

# Unit 4 Ocean issues and resource management

DRAFT

Adam Richmond



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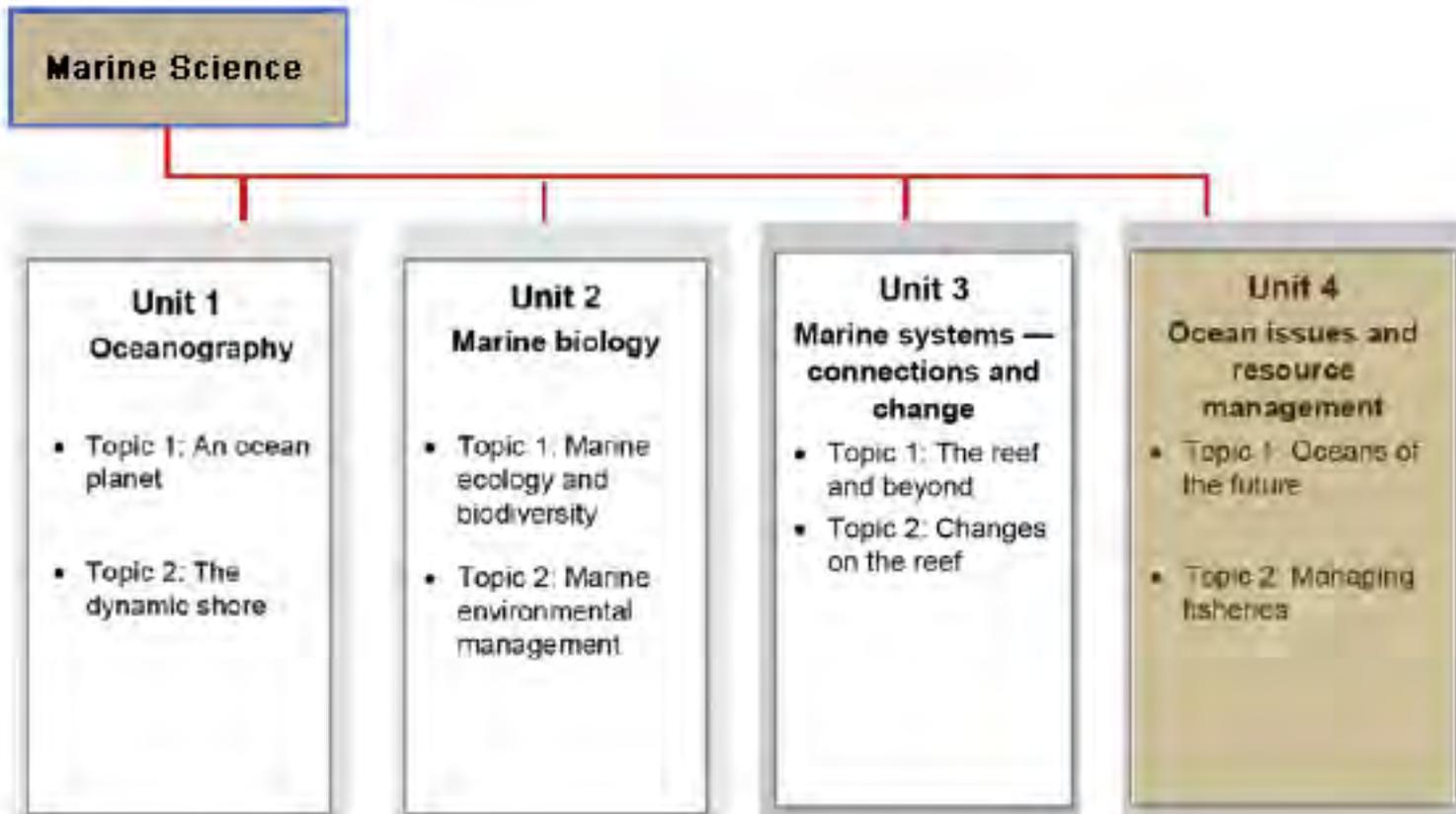
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# Syllabus reference

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# Classification of verbs – degree of difficulty

		
calculate (e.g. numerical answer; mathematical processes)	analyse	appraise
clarify	apply	appreciate
comprehend (meaning)	categorise	argue
construct (e.g. a diagram)	classify	assess
define	compare	comment (make a judgment)
demonstrate	consider	conduct (e.g. investigations)
describe	contrast	construct (e.g. an argument)
document	critique	create (e.g. a unique product/ artefact; language texts; meaning)
execute	deduce	decide/determine
explain	derive	discuss/explore
identify	determine	evaluate
implement (e.g. a plan, proposal)	discriminate	experiment/test (e.g. ideas, methods)
recall	distinguish	generate/test (e.g. hypotheses)
recognise (e.g. features)	identify	investigate/examine
select	infer/extrapolate	justify/prove (e.g. an argument, statement or conclusion)
understand	interpret (e.g. meaning)	modify
use		predict (e.g. a result)

# Topic 1: Oceans of the future

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## **Set 19 Management and conservation**

- T122 Habitat preservation arguments
- T123 MPA design criteria II
- T124 Marine ecosystem health
- T125 MPA success stories
- T126 Government and NGO management roles

## **Set 20 Future scenarios**

- T127 Atmospheric condition datasets
- T128 Historical geological data comparisons
- T129 Ocean acidification consequences
- T130 Weather and climate drivers
- T131 Impacts of global temperature rise

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## **Set 19 Management and conservation**

T122 Habitat preservation arguments

T123 MPA design criteria II

T124 Marine ecosystem health

T125 MPA success stories

T126 Government and NGO management roles

# T122 Habitat preservation arguments

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Adam Richmond

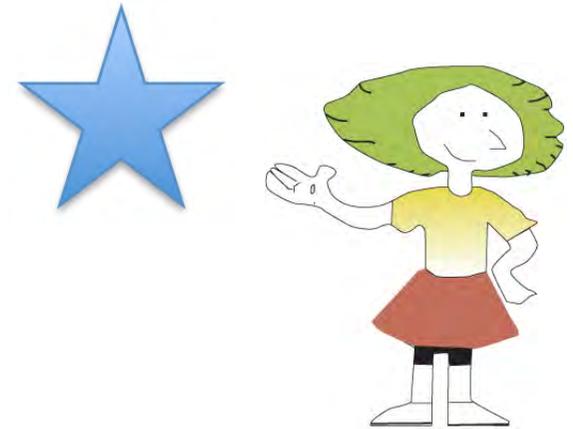


# Syllabus statement

At the end of this topic you should be able to ...

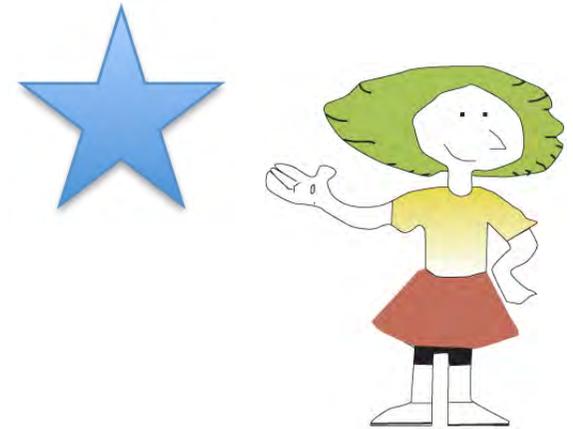
## Recall

and **use** the arguments for preserving species and habitats (i.e. ecological, economic, aesthetic, ethical) through identifying their associated direct and indirect values in a given case study



# Recall

- remember; present remembered ideas, facts or experiences;
- bring something back into thought, attention or into one's mind



# Objectives

Explain the different arguments for protecting biodiversity

Identify the direct and indirect values of a marine species or habitat

Argue why your chosen species or habitat should be protected



**Recall the ecological, economic, social, aesthetic, ethical arguments for preserving species and habitats.**

Revisit T060 Species habitat preservation.

Category	Argument
Genetic	
Ecological	
Economic	
Social	
Aesthetic	
Ethical	

Summarise ecological, economic, social, aesthetic, ethical arguments for preserving species and habitats in a table.

Category	Argument
Genetic	Wild animals and plants are sources of genes for new adaptations to assist the survival in a changing environment. Ecosystems become more resilient to the loss of a species/reduction of population. Some species are keystone species, which if removed from the ecosystem can lead to many other species becoming extinct
Ecological	More species increases food web complexity. If prey or predator is lost other species can fill in gap. Life-support service value e.g. stable climate
Economic	People take vacations on areas surrounded by natural beauty and national parks (examples: snorkelling, fishing, boating, sailing, hiking) Unknown value in the potential of the species for agriculture, medicine, genetic diversity and biotechnology The sea is also a vast source of commercial resources such as oil and gas, which help run the electricity in your school.
Social	Provide a place for people to socialize - Let's all go for a surf, paddle, swim – source of networking, buildings environmental groups. OR Different societies need to defend environmental protection. Biodiversity should be preserved for its own sake as humans have a responsibility to act as stewards of the Earth.
Aesthetic	Source of beauty. People rely on wild places for spiritual fulfillment Nature can provide inspiration for the arts eg: music, poetry, painting, stories Surfers have a special relation with the sea which leads to the phrase - "only a surfer knows the feeling". I am sure you have your OWN special feelings and it is for these that habitats and species are worth preserving.
Ethical	Each species has a right to exist (a bioright) which is unrelated to human needs/ Habitats should be preserved for their own sake. Humans have a responsibility to act as stewards of our oceans and land

# Genetic

Wild animals and plants are sources of genes for new adaptations.

This assists survival in a changing environment.



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Ecosystems become more resilient to the loss of a species/reduction of population. Some species are keystone species, which if removed from the ecosystem can lead to many other species becoming extinct.



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# Ecological

More species types and numbers increases food web complexity.

Greater biodiversity provides greater ecosystem health.



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If one type of prey or one type of predator is lost, other species can fill in the gap.

For example, if one type of coral is more tolerant to pollution than another, it will replace the “weaker” type to allow continuation of the species.



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In the “big picture”, habitats play a vital role as life-support services. The ocean adjacent to the land provides a place for transport of reproductive materials and stages.

For example, mangrove seeds can be dispersed, barnacle larvae can grow and migrate back to shore.



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# Economic

People take vacations on areas surrounded by natural beauty and national parks.

The tourism industry can flourish, bringing millions of dollars into countries economies.



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As part of their holiday, they can go snorkelling, fishing, boating, sailing, hiking creating a multitude of service industry jobs.



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Gas platforms drill deep into the ocean floor extracting natural gas, offloading to ships or undersea pipelines and is then processed on shore.



Harriet A gas platform

© Copyright CSIRO Australia

## The direct value of the Great Barrier Reef

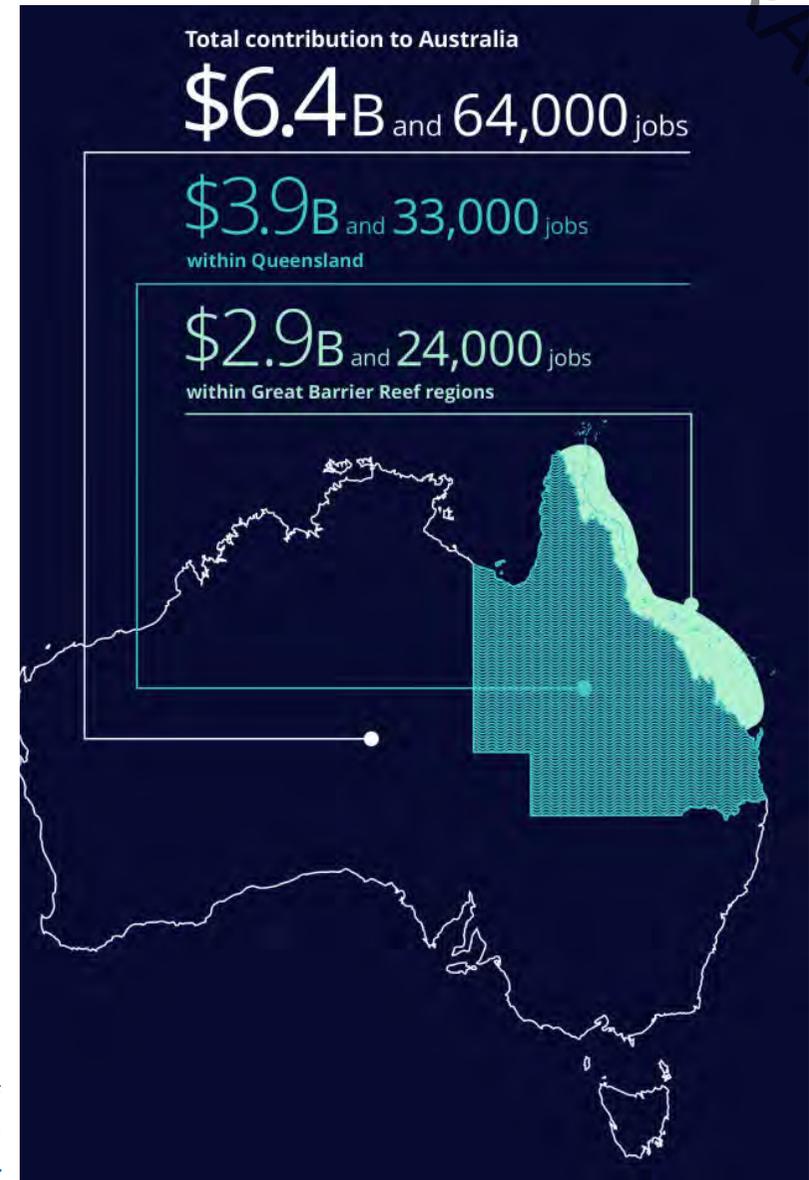
The Deloitte report investigated the economic, social and icon value of the Great Barrier Reef.

Download the report here:

<https://www2.deloitte.com/content/dam/Deloitte/au/Documents/Economics/deloitte-au-economics-great-barrier-reef-230617.pdf>

The Great Barrier reef provides 64 000 jobs and contributes \$6.4 B (\$6 400 000 000) to the Australian economy every year.

Image: © 2019 Great Barrier Reef Foundation, reproduced with permission. <https://www.barrierreef.org>



## What is the indirect value of the Great Barrier Reef?

The Great Barrier Reef is worth \$56 B to Australians who use the reef, visit the reef, or just like knowing that its there.

This is almost 9 times more than the direct contribution of the GBR to Australia's economy.

The indirect value is much more complicated to calculate as it includes "non-use" values.



Image: © 2019 Great Barrier Reef Foundation, reproduced with permission. <https://www.barrierreef.org>

The main reason Australians want to preserve the Great Barrier Reef is so future generations can visit it. This "bequest value" is an indirect non-use benefit.

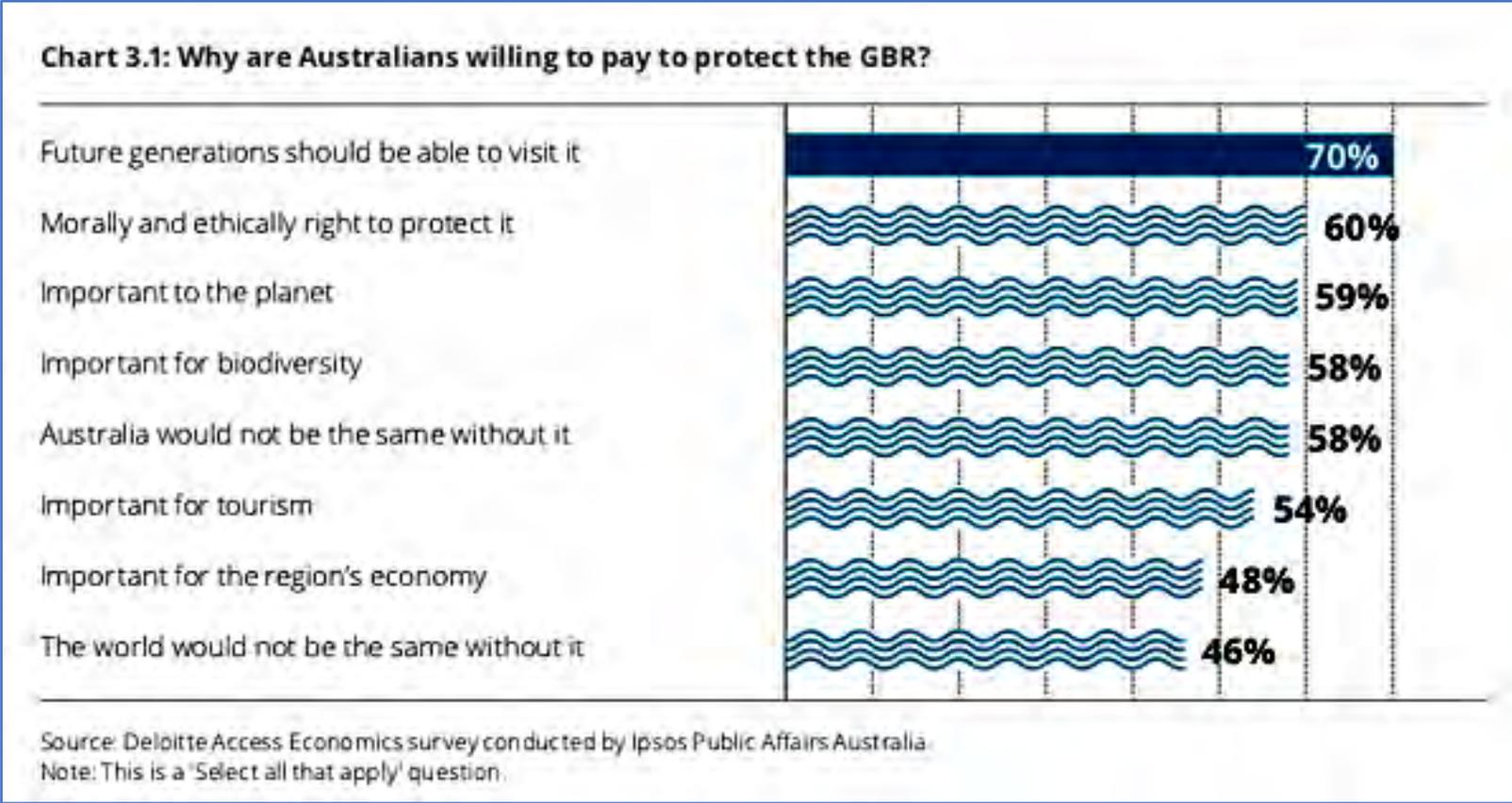
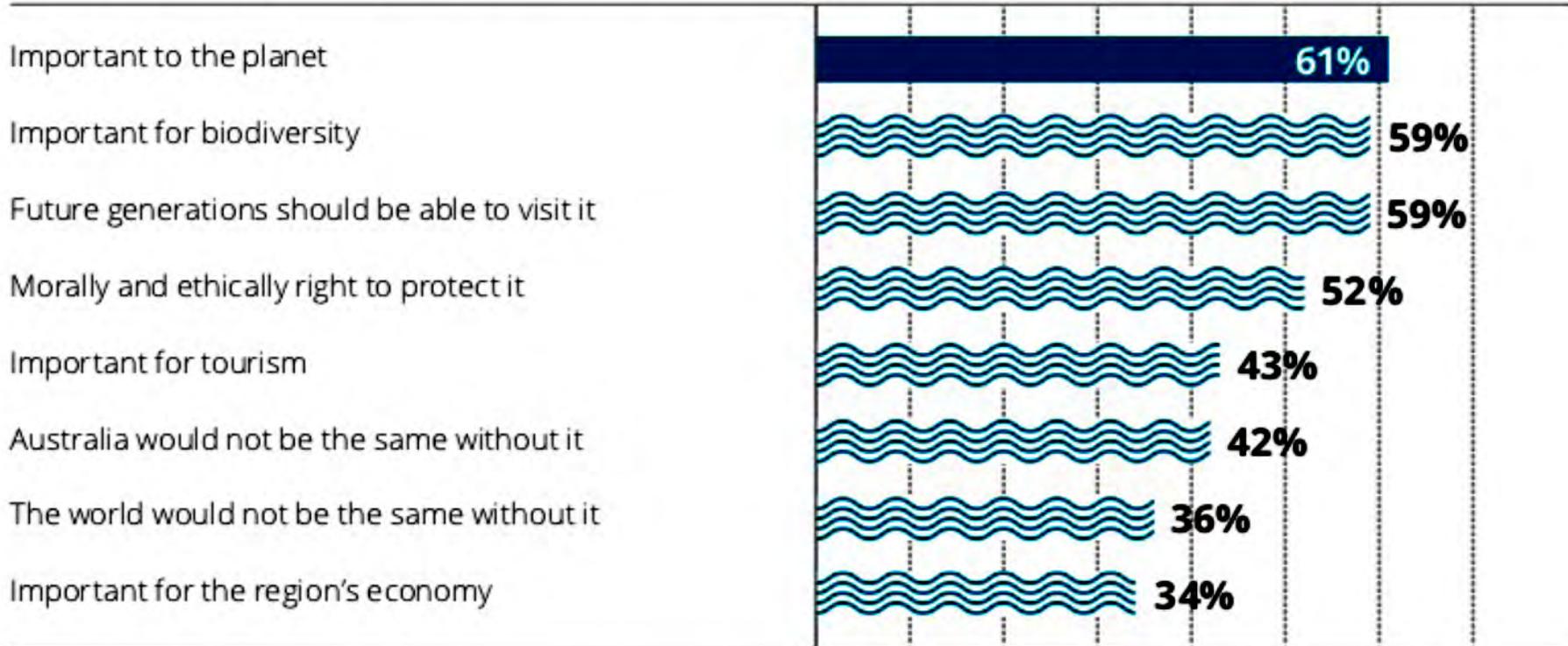


Image: O'Mahoney J, Simes R, Redhill D, Heaton K, Atkinson C, Hayward E, Nguyen M. 2017. At what price? The economic, social and icon value of the Great Barrier Reef. Deloitte Access Economics. Available: <https://www2.deloitte.com/content/dam/Deloitte/au/Documents/Economics/deloitte-au-economics-great-barrier-reef-230617.pdf> Reproduced with permission.

Internationally, people want to preserve the Great Barrier Reef more for its ecological values

**Chart 5.3 Why are people willing to pay to for the GBR's future health?**



Source: Deloitte Access Economics

Note: Domestic and international results combined.

Image: O'Mahoney J, Simes R, Redhill D, Heaton K, Atkinson C, Hayward E, Nguyen M. 2017. At what price? The economic, social and icon value of the Great Barrier Reef. Deloitte Access Economics. Available: <https://www2.deloitte.com/content/dam/Deloitte/au/Documents/Economics/deloitte-au-economics-great-barrier-reef-230617.pdf> Reproduced with permission.

# Social

Provide a place for people to socialise - Let's all go for a surf, paddle, swim – source of networking and building environmental groups.



One syllabus interpretation – what's yours?



Preserving our clean water provides a healthy environment for us all.  
Australia's clean water image is promoted around the world.



Surfing Australia - reproduced with permission from the bring back Kirra campaign (thanks Steph)

Different societies need to defend environmental protection.

“Biodiversity should be preserved for its own sake as humans have a responsibility to act as stewards of the Earth”



Another syllabus interpretation

# Aesthetic

The ocean is a source of beauty.

People rely on wild places for spiritual fulfillment and the ocean provides limitless opportunities.



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Habitats can provide inspiration for the arts.  
For example,  
Music, poetry, painting, photography and stories.



Surfers have a special relationship with the sea which leads to the phrase - “only a surfer knows the feeling”.

By Steve Jurvetson from Menlo Park, USA - Step Into Liquid, CC BY 2.0  
<https://commons.wikimedia.org/w/index.php?curid=3561785>

Aboriginal and Torres  
Strait Islander peoples  
record stories and their  
heritage in art.



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# Ethical

Each species has a right to exist (a bio-right) which is unrelated to human needs.

This idea holds that some, or all, non-human animals are entitled to the possession of their own lives and that their most basic interests - such as the need to avoid suffering - should be afforded the same consideration as similar interests of human beings.



Left By Alan Wilson - [www.naturespicsonline.com](http://www.naturespicsonline.com):  
[1], CC BY-SA 3.0,  
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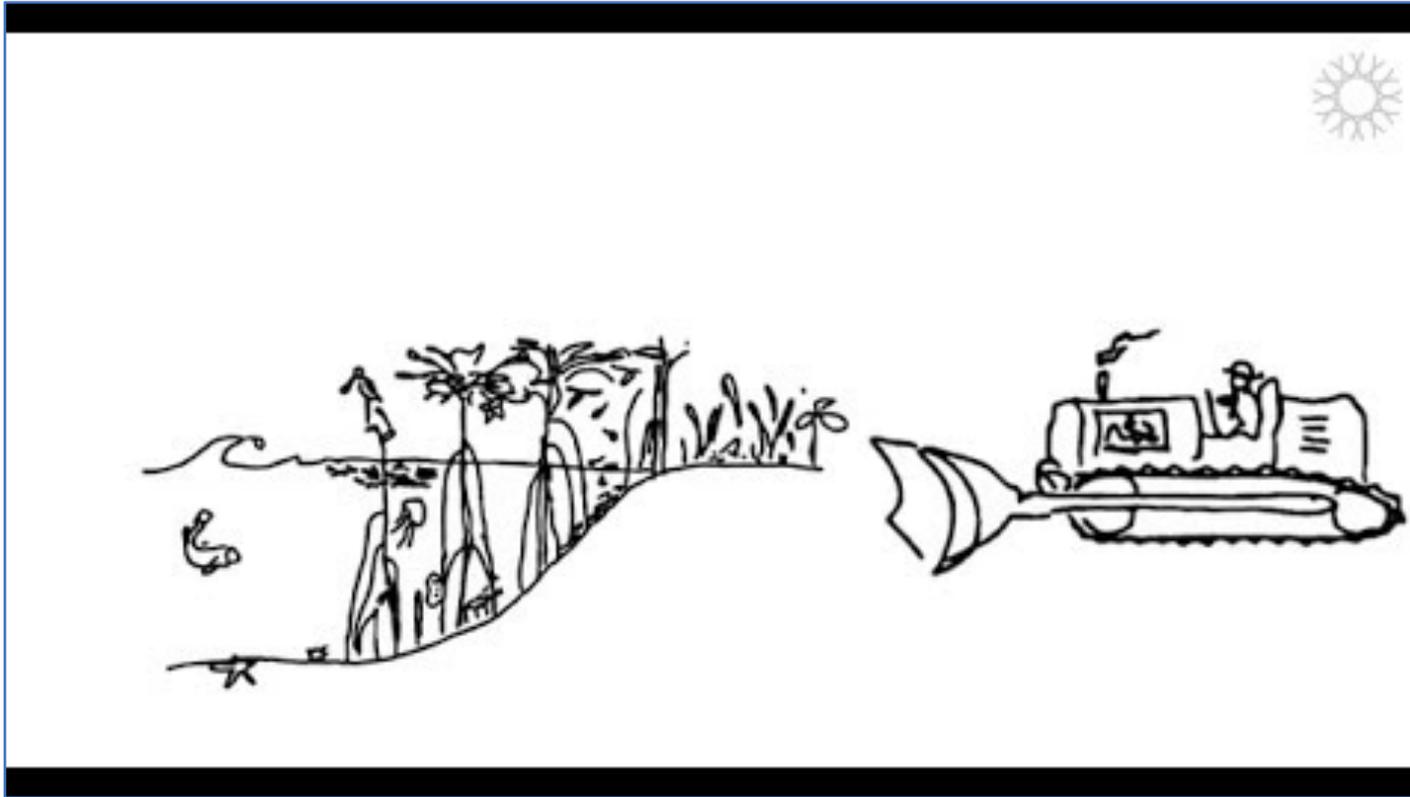
Habitats should be preserved for their own sake for future generations.  
Humans have a responsibility to act as stewards of our oceans and land.



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This YouTube video summarises direct and indirect and aesthetic values of ecosystems

<https://youtu.be/BCH1Gre3Mg0>



## Ecosystem Services

YouTube video by California Academy of Sciences, available: <https://youtu.be/BCH1Gre3Mg0>

## Class discussion

Here are some arguments for conserving green sea turtle.

*Which type of argument do they represent?*

- Sea turtles should be preserved because they are beautiful animals, and observing them in their natural habitat provides joy.
- All animals have a right to live. As humans, we have an obligation to ensure that we do not cause sea turtles to become extinct.
- Restoring the oceans where turtles live would be more expensive than maintaining them. Saving the turtles will boost the economies of coastal countries, through tourism.
- The fragile ocean ecosystem can be disrupted by small changes to the balance of species. Losing the sea-turtle would have significant effects on the ecosystem as a whole.

Reference: Brackney, M., & McAndrew, F. (2001). Ecological Worldviews and Receptivity to Different Types of Arguments for Preserving Endangered Species. *The Journal Of Environmental Education*, 33(1), 17-20. doi: 10.1080/00958960109600797



Entangled Sea turtle

Image: Stefan Hunt [CC BY 3.0 (<https://creativecommons.org/licenses/by/3.0/>)]

## Suggested answer

Sea turtles should be preserved because they are beautiful animals, and observing them in their natural habitat provides joy.

### - Aesthetic

All animals have a right to live. As humans, we have an obligation to ensure that we do not cause sea turtles to become extinct.

### - Moral/ethical

Restoring the oceans where turtles live would be more expensive than maintaining them. Saving the turtles will boost the economies of coastal countries, through tourism.

### - Economic

The fragile ocean ecosystem can be disrupted by small changes to the balance of species. Losing the sea-turtle would have significant effects on the ecosystem as a whole.

### - Ecological

Reference: Brackney, M., & McAndrew, F. (2001). Ecological Worldviews and Receptivity to Different Types of Arguments for Preserving Endangered Species. *The Journal Of Environmental Education*, 33(1), 17-20. doi: 10.1080/00958960109600797



Green Sea turtle hatchling

Image: Stefan Hunt [CC BY 3.0 (<https://creativecommons.org/licenses/by/3.0/>)]

# Question

Choose any marine habitat or species.

- Brainstorm reasons why it should be protected-include each type of preservation argument.



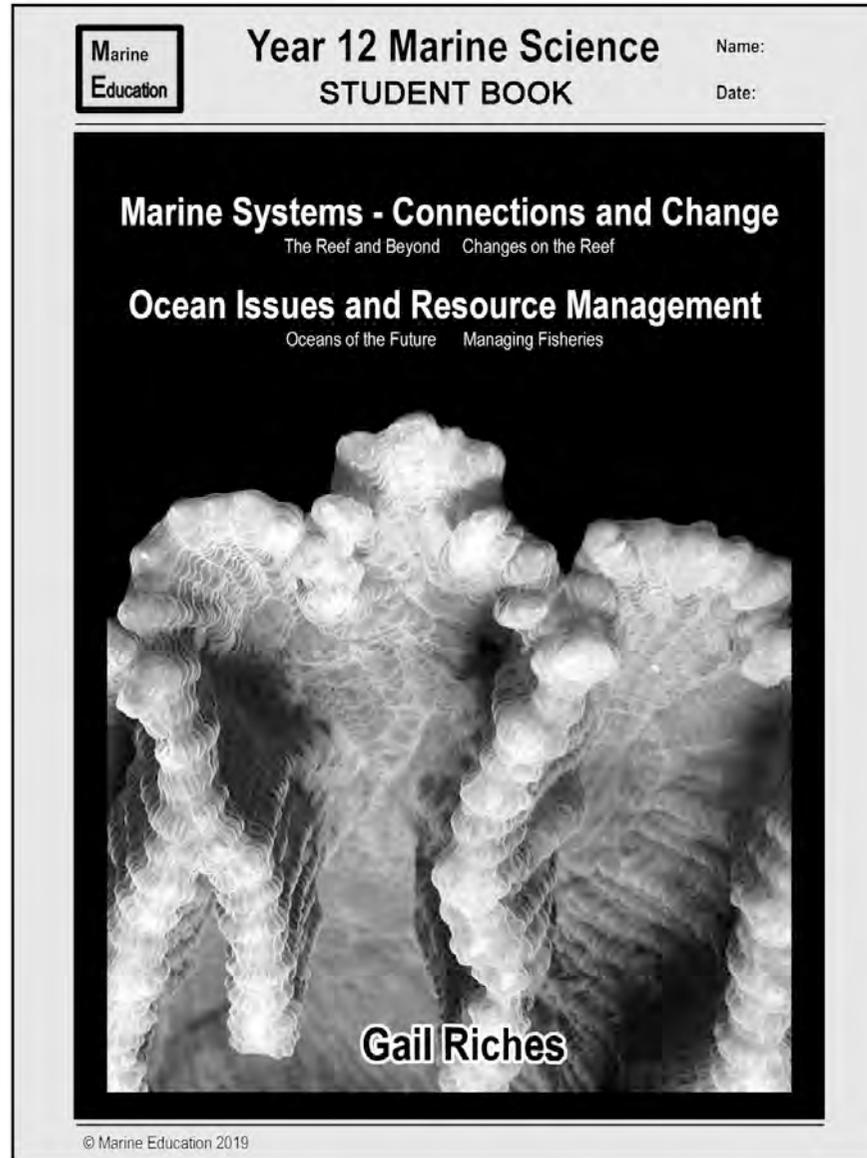
# Worksheet

## *Project why?*

by

Gail Richie

[www.marineeducation.com.au](http://www.marineeducation.com.au)



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# T123 MPA design criteria II

Adam Richmond



# Syllabus statement

At the end of this topic you should be able to ...

**Recall**



And

**Explain**

the criteria (i.e. site selection, networking and connectivity, replication, spacing, size and coverage) used to design protected marine areas



# Recall

- remember; present remembered ideas, facts or experiences; bring something back into thought, attention or into one's mind



# Explain

- make an idea or situation plain or clear by describing it in more detail or revealing relevant facts; give an account;
- provide additional information



# Review T067 MPA designs

In T067 MPA designs (last year), you listed three environmental criteria for places to be included into a marine park.



**The guidelines**

↓

**Guidance on Achieving Comprehensiveness, Adequacy, and Representativeness in the Commonwealth waters component of the National Representative System of Marine Protected Areas**

**The Scientific Peer Review Panel for the National Representative System of Marine Protected Areas**

February 20, 2006

**Purpose**

The purpose of this paper is to outline the approach of the Scientific Peer Review Panel for the National Representative System of Marine Protected Areas (the Peer Review Panel) in assessing the principles of comprehensiveness, adequacy and representativeness of Marine Protected Area (MPA) proposals for inclusion in the Commonwealth waters component of the National Representative System of Marine Protected Areas (NRSMPA). The advice provided in this paper is based on national guidelines produced by the Australian and New Zealand Environment and Conservation Council (ANZECC) for establishing a comprehensive, adequate and representative MPA system<sup>1</sup>.

← **Criteria**

## The Australian Government: Statements relating to MPA Development

The ANZECC guidelines to assist governments to develop a NRSMPA will be:

- Comprehensive: include MPAs that sample the full range of Australia's ecosystems;
- Adequate: include MPAs of appropriate size and configuration to ensure the conservation of marine biodiversity and integrity of ecological processes; and
- Representative: include MPAs that reflect the marine life and habitats of the areas they are chosen to represent.

The ANZECC documents recognize that governments will interpret the Guidelines so that they are effectively integrated with existing processes and legislation in each jurisdiction.

<http://www.environment.gov.au/resource/guidance-achieving-comprehensiveness-adequacy-and-representativeness-commonwealth-waters>

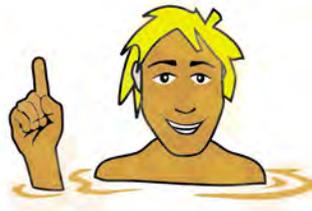
# AND the principles in decision making

- 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

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Now we look at the criteria used for designing marine protected areas in Australia.

i.e. site selection, networking and connectivity, replication, spacing, size and coverage.



# Objectives

- List the criteria used for designing marine protected areas in Australia.
- Describe in your own words why these criteria should be considered.
- Explain why can't we just protect the whole ocean?
- Classify scientific evidence for MPA design into the 4 CARE principles.



## Definition

For an area to be recognised as an MPA it must meet the IUCN protected area definition:

*A clearly defined geographical space, recognised, dedicated, and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values*

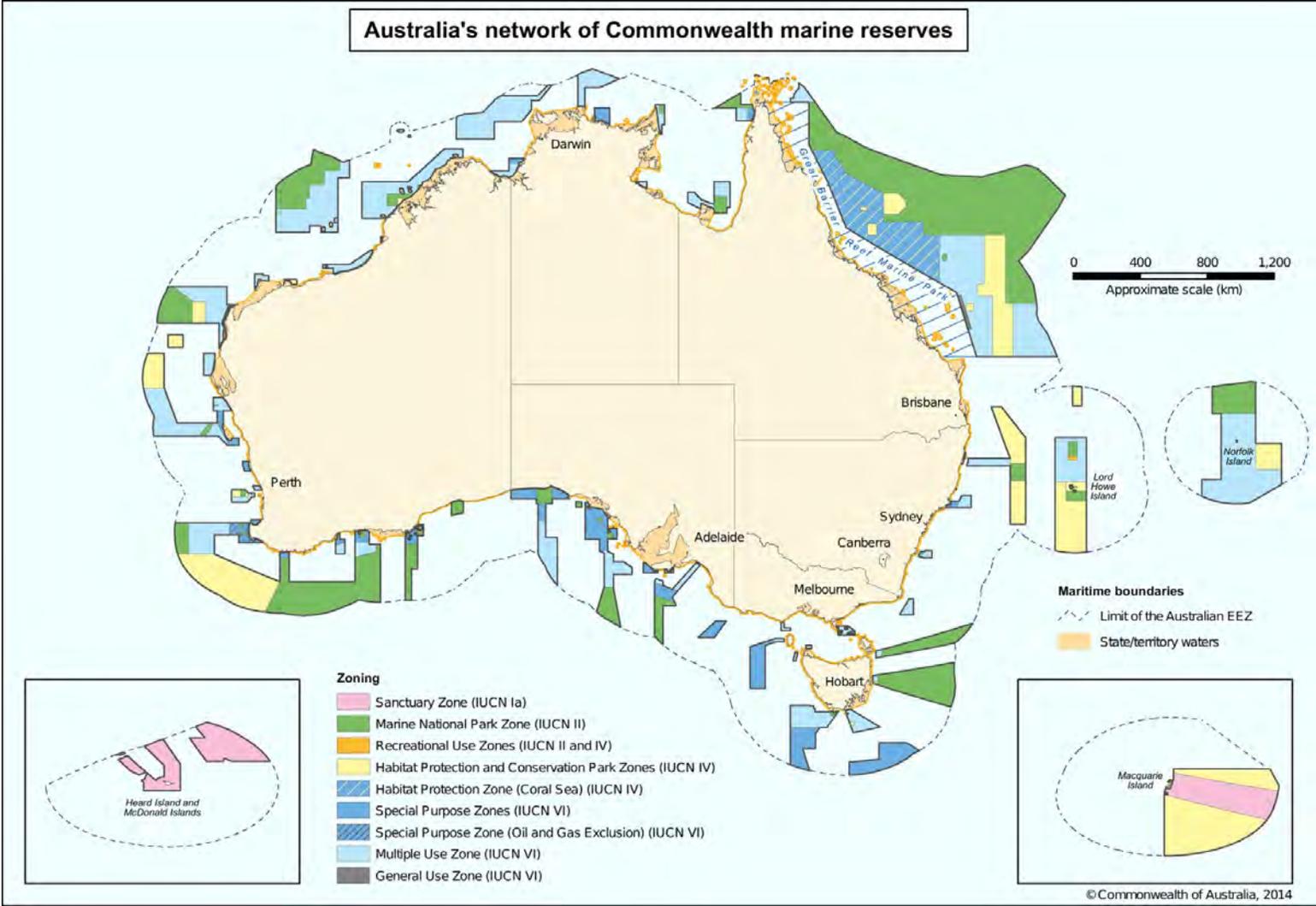
\*The IUCN is the International Union for the Conservation of Nature

Reference: IUCN WCPA, 2018. Applying IUCN's Global Conservation Standards to Marine Protected Areas (MPA). Delivering effective conservation action through MPAs, to secure ocean health & sustainable development. Version 1.0. Gland, Switzerland. 4pp.

Available:

[https://www.iucn.org/sites/dev/files/content/documents/applying\\_mpa\\_global\\_standards\\_final\\_version\\_050418.pdf](https://www.iucn.org/sites/dev/files/content/documents/applying_mpa_global_standards_final_version_050418.pdf)

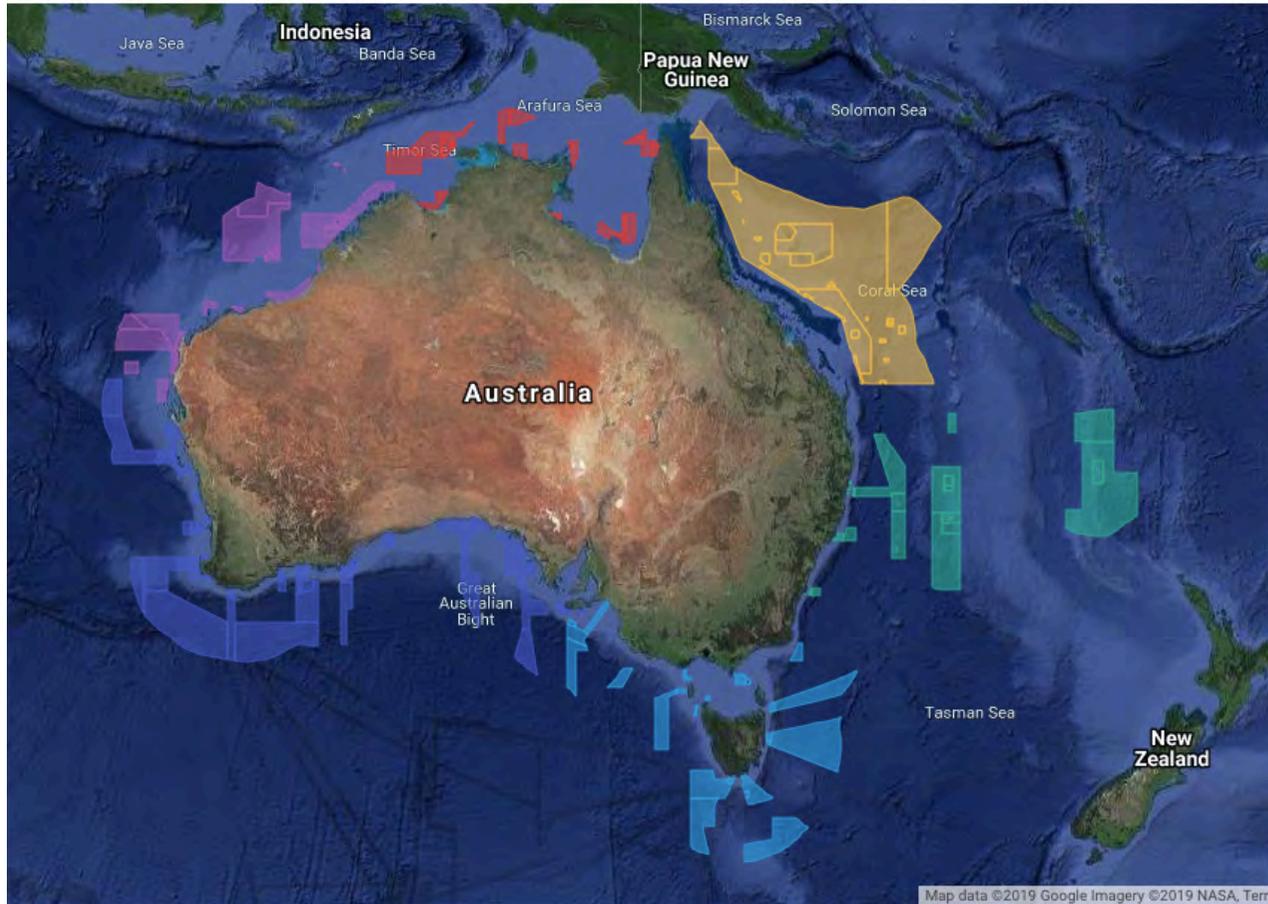
# These are the Marine Protected Areas managed by the Commonwealth Government



## Map of all Australian networks and marine parks

Image: By © Commonwealth of Australia 2014, CC BY 3.0 au, <https://commons.wikimedia.org/w/index.php?curid=59479818>

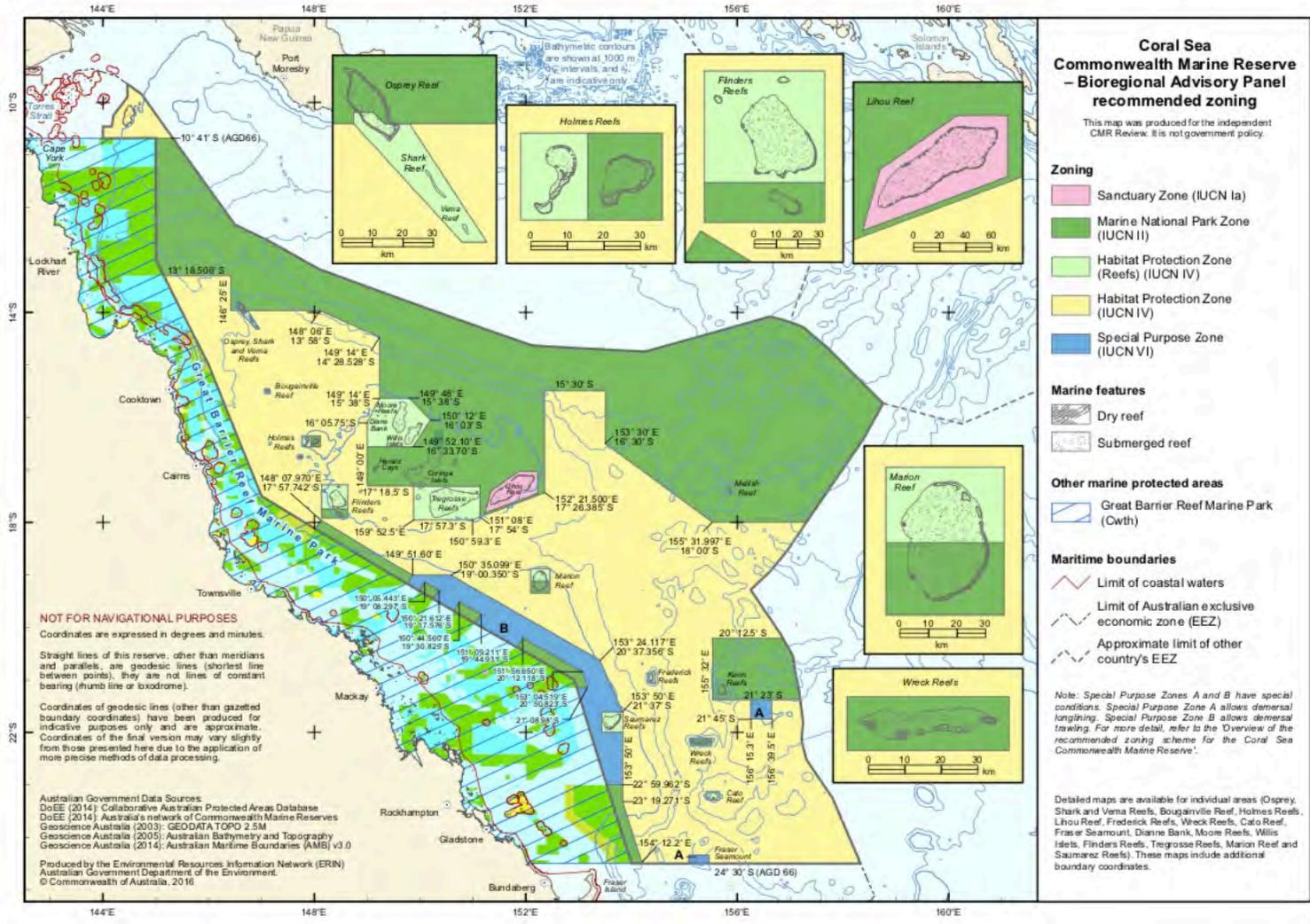
There are 58 marine protected areas- known as Marine Parks- in Commonwealth waters, over 3 nautical miles from the coast. These are managed by Parks Australia



Most of these Marine Parks are grouped into groups called “networks”

Image screen shot from: <https://parksaustralia.gov.au/marine/> Copyright NASA, Google.

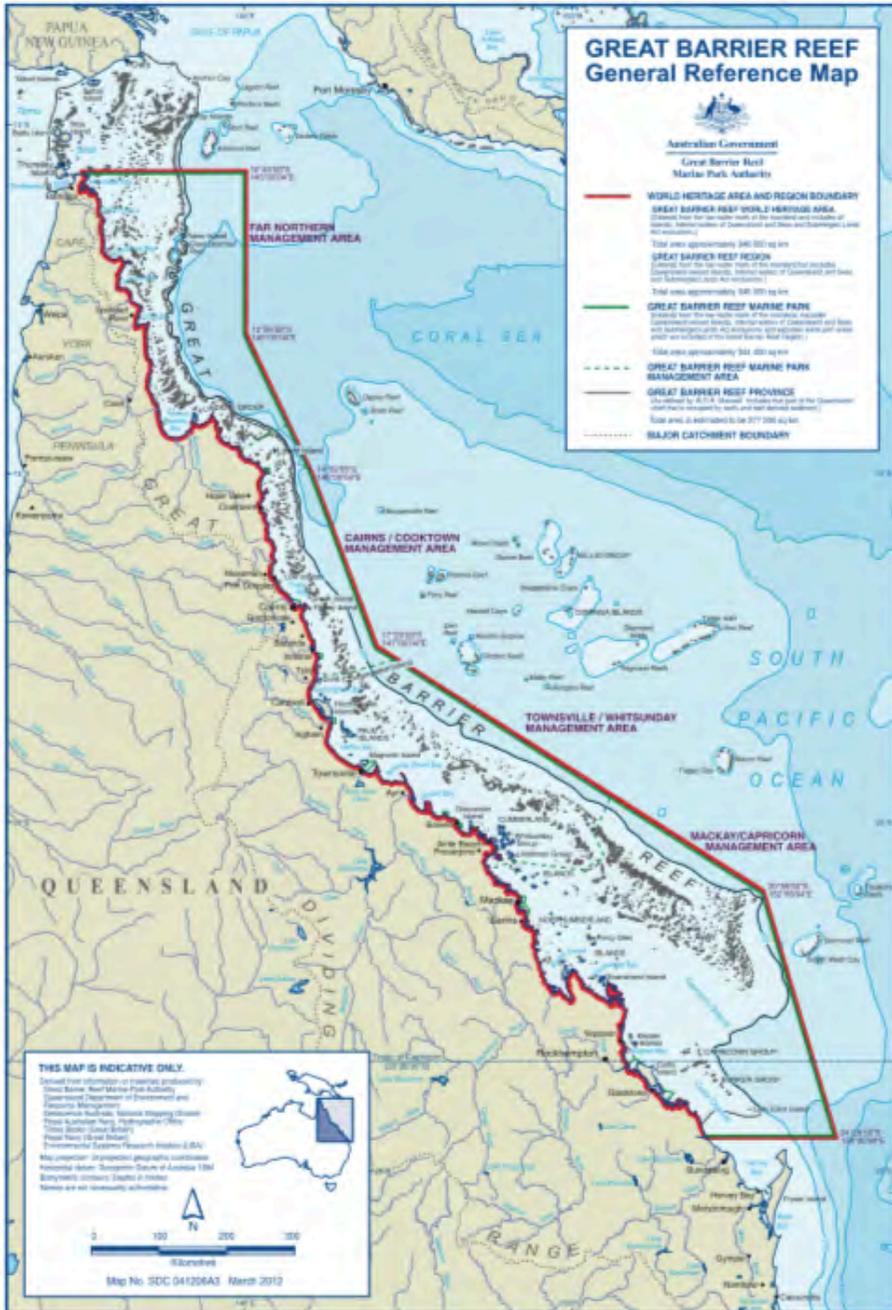
# The Coral Sea Marine Reserve is beyond the Great Barrier Reef Marine Park



## Coral Sea Commonwealth Marine Reserve

Image: © Commonwealth of Australia, 2016

Available: [http://www.environment.gov.au/submissions/reportmaps/coral\\_sea\\_cmr\\_review\\_recommended\\_zoning\\_incl\\_coordinates.pdf](http://www.environment.gov.au/submissions/reportmaps/coral_sea_cmr_review_recommended_zoning_incl_coordinates.pdf)



The Great Barrier Reef Marine Park is widely recognised as one of the best managed marine protected areas in the world.

The Great Barrier Reef Marine Park Authority (GBRMPA) is responsible for the care and protection of the Great Barrier Reef Marine Park.

### The Great Barrier Reef Marine Park

Image: © Copyright Commonwealth of Australia (GBRMPA) 2016 Great Barrier Reef Marine Park Authority

Available: <http://hdl.handle.net/11017/869>



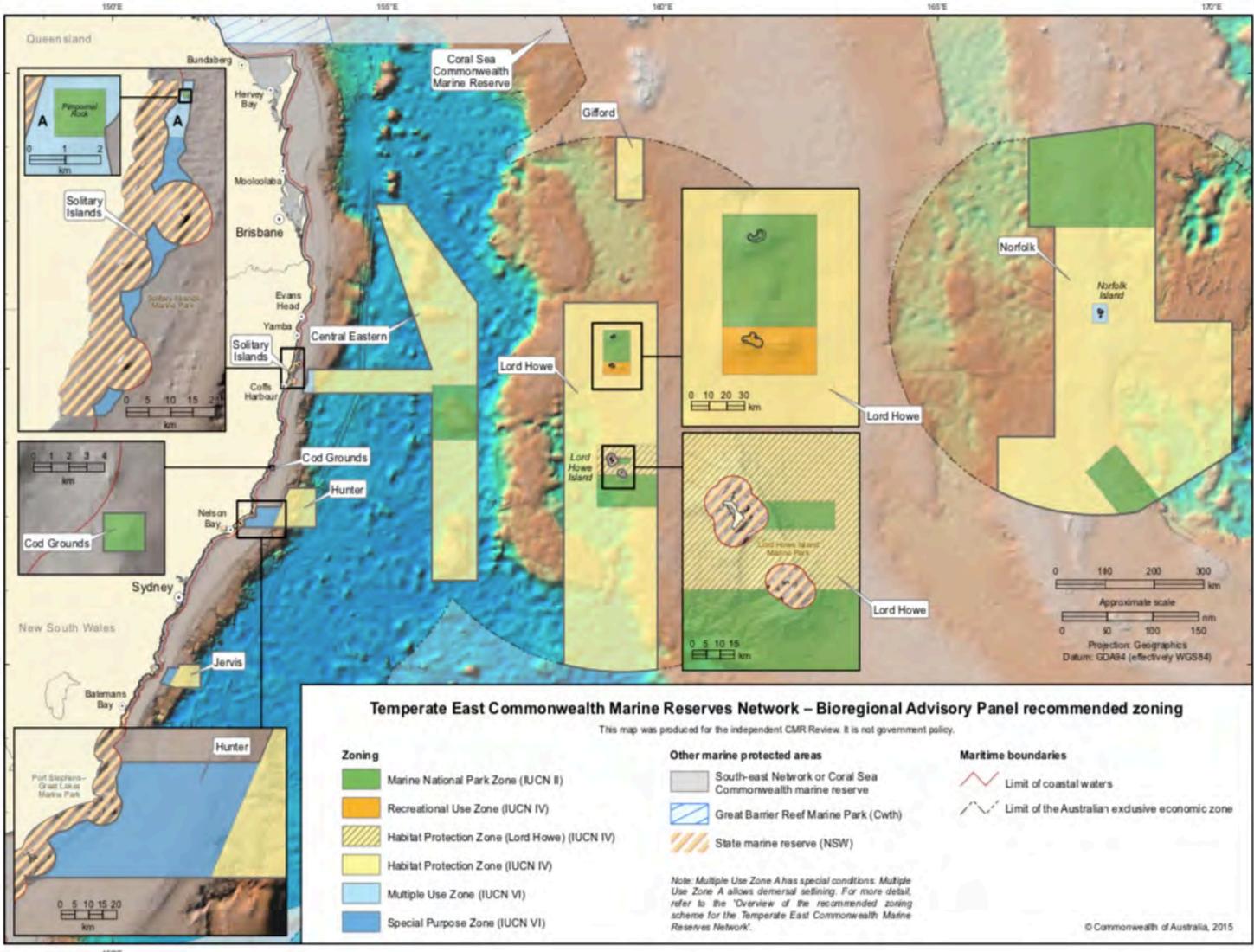
The Great Barrier Reef Coast Marine Park, Great Sandy Marine Park and Moreton Bay Marine Park are managed by the Queensland Parks and Wildlife Service.

These marine parks protect tidal lands and waters- including mangrove wetlands, seagrass beds, mudflats, sandbanks, beaches, rocky outcrops and fringing reefs.

Learn more about Queensland marine parks here:

<https://www.qld.gov.au/environment/coasts-waterways/marine-parks/about>

Marine science in southern Australian states involve temperate zones.



## Temperate East Commonwealth Marine Reserves Network

Image: © Commonwealth of Australia, 2015  
Available: [http://www.environment.gov.au/submissions/reportmaps/temperate\\_east\\_network\\_cmr\\_review\\_recommended\\_zoning.pdf](http://www.environment.gov.au/submissions/reportmaps/temperate_east_network_cmr_review_recommended_zoning.pdf)

With so many different Marine Protected Areas managed by different authorities, it is useful to have a common framework.

The International Union for Conservation of Nature has created a global standard- as this YouTube video explains:



## IUCN Global Standard for Marine Protected Areas

YouTube video by [IUCN, International Union for Conservation of Nature](https://www.youtube.com/channel/UCN)

Available: <https://youtu.be/g2cAVcgHjic>

The Australian and State governments are developing a National Representative System of Marine Protected Areas (NRMSPA), The goals and principles are published here:

<https://parksaustralia.gov.au/marine/management/resources/scientific-publications/goals-and-principles-establishment-national-representative-system-marine-protected-areas/>

The four goals guide the identification of marine reserve networks:

- Goal 1: Each bioregion should be represented
- Goal 2: All depth ranges should be covered
- Goal 3: Examples of habitats and communities should be included
- Goal 4: All 21 types of seafloor should be included

See the link above for more detail.

The guiding principles are summarised below:

**Location:** locate marine reserves considering- the location of existing measures, and have fewer larger separate reserves (rather than many small reserves)

**Selection:** select areas considering capacity to mitigate threats, unique habitats or species; ecologically important features; small-scale ecosystems and sediment types; heritage sites; minimising socio-economic costs

**Design:** the size and shape of the reserve should include continuous depth transects; include entire geomorphic features, with replication; account for connectivity and dispersal; have simple, easily identifiable boundaries; minimising socio-economic costs.

**Zoning:** include highly protected areas, consider the threats posed by specific activities; apply a precautionary approach to threats and costs and benefits.

For more detail see:

<https://parksaustralia.gov.au/marine/management/resources/scientific-publications/goals-and-principles-establishment-national-representative-system-marine-protected-areas/>

The document *Scientific Principles for Design of Marine Protected Areas in Australia: A Guidance Statement* was developed to support the design and planning of NRSMPA.

It promotes the CAR principles:

**C**      Comprehensiveness

**A**      Adequacy

**R**      Representativeness

Reference: The Ecology Centre, The University of Queensland (2009) *Scientific Principles for Design of Marine Protected Areas in Australia: A Guidance Statement*. 29pp.

Available:

[https://ecology.uq.edu.au/filething/get/39100/Scientific\\_Principles\\_MPAs\\_c6.pdf](https://ecology.uq.edu.au/filething/get/39100/Scientific_Principles_MPAs_c6.pdf)

The CAR principles can be summarised as:

<b>C</b>	<b>Comprehensiveness</b>	include the full range of ecosystems recognized at an appropriate scale within and across each bioregion.
<b>A</b>	<b>Adequacy</b>	have the required level of reservation to ensure the ecological viability and integrity of populations, species and communities.
<b>R</b>	<b>Representativeness</b>	reflect the biotic diversity of the marine ecosystems from which they derive.

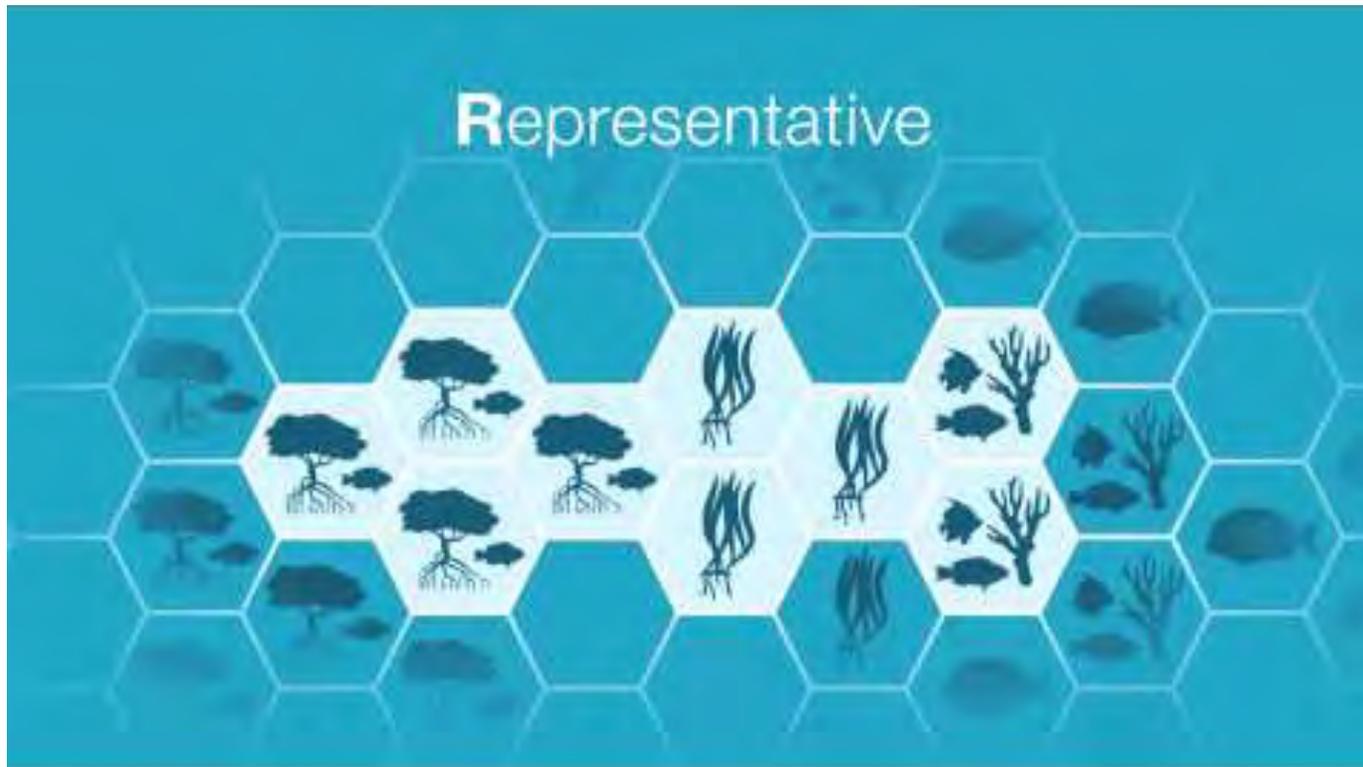
For more detail, download the guidance statement:

[https://ecology.uq.edu.au/filething/get/39100/Scientific\\_Principles\\_MPAs\\_c6.pdf](https://ecology.uq.edu.au/filething/get/39100/Scientific_Principles_MPAs_c6.pdf)

Reference: The Ecology Centre, The University of Queensland (2009) Scientific Principles for Design of Marine Protected Areas in Australia: A Guidance Statement. 29pp. Available:  
[https://ecology.uq.edu.au/filething/get/39100/Scientific\\_Principles\\_MPAs\\_c6.pdf](https://ecology.uq.edu.au/filething/get/39100/Scientific_Principles_MPAs_c6.pdf)

This YouTube video explains that Marine Parks should be designed with CARE Connected, Adequate, Representative, Efficient- which are similar to the CAR principles, but considering connectedness and the efficiency of the design.

<https://youtu.be/-YifiHLnmWY>



## Protected Area Design using CARE Tropic101x - KAM 5.2.1

YouTube video by [UQx Tropic101x Tropical Coastal Ecosystems](https://youtu.be/-YifiHLnmWY), available: <https://youtu.be/-YifiHLnmWY>

This video explains the same CARE model, as presented by Prof Hugh Possingham, Chief Scientist The Nature Conservancy, whose work has informed the creation of many of the world's marine protected area systems.

[https://youtu.be/cq3CO\\_JZlh8](https://youtu.be/cq3CO_JZlh8)



## Marine Protected Area Systems

YouTube video by [UQx Tropic101x Tropical Coastal Ecosystems](https://youtu.be/cq3CO_JZlh8)

Available: [https://youtu.be/cq3CO\\_JZlh8](https://youtu.be/cq3CO_JZlh8)

The CARE model is summarised here:

<b>C</b>	<b>Connected</b>	Many organisms depend on connected ecosystems, eg coral reefs, seagrass and mangroves
<b>A</b>	<b>Adequate</b>	Contains enough of every habitat and species to ensure it persists through time
<b>R</b>	<b>Representative</b>	Captures and protects replicate samples of all habitats and species-
<b>E</b>	<b>Efficient</b>	Meets the connectivity, adequacy and representativeness criteria whilst minimizing impacts

Class activity: Print and cut out the scientific evidence on pages 19- 29 of *Scientific Principles for Design of Marine Protected Areas in Australia: A Guidance Statement* and sort them according to where they fit in the CARE model.

**C** Connected  
**A** Adequate  
**R** Representative  
**E** Efficient

The Ecology Centre, The University of Queensland (2009) *Scientific Principles for Design of Marine Protected Areas in Australia: A Guidance Statement*. 29pp.  
Available: [https://ecology.uq.edu.au/filething/get/39100/Scientific\\_Principles\\_MPAs\\_c6.pdf](https://ecology.uq.edu.au/filething/get/39100/Scientific_Principles_MPAs_c6.pdf)

Sample answers:

<b>C</b>	<b>Connected</b>	<i>Provide connectivity within the network of no-take areas</i>
<b>A</b>	<b>Adequate</b>	<i>Include adequate size (larger reserves preferred to smaller reserves)</i>
<b>R</b>	<b>Representative</b>	<i>Represent a minimum amount of each 'habitat type'</i>
<b>E</b>	<b>Efficient</b>	<i>Maximise complementarity of no-take areas with human values, activities and opportunities</i>

Sample answers selected from: The Ecology Centre, The University of Queensland (2009) Scientific Principles for Design of Marine Protected Areas in Australia: A Guidance Statement. 29pp. Available: [https://ecology.uq.edu.au/filething/get/39100/Scientific\\_Principles\\_MPAs\\_c6.pdf](https://ecology.uq.edu.au/filething/get/39100/Scientific_Principles_MPAs_c6.pdf)

The following specific criteria are mentioned in the Marine Science syllabus:

- Site selection
- Networking and connectivity
- Replication
- Spacing
- Size
- Coverage

These will be addressed individually in the next 5 slides.



## Site selection

The site (or network of sites) selection must represent the full biodiversity in the region. This should include, but not be limited to threatened species or habitats.  
*(Representative)*

Sites should be selected to preserve regions in a natural state and to help recover and restore those sites that have been impacted by human activities.

Networks should aim to provide conditions for expansion in the ranges of species that are depleted, and to accommodate changes in range as environmental conditions change.  
*(Connected)*



Raine Island is protected for its environmental and cultural values

Image: © Queensland Government.  
Available: <https://eatlas.org.au/media/969>

Reference: Roberts, C. M., Gell, F. & Hawkins, J. P. 2003. Protecting nationally important marine areas in the Irish Sea Pilot Project Region. JNCC, Peterborough.

Available:

[https://www.researchgate.net/publication/264840019\\_Protecting\\_nationally\\_important\\_marine\\_areas\\_in\\_the\\_Irish\\_Sea\\_Pilot\\_Project\\_region](https://www.researchgate.net/publication/264840019_Protecting_nationally_important_marine_areas_in_the_Irish_Sea_Pilot_Project_region)

## Networking and Connectivity

A protected area network needs to be greater than the sum of its parts- protecting mangroves, seagrass and coral reefs together has a bigger impact than individually.

Connectivity affects the levels of coverage, replication, size and spacing of protected areas.

This zoning map of the Capricorn region shows a network of green zones covering different bioregions.

Reference: Roberts, C. M., Gell, F. & Hawkins, J. P. 2003. Protecting nationally important marine areas in the Irish Sea Pilot Project Region. JNCC, Peterborough. Available: [https://www.researchgate.net/publication/264840019\\_Protecting\\_nationally\\_important\\_marine\\_areas\\_in\\_the\\_Irish\\_Sea\\_Pilot\\_Project\\_region](https://www.researchgate.net/publication/264840019_Protecting_nationally_important_marine_areas_in_the_Irish_Sea_Pilot_Project_region)

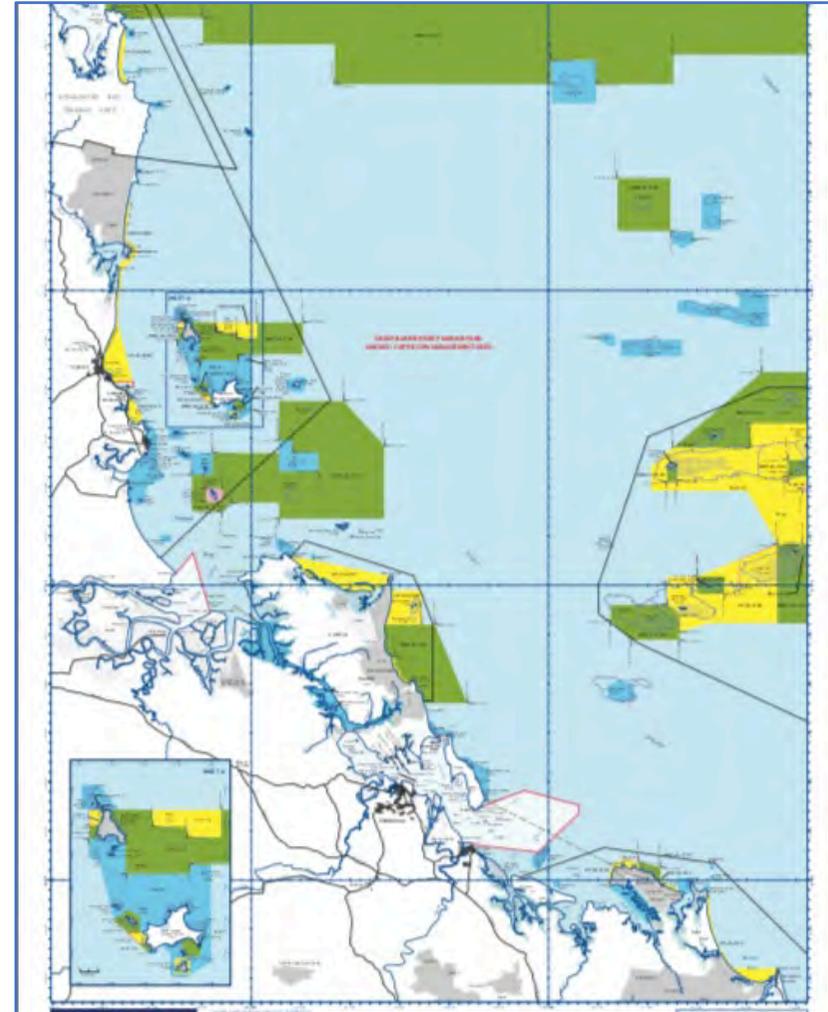


Image: © Commonwealth of Australia (GBRMPA) 2016. Reproduced with permission. Image partially cropped.

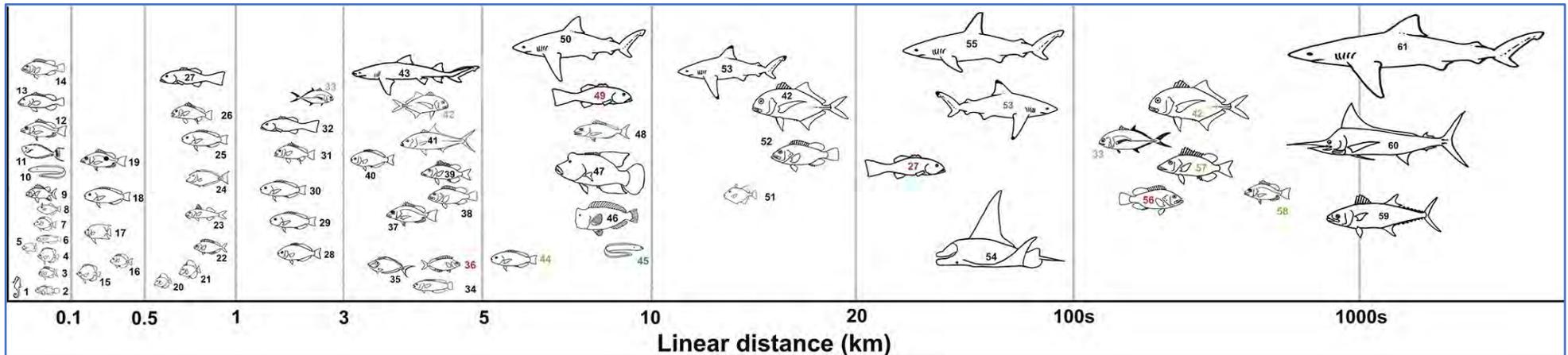


## Spacing

Ecological linkages such as ontogenetic migration and larval dispersal cover geographical scales from metres to thousands of kilometers.

For a wide range of species, those scales are typically metres to a few tens of kilometers.

To ensure ecological connectivity in the network, protected areas with similar habitats should generally be spaced from a few to a few tens of kilometers apart.



The scale of migration of adults fish ranges from metres to 100s of km.

Reference: Roberts, C. M., Gell, F. & Hawkins, J. P. 2003. Protecting nationally important marine areas in the Irish Sea Pilot Project Region. JNCC, Peterborough.

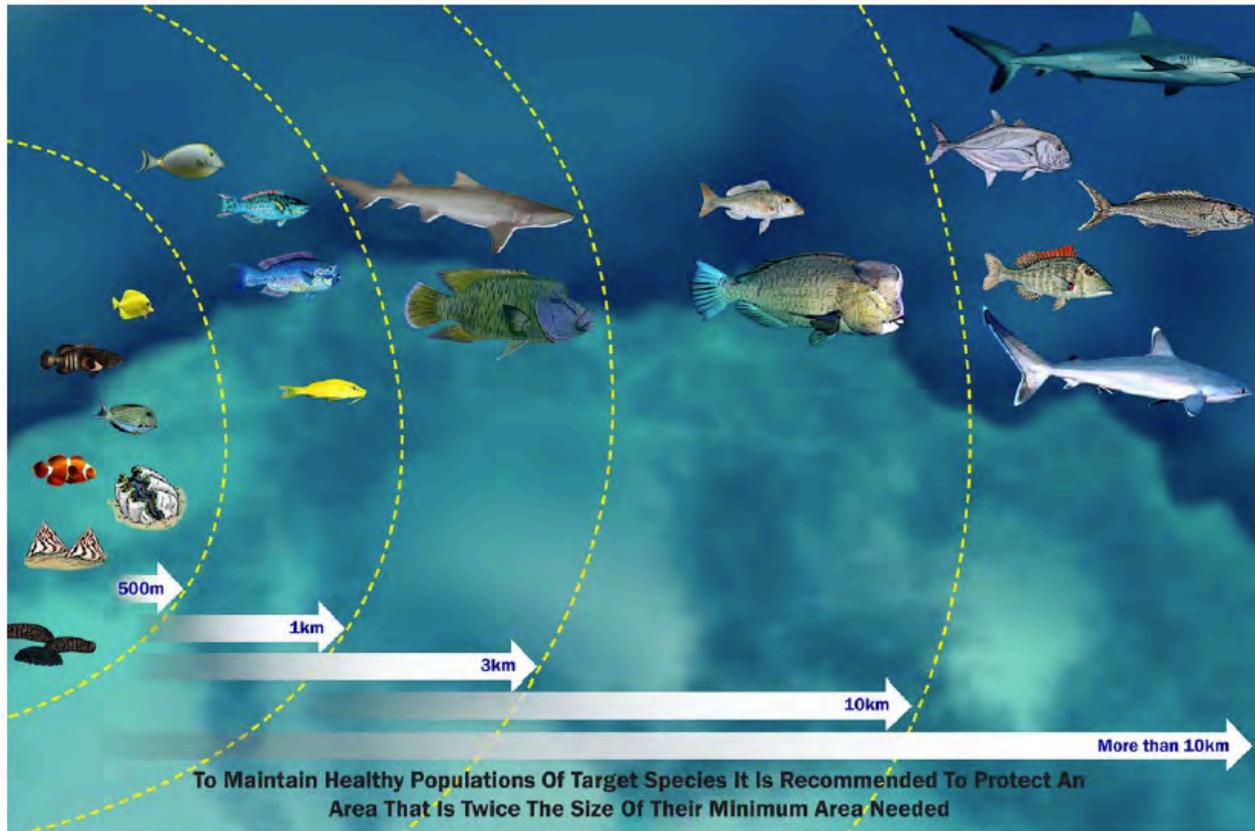
Available: [https://www.researchgate.net/publication/264840019\\_Protecting\\_nationally\\_important\\_marine\\_areas\\_in\\_the\\_Irish\\_Sea\\_Pilot\\_Project\\_region](https://www.researchgate.net/publication/264840019_Protecting_nationally_important_marine_areas_in_the_Irish_Sea_Pilot_Project_region)

Image: Green, A., Maypa, A., Almany, G., Rhodes, K., Weeks, R., & Abesamis, R. et al. (2014). Larval dispersal and movement patterns of coral reef fishes, and implications for marine reserve network design. *Biological Reviews*, 90(4), 1215-1247. doi: 10.1111/brv.12155, open access article, available:

<https://onlinelibrary.wiley.com/doi/full/10.1111/brv.12155>

## Size

The size of a protected area needs to consider protection goals, habitat distribution, heterogeneity and patchiness, and the mobility of species.

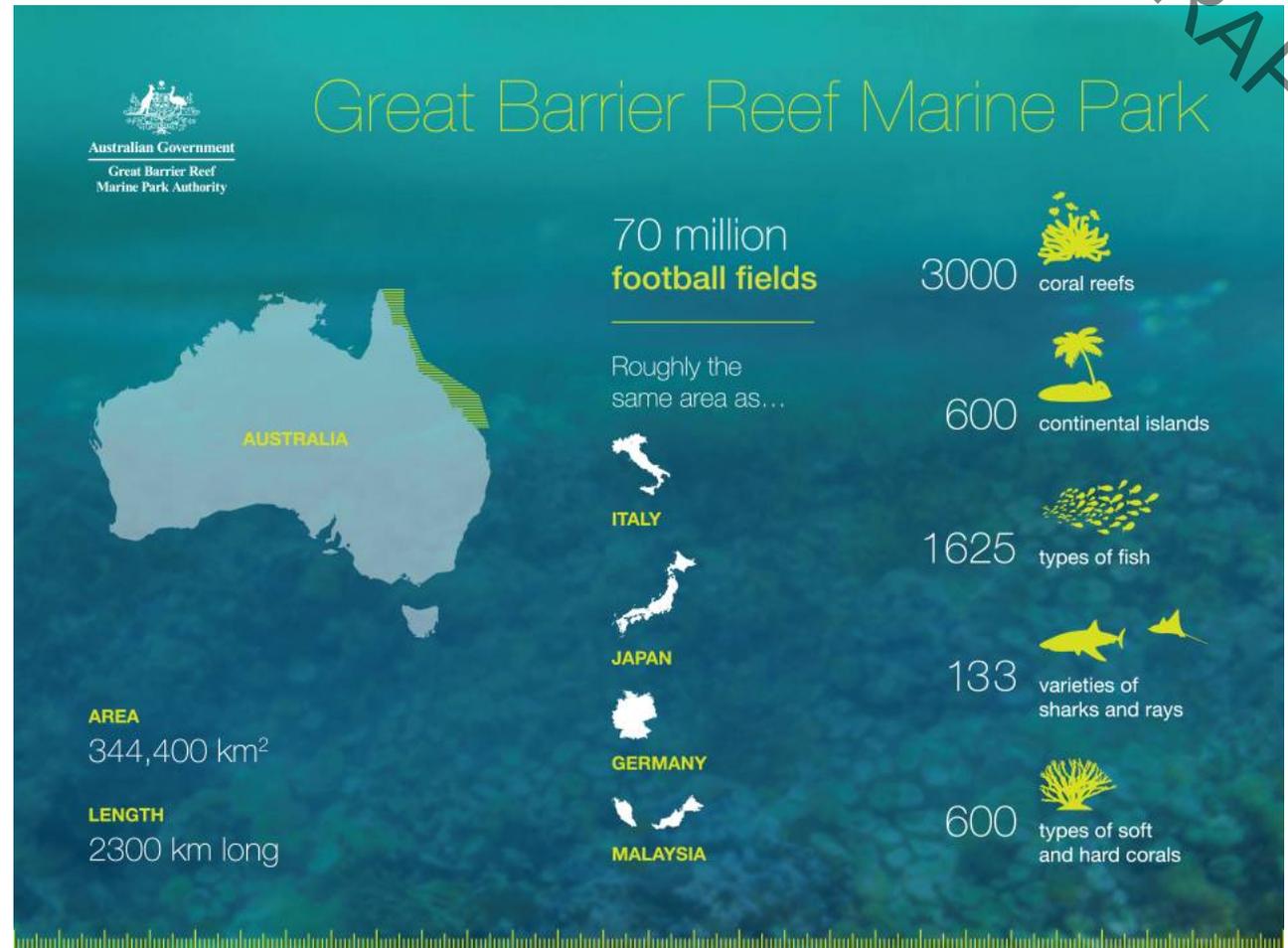


Different fish species have home ranges of different sizes, so they need different sized marine reserves.

Image: ©2013 Coral Triangle Support Partnership, from Green, A., White, A., & Kilarski, S. (2013). *Designing marine protected area networks to achieve fisheries, biodiversity, and climate change objectives in tropical ecosystems*.

Size of protected areas must be matched to the scales of mobility of the species in the habitats being considered.

Protected areas must be large enough and numerous enough to sustain long-term populations of the majority of species.



The Great Barrier Reef Marine Park is half the size of Texas

Image: © Copyright 2018 GBRMPA, available: <http://www.gbrmpa.gov.au/the-reef/reef-facts>

Reference: Roberts, C. M., Gell, F. & Hawkins, J. P. 2003. Protecting nationally important marine areas in the Irish Sea Pilot Project Region. JNCC, Peterborough.  
Available: <https://www.researchgate.net/publication/264840019> Protecting nationally important marine areas in the Irish Sea Pilot Project region

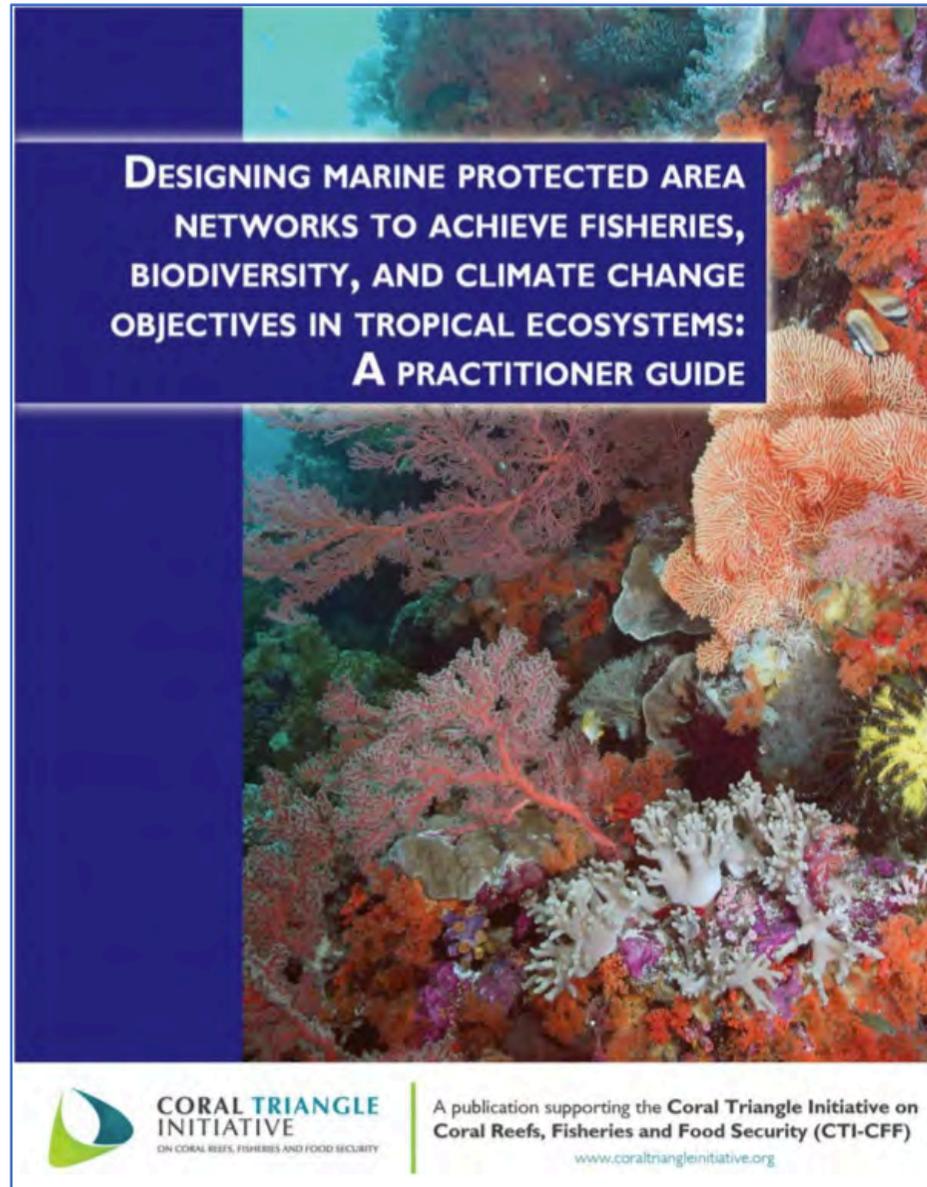


DRAFT

If you want to know more,  
download this his document:

[https://www.reefresilience.org/pdf/PractitionerGuide\\_FINAL\\_031113.pdf](https://www.reefresilience.org/pdf/PractitionerGuide_FINAL_031113.pdf)

It contains a detailed  
explanation of 15 design  
principles for MPAs



**DESIGNING MARINE PROTECTED AREA  
NETWORKS TO ACHIEVE FISHERIES,  
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OBJECTIVES IN TROPICAL ECOSYSTEMS:  
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Image: ©2013 Coral Triangle Support Partnership, from Green, A., White, A., & Kilarski, S. (2013). *Designing marine protected area networks to achieve fisheries, biodiversity, and climate change objectives in tropical ecosystems.*

# Questions

1. List the criteria used for designing marine protected areas in Australia.
2. Describe in your own words why these criteria should be considered.
3. Explain why can't we just protect the whole ocean?
4. Classify scientific evidence for MPA design into the 4 CARE principles.



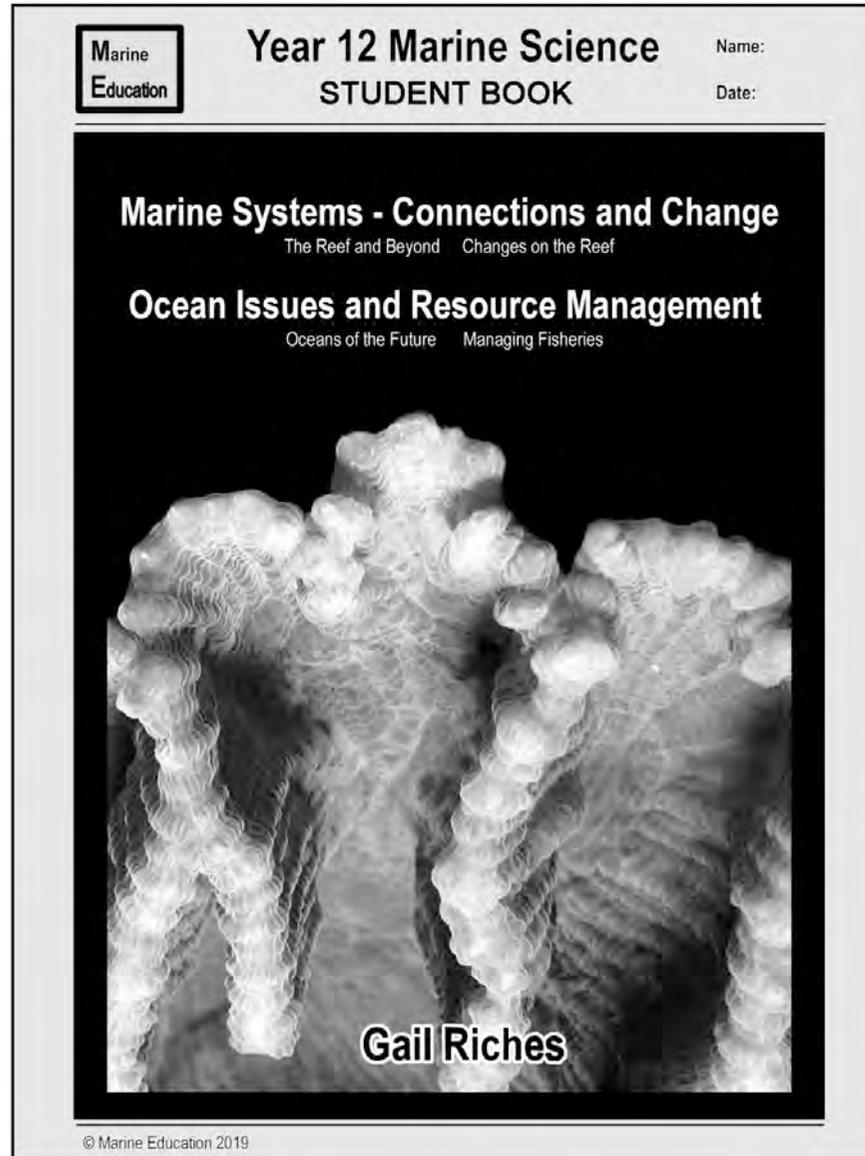
# Worksheet

## *Project how?*

by

Gail Richie

[www.marineducation.com.au](http://www.marineducation.com.au)



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