

The Great Barrier Reef Marine Park Authority is implementing the Representative Areas Program to help ensure better protection of the Marine Park's biodiversity. This will involve a review of the existing zoning throughout the Marine Park. This information sheet is part of a package of materials that help explain various technical elements of the Representative Areas Program and the zoning review.

Biophysical Operational Principles as recommended by the Scientific Steering Committee for the Representative Areas Program

The Scientific Steering Committee

The independent Scientific Steering Committee (SSC) to the Representative Areas Program (RAP) provides advice on scientific issues, programming and priorities to assist the Great Barrier Reef Marine Park Authority (GBRMPA) to achieve the best possible outcomes. The membership of RAP's SSC was decided by the GBRMPA after consultation with over 70 of Australia's top scientists with expertise in the GBR region.

Background and context for these recommendations

The SSC believes that the existing network of Green Zones (no-take areas)¹ in the Great Barrier Reef Marine Park (GBRMP) is insufficient to maintain the biological diversity and ecological integrity of the Great Barrier Reef (GBR) into the future. The reasons are that:

- less than 5% of the Marine Park is currently in no-take areas;
- the existing areas are largely confined to coral reefs or the remote far north of the Marine Park; and
- the coverage of no-take areas in many of the 70 bioregions in the Great Barrier Reef World Heritage Area (GBRWHA) is minimal or non-existent.

The GBRMPA shares this concern and is rezoning the entire Marine Park through RAP. This rezoning will result in more no-take areas that will help:

- maintain biological diversity at the levels of ecosystem, habitat, species, population and genes;
- allow species to evolve and function undisturbed;
- provide an ecological safety margin against human-induced disasters;
- provide a solid ecological base from which threatened species or habitats can recover or repair themselves; and
- maintain ecological processes and systems.

As part of the RAP, new no-take areas or Green Zones will be created and existing Green Zones may be expanded to achieve greater protection of biodiversity. The existing range of multiple-use zones will remain (ranging from 'General Use Zones' where most reasonable activities are allowed, through the new 'National Park Zones' [aka Green Zones or 'no-take' areas], to small areas of 'Preservation Zone' which are 'no-go' areas).

The Representative Areas Program has several phases:

- **classification** - map the marine diversity in the Great Barrier Reef World Heritage Area into bioregions;
- **review** - determine the extent to which the existing zoning protects the biodiversity shown by the bioregions;

¹ Green Zones (no-take areas) within the GBR Marine Park are equivalent to the existing "National Park Zones" (Cairns & Far North Sections) and "Marine National Park B Zones" (Central & Mackay-Capricorn Sections) in which activities such as boating, diving and snorkelling are permitted, but the taking of plants, animals and marine products is prohibited.

- **identification** – identify networks of candidate areas which will achieve the biological objectives of RAP; and
- **selection** – select from amongst the options of candidate areas to maximise beneficial and minimise detrimental impacts whilst considering social, economic, cultural and management implications (Day et al, in press).

Origin and justification of the biophysical operational principles

The following biophysical operational principles are recommended by the SSC to guide the establishment of a new network of no-take areas that could achieve the objectives of RAP. These principles will guide reserve design processes in RAP. The SSC recognises that other processes in RAP will address the cultural, social and economic dimensions of the program and that these may influence the degree to which the GBRMPA is able to achieve, in full, its recommendations. An independent Social, Economic and Cultural Steering Committee has developed operational principles for assessing [social, economic, cultural impacts and management feasibility](#) that complement the biophysical operational principles defined here (http://umparra.gbrmpa.gov.au/testweb/corp_site/key_issues/conservation/rep_areas/documents/tech_sheet_07.pdf).

The biophysical operational principles outlined below were established by the SSC by taking into account:

- the level of uncertainty about the biodiversity of the GBR World Heritage Area;
- the fact there is already a basic level of protection across the GBR Marine Park; and
- other efforts to ensure protection of the GBR Marine Park by improvements in, for example, water quality and sustainable fishing.

Amount of protection required

The extent of protection required to ensure the ongoing conservation and protection of marine biodiversity is a subject of debate in the scientific literature. Amounts recommended in the literature generally fall in the range of 20 - 40% of the sea in no-take areas. The scientific arguments for setting aside substantial amounts of the marine environment as no-take areas include:

- **Risk minimisation** – protecting a large proportion and replicate examples of a marine area – in total 20% or more – will reduce risks of over-exploitation of harvested resources and consequent effects on the ecosystem, whilst leaving reasonable opportunity for existing activities to continue in the remaining areas;
- **Connectivity** – the life cycles of most marine organisms mean that offspring from one area often replenish populations in other areas (referred to as ‘connectivity’). As more areas are closed to extractive activities, the benefits to the whole system through such connectivity (both among reserves and between reserves and non-reserves) is expected to increase, thereby offering greater security for conservation;
- **Resilience against human and natural catastrophes** – for any one disturbance, much of the network of protected areas should remain intact so that affected areas can recover more quickly and completely through replenishment from other non-impacted no-take areas;
- **Harvested species** – the protection of 20 - 40% of any fished grounds in no-take areas offers some fisheries the opportunity for better management, and permits no-take areas to maintain more natural population levels of harvested species and, consequently, more natural communities as a whole; and
- **Maintenance of ecological services and goods** – in no-take areas, ecosystems can function in a more natural manner which contributes to maintenance of ecological processes. This leads to more sustainable delivery of ecological goods and services to both the environment and humans.

The SSC is aware of the literature on theoretical and empirical evidence for levels of protection. Their considerations have been supported by independent advice from other

experts in coral reef and non-reef ecosystems, and experts with technical knowledge about the design of protected area networks. The SSC recognises:

- national and international expectations associated with managing the world’s largest coral reef ecosystem and the world’s largest World Heritage Area in a developed country; and
- international experience and opinion advocating greater protection of the world’s oceans.

The percentages presented in these recommendations have been developed using best available knowledge of the GBR World Heritage Area system and general principles of reserve design. Despite this, detailed knowledge about the distribution of many plants and animals in the area is limited and the SSC recognises that many species are yet to be discovered. The SSC considers that species-specific information is insufficient to determine exact amounts of protection required for the whole ecosystem and that all knowledge gathered to date indicates that the protection of biodiversity requires much more than protection of particular species and a much greater extent of protection than currently exists in the GBRMP.

The percentage figures presented in the biophysical operational principles were developed using all available information and local knowledge/experience of the GBR World Heritage Area and recognition that requirements vary with areas and habitats. The final percentage protection recommended per bioregion is the outcome of implementing all the principles below including principles 5 and 6 (which refer to each bioregion) and principles referring to specific levels of protection for different habitats, communities and special and unique areas. The SSC also was mindful of the need for a precautionary approach to the protection of the unique biophysical properties of the GBRMP when recommending minimum amounts for no-take areas.

Biophysical operational principles recommended by the SSC

Principle	Explanation
1. Have no-take areas the minimum size of which is 20km along the smallest dimension (except for coastal bioregions, refer to Principle 6)	While no-take areas may be of various shapes and sizes, 20km should be the minimum distance across any no-take area in order to ensure that the size of each area is adequate to provide for the maintenance of populations of plants and animals within Green Zones and to insure against edge effects resulting from use of the surrounding areas.
2. Have larger (versus smaller) no-take areas	For the same amount of area to be protected, protect fewer, larger areas rather than more smaller areas, particularly to minimise ‘edge effects’ resulting from use of the surrounding areas. This principle must be implemented in conjunction with principle 3.
3. Have sufficient no-take areas to insure against negative impacts on some part of a bioregion	“Sufficient” refers to the amount and configuration of no-take areas and may be different for each bioregion depending on its characteristics. For most bioregions, 3-4 no-take areas are recommended to spread the risk against negative human impacts affecting all Green Zones within a bioregion. For some very small bioregions fewer areas are recommended, whilst for some very large or long bioregions, more no-take areas are recommended.

<p>4. Where a reef is incorporated into no-take zones, the whole reef should be included</p>	<p>Reefs are relatively integral biological units with a high level of connectivity among habitats within them. Accordingly, reefs should not be subject to ‘split zoning’ so that parts of a reef are ‘no-take’ and other parts are not.</p>
<p>5. Represent a minimum amount of each reef bioregion in no-take areas</p>	<p>In each reef bioregion, protect at least 3 reefs with at least 20% of reef area and reef perimeter² included in no-take areas. The number and distribution of no-take areas is described in principle 3.</p>
<p>6. Represent a minimum amount of each non-reef bioregion in no-take areas</p>	<p>In each non-reef bioregion, protect at least 20% of area. Two coastal bioregions³, which contain finer scale patterns of diversity due to bays, adjacent terrestrial habitat and rivers require special provisions. The number and distribution of no-take areas is described in principle 3.</p>
<p>7. Represent cross-shelf and latitudinal diversity in the network of no-take areas</p>	<p>Many processes create latitudinal and longitudinal (cross-shelf) differences in habitats and communities within the GBR World Heritage Area. This diversity is reflected partly in the distribution of the bioregions, but care should be taken to choose no-take areas that include differences in community types and habitats that cover wide latitudinal or cross-shelf ranges (see principle 8).</p>
<p>8. Represent a minimum amount of each community type and physical environment type in the overall network taking into account principle 7⁴ (see footnote 4 over page)</p>	<p>This principle is to ensure that all known communities and habitats that exist within bioregions are included in the network of no-take areas. Communities and habitats were identified for protection in no-take areas based upon the reliability and comprehensiveness of available data. The requirements listed in Footnote 5 help implement this principle, which is intended to ensure that particularly important habitats are adequately represented in the network of no-take areas.</p>
<p>9. Maximise use of environmental information to determine the configuration of no-take areas to form viable networks</p>	<p>The network of areas should accommodate what is known about migration patterns, currents and connectivity among habitats. The spatial configurations required to accommodate these processes are not well known and expert review of candidate networks of areas will be required to implement this principle.</p>

² These bioregions are excepted:

- Capricorn-Bunker Mid-Shelf Reefs (RCB2) – include one of the inner 2 and one of the outer 2 reefs. This exception exists because RCB2 has only 4 reefs;
- Deltaic Reefs (RA1) – minimum 25% and minimum 15 reefs in one continuous area. This exception exists because the bioregion is too small for multiple no-take areas;
- High Continental Island Reefs (RHC) – 20% of reef perimeter only. This exception exists because reef perimeter makes more biological sense for fringing reefs; and
- Central Open Lagoon Reefs (RF2) – 3 reefs. There are very few reefs in this bioregion.

³ For coastal bioregions:

- Coastal Strip-Sand (NA1) – protect at least six no-take areas, each at least 10km in length, spaced approximately every 70-100km apart. (This bioregion is approx. 800 km long); and
- High Nutrient Coastal Strip (NA3) – at least eight no-take areas, each at least 10km in length, spaced approximately every 70-100 km apart. (This bioregion is approx. 1400 km long).

<p>10. Include biophysically special/unique places</p>	<p>These places might not otherwise be included in the network but will help ensure the network is comprehensive and adequate to protect biodiversity and the known special or unique areas in the GBRMP. Aim to capture as many biophysically special or unique places as possible.</p>
<p>11. Include consideration of sea and adjacent land uses in determining no-take areas</p>	<p>Past and present uses may have influenced the integrity of the biological communities and the GBRMPA should consider these effects, where known, when choosing the location of no-take areas. For example, existing no-take areas and areas adjacent to terrestrial National Parks are likely to have greater biological integrity than areas that have been used heavily for resource exploitation.</p>

The biophysical operational principles should be treated as a package to underpin the choice of what number, size and location of no-take areas to implement. If these principles are implemented in full, the SSC expects that around 25-30% of the GBRMP will be protected in Green Zones or no-take areas – in some locations more and others less so⁵. These biophysical operational principles refer to minimum amounts of protection. The SSC considers that to achieve the objectives of RAP the GBRMPA should protect at least these amounts in each bioregion and each habitat – none of these recommendations are for “ideal” or “desired” amounts. Ideal or desired amounts required for full protection are likely to be greater than indicated by the biophysical operational principles.

The SSC realizes that there are many different spatial configurations of no-take areas that would fulfill these biophysical operational principles and that the final location of no-take areas will be decided in consultation with Traditional Owners, users and other stakeholders.

FOOTNOTE 4 - Data and objectives to implement principle 8:

- **Halimeda beds** – ensure no-take areas represent 10% of known *Halimeda* beds;
- **shallow water seagrass** – ensure no-take areas represent 10% of shallow water seagrass habitat;
- **deepwater seagrass** – ensure no-take areas represent 10% of known deepwater seagrass habitat;
- **algae** – ensure no-take areas represent 10% of known algal habitat;
- **epibenthos** – ensure no-take areas represent different faunal classes (5% each of echinodermata, sponges, bryozoans, solitary corals, soft corals, foraminifera, brachyura);
- **dugong** – ensure no-take areas represent identified dugong habitat areas summing to about 50% of all high priority dugong habitat;
- **cays** – where cays exist within a bioregion, try to include at least two examples of them in potential no-take areas;
- **reefs size** - capture 5% of reef area in each of five reef-size classes;
- **inter-reef channels** - capture at least one inter-reef channel in bioregions where they exist;
- **exposure** - ensure the entire network captures 5% of reef and non-reef area in each of five wave exposure classes;
- **islands** – where islands exist within a bioregion try to include one example of them in no-take areas;
- **oceanographic diversity in water quality** – ensure representation of reefs within the “natural” diversity of water quality (5% of reef and non-reef area in each of nine oceanographic “bioregions”; 5% of reef and non-reef area in each of four flood frequency classes);
- **adjacent coastal and estuarine habitats** (including islands) – locate no-take areas adjacent to mangroves, wetlands and protected areas rather than adjacent to suburbs; and
- **major turtle sites** – ensure no-take areas include known major turtle nesting and foraging sites (100% of about 30 sites of the 115 identified – these include both nesting sites and foraging sites).

⁵ More new no-take zones will be located over non-reef areas than reef areas because 21% of reef area is already in no-take zones.

The SSC considers that the biophysical operational principles are best estimates of the requirements to provide minimum protection through declaration of no-take areas (Green Zones), available literature and expert knowledge, and are based upon current knowledge of the system but may require review as new information becomes available.

References for further reading can be supplied upon request.

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