heritage values; or positive impacts.

Figure A2.3 - Risk matrix legend

Likelihood and consequence are combined to determine risk level, in accordance with the Australian Standard for Risk Assessment (AS/NZS ISO 31000:2009).



Attachment 3: Condition and trend of Great Barrier Reef values

Relationship between values and processes and 'outstanding universal value'

A property is considered to be of 'outstanding universal value' if it meets one or more of 10 world heritage criteria and is inscribed on the World Heritage List. To be deemed to be of outstanding universal value 'a property must also meet the conditions of integrity and/or authenticity and must have an adequate protection and management system to ensure its safeguarding'. Effective future protection of the Great Barrier Reef's outstanding universal value, together with the seven matters of national environmental significance, relies on the integration of management measures and a systems approach to the protection of values and processes.

Given the scale and complexity of the Great Barrier Reef and its diversity and interconnectedness, key values and processes are combined into one comprehensive set as a basis for assessment of outstanding universal value and the seven matters of national environmental significance. The key values and processes presented in the following tables are based on those identified in the description of each matter in Sections 4.2 to 4.9 of the Great Barrier Reef Region Strategic Assessment Report.

Great Barrier Reef Outlook report condition and trend assessment approach (adapted from page 9 of the Great Barrier Reef Outlook Report 2014)

A set of assessment criteria is used to analyse available evidence. For example, the assessment of biodiversity uses two assessment criteria — habitats to support species and populations of species or groups of species. Within each assessment criterion there are multiple assessment components. A series of statements is then used to standardise the allocation of grades for all components examined in an assessment, as well as the overall grade for the criterion.

Grading statements (refer to Table A3.1)

The grade allocated is a 'grade of best fit', based on a qualitative assessment of the available evidence for the Region. It is not a comparison of the Region in relation to other tropical ecosystems around the world. The statements developed for assessing most heritage values are based on those used in the Australian State of the Environment Report and Strategic Assessment draft report. Those for the assessment of world and national heritage values are adapted from a grading system developed by the International Union for Conservation of Nature to assess the outstanding universal value of natural world heritage sites. One aspect considered in grading the condition of heritage values is the degree to which those values have been recorded and identified. This recognises the important role an understanding of heritage plays in its protection.

Trend and confidence

The approach to grading is refined by including an indication of trend and confidence, similar to the Australian State of the Environment Report and the Strategic Assessment report. There are four categories for trend: improved, stable, deteriorated and no consistent trend. The category of 'no consistent trend' is applied to a component when the available information is too variable to establish a trend, for example where there is strong variation across broad areas or across species within a group. The terms 'improved' and 'deteriorated' are replaced with 'increased' and 'decreased' in assessments of benefits, impacts, threats and risks. Similar to the Australian State of the Environment Report and the Strategic Assessment report, the level of confidence in each assessment of grade and trend is rated. The categories used are:

- adequate high quality evidence and high level of consensus
- limited evidence or limited consensus
- inferred, very limited evidence.

For components where the confidence level is 'inferred, very limited evidence', the assessment is based on knowledge from managing agencies, Traditional Owners, topic experts and informed stakeholders (expert elicitation).

Evidence used

The evidence used in the Great Barrier Reef Outlook Report is derived from existing research and information sources. It is drawn from the best available published science based on:

- relevance to the required assessments
- duration of study
- extent of area studied
- reliability (such as consistency of results across different sources, peer-review and rigour of study).



Table A3.1 - Condition of values grading statements

Functional group of values	Condition grading statement			
	Very good	Good	Poor	Very poor
Habitat to support species	All major habitats are essentially structurally and functionally intact and able to support all dependent species.	There is some habitat loss, degradation or alteration in some small areas, leading to minimal degradation but no persistent, substantial effects on populations of dependant species.	Habitat loss, degradation or alteration has occurred in a number of areas leading to persistent substantial effects on populations of dependent species.	There is widespread habitat loss, degradation or alteration leading to persistent, substantial effects on many populations of dependent species.
Populations of species and groups of species	Only a few, if any, species populations have deteriorated as a result of human activities or declining environmental conditions.	Populations of some species (but no species groups) have deteriorated significantly as a result of human activities or declining environmental conditions.	Populations of many species or some species groups have deteriorated significantly as a result of human activities or declining environmental conditions.	Populations of a large number of species have deteriorated significantly.
Physical, chemical and ecological processes	There are no significant changes in processes as a result of human activities.	There are some significant changes in processes as a result of human activities in some areas, but these are not to the extent that they are significantly affecting ecosystem function.	There are substantial changes in processes as a result of human activities, and these are significantly affecting ecosystem functions in some areas.	There are substantial changes in processes across a wide area as a result of human activities, and ecosystem functions are seriously affected in much of the area.
Outbreak of disease, introduced species and pest species	No records of diseases above expected natural levels; no introduced species recorded; pests populations within naturally expected levels.	Diseases occasionally above expected natural levels but recovery prompt; any occurrences or introduced species successfully addressed; pests sometimes present above natural levels with limited effects on ecosystem function.	Unnaturally high levels of disease regularly recorded in some areas; occurrences of introduced species require significant intervention; pests outbreaks in some areas affecting ecosystem function more than expected under natural conditions.	Unnaturally high levels of disease often recorded in many areas; uncontrollable outbreaks of introduced pests; opportunistic pests seriously affecting ecosystem function in many areas.
Indigenous, historic, social, aesthetic, scientific, Commonwealth and Natural heritage values	Heritage values have been systematically and comprehensively identified and included in relevant inventories or reserves. Known heritage values are well maintained and retain a high degree of integrity.	Heritage values have been mostly identified and included in relevant inventories or reserves. Known heritage values are generally maintained and retain much of their integrity.	Heritage values have not been systematically identified. Known heritage values are degrading and generally lack integrity.	Heritage values have not been identified. Known heritage values are degraded and lack integrity.
World and national heritage values	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.	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.	Loss or alteration of the elements necessary to maintain outstanding universal value has occurred, which is leading to a significant reduction in this element of the outstanding universal value.	Loss or alteration of most elements necessary to maintain the outstanding universal value has occurred, causing a major loss of the outstanding universal value.
Economic and social benefits of use	Use of the Region provides significant economic and social benefit, in ways that sustain the fundamental value of the natural resource. The Region is strongly recognised, valued and enjoyed by catchment residents, the nation and the world community.	Use of the Region provides valuable economic and social benefit. The Region is valued by catchment residents, the nation and the world community.	There are few and declining economic and social benefits derived from the use of the Region. Many do not recognise the value of the Region and do not enjoy their visit to the Region.	Use of the Region contributes little or no economic and social benefit. The Region holds little value for catchment residents, the nation or the world community.

Table A3.2 – Key Great Barrier Reef values and attributes

The following table outlines key values and attributes for the Great Barrier Reef. These values and attributes underpin Reef-related Matters of National Environmental Significance. For the World Heritage Area, values are based the Statement of Outstanding Universal Value.

Key values and attributes	World heritage properties				Great Barrier Reef Marine Park	National heritage places	Commonwealth marine areas	Listed migratory and threatened species							Wetlands of international importance		
	Criterion i (now viii)	Criterion ii (now ix)	Criterion iii (now vii)	Criterion iv (now x)				Integrity	Marine turtles	Estuarine crocodiles	Whales	Dolphins	Dugongs	Sharks and rays		Seabirds	Shorebirds
Biodiversity — Great Barrier Reef habitats																	
Islands		●	●	●	●	●	●	●	●					●	●	●	
Beaches and coastlines			●		●	●	●	●	●						●	●	●
Mangrove forests			●	●	●	●	●	●	●				●	●	●	●	
Seagrass meadows				●	●	●	●	●			●	●	●			●	
Coral reefs (<30 m)		●	●	●	●	●	●	●					●			●	
Deeper reefs (>30 m)		●	●	●	●	●	●	●					●				
Lagoon floor				●	●	●	●				●	●	●				
Shoals				●	●	●	●				●		●	●			
Halimeda banks		●			●	●	●	●									
Continental slope					●	●	●										
Open waters			●	●	●	●	●	●	●	●	●	●	●	●		●	
Biodiversity — terrestrial habitats that support the Great Barrier Reef																	
Saltmarshes						●		●	●					●	●	●	
Freshwater wetlands						●		●	●					●	●	●	
Forested floodplain						●		●								●	
Heath and shrublands						●		●									
Grass and sedgeland						●		●							●	●	
Woodlands						●		●								●	
Forests						●		●								●	
Rainforests			●			●		●									
Connecting water bodies				●	●	●	●	●	●		●	●	●	●	●	●	
Biodiversity — species																	
Mangroves			●	●	●	●	●	●								●	
Seagrasses				●	●	●	●	●			●					●	
Macroalgae				●	●	●	●	●									

Key values and attributes	World heritage properties						Listed migratory and threatened species							Wetlands of international importance				
	Criterion i (now viii)	Criterion ii (now ix)	Criterion iii (now vii)	Criterion iv (now x)	Integrity	Great Barrier Reef Marine Park	National heritage places	Commonwealth marine areas	Marine turtles	Estuarine crocodiles	Whales	Dolphins	Dugongs		Sharks and rays	Seabirds	Shorebirds	
Benthic microalgae				●	●	●	●	●										
Corals			●	●	●	●	●	●										
Other invertebrates		●		●	●	●	●	●	●		●	●		●	●	●	●	
Plankton and microbes				●	●	●	●	●			●							
Bony fish		●	●	●	●	●	●	●			●	●		●	●	●	●	
Sharks and rays				●	●	●	●	●			●			●				
Sea snakes				●	●	●	●	●										
Marine turtles			●	●	●	●	●	●	●								●	
Estuarine crocodiles				●	●	●	●	●		●								
Seabirds			●	●	●	●	●	●							●			
Shorebirds				●	●	●	●	●								●	●	
Whales			●	●	●	●	●	●			●							
Dolphins				●	●	●	●	●				●						
Dugongs				●	●	●	●	●					●				●	
Geomorphological features																		
Coral reefs	●		●		●	●	●	●										
Islands and shorelines	●		●		●	●	●	●	●						●	●	●	
Channels and canyons	●				●	●	●	●										
River deltas	●				●	●	●	●										
Halimeda banks	●				●	●	●	●										
Seagrass meadows	●				●	●	●	●	●								●	
Aboriginal and Torres Strait Islander heritage																		
Cultural practices, observances, customs and lore		●			●	●	●	●	●	●	●	●	●	●	●	●	●	●
Sacred sites, sites of particular significance, places important for cultural tradition		●			●	●	●	●									●	
Stories, songlines, totems and languages		●			●	●	●	●	●	●	●	●	●	●	●	●	●	
Indigenous structures, technology, tools and archaeology		●			●	●	●	●									●	
Historic heritage																		
Places of historic significance — historic shipwrecks						●		●										

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Key values and attributes	World heritage properties					Listed migratory and threatened species										Wetlands of international importance		
	Criterion i (now viii)	Criterion ii (now ix)	Criterion iii (now vii)	Criterion iv (now x)	Integrity	Great Barrier Reef Marine Park	National heritage places	Commonwealth marine areas	Marine turtles	Estuarine crocodiles	Whales	Dolphins	Dugongs	Sharks and rays	Seabirds		Shorebirds	
Places of historic significance — World War II features and sites						●		●										
Places of historic significance — lightstations						●		●										
Places of historic significance — other						●		●										●
Places of scientific significance (research stations, expedition sites)						●		●										
Places of social significance — iconic sites						●		●										
Community benefits of the environment																		
Income						●		●										●
Employment						●		●										●
Understanding						●		●										
Appreciation			●			●	●	●										●
Enjoyment			●			●	●	●										
Access to Reef resources						●		●										
Personal connection						●		●										
Health benefits						●		●										
Aesthetics			●		●	●	●	●	●	●	●	●	●	●	●	●	●	●

Table A3.3 Key environmental processes relevant to matters of national environmental significance

For the World Heritage Area, connections are based on the Statement of Outstanding Universal Value. For listed species, processes that have a major supporting role in maintaining the species are shown (for example, the role that beaches play in the nesting of listed marine turtles). For wetlands of international importance, the connections shown are those discussed in the Ramsar Convention information sheet.

Key environmental processes	World heritage properties				Integrity	Great Barrier Reef Marine Park	National heritage places	Commonwealth marine areas	Listed migratory and threatened species								Wetlands of international importance
	Criterion i (now viii)	Criterion ii (now ix)	Criterion iii (now vii)	Criterion iv (now x)					Marine turtles	Estuarine crocodiles	Whales	Dolphins	Dugongs	Sharks and rays	Seabirds	Shorebirds	
Waves, currents and tides	●	●			●	●	●	●	●						●	●	
Cyclones	●	●			●	●	●	●	●	●		●	●	●	●	●	
Wind	●	●			●	●	●	●							●		
Sedimentation	●	●			●	●	●	●	●				●			●	●
Sea level	●	●			●	●	●	●	●	●						●	●
Sea temperature		●			●	●	●	●	●	●							
Light		●			●	●	●	●	●				●				
Nutrient cycling		●			●	●	●	●									●
Ocean acidity		●			●	●	●	●									
Freshwater inflow and salinity		●			●	●	●	●									●
Microbial processes		●			●	●	●	●									
Particle feeding		●			●	●	●	●									
Primary production		●			●	●	●	●	●				●				
Herbivory		●			●	●	●	●	●				●				
Predation		●			●	●	●	●	●	●	●	●		●	●	●	
Symbiosis		●			●	●	●	●									
Competition		●			●	●	●	●	●	●	●	●	●	●	●	●	
Connectivity	●	●			●	●	●	●	●	●	●	●	●	●	●	●	●
Recruitment		●			●	●	●	●	●	●	●	●	●	●	●	●	●
Reef building	●	●	●		●	●	●	●									



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