The Great Sea Reef in Fiji

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Introduction / Purpose

The Great Sea Reef in Fiji, is threatened by overfishing, pollution, habitat degradation, and climate change. This has resulted in declining key fish populations and loss of mangroves, which increases the risk of inundation of coastal settlements, social and economic hardships, and loss of biodiversity.

This plan seeks to improve conservation efforts to protect coral reef and fish populations by reducing habitat degradation caused by various anthropogenic actions. We also plan to protect local communities from consequences caused by declining health in the GSR. Livelihood of communities will also be a priority.

Planning Context

Decision Makers and Target Audience:

- Conservation International
- Ministry of Labour, Industrial Relations, Tourism and Environment
- Fiji Locally-Managed Marine Area Network

Planning Team:

- Coastal Management Organizations
- Educators
- Conservation Planning Organizations
- Federal/ Municipal/ Local Government
- Indigenous Communities

Stakeholders:

- Fishers
- Local Communities
- Indigenous groups
- Tourism industry
- Environmental NGO's
- Government agencies
- Scientists and Researchers
- International Organizations
- Coastal homeowners
- Conservation planners

Project Scope

The Great Sea Reef

Legend

The conservation plan is focused on the Great Sea Reef in Fiji. This reef is located on the northern shore of Vanua Levu island. Stretching over 450 km, it is the third longest continuous barrier reef in the world. The conservation plan focuses on the entire reef ecosystem, as the coral reef itself as well as the the species that inhabit it are threatened by human activity.

Fundamental Objectives

Great Sea Reef Ecoregion	6. Fundamental Obj	7. Features	8. Indicators	9. Targets
	What & Direction	What can be measured	How will 'what' be measured	Goal/time
Environmental-Bio diversity	Increase coral coverage	Coral coverage	Ha of coral coverage	Increase coral coverage by 20% in 15 years
	Increase key fish populations (Parrotfish, Humphead Wrasse, Camouflage Grouper)	Fish biomass	Fish biomass grams per square meter	Increase fish biomass by 30% in 10 years
Environmental –Ecological Processes	Increase clarity of water	Turbidity	Depth (meters) Secchi disc is visible	Increase depth Secchi disc is visible for by 1 meter every year for 5 years
Environmental –Ecosystem Services	Increase buffers for natural disasters	Mangrove coverage in buffer areas	Kilometers squared of mangrove coverage in buffer area	Increase mangrove coverage by 5 Kilometers Squared over 10 years
Economic	Increase local sustainable fisheries	Illegal fishing	Rate of illegal fishing	Reduce illegal fishing rates to 0% in five years
Social	Increase livelihood of local communities	Household income	Average household income	Increase average household income by 10% by 2030

This table outlines the fundamental objectives of our conservation plan which highlights the primary goals this project hopes to achieve.

Multiple Criteria Decision Analysis

Fundamental objectives Weight (1-5) / Strategies Weight (1-10)	Increase coral coverage (5)	Increase key fish populations (5)	Increase clarity of water (3)	Increase buffers for natural disasters (4)	Increase local sustainable fisheries (4)	Increase livelihood of local communities (5)	Total
Create better waste management plan/ increase funding	8 (40)	8 (40)	10 (30)	2 (8)	4 (16)	6 (30)	164
Place buffer zones (mangroves)	8 (40)	7 (35)	7 (21)	10 (40)	4 (16)	7 (35)	187
Enforce reduction of over fertilization	8 (40)	6 (30)	10 (30)	1 (4)	2 (8)	5 (35)	147
Increase awareness of threats to GSR	7 (35)	6 (30)	7 (21)	7 (28)	7 (28)	8 (40)	182
Increase enforcement of MPAs	7 (35)	9 (45)	8 (24)	7 (28)	7 (28)	7 (35)	195
Daily catch restrictions	6 (30)	10 (50)	6 (18)	3 (12)	8 (32)	5 (35)	177
Limit single use plastic in tourism industry	7 (35)	8 (40)	8 (24)	4 (16)	3 (12)	4 (20)	147
Place/enforce zoning laws (restrict development on coast)	10 (50)	8 (40)	9 (27)	10 (40)	7 (28)	7 (35)	220
Enforce policies to reduce illegal mining/reuse mining waste	10 (50)	9 (45)	10 (30)	7 (28)	8 (32)	8 (40)	225
No action	1 (5)	1 (5)	1 (3)	1 (4)	1 (4)	1 (5)	26

The MCDA looks at the fundamental objectives and strategies and weighs them on a scale of 1 to 5 for (FO) and 1 to 10 for strategies. To calculate the total scores, the weight (1-5) of (FO) was multiplied by the score (1-10) given to each of the strategies options then adding up the row.

Consequence Table

Fundamental objectives		Increase coral coverage	Increase key fish populations	Increase clarity of water	Increase buffers for natural disasters	Increase local sustainable fisheries	Increase livelihood of local communities	
Strategies	Indicators	Ha of coral coverage	Fish biomass grams per square meter	Depth (meters) Secchi disc is visible	Kilometers squared of mangrove coverage in buffer area	Rate of illegal fishing	Average household income	Net impact
Create better waste management plan/ increase funding		+	+	+	+	/	+	5
Place buffer zones (mangroves)		/	+	+	+	/	+	3
Enforce reduction of over fertilization		+	+	+	+	/	-	3
Increase awareness of threats to GSR		+	+	+	/	+	+	3
Increase enforcement of MPAs		+	+	+	+	+	+	5
Daily catch restrictions		+	+	+	+	+	+	5
Limit single use plastic in tourism industry		+	+	+	+	/	+	3
Place/enforce zoning laws (restrict development on coast)		+	/	+	+	/	+	3
Enforce policies to reduce illegal mining/reuse mining waste		+	+	+	+	/	+	4
No action		-	-	-	-	-	-	-6

The consequence table analyzes strategies by rating if they have a positive (+), negative (-) or no impact (/) on the corresponding fundamental objectives.

Situational Analysis

Introduction & Purpose

The Great Sea Reef in Fiji, is threatened by overfishing, pollution, habitat degradation, and climate change. This has resulted in declining key fish populations and loss of mangroves, which increases the risk of inundation of coastal settlements, social and economic hardships, and loss of biodiversity.

This plan seeks to improve conservation efforts to protect coral reef and fish populations by reducing habitat degradation caused by various anthropogenic actions. We also plan to protect local communities from consequences caused by declining health in the GSR. Livelihood of communities will also be a priority.

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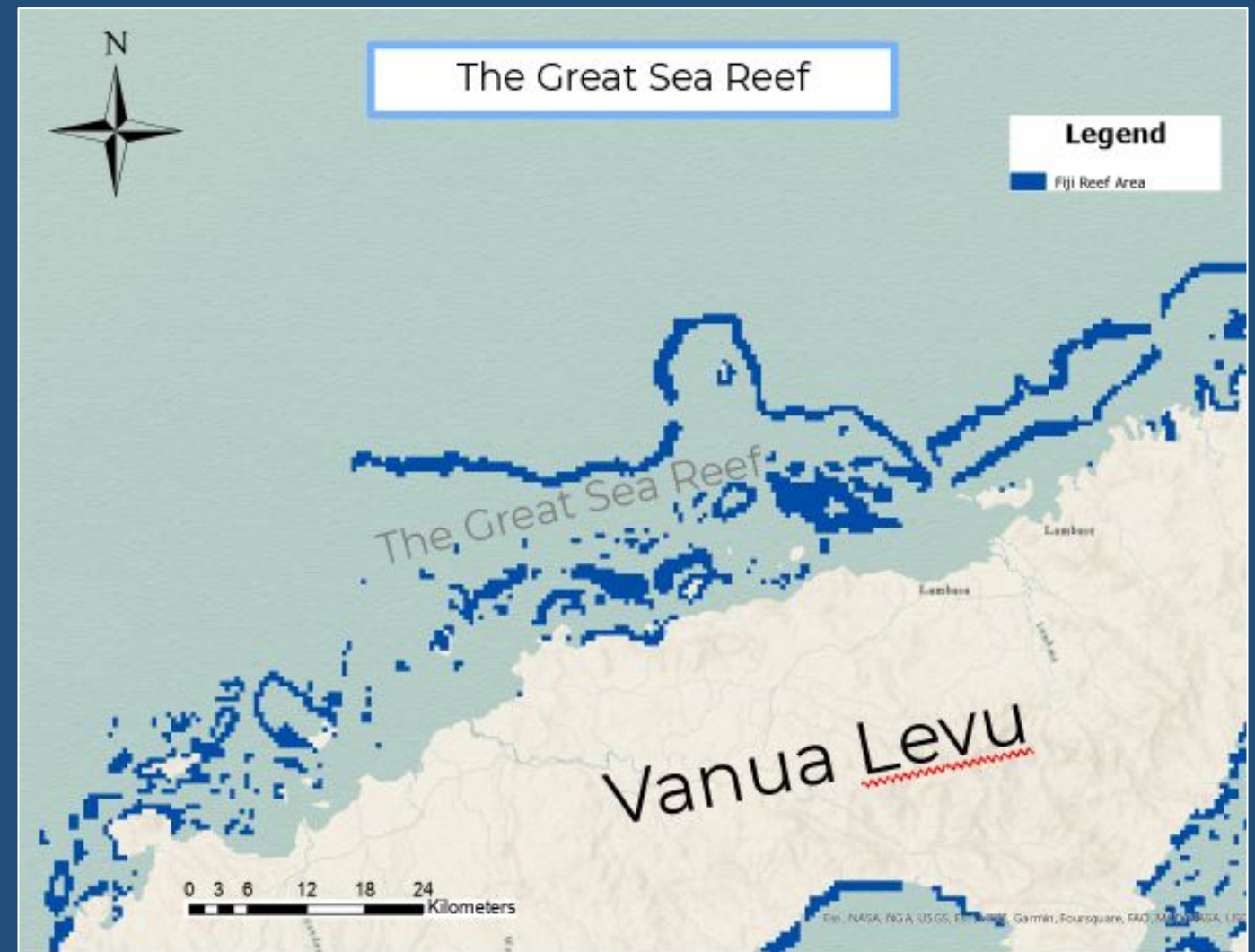- Coastal homeowners
- Conservation planners

Project Scope

The conservation plan is focused on the Great Sea Reef in Fiji. This reef is located on the northern shore of Vanua Levu island. Stretching over 200km, it is the third longest continuous barrier reef in the world. The reef is home to a diverse range of species including over 1000 fish species and 300 coral species. This includes 12 endangered IUCN red-listed marine species. (WWF). The reef ecosystem also supports coastal mangroves. The conservation plan focuses on the entire reef ecosystem, as the coral reef itself as well as the the species that inhabit it are threatened by human activity.

The success of this project is dependent on efficient and effective decision making by our planning team, discussion and cooperation with the stakeholders involved, as well as evaluation and reevaluation of the conservation plan as progress is made and the plan is implemented.

Timeline:
- Coral coverage, mangrove coverage, fish populations: 10-15 years
- Sustainable fisheries, clarity of water: 5 years
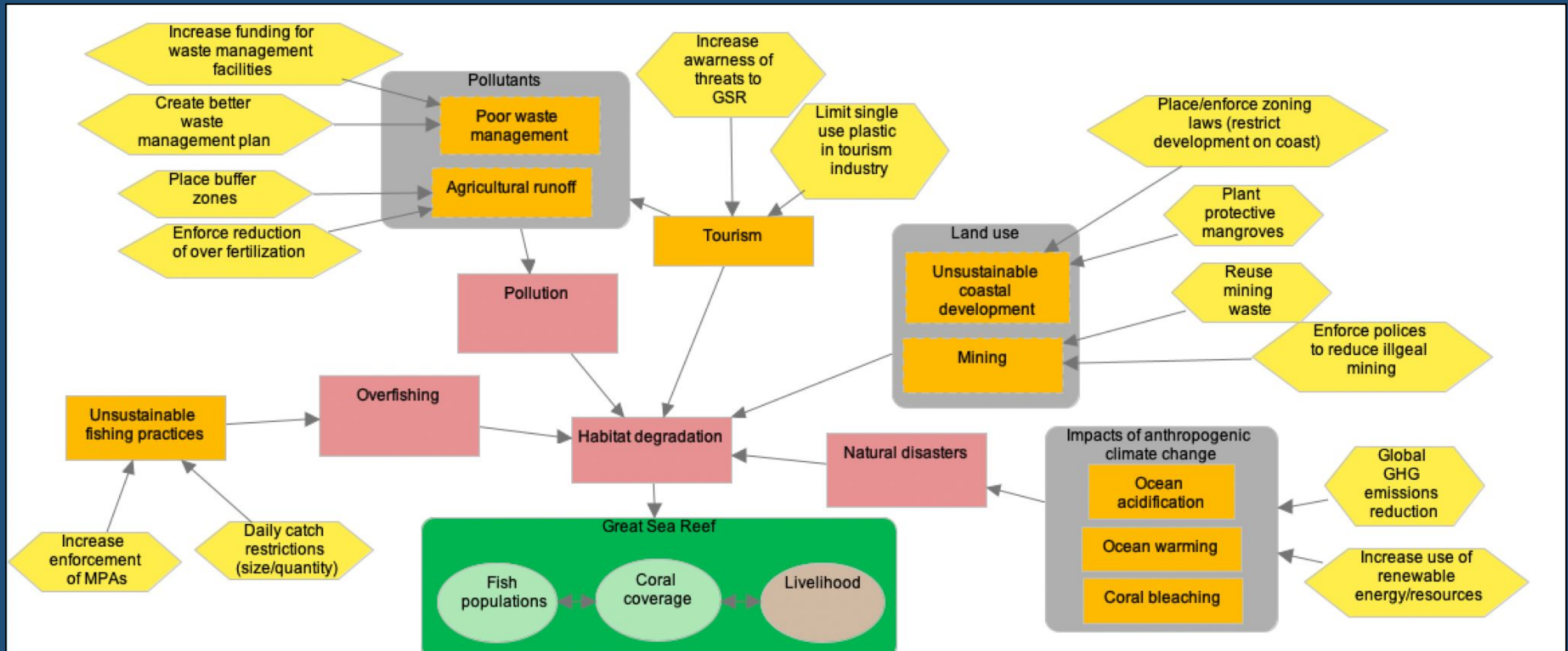- Household income: by 2030

The Great Sea Reef

Legend
Fiji Reef Area

The Great Sea Reef

Vanua Levu

0 3 6   12   18   24
Kilometers

Data: Institute for Marine Remote Sensing, University of South Florida

Fundamental Objectives

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	What & Direction	*What can be measured*	*How will 'what' be measured*	*Goal/time*
Environmental-Bio diversity	Increase coral coverage Increase key fish populations (Parrotfish, Humphead Wrasse, Camouflage Grouper)	Coral coverage Fish biomass	Ha of coral coverage Fish biomass grams per square meter	Increase coral coverage by 20% in 15 years Increase fish biomass by 30% in 10 years
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This table outlines the fundamental objectives of our conservation plan which highlights the primary goals this project hopes to achieve. These fundamental objectives cover environmental concerns including biodiversity, ecological processes, and ecosystem services. Additional economic and social fundamental objectives are focused on in order to preserve human wellbeing in local communities.

Situational Analysis

Increase funding for waste management facilities

Create better waste management plan

Place buffer zones

Enforce reduction of over fertilization

Pollutants
- Poor waste management
- Agricultural runoff

Increase awarness of threats to GSR

Limit single use plastic in tourism industry

Tourism

Pollution

Place/enforce zoning laws (restrict development on coast)

Plant protective mangroves

Land use
- Unsustainable coastal development
- Mining

Reuse mining waste

Enforce polices to reduce illgeal mining

Unsustainable fishing practices

Overfishing

Habitat degradation

Natural disasters

Impacts of anthropogenic climate change
- Ocean acidification
- Ocean warming
- Coral bleaching

Global GHG emissions reduction

Increase use of renewable energy/resources

Increase enforcement of MPAs

Daily catch restrictions (size/quantity)

Great Sea Reef
- Fish populations
- Coral coverage
- Livelihood

Consequence Table

Fundamental objectives		Increase coral coverage	Increase key fish populations	Increase clarity of water	Increase buffers for natural disasters	Increase local sustainable fisheries	Increase livelihood of local communities	
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Enforce reduction of over fertilization		+	+	+	+	/	-	3
Increase awareness of threats to GSR		+	+	+	/	+	/	3
Increase enforcement of MPAs		+	+	+	+	+	-	5
Daily catch restrictions		+	+	+	+	+	-	5
Limit single use plastic in tourism industry		+	+	+	/	+	-	3
Place/enforce zoning laws (restrict development on coast)		+	/	+	+	/	-	3
Enforce policies to reduce illegal mining/reuse mining waste		+	+	+	+	/	-	4
No action		-	-	-	-	-	-	-6

The consequence table (*Table 4*) analyzes some of the main strategies listed in the situational analysis (*Figure 1*) by rating whether each strategy has a positive (+), negative (-) or no impact (/) on the corresponding fundamental objectives. By having a consequence table we can easily analyze which strategies will be most effective based on their net impact score. The net impact score is calculated by adding up all the (+) and subtracting the (-) in a row to get the net impact value, we don't include the (/) because it does not include any change to the net impact score.

Multiple Criteria Decision Analysis Table

The Multiple Criteria Decision Analysis (Table 5) looks at the fundamental objectives (FO) and strategies and weighs them on a scale of 1 to 5 with 1 being the lowest and 5 being the highest priority for (FO) and 1 to 10 with 1 being the lowest and 10 being the highest for strategies. These ratings are based on stakeholder preference and what planners find most important for conservation of the Great Reef System (GRS) in Fiji. To calculate the total scores, the weight (1-5) of (FO) was multiplied by the score (1-10) given to each of the strategies options then adding up the row.

Fundamental objectives Weight (1-5) ⎯⎯⎯⎯ Strategies Weight (1-10)	Increase coral coverage (5)	Increase key fish populations (5)	Increase clarity of water (3)	Increase buffers for natural disasters (4)	Increase local sustainable fisheries (4)	Increase livelihood of local communities (5)	Total
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Conclusion

- Although resilient, the Great Sea Reef is threatened and must be protected
- A conservation plan is integral to foster the sustainable management of coastal ecosystems in the Great Sea Reef is integral in order to maintain and restore its crucial biodiversity.
- The habitats provided by the reef support a myriad of marine species, many of which are threatened or endangered
- The reef is vital not only to the surrounding environment, but to local and indigenous communities whose livelihoods are dependent on the health of this vast barrier reef.
- By conserving populations of marine species, mangroves, and corals, this will stabilize this ecosystem, boosting its health, productivity, quality, and resilience, especially in the wake of climate change, a great threat to our oceans and reefs.

Discussion Questions

1. What would you consider one of the biggest threat to coral reefs ?
2. What do you think possible impacts of coral reefs disappearing might look like?
3. What are somethings you could do to protect coral reef systems when traveling or visiting reefs?