

Committee: Environment Sub-Commission 1

Issue: Fostering the protection of the Great Barrier Reef

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INTRODUCTION

The United Nations Educational, Scientific and Cultural Organization (UNESCO) has listed the Great Barrier Reef as a World Heritage Area because of its remarkable variety and beauty. The Great Barrier Reef is situated on the north-east coast of Australia, and it contains the world's largest collection of coral reefs, with 400 types of coral, 1,500 species of fish and 4,000 types of mollusk. It also holds great scientific interest as it is home to endangered species such as the dugong ('sea cow') and the large green turtle. Famous for activities such as scuba diving and sightseeing, the Great Barrier Reef has over two million visitors each year.

In recent decades, human activities have created threats to the Great Barrier Reef. The economic and environmental impact of the destruction of this reef could be devastating, as the whole marine ecosystem is at stake. However, there have been efforts made by the Australian government and various Non-Governmental Organizations to curb the threats. There have been signs of positive results; water quality of the Great Barrier Reef has increased, as annual average pesticide load has been reduced by 28 per cent, sediment load by 11 per cent and total nitrogen load by 10 per cent. Furthermore, the Australian Government has now started to prioritize the Reef's health over other tasks. This is evident from the comprehensive Reef 2050 Long-Term Sustainability Plan that they have drafted. With that being said, we need to keep in mind that there needs to be a lot more done to sustain the Great Barrier Reef.

DEFINITION OF KEY TERMS

Coral Reef

A Coral reef is a diverse underwater ecosystem held together by calcium carbonate structures secreted by corals. ⁽¹⁾

Coral Polyp

Coral polyps are tiny, soft-bodied organisms related to sea anemones and jellyfish. Many identical individual polyps make a coral. ⁽²⁾

Hard Coral

The first type of Coral is Hard Coral. They are reef-building corals, which extract a lot of Calcium Carbonate and form the basic framework of any reef. The Polyps of these Corals have 6 tentacles. ⁽³⁾

Soft Coral

The second type of Coral is Soft Coral. They are non reef-building corals, which extract minimal Calcium Carbonate. The Polyps of these Corals have 8 tentacles. ⁽⁴⁾

Coral Bleaching

It is the whitening of a coral because of the loss of a coral's symbiotic algae or the degradation of the algae's photosynthetic pigment. ⁽⁵⁾

El Niño Phenomenon

El Niño is an abnormal weather pattern that is caused by the warming of the Pacific Ocean. ⁽⁶⁾

The pH scale

It is a measure of acidity or alkalinity of substances. A pH value is a number from 1 to 14, with 7 as the middle (neutral) point. Values below 7 indicate acidity, which increases as the number decreases, 1 being the most acidic. Values above 7 indicate alkalinity, which increases as the number increases, 14 being the most alkaline. ⁽⁷⁾

1 <http://www.defenders.org/coral-reef/basic-facts>

2 <http://animals.nationalgeographic.com/animals/invertebrates/coral/>

3 <http://animals.mom.me/difference-between-hard-soft-corals-6233.html>

4 <http://animals.mom.me/difference-between-hard-soft-corals-6233.html>

5 http://oceanservice.noaa.gov/facts/coral_bleach.html

6 <http://www.sciencemag.org/news/2016/03/el-ni-o-s-warmth-devastating-reefs-worldwide>

7 <http://www.businessdictionary.com/definition/pH-scale.html>

Destructive Fishing

Destructive fishing practices refer to any type of fishing technique that destroys fish habitat and devastates the marine environment including bottom trawling, bycatch, the use of poison and explosives and ghost fishing.

Dredging

Dredging is an excavation activity usually carried out underwater, in shallow seas or freshwater areas with the purpose of gathering up bottom sediments and disposing of them at a different location.

BACKGROUND INFORMATION

Threats

There are many natural and manmade threats to the Great Barrier Reef. The most prominent ones are change in water temperature, increase in CO₂ emissions, destructive fishing practices and overfishing, dredging and the outbreak of Crown-of-thorns Starfish. Each of them are explained below:

Changes in Water Temperature

Due to climate change, the average temperature of water bodies has increased significantly, which has resulted in coral bleaching. When the water gets warm, corals expel algae (Algae and Corals have a symbiosis relationship, where Corals use Algae as a source of nutrition), which turn the coral white (due to insufficient nutrition). Although the corals do not die directly during the process of coral bleaching, its chances of survival reduce in the future.

In addition to climate change, the El Niño phenomenon contributes to increasing the water temperature. According to this phenomenon, the temperature of water bodies rise significantly every 2 to 7 years. In 1998, a huge underwater heat wave killed 16% of the corals on reefs around the world. Triggered by the El Niño of that year, it was declared the first major global coral bleaching incident. Currently, the third global coral bleaching event is underway, and is expected to be the most dangerous of them all. Due to the El Niño in 2015 (which is expected to continue until 2017), the coral bleaching process has started.

According to the Australian Research Council, an estimated 35 percent of the corals in the northern and central part of the reef are either dead or dying due to the El Nino this year. ⁽⁸⁾

Increase in CO₂ emissions

Due to industrialization, the amount of carbon dioxide in the air is increasing, which is slowly being absorbed by water bodies. Consequently, the acidity of water bodies is increasing; the pH has decreased from 8.2 to 8.1 (it has become more acidic) in the past few decades. This is known as Ocean Acidification. Although it may seem like a very small drop, it has a tremendous negative impact. Hard corals are the reef-building corals, and their stone-like structures are composed of calcium carbonate. In most areas, seawater is supersaturated with calcium carbonate minerals. This means that there are abundant building blocks for calcifying organisms to build their skeletons and shells. However, continued ocean acidification is causing many parts of the ocean to become undersaturated with these minerals, and has reduced the ability of reef-building corals to produce their skeletons. Some studies have shown a 52-73% decline in larval settlement on reefs that are experiencing lower pH levels. Scientists can also measure the calcification rates of hard corals, and ocean acidification has had a negative impact on the rate at which corals calcify. This means that coral colonies in the future may be more brittle and less resilient to other factors influencing their survival. As a whole, ocean acidification could cause a shift in the timing of zooplankton development; leading to changes in predator-prey relationship (Due to the loss of one particular species, other species that are dependent on it will try to find other preys for survival). This will affect food webs causing a shift in the composition, structure, and function of ecosystems. Ultimately, this will affect the goods and services provided to society (fisheries and aquaculture will be affected, threatening food security).

Destructive Fishing Practices and Overfishing

Destructive fishing practices such as bottom trawling, cyanide fishing, dynamite fishing and ghost fishing have damaged the Great Barrier Reef in many ways. Bottom trawling is the practice of dragging large fishing nets across the sea floor. Nets used for bottom trawling are attached to rubber rollers called 'rock hoppers'; the aim of these rock hoppers is to destroy any obstruction that comes in the way of the fishing nets.

⁸ <http://www.vox.com/2016/5/31/11818394/great-barrier-reef-bleaching-dying>

Unfortunately, corals are one of the major obstructions and many of them are killed due to these rock hoppers.

Cyanide fishing is a technique in which fishermen squirt sodium cyanide into the water to stun fish without killing them. In this process, corals and life forms that rely on these fish are killed as well. As the name suggests, dynamite fishing is the process of setting off explosives underwater and then collecting the dead fish. Like with cyanide fishing, the death of corals during dynamite fishing is a spillover effect.

The Great Barrier Reef is divided into discrete zones. Each zone has an assigned color and these colors indicate the restrictions put in that particular zone. The zone colors are pink, green, orange, olive green, yellow, dark blue and light blue; pink being the most strict zone where nothing is allowed and light blue being the most lenient area where most of the activities are allowed. The authorities carefully evaluate each zone and then assign different colors to the zones. ⁽⁹⁾

ACTIVITIES GUIDE (see relevant Zoning Plans and Regulations for details)	Zones						
	General Use Zone	Habitat Protection Zone	Conservation Park Zone	Buffer Zone	Scientific Research Zone	Marine National Park Zone	Preservation Zone
Aquaculture	Permit	Permit	Permit ¹	✗	✗	✗	✗
Bait netting	✓	✓	✓	✗	✗	✗	✗
Boating, diving, photography	✓	✓	✓	✓	✓ ²	✓	✗
Crabbing (trapping)	✓	✓	✓ ³	✗	✗	✗	✗
Harvest fishing for aquarium fish, coral and beachworm	Permit	Permit	Permit ¹	✗	✗	✗	✗
Harvest fishing for sea cucumber, trochus, tropical rock lobster	Permit	Permit	✗	✗	✗	✗	✗
Limited collecting	✓ ⁴	✓ ⁴	✓ ⁴	✗	✗	✗	✗
Limited spearfishing (snorkel only)	✓	✓	✓ ¹	✗	✗	✗	✗
Line fishing	✓ ⁵	✓ ⁵	✓ ⁶	✗	✗	✗	✗
Netting (other than bait netting)	✓	✓	✗	✗	✗	✗	✗
Research (other than limited impact research)	Permit	Permit	Permit	Permit	Permit	Permit	Permit
Shipping (other than in a designated shipping area)	✓	Permit	Permit	Permit	Permit	Permit	✗
Tourism programme	Permit	Permit	Permit	Permit	Permit	Permit	✗
Traditional use of marine resources	✓ ⁷	✓ ⁷	✓ ⁷	✓ ⁷	✓ ⁷	✓ ⁷	✗
Trawling	✓	✗	✗	✗	✗	✗	✗
Trolling	✓ ⁵	✓ ⁵	✓ ⁵	✓ ^{5,8}	✗	✗	✗

Figure 1: This figure shows the different zones present in the Great Barrier Reef and the restrictions for each zone.

⁹ <http://www.gbrmpa.gov.au/visit-the-reef/zoning/zoning-guide-to-using-the-marine-park/interpreting-zones>

Though each zone clearly states the restrictions, people still go fishing in the wrong zones; some go intentionally, while others are unaware of these zones. The number of illegal fishing offences reported on the Great Barrier Reef has more than tripled since 2011. During 2014, 634 illegal fishing offences were reported on the reef, many of them in the protected "green zones". According to an officer in the Great Barrier Reef Marine Park Authority, many fishermen intentionally break the law and intentionally go into the green zones because the number of fishes in these areas is almost double compared to the non-protected areas.

One of the key roles of green zones is to allow fish stocks to grow in those areas and then spill over into legal fishing zones. By damaging fish stocks in the green zones, illegal fishermen are preventing the full spillover benefit occurring in legal fishing zones, which hurts the fishermen who obey the laws. If this continues, many types of fish will become extinct, causing a misbalance in the food cycle and eventually disturbing the reef ecosystem. Some endangered species found in the Great Barrier Reef include types of: seahorses, pipefish, sea dragons, potato cod, Queensland grouper, barramundi cod, Maori wrasse, whale shark, great white shark, sea snakes and marine turtles.

Dredging

Dredging is undertaken in coastal waters so that large ships can access ports. Dredging involves cutting away large swathes of seafloor, lifting or sucking it up and dumping it elsewhere, and it can either be capital or maintenance. Capital dredging is done to create new port facilities, whereas maintenance dredging is done to maintain already created port facilities. Though the Australian government banned capital dredging in 2015, maintenance dredging still takes place. When an area is dredged, the seabed, sea grass and marine animals living on the sea floor in that area are totally eradicated. Dredging can also cause the direct death of larger mobile species such as turtles by being drawn into the path of the dredgers. Sediment plumes (sediments that settle on the surface of the water) reduce the light available for seagrass and coral, which hinder the reproduction of corals, as adequate light is essential for the survival of these underwater plants and animals, which in turn support many other animals of the Reef. Healthy seagrass beds, for example, are the main source of food for threatened animals like dugongs.

When companies are allowed to make facilities by dredging, they are required to monitor the environmental impacts of it. The issue here is the monitoring, as it is not accurate and underestimates the environmental impacts. This is because the companies who are carrying out the dredging are the ones who are also doing the monitoring, and they

wouldn't want to show the full environmental impact, as that is against their interests. For example, in one of the evaluation reports made by the company that carried out dredging, stated that 95% of the corals were not harmed; however, when investigated by the Great Barrier Reef Marine Park Officers, it was seen that corals that had dead patches but had signs of recovery were also put in the category of 'unharmed corals,' and hence the statistics showed 95%. Recording damage in this way has obscured the fact that these corals were damaged and underestimated the impacts of the dredging.

The Outbreak of Crown-of-thorns Starfish

The Crown-of-thorns Starfish is a type of species that preys on Coral polyps. When crown-of-thorns starfish numbers are low (for example, when only one starfish is seen during a 20-minute swim), there is no problem, as corals can readily recover from the limited predation. However, when the density of crown-of-thorns starfish increases to a point (When about 20 starfish are seen during a 20-minute swim) where the starfish consumes corals faster than the corals can grow, a decline in coral cover is likely to occur. This outbreak has occurred four times: in the 1960s, late 1970s, early 1990s and 2010. There are two causes of a Crown-of-thorns Starfish: the first one being the increase in the number of Planktons. There are many farms close to the Great Barrier Reef, and during the time of heavy rainfall, many toxic chemicals and fertilizers enter the sea through Run-offs. As a result of excess nutrients (fertilizers that are there in the sea), there is a significant increase in the number of planktons, which is a food source for Crown-of-thorns Starfish larvae. Hence, the significant increase in planktons increases the number of Crown-of-thorns Starfish larvae that survive. The second reason for the outbreak of Crown-of-thorns Starfish is the decrease in the number of the Starfish's predators. Due to overfishing, predators such as the Maori wrasse have decreased in numbers; therefore, less number of Crown-of-thorns Starfish are being preyed on. A short-term solution to the outbreak of Crown-of-thorns Starfish is existent, the solution being the manual injection of bile salt into the Crown-of-thorns Starfish. ⁽¹⁰⁾ However, there is no long-term solution that is being implemented efficiently at the moment.

Impact

¹⁰ <http://www.gbrmpa.gov.au/about-the-reef/animals/crown-of-thorns-starfish/what-is-the-short-term-strategy>

If the Great Barrier Reef were to be destroyed, there would be many consequences. Below is a brief about the Economical, Social and Environmental Impact.

Economical Impact

If the Great Barrier Reef were destroyed, it would be a catastrophe. Tourism in Australia is an important component of the Australian economy. Tourism represents 3% of Australia's Gross Domestic Product (GDP) contributing a \$47.5 billion to the national economy. 580,000 people (5% of the whole Australian Workforce) rely on tourism as their income. The Great Barrier Reef is a major tourist attraction, and if that gets destroyed, then the whole tourism industry will fall. If 5% of the whole workforce loses their jobs, Australia will face a major financial crisis. It will take decades to become a stable economy again. Also, there are about 18,000 people employed in the fishing industry, who will be majorly affected if the Great Barrier Reef collapses. There will also be indirect consequences that will affect every Australian resident; this indirect consequence could be in the form of higher taxes to accommodate the unemployed.

Environmental Impact

The environmental consequences of the destruction of the Great Barrier Reef are devastating. The death of the largest coral reef on the planet could shake the whole ecosystem. 90% of fish species are dependent on coral reefs; therefore, there will be many types of fish that will become extinct, as they are only found in the Great Barrier Reef. As a result, food cycles of these fish will be disturbed and predators will decrease in number, whereas preys will increase in number. Consequently, the food cycle of these predators and preys will be affected and the reaction will keep on going. According to Kent Carpenter, a professor at Old Dominion University, the whole ecosystem will collapse. He stated in his article "You could argue that a complete collapse of the marine ecosystem would be one of the consequences of losing corals," Carpenter said. "You're going to have a tremendous cascade effect for all life in the oceans." Though this might seem far-fetched, it is very much realistic and possible. ⁽¹¹⁾

Social Impact

One major social impact will be that fish, a necessity for over 3 billion people

¹¹ http://usatoday30.usatoday.com/news/world/environment/2010-03-26-coral-reefs_N.htm

throughout the world, will become a luxury good. As the Great Barrier Reef will collapse, a lot of fish will that rely on the coral reef will die. Hence, the supply of fish will be at an all time low. As a result, the price for fish will rise significantly making it a luxury good. Other food products will also increase in price, as the demand for it will increase. This can cause problems such as poverty and hunger on a global scale.

MAJOR COUNTRIES AND ORGANISATIONS INVOLVED

Australia

As the Great Barrier Reef is in Australian waters, the Australian government is responsible for its maintenance. Hence, the Australian Government created the Great Barrier Reef Marine Authority (GBRMA); its role is to supervise and regulate all activities that take place in the Great Barrier Reef. The Great Barrier Reef Marine Park Act 1975 is the foundation of all rules and regulations in the Great Barrier Reef. Also, the Australian Government created the Environment Protection and Biodiversity Conservation Act 1999 to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places including the Great Barrier Reef. Some other acts formed by the Australian government to protect the Great Barrier Reef are National Strategy for Ecologically Sustainable Development, National Strategy for the Conservation of Australia's Biological Diversity, Australia's Oceans Policy and National Strategy for the Conservation of Australian Species and Communities Threatened with Extinction. The Queensland Government, under the Australian government has conducted various long-term plans to protect the Great Barrier Reef. ⁽¹²⁾

United States of America

The National Oceanic and Atmospheric Administration (NOAA), which is under the U.S. government has partnered with the Great Barrier Reef Marine Authority (GBRMA). It has started the NOAA Coral Reef Conservation Program. The NOAA Coral Reef Conservation Program brings together expertise from across NOAA for a multidisciplinary approach to studying these complex ecosystems to inform more effective management. NOAA has also carried out many scientific surveys to find out details about the threats to Coral Reefs. In

¹² <https://www.environment.gov.au/marine/gbr/protecting-the-reef>

doing so, it has helped the GBRMA with its expertise and findings.

World Wildlife Fund (WWF)

The WWF is an international Non-Governmental Organization that has taken steps to protect the Great Barrier Reef. One of the many projects undertaken by the WWF is the Catalyst project; this is a project where farmers are educated about innovative farming techniques that aim to reduce nutrient pollution (fertilizers going into water bodies) and improve water quality. The WWF has collaborated with the Australian Marine Conservation Society (AMCS) to start a campaign that spreads awareness and protects the Reef.

United Nations Environmental Programme (UNEP)

The United Nations Environmental Programme has taken many steps to protect the Great Barrier Reef. Firstly, it supervises and regulates the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which aims to protect endangered species such as Marine Turtles and Whales. Secondly, it recently passed a resolution on sustainable coral reefs management in May 2016. The resolution calls for initiatives, cooperation and commitments to conserve and sustainably manage coral reefs. It supports the establishment of Marine Protected Areas (MPAs). The resolution further requests UNEP to pursue a number of specific actions, in relation to awareness raising; knowledge transfer; development and implementation of national or regional measures and action plans; and development of indicators and assessment of coral reef status and trends. Thirdly, the UNEP also released an official report about Coral Ecosystems.

United Nations Educational, Scientific, and Cultural Organization (UNESCO)

UNESCO keeps a close watch on the Great Barrier Reef and the work being done to sustain the Reef. Recently, UNESCO was about to list the Great Barrier Reef as “in-danger”; however, UNESCO did not do it and left Australia with a warning. The Australian Government needs to show improved results by next December to avoid further actions by the UNESCO.

TIMELINE OF EVENTS

Date	Description of Event
1960s	Outbreak of Crown-of-thorns Starfish
1973	The Convention on International Trade in Endangered Species of Wild Fauna and Flora was written up.
1975	The Great Barrier Reef Marine Park Act of 1975 is passed. The Great Barrier Reef Marine Park Authority is formed.
Late 1970s	Outbreak of Crown-of-thorns Starfish
Early 1990s	Outbreak of Crown-of-thorns Starfish
1998	The El Niño strikes, and kills 16% of all the corals throughout the world.
1998	The first major coral bleaching event recorded in history, which is caused by the El Niño.
2010	The El Niño takes place again after 12 years.
2010	The second major coral bleaching event, which is caused by the El Niño.
2010	Outbreak of Crown-of-thorns Starfish
2014	The El Niño occurs again.
2015	The third and the most destructive major coral bleaching event, which is caused by the El Niño.
2015	The Australian Government bans dumping of sediments from capital dredging.
2016	UNEP adopted a resolution on sustainable coral reefs management.

UN INVOLVEMENT: RELEVANT RESOLUTIONS, TREATIES AND EVENTS

- Resolution on Sustainable Coral Reefs Management (Resolution 2/12. Adopted at UNEA-2)

PREVIOUS ATTEMPTS TO SOLVE THE ISSUE

Project Catalyst by WWF aims to reduce nutrient pollution by the use of innovative farming techniques. Project Catalyst seeks to test and validate practices that are efficient and eco-friendly. As part of Project Catalyst, 78 farmers are working to improve soil, nutrient, pesticide, irrigation and storm water management on over 20,000 hectares of farmland. Results have constantly proved that the Project Catalyst is a major success, as it has reduced pollutant loads and improved the quality of over 100,000 mega liters of run-off and drainage water entering the Great Barrier Reef lagoon.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was written up to prevent the international trade of endangered species for commercial purposes. These species included many that lived in the Great Barrier Reef. For example, the humphead wrasse, which was almost an extinct species; listing this species on CITES provided the much-needed regulation. Today, the humphead wrasse is still existent in this world. Though this has been a success, much more needs to be done.

POSSIBLE SOLUTIONS

Destructive Fishing Practices and Overfishing

To combat the problem of illegal fishing in protected zones, punishment should become stricter. This will ensure that fishermen do not purposely go to Marine Protected Areas. However, there should also be more awareness spread about the Marine Protected Areas and the different zones present in the Great Barrier Reef so that people are more cautious and careful when they are going fishing. Also, it's been a long time since the zones have been evaluated. Hence, the GBRMA could reevaluate the zones to check whether the zone color of any zones should change or not; this will help protect species that were not previously protected or will help protect certain species more that weren't protected

enough before. Bottom trawling could be restricted more or even be banned if needed in certain reef areas, as the bycatch in bottom trawling is very high.

Dredging

Though capital dredging has stopped, maintenance dredging is still an issue. There should be unbiased and more accurate monitoring. One possible suggestion could be the formation of a body under the GBRMPA, which will carry out monitoring for each and every dredge. This will give better estimates of the impact, and then research can be carried out on more efficient and less harmful ways of maintenance dredging. Also, there could be heavy fees put on dredging, so that companies are reluctant to get maintenance dredging done very often.

Outbreak of Crown-of-thorns Starfish

To solve the problem of the Crown-of-thorns Starfish outbreak, the number of Crown-of-thorns Starfish's predators should be maintained. This could be done by establishing Marine Protected Areas where the population of these predators are high. Also, reducing the amount of nutrient pollution by educating farmers about crop and soil management strategies such as crop rotation and building conservation buffers could be effective. These steps could potentially balance the number of predators and the Crown-of-thorns Starfish.

Increase in CO₂ emissions

There should be extra restrictions on pollution for areas close to the reef. Also, factories should be banned near the reef. New technologies should be implemented to reduce air pollution. Furthermore, there could be extensive research carried out by the Australian Government and other NGOs to find out ways to reduce the negative impacts of ocean acidification.

Last but not least, effectively spreading awareness about the threats to the Great Barrier Reef would educate the citizens and would make them more aware of the situation. This would encourage more support through donations and volunteers. Also, reaching out to the youth is very important, so the government should carry out campaigns in school about the importance of the Great Barrier Reef and the threats that it faces.

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Figure

Figure 1: *Mesa.edu.au*. N.p., 2016. Web. 28 July 2016.