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Sustainable Development

Protection of coral reefs for sustainable livelihoods and development

Report of the Secretary-General

Summary

Often referred to as the “rain forests of the sea”, tropical coral reefs rank among the most biologically rich and productive global ecosystems and are representing social, economic and environmental benefits for millions of people. Despite their importance, coral reefs are facing numerous local and global threats caused by human activity and climate change. Unsustainable fishing practices, coastal development, pollution, ocean warming and ocean acidification have already damaged one fifth of the coral reefs beyond repair and predictions are alarming should no change occur. Concerted global, national, regional and local efforts are therefore urgently required. Protection, resilience building, recovery, conservation and adaptation measures need to be implemented in an integrated, coherent manner and tailored to regional, national and local community needs, while involving all stakeholders. Rio+20 will offer the opportunity to review progress made to date as well as the remaining gaps in the implementation of the principles of the Rio Declaration, Agenda 21, the marine-related goals and targets set in the Johannesburg Plan of Implementation (JPOI) as well as other ocean-related international agreements. In addition, it could serve to secure renewed political commitment by formulating concrete, ocean and coral reef related measures and actions.

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| Contents | <i>Page</i> |
|--|-------------|
| I. Introduction..... | 3 |
| II. Coral reefs and sustainable development..... | 4 |
| III. Importance of protecting coral reefs and related ecosystems for sustainable livelihoods and development (including current status and adverse impacts)..... | 8 |
| IV. Economic, social and environmental benefits of protecting coral reefs, in the context of the themes and objectives of the United Nations Conference on Sustainable Development in 2012 | 15 |
| V. The role of national legislation in protecting coral reefs (including importance of inclusion of indigenous/local communities)..... | 21 |
| VI. The way forward: Potential actions (consistent with international law) needed to protect coral reefs and related ecosystems, including proposals for coordinated and coherent action across the United Nations system | 23 |

I. Introduction

1. The General Assembly adopted resolution 65/150 on the “Protection of coral reefs for sustainable livelihoods and development” at its sixty-fifth session while among others urging States to take all practical steps at all levels to protect coral reefs and related eco-systems for sustainable livelihoods and development, including immediate and concerted global, regional and local action to respond to the challenges and to address the adverse impact of climate change as well as of ocean acidification on coral reefs and related ecosystems. In addition, the General Assembly appealed on States to formulate, adopt and implement integrated and comprehensive approaches for the management of coral reefs and related ecosystems.
2. In paragraph 3 of this resolution, the General Assembly requested the Secretary-General to prepare a comprehensive report on the protection of coral reefs for sustainable livelihoods and development for its consideration at the sixty-sixth session. Consequently, the present report is intended to highlight the importance of protecting coral reefs while conducting an analysis of the economic, social and development benefits of coral reef protection in the context of the themes and objectives of Rio+20. The report furthermore aims to identify potential actions needed to protect coral reefs and related ecosystems.
3. The report draws on substantive inputs and information provided by Governments and United Nations programmes and agencies, in particular the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP)¹. The International Maritime Organization (IMO) as well as the International Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO), the Intergovernmental Panel on Climate Change (IPCC), the International Union for Conservation of Nature (IUCN), the World Resources Institute (WRI), the International Coral Reef Initiative (ICRI), the Western Indian Ocean Coastal Challenge and Conservation International (CI) also contributed inputs.²

¹ See UNEP Coral Reef Unit -<http://coral.unep.ch/>

² See inputs at: <http://www.un.org/esa/dsd/>

II. Coral reefs and sustainable development

4. The importance of oceans and coral reefs in achieving sustainable development goals is well established³. In this context, this report enumerates a number of international, national, regional and local efforts that have been designed to protect and manage coral reefs as part of an overall effort to enhance the sustainable development of marine and coastal areas.

A. United Nations

5. Member states at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil (1992) adopted the “Rio Declaration on Environment and Development” and “Agenda 21”. Chapter 17 of “Agenda 21” specifically addresses the protection and sustainable development of the marine and coastal environment within the context of the United Nations Convention on the Law of the Sea (UNCLOS). This convention establishes ocean governance and provides the overall legal framework for ocean matters, including economic activities in maritime areas, protection and preservation of the marine environment, as well as marine science and technology.
6. The Convention on Biological Diversity (CBD) entered into force in 1993 and adopted the Jakarta Mandate on Marine and Coastal Biological Diversity in 1995. Since 1998, the Convention has addressed issues such as integrated marine and coastal area management, marine protected areas, coral bleaching as well as physical degradation and destruction of coral reefs.
7. The meeting of the CBD Conference of the Parties (COP 10) in Nagoya, Japan in 2010 resulted in decision X/2 regarding the establishment of a strategic plan for biodiversity (2011-2020) which aimed to minimize the multiple threats to coral reefs, and other vulnerable ecosystems by 2015. In the same context, decision X/29 emphasized the need for data collection and analysis, environmental (impact) assessments and the establishment of measures to ensure conservation and sustainable use of marine and coastal living resources. In addition, it suggested the drafting of a report on the progress made in the implementation of the specific work plan on coral bleaching.
8. The United Nations Framework Convention on Climate Change (UNFCCC) came into force in 1994 and provides the framework for establishing protocols to stabilize greenhouse gas (GHG) concentrations in the atmosphere and for undertaking intergovernmental efforts to tackle the challenges posed by climate change.

³ Some coral reefs are even declared UNESCO World Heritage Sites (e.g. Belize Barrier Reef in 1996)

9. Other conventions that are relevant for the protection of coral reefs include the International Convention for the Prevention of Pollution from Ships (MARPOL), The London Convention and the London Protocol, the Convention on International Trade in Endangered Species of Wild Fauna and Flora, the Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat, the Convention on the Conservation of Migratory Species of Wild Animals, and the Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region.
10. In 1994, the Global Conference on the Sustainable Development of Small Island Developing States (SIDS) adopted the Barbados Programme of Action, which explicitly identified coastal and marine resources as an area requiring urgent action. Its implementation was reviewed at the fourth (1996) and sixth session (1998) of the Commission on Sustainable Development and it was reaffirmed by the Mauritius Declaration and Strategy in 2005.
11. At the seventh session of the Commission on Sustainable Development (CSD-7) in 1999, a call for action was launched to eliminate overfishing and wasteful fishing practices. Decision 7/1 emphasized that “oceans and seas constitute the major part of the planet that supports life, drive the climate and hydrological cycle and provide the vital resources to be used to ensure well-being for present and future generations and economic prosperity, to eradicate poverty, to ensure food security and to conserve marine biological diversity and its intrinsic value for maintaining the conditions that support life on earth”.
12. Other resolutions taken relating to coral reefs include resolution 61/105 (2006) on sustainable fisheries, resolution 63/214 on the sustainable development of the Caribbean Sea (2008) and resolution 64/73 (2009) on the protection of the global climate for present and future generations.
13. In 2000, the United Nations Millennium Declaration re-emphasized the need to protect the environment and to manage all living species and natural resources in a sustainable manner, while reaffirming support for the principles of sustainable development, including those set out in Agenda 21.
14. Paragraphs 30-36 of the “Johannesburg Plan of Implementation” (JPOI), adopted at the World Summit on Sustainable Development (WSSD) in 2002, focus on oceans, seas, islands and coastal areas. The JPOI promotes the establishment of inter-agency coordination mechanisms within the United Nations system and encourages regional cooperation among relevant regional organizations and programmes.
15. The Intergovernmental Oceanographic Commission of UNESCO facilitates and coordinates sustained observations, modeling and analysis of marine and ocean

variables and processes to support decision-making process worldwide. In this context, the Global Ocean Observing System (GOOS) has been developed to provide accurate descriptions of the present state of the ocean, including living resources, continuous forecasts of the future conditions of the sea, and the basis for forecasts of climate change, including those needed to monitor and protect coral reefs.

16. In 2003, UN-Oceans⁴ was created as an inter-agency coordination mechanism on ocean and coastal issues, including coral reefs, building on the work of the former Subcommittee on Oceans and Coastal Areas (SOCA) of the United Nations Administrative Committee on Coordination (ACC). Its role is to promote the coherence of United Nations system activities on oceans and coastal areas with the mandates of the General Assembly, the priorities contained in the Millennium Development Goals, the Johannesburg Plan of Implementation and of governing bodies of all members of UN-Oceans as well as to support the integrated management of oceans at the international level.

B. International/regional networks and NGOs

17. As a partnership among governments, international organizations and non-governmental organizations, the International Coral Reef Initiative (ICRI) was launched in 1994 as the only global entity devoted solely to coral reef conservation. Its aim is to preserve coral reefs and related ecosystems by implementing Chapter 17 of Agenda 21, and other relevant international conventions and agreements. At the same time, the Global Coral Reef Monitoring Network (GCRMN) was established as an operating unit of ICRI, which assists in the development of coral reef monitoring and data management, with equal emphasis on ecological and socio-economic information, and compiles reports on the global status of coral reefs.
18. In 1995, ICRI called on member states to commit themselves towards increasing research on and monitoring of coral reefs in order to provide data for effective management (“The Call to Action” and “Framework for Action”).
19. In 2007, the government of the Seychelles initiated the Western Indian Ocean Coastal Challenge (WIO-CC), which invited countries of the region to collaborate in order to reduce the adverse impacts of climate change, while promoting resilient ecosystems, sustainable livelihoods, and human security.
20. In 2009, the World Ocean Conference, a global forum on oceans, assembled Ministers and Heads of Delegations, experts, scientists, inter-governmental and non-governmental organizations to discuss threats to the ocean, effects of climate

⁴ Current members include: CBD, FAO, IAEA, ILO, IOC-UNESCO, IMO, ISA, UN-DESA, UN-DOALOS, UNDP, UNEP, UNIDO, WMO, World Bank (IBRD), WTO.

change on the ocean, and the role of ocean in climate change. As a result, the “Manado Ocean Declaration” was adopted which stressed the need for national strategies for the sustainable management of coastal and marine ecosystems.

21. In 2010, the “Pacific Oceanscape Framework” was adopted by the Pacific Leaders Forum as a call for united action against ocean threats across the Pacific. This framework was part of a broader movement named the “Pacific Ocean 2020 Challenge”, an intergovernmental initiative encouraging leaders to cooperate in order to respond to the Pacific's major threats.
22. Other important regional initiatives relevant to coral reefs include the Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security, the Micronesia Challenge, the Caribbean Challenge, the Eastern Tropical Pacific Seascape project, the West Indian Ocean Partnership, the West African Conservation Challenge, and the Regional Initiative for the Conservation and Wise Use of Mangroves and Corals for the Americas Region.
23. Finally, numerous non-governmental organizations and foundations are implementing programmes and initiatives to protect and conserve coral reefs.

C. Opportunity for further cooperation

24. The United Nations Conference on Sustainable Development “Rio+20” will take place in Rio de Janeiro, Brazil (4-6 June 2012) and is a unique opportunity to bring together government representatives, civil society, academia, the scientific community and the private sector to discuss sustainable development issues, including the sustainable management and protection of coral reefs.
25. Rio+20 will offer a chance to review progress made to date as well as the remaining gaps in the implementation of the principles of the Rio Declaration, Agenda 21, the marine-related goals and targets set in the Johannesburg Plan of Implementation (JPOI) as well as other ocean-related international agreements.
26. In addition, Rio+20 could serve as an opportunity to secure renewed political commitment by formulating concrete, ocean and coral reef related measures and actions. New and emerging challenges as for example the recent severe impacts of climate change as well as the opportunities but also possible drawbacks given by new technologies (e.g. geoengineering) could also be addressed.
27. The Commission on Sustainable Development is scheduled to undertake a two year review of oceans, marine life and small island developing States (SIDS) in 2015-2016.

III. Importance of protecting coral reefs and related ecosystems for sustainable livelihoods and development (including current status and adverse impacts)

28. Large reef-building areas can be found in the Atlantic, the Indian Ocean, the Middle East, the Pacific, Southeast Asia and Australia with its Great Barrier Reef, which represents the world's largest coral reef system. Based on the seabed, coral reefs are built over very long periods of time (centuries or more) through the accumulation of calcium-carbonate skeletons, which are discarded by reef-building corals (mainly stony corals).
29. Most coral reefs exist in tropical waters. Corals that build tropical coral reefs are small marine organisms called polyps that live in compact colonies and depend upon a symbiotic relationship with algae which live within their tissues and give them their coloration.
30. Rivalling the species diversity of tropical coral reefs, cold water coral communities are now known to occur around the world, generally in waters deeper than 40m and up to well beyond 1000m. While only a few species form actual 'reefs', cold water coral mounds and banks provide habitat and reproductive grounds for a range of species, including commercially important fish and shellfish. Discovered in 2002, the Røst Reef in Northern Norway is regarded as the largest cold water reef. To date, knowledge of cold water coral ecology, extent and status, as well as socio-economic value, remains limited.
31. Often referred to as "rainforests of the sea", tropical coral reefs are among the most biodiverse systems on the planet. They are also highly productive, and sustain human society through a range of provisioning and supporting services. Tropical coral reefs cover about 250,000 sq km of the ocean and while representing only less than one-tenth of 1% of the marine environment, they offer habitat to 25% of all known marine species.
32. One of the main functions of global coral reefs is the protection of around 150,000 km of shoreline in more than 100 countries and territories as they dissolve wave energy and reduce damages from erosion, floods and storm thus protecting human settlements, infrastructure, and coastal ecosystems.
33. Apart from environmental benefits, coral reefs also offer important social and economic benefits. Coral reefs, along with mangroves and seagrass beds, have been estimated to deliver the highest annual value in terms of ecosystem services of all natural ecosystems on the planet. Approximately 850 million people, one-eighth of the global population, live within 100 km of reefs and derive some benefits from coral reefs, while over 275 million, mostly in developing countries and island nations, depend directly on reefs for livelihoods and sustenance.

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34. Coral reef fish species represent an important source of protein and contribute around one-quarter of the total fish catch on average in developing countries, at the same time creating job opportunities. A healthy and effectively-managed coral reef can produce between 5 and 15 tons of fish and seafood per square kilometre per year.
 35. Coral reefs support the tourism industry of more than one hundred countries as they attract divers, snorkelers and recreational fishers and provide sand for beaches. In addition, some reef-related marine species have even been analysed and tested for pharmaceutical use, mainly in the area of cancer, HIV and malaria treatment. Further information on economic, social and environmental benefits can be found in chapter IV of this report.
 36. Despite their importance, coral reefs are facing numerous local and global threats, which in general occur in combination.
 37. Main local threats are unsustainable fishing practices, coastal development and watershed-based and marine-based pollution. Those threats reduce the ability of coral reefs, associated ecosystems and human populations to withstand and adapt to increasing climate change (Table 1).
 38. From a regional perspective, Southeast Asia is the most affected by local threats resulting in almost 95% of its coral reefs being endangered. The coral reefs in Australia are the least threatened with only around 14% of its coral reefs being at risk.⁵

Table 1: Overview of local threats and their impacts

⁵ Burke, L., K. Reytar, M. Spalding, and A. Perry, "Reefs at Risk Revisited" (Washington, DC, USA: World Resources Institute, 2011), p.1-14

| Threat | Details | % of affected coral reefs | Impacts | Trends |
|--|---|--|---|---|
| Local threats | | | | |
| Overfishing and destructive fishing | <ul style="list-style-type: none"> • Unsustainable harvesting of fish or invertebrates • Damaging fishing practices (use of explosives or poisons) • Illegal, unreported and unregulated fishing • Destructive fish gear (e.g. gill nets, discarded/lost nets) • “Fishing down the food chain” | <p>More than 55%</p> <p>(of which 30% face high threat)</p> | <ul style="list-style-type: none"> • Reduced areas of living corals • Reduced species diversity • Lower fish abundance | <p>Will continue to increase</p> <p>due to:</p> <ul style="list-style-type: none"> • population growth • excess fishing capacity • poor fisheries governance and management practices • international demand for fish • lack of alternative income |
| <p>Coastal development</p> <p>(e.g. human settlements, industry, aquaculture, infrastructure)</p> | <ul style="list-style-type: none"> • Coastal engineering • Runoff from land construction and clearing (sediment) • Dredging or Land filling • Pollution: Sewage discharge & toxic chemicals • Direct construction on reef expanses (airports etc.) • Unsustainable tourism | <p>Approx. 25%</p> <p>(of which 10% face high threat)</p> | <ul style="list-style-type: none"> • Increased algal cover/ overgrowth • Reduced coral growth | <p>Will continue to increase:</p> <ul style="list-style-type: none"> • as population growth in coastal areas continues to outpace overall population growth |
| Watershed-based pollution | <ul style="list-style-type: none"> • Erosion (sediment) • Nutrient fertilizer | More than 25% | <ul style="list-style-type: none"> • Corals more susceptible to storms, | Will continue to increase |

| | | | | |
|--|---|---|---|---|
| (e.g. crop cultivation, intensive livestock farming, deforestation, mining) | <ul style="list-style-type: none"> • Pesticides • Chemical toxins <p>Runoff delivered by rivers to coastal waters</p> | (of which 10% face high threat) | <p>diseases, infestations</p> <ul style="list-style-type: none"> • Coral bleaching • “Dead zones” /ecosystem collapse | <p>due to:</p> <ul style="list-style-type: none"> • Deforestation • Climate change induced increase in precipitations • Increased fertilizer use (especially in Africa and South Asia) due to increased food demand of increasing global population |
| <p>Marine-based pollution and damage from ships</p> <p>(e.g. commercial, recreational, passenger vessels)</p> | <ul style="list-style-type: none"> • Solid waste (incl. plastics), nutrients and toxins from oil and gas installations and shipping (e.g. contaminated bilge water, fuel leakages) • Accidental transport of invasive species in ships’ ballast water • Physical damage from ship groundings, anchors and oil spills | <p>Approx. 10%</p> <p>(of which 1% face high threat)</p> | <ul style="list-style-type: none"> • Collapses and closures of fisheries | <p>Will continue to increase</p> <p>due to:</p> <ul style="list-style-type: none"> • Increase in global oil demand • Increase in maritime shipping and cruise tourism • Increased threat by invasive species |

Source: Reefs at risk revisited, WRI (2011)

39. Apart from these local threats, serious global threats induced by climate change are endangering coral reefs (Table 2).

Table 2: Overview of main global threats and their impacts

| Threat | Details | % of affected coral reefs | Impacts | Trends/ Projections 2030-2050 |
|----------------------------|---|--|--|--|
| Global threats | | | | |
| Ocean acidification | <ul style="list-style-type: none"> Increased CO₂ emissions cause change in chemistry of ocean surface waters –building of carbon acid | More than 75% (in combination with local threats) | <ul style="list-style-type: none"> Reduction of coral growth rates Weakening of coral skeletons Support of coral bleaching Halt of coral growth Slow dissolution of coral reefs | <p><u>By 2030:</u> Less than 50% of global coral reefs expected to be in areas favourable for coral growth</p> <p><u>By 2050:</u> Only approx. 15% expected to be in areas favourable for coral growth</p> |
| Ocean warming | <ul style="list-style-type: none"> Rising sea temperatures | More than 75% (in combination with local threats) | <ul style="list-style-type: none"> (Mass) Coral bleaching Coral death | <p><u>By 2030:</u> 50% of global coral reefs expected to experience thermal stress and coral bleaching</p> <p><u>By 2050:</u> More than 95% expected to experience thermal stress and coral bleaching</p> |

Source: Reefs at risk revisited, WRI (2011)

40. One severe global threat is ocean warming which leads to “coral bleaching”, where corals lose their symbiotic algae and as a result their coloration. If a continued algae loss occurs, the corals eventually die. The most severe coral bleaching to date occurred in 1998 caused by extreme El Niño weather events resulting in the killing of around 16% of global corals.⁶ Since then, repeated coral bleaching has been recorded in most regions. In 2010, a mass coral bleaching event affected the Greater Coral Triangle Region. Recent studies predict the dominance of algae on the Great Barrier Reef and Caribbean reefs by 2030-2050 as they often colonise dead corals after coral bleaching events thus preventing the settlement of new corals.⁷
41. The other important global threat is ocean acidification caused by increasing CO₂ emissions. Around 30% of global CO₂ emissions are absorbed by oceans and form carbon acid in reaction with water, which leads to reduced coral growth and calcification, weakened coral skeletons and even the slow dissolution of existing coral reefs.⁸
42. Since the beginning of the industrial revolution, oceans have become 30% more acidic and predictions show that by 2050 ocean acidity could even increase by 150%, which would give marine ecosystems a very small period of time for adaptation as it would represent an increase that is 100 times faster than any ocean acidity change experienced over the last 20 million years.⁹
43. The reduction of global CO₂ emission is crucial and first steps have already been undertaken, among others through the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. In July 2011, mandatory measures to reduce emissions of greenhouse gases (GHGs) from international shipping were adopted at the 62nd session of the Marine Environment Protection Committee (MEPC) of the International Maritime Organization (IMO). The regulations apply to all ships of 400 gross tonnage and above and are expected to enter into force on 1 January 2013.
44. Other potential threats are: (a) Sea level rise (mostly affecting Pacific small island developing States and atolls), which increases erosion, inundation and pollution of freshwater below islands; (b) Increased frequency of high-intensity tropical storms (e.g. hurricanes); (c) Diseases (mainly in the Caribbean); (d) Plagues and

⁶ Burke, L., K. Reytar, M. Spalding, and A. Perry, “Reefs at Risk Revisited” (Washington, DC, USA: World Resources Institute, 2011), p.21-37

⁷ Wooldridge, S., T. Done, R. Berkelmans, R. Jones and P. Marshall, “Precursors for resilience in coral communities in a warming climate: a belief network approach” in *Mar. Ecol.-Prog. Ser.*: 295 (2005), p. 157-169

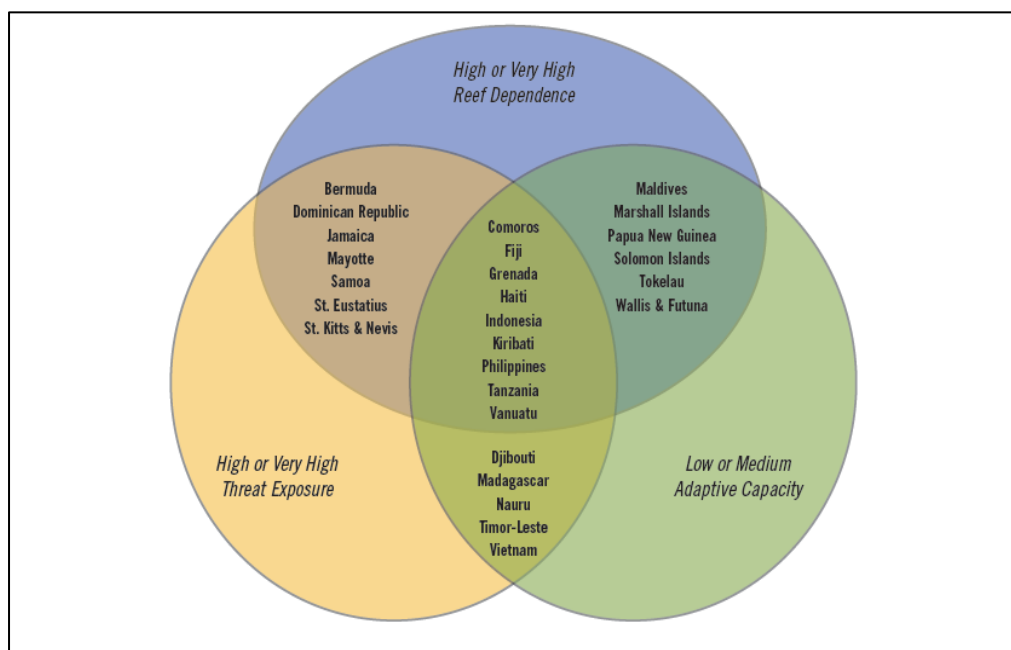
⁸ Burke, L., K. Reytar, M. Spalding, and A. Perry, “Reefs at Risk Revisited” (Washington, DC, USA: World Resources Institute, 2011), p.21-37

⁹ Secretariat of the Convention on Biological Diversity, “Scientific Synthesis of the Impacts of Ocean Acidification on Marine Biodiversity” in *Technical Series No. 46* (Montreal, 2009), p. 9

outbreaks of crowns-of-thorns starfishes (natural predators of corals).

45. Slow growing and fragile, cold water coral reefs are also extremely vulnerable to physical damage caused by human activity. Bottom fishing and deep sea trolling have already caused and continue to cause severe impacts and prospecting constitutes another potentially significant direct threat. In addition, the placement of underwater pipelines and cables endangers cold water coral reefs.
46. Twenty-seven global countries and territories are highly vulnerable to coral reef loss, from which nineteen are small island developing States (SIDS). Nine countries showed the lowest adaptive capacity, meaning their ability to cope with the effects of coral reef degradation, and will need particular attention (see also Figure 1).

Figure 1: Vulnerability drivers in 27 very highly vulnerable nations



Source: Reefs at risk revisited, WRI (2011)

47. Despite these threats, only around 27% of global coral reefs are located inside marine protected areas (MPA), more than half of them being in Australia. In addition, according to a recent study of the WRI, only 6% of global coral reefs are located in effectively managed MPAs.¹⁰
48. As a result, the negative impacts on coral reefs, mangroves and seagrass beds have been considerable. Global coverage of seagrass beds has declined by almost a third

¹⁰ Burke, L., K. Reytar, M. Spalding, and A. Perry, "Reefs at Risk Revisited" (Washington, DC, USA: World Resources Institute, 2011), p.79-84

in 100 years and at least a quarter of the historical mangrove cover has been lost.

49. According to ICRI, around one fifth of the global coral reefs have already been damaged beyond repair and 35% are predicted to be lost within the next twenty to forty years if no change occurs. The recent report “Reefs at Risk Revisited” of WRI notes that some 341 coral reef species, including 200 reef-building corals, are currently threatened and predicts that through the combined impacts of local and global threats 90% of coral reefs will be threatened by 2030 and all coral reefs will be threatened by 2050 if no protective measures are taken.
50. The protection of coral reefs, mangroves and seagrass beds is therefore crucial¹¹ and should be understood as a broad range of actions towards sustainable management that directly and tangibly protect coral reefs as well as the rights and interests of reef dependent populations and sectors.

IV. Economic, social and environmental benefits of protecting coral reefs, in the context of the themes and objectives of the United Nations Conference on Sustainable Development in 2012

51. At the Second Preparatory Committee Meeting of Rio+20 in March 2011, many small island developing States (SIDS) specifically called for Rio+20 to provide support for sustainable ocean management and the protection of marine resources. Therefore, the topic of oceans, including coral reefs, is expected to figure prominently at the Conference. Furthermore, numerous preparatory meetings are expected to cover the topic of ocean management and protection¹².
52. The Conference will focus on two themes: (a) a green economy in the context of sustainable development and poverty eradication; and (b) the institutional framework for sustainable development.
53. Although a precise definition has yet to be determined, the concept of green economy can be seen as focusing primarily on the intersection between environment and economy and as a lens for concentrating on and seizing opportunities to advance economic and environmental goals simultaneously. The development of this “green economy” will rely heavily on the sustainable management of oceans and the conservation of marine resources, including coral reefs.
54. Many member states are now replacing the term “green economy” with the “blue economy” approach, which implies that green economy development needs to

¹¹ See also: “Action Plan to Conserve Coral Reef Ecosystem” in Japan (established in 2010)

¹² See: <http://www.uncsd2012.org>

include a focus on benefits for coastal communities, especially in small island developing States and developing countries, which depend on the ocean and its marine resources for their existence.¹³ It further highlights the importance of healthy oceans in relation to the three pillars of sustainable development as they can generate significant economic, social, environmental benefits. The identification of coral reef benefits is therefore crucial.

55. Coral reefs offer employment opportunities in fisheries and are an important nutrition source. No less than 30 million people of global coastal communities are entirely dependent on coral reefs as their primary sources of food production, income and livelihood.¹⁴
56. In average, people in coral reef countries consume 29 kg of fish and seafood per year, while the consumption in the Maldives is the highest. Main fish consumer countries are the Pacific small island developing States with average fish consumption twice or four times higher than the global average. Nevertheless, potential shortage of fish resources has been predicted for 2030 in the Pacific area.
57. In 2010, coral-reef fisheries generated global annual net benefits of US\$6.8 billion. Effectively managed and environmentally-sound fisheries can play an important role in supporting sustainable development and poverty eradication by providing food and employment opportunities. Fisheries are in general small-scale and artisanal enterprises and as such represent an attractive business option due to low entry costs. The greatest number of coral reef fisheries can be found in Asian countries (e.g. Indonesia, Vietnam, China), which each have between 100,000 and more than 1 million coral reef fishers.
58. According to the WRI, global annual net benefits from all coral reef-related good and services amounted to a total of approximately US\$29 billion in 2010, but the economic revenues derived from coral reefs vary considerably by site, among others depending on: (a) size of tourism markets, (b) importance and productivity of fisheries, (c) level of coastal development, and (d) distance to major urban centers. In general, economic revenues mainly originate from coral reef exports and tourism.
59. The export of coral reef species and products represents an important source of income for many countries and includes among others live reef food fish, aquarium fish and tourist souvenirs. The greatest relative value of coral reef exports (mainly black pearls) can be found in French Polynesia¹⁵, where they represent 62% of the gross domestic product (GDP).

¹³ Australia/Pew Environment Group, "Keeping the Green Economy Blue concept paper" (2011)

¹⁴ Wilkinson, C., "Status of coral reefs of the world: 2008" (Townsville, Australia: Global Coral Reef Monitoring Network and Reef and Rainforest Research Centre, 2008), p.5-19

¹⁵ See also: French Initiative for Coral Reefs (L'IFRECOR): <http://www.ifrecor.fr/>

60. Coral reef tourism provides considerable income for both developing and developed countries and generated global annual net benefits of US\$11.5 billion in 2010. More than 96 coral reef countries benefit from coral reef tourism, which in twenty-three of them represents 15% of their GDP. Revenue from coral reef tourism comes from divers, snorkelers, recreational fishers and beach visitors, who are paying for diving and fishing activities, hotels, restaurants, transportation and in some cases have to contribute a “visitor fee”.
61. In addition, coral reefs offer shoreline protection, are providing livelihood for marine species and contribute to the formation of (tourist) beaches. In some small island developing States, coral reefs protect more than 80% of the coastline. The global annual net benefits of shoreline protection amounted to US\$10.7 billion in 2010. Apart from shoreline protection, coral reefs offer habitat to 25% of all marine species and create favourable conditions for other ecosystems (e.g. mangroves, seagrass beds).¹⁶
62. Finally, coral reefs possess a significant cultural and spiritual value for many indigenous and other coastal communities.
63. While the dependence on coral reefs is high in many countries, with half a billion people greatly depending on coral reefs for food, livelihood and tourism,¹⁷ small island developing States (SIDS) and coastal communities in developing countries are the most reef-dependent and their particular needs and concerns need to be given particular attention.
64. According to WRI, coral reef degradation caused by human activity and climate change could lead to significant economic losses in the Caribbean by 2015, namely US\$95-140 million in diminished net revenues from fisheries and US\$100-300 million in reduced income from tourism. In addition, annual losses of US\$140-420 million from reduced coastal protection are predicted in the region within the next fifty years.
65. According to other studies, the climate change induced deterioration of the Great Barrier Reef could cost Australia US\$2.2-5.3 billion over the next nineteen years, while Indonesia could experience losses in the amount of US\$1.9 billion over twenty years due to overfishing.¹⁸

¹⁶ Burke, L., K. Reytar, M. Spalding, and A. Perry, “Reefs at Risk Revisited” (Washington, DC, USA: World Resources Institute, 2011), p.66-78

¹⁷ Wilkinson, C., “Status of coral reefs of the world: 2008” (Townsville, Australia: Global Coral Reef Monitoring Network and Reef and Rainforest Research Centre, 2008), p.5-19

¹⁸ Burke, L., K. Reytar, M. Spalding, and A. Perry, “Reefs at Risk Revisited” (Washington, DC, USA: World Resources Institute, 2011), p.66-78

66. The second objective of Rio+20 is to strengthen the institutional framework for sustainable development. There are numerous local, regional, national and international targets, initiatives and processes relevant to coral reefs and dependent communities and sectors, and many of these have firm anchoring in international agreements.
67. There is a need to reinforce political commitment with regard to existing international agreements and conventions such as UNCLOS, which should include necessary actions for the protection and preservation of rare and fragile ecosystems, as well as the habitat of depleted, threatened or endangered species and other forms of marine life, including coral reefs.
68. The establishment, monitoring and enforcement of sustainable national marine managed (MMAs) and MPAs as well as the building of (regional) networks are important.¹⁹
69. Countries are increasingly creating MPAs, even if coral reefs and their resources only constitute a minor part of their national economy, due to its fundamental importance for their coastal communities. One example is Sudan, which participates in the activities of the Regional Organisation for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA) geared to the conservation of all aquatic resources, including coral reefs.
70. Effectively managed areas as for example the Bonaire National Marine Park (Box1) and the Gulf of Mannar Biosphere Reserve project (Box 2), have shown that adequate measures can significantly reduce threats and generate important economic, social and environmental benefits.

Box 1: Benefits of Bonaire National Marine Park

Background:

Bonaire is located approximately 100 km north of Venezuela in the Caribbean. The 2700 hectare Bonaire National Marine Park (BNMP) was created in 1979 with the goal "to protect and manage the island's natural, cultural and historical resources, while allowing ecologically sustainable use, for the benefit of future generations". Since 1991, the non-governmental organization STINAPA is managing the BNMP and is responsible for covering all its direct costs (incl. law enforcement, maintenance, education, research and monitoring).

Tourism, especially diving, represents Bonaire's primary economic revenue. In 1994, 25,000 divers visited Bonaire, generating gross revenues of US\$34 million. Currently more than 28,000 divers are visiting Bonaire annually.

¹⁹ See also: ICRI's East Asia Initiative on MPAs Networks (including Thailand)

Measure: Introduction of admission fee (“nature fee”)

In collaboration with all relevant stakeholders a successful fee system was introduced, which comprises the payment of an admission fee (“nature fee”) in order for visitors to be able to enter the BNMP. In 1992, the imposed visitor fees amounted in over US\$ 170,000, which were used to cover management costs as well as coral reef protection and conservation measures.

Today, the BNMP is charging \$25 for scuba divers and \$10 for non-scuba divers for one calendar year. Passes are also available at \$10 for one day of scuba diving. Bonaire’s residents are paying a reduced fee. Further revenues are generated from renting of moorings, the sale of tourist souvenirs as well as from grants and donations.

Result

As a result, the Bonaire National Marine Park is financially self-sufficient.

Sources: STINAPA Bonaire, Bonaire National Marine Park Management Plan 2006
<http://www.stinapa.org>

71. According to Conservation International (CI), incomes within MPAs are twice as high as outside of those marine protected areas and MPAs can significantly improve livelihood opportunities, food security, and environmental awareness.
72. Another successful approach in the area of coral reef protection and conservation is the declaration of “Particularly Sensitive Sea Areas (PSSA)” by the International Maritime Organization (IMO). In order to designate an area as PSSA, it must be vulnerable to damage by international shipping activities, while showing certain ecological, socio-economical and scientific characteristics. Since 1990, IMO has designated thirteen PSSAs, of which eight are designed to protect coral reefs from the impacts of international shipping²⁰.

Box 2: Benefits of Gulf of Mannar Biosphere Reserve (UNDP-GEF) project**Background:**

The Gulf of Mannar lies between the southern tip of India, the south-eastern coast of Tamil Nadu state, and the north-west coast of Sri Lanka. In 1986, twenty-one inshore coral sand islands and their surrounding coral reefs, seagrass beds and mangrove habitat were declared the Gulf of Mannar National Park. In 1989, the entire Gulf of Mannar was designated as Biosphere Reserve, which represented the first marine conservation area of this kind in India and the South

²⁰ See also: <http://www.imo.org/OurWork/Environment/PollutionPrevention/PSSAs>

Asian region.

The “Gulf of Mannar Biosphere Reserve project” was first implemented in 2002 as a partnership between the governments of India and Tamil Nadu, the United Nations Development Program (UNDP) and the Global Environment Facility (GEF). It aims to demonstrate the modalities for integrating biodiversity conservation, sustainable coastal zone management and the livelihoods of local communities, including indigenous/tribal populations. Its overall objective is to use a multi-sectoral and integrated systems approach to conserve the coastal biodiversity of the Gulf of Mannar.

Measures:

Empower local communities to manage the coastal ecosystems in a sustainable manner by strengthening conservation efforts, supporting alternative livelihood and implementing awareness programmes.

Result

This project has helped to transform the behaviours of local communities and fishermen. In turn, threats to marine resources have been significantly reduced, evidenced by a 7.5% increase in coral cover in the project area from 2006 to 2010.

Sources: UNDP-GEF²¹

73. A wide range of actors from governmental and non-governmental organizations, initiatives, civil society and the private sector are involved in coral reef protection and conservation. It is therefore crucial to ensure coherence in their activities in order to avoid duplication and optimize protection, recovery, conservation and adaptation measures.
74. In order to engage all stakeholders, including the private sector, in the effective management and protection of coral reefs, economic incentives (e.g. buyouts, conservation agreements, alternative livelihoods incentives) can be an attractive complement to more traditional measures such as fines and penalties.²²
75. Due to the fact that cold water corals exist beyond national jurisdiction and coral reefs in general face not only local, but also global threats, coral reef protection has to take place not only at the local, regional and national levels but also at the international level while still allowing local communities to maintain a strong ownership of the management of coral reefs and their resources.

²¹ See also: <http://www.gombrrt.org/>

²² See also: Niesten, E. and H. Gjertsen, “Economic Incentives for Marine Conservation” (Arlington, Virginia, USA: Science and Knowledge Division, Conservation International, 2010)

76. Regional fisheries management organisations (RFMOs) have a key role to play in the conservation of marine species beyond national jurisdiction as they are responsible for managing high seas fish stocks and highly-migratory species and can help to set catch and fishing effort limits, technical measures, and control obligations.

V. The role of national legislation in protecting coral reefs (including importance of inclusion of indigenous/local communities)

77. The role of national governments and legislation in providing an enabling environment for all stakeholders to meaningfully contribute to coral reef protection is pivotal.²³

78. In Brazil for example, nine coral reef conservation units have been created, including municipal, state and federal units. The government initiated the National System of Conservation Units, which brought together all existing instruments and regulations on the issue, constituting a framework for the creation, implementation, consolidation and management of these units. With the integration of the various units, the Federal Government joins state and local governments in providing better protection of the environment in Brazil.

79. Apart from focussing on coral reef protection, national legislations should also include climate change adaptation measures, which reduce the vulnerability of reef-dependent populations. Effective government institutions, regulations and enforcement mechanisms also play an important role in the establishment, monitoring and enforcement of sustainable MMAs and MPAs.

80. The application of “payments for ecosystem services” (PES) and other incentive-based mechanisms can support the implementation of protection and conservation measures²⁴. Of particular importance for marine and coastal PES due to the public good nature of these resources is the ability to identify “sellers” and “buyers” of the ecosystem service of interest. New institutional arrangements, such as community-based management, management concessions, and co-management schemes can substitute use and access rights for ownership.

81. A noted example for PES within the context of coral reefs habitat is the private, non-profit Chumbe Island Coral Park Ltd (CHICOP) in Tanzania. The Government of Zanzibar established a protected area around the island and its fringing coral reef in 1994 and gave the management rights to CHICOP, which is responsible for implementing the CHICOP Management Plans 1995-2016.

²³ See also: “National Environmental Policy for Sustainable Development of oceans and coastal areas and Island” of Colombia

²⁴ See also: <http://ec.europa.eu/environment/nature/biodiversity/economics/>

82. The success of national legislation often depends on the integration of all stakeholders in the decision-making process. The inclusion of indigenous and other local communities is therefore of utmost importance as they are often the most dependent on coral reefs for food and livelihood.
83. The German government provides, for example, support to international initiatives and projects devoted to coral reefs in the context of integrated coastal area planning and management, which include indigenous and local communities as well as partners at local, national, regional and international levels.
84. Two other national legislations, namely from Australia and Palau, which might be able to offer valuable lessons learned, have undertaken successful measures to protect coral reefs while involving their indigenous and other local communities.

A. Protection of the Great Barrier Reef in Australia

85. The Australian Government began taking steps to protect its Great Barrier Reef in 1975, when it created the Great Barrier Reef Marine Park Authority (GBRMPA). Different protection and conservation measures have been put in place, including the establishment of a new Zoning Plan in 2004 that increased the proportion of the Marine Park highly protected by ‘no take zones’ from less than 5% to more than 33%²⁵.
86. The GBRMPA is working in partnership with indigenous groups (Aboriginal and Torres Strait Islander) to develop formal, legally recognised agreements, called “Traditional Use of Marine Resource Agreements (TUMRAs)”, regarding the management of the Marine Park. TUMRAs provide a practical and more flexible pathway for traditional owner groups to express their rights and interests. The framework also provides collaborative opportunities to protect cultural values and manage culturally important species in accordance with traditional lore and to also address other activities that impact Aboriginal and Torres Strait Islander people, such as illegal fishing or resource poaching.
87. Other important initiatives include the “Reef Water Quality Protection Plan (Reef Plan)” and the “Reef Rescue” five year program (2008-2013) which aims to reduce the discharge of dissolved nutrients and chemicals from agricultural lands to the Great Barrier Reef lagoon by 25% and the discharge of sediment and nutrients by 10%.
88. Australia’s marine bioregional planning is designed to provide long-term protection of coral reefs and related ecosystems by improving the conservation, sustainable use, and management of marine resources and ecosystems (through

²⁵ See also: Mexico’s “National Law of the Waters” (approved in 2008), which specifically addresses the establishment of regulated zones, zones closed to fishing, and water reserves.

MMA and MPAs), including coral reef habitats.

89. Adopted by the General Assembly in 2010, resolution 65/150 on the “Protection of coral reefs for sustainable livelihoods and development” was initiated by the Australian government in close partnership with Pacific and other countries that may be directly affected by the degradation or loss of coral reefs and related ecosystems (e.g. Nauru).

B. Marine Protected Areas in Palau

90. Palau is located approximately 800 km east of the Philippines. In 2003, the Government introduced the “Protected Areas Network Act” (PAN Act), which comprised the establishment of a nationwide network of MPAs with the goal of protecting biodiversity and natural resources. Of the twenty-eight MPAs designated, twenty-four are containing coral reefs.
91. The PAN Act has been supported by indigenous communities as well as the highest level of national government as it allows stakeholder involvement and flexibility in the planning process. It included the establishment of PANF, a non-government corporation, and the implementation of an admission fee of US\$15 collected from visitors upon departure from the airport (“Green Fee”). The Act inspired several Micronesian governments to establish the “Micronesia Challenge” launched in 2006.

VI. The way forward: Potential actions (consistent with international law) needed to protect coral reefs and related ecosystems, including proposals for coordinated and coherent action across the United Nations system

92. The protection of oceans and related ecosystems, including coral reefs, remains a main objective, as already envisaged in chapter 17 of Agenda 21, the Johannesburg Plan of Implementation (JPoI) and other international agreements.
93. Recent studies have shown that coral reefs have the capacity to recover from even very extreme damage if adequate protection, resilience building, recovery and conservation measures, such as the “Coral Reef Conservation Act” in the USA, are in place. In this context, the establishment of marine national parks and artificial coral reefs²⁶ (e.g. through biorock technology) has been successful in certain areas. Other positive trends are increased public awareness and a more active local engagement. Although strong recovery has been seen in parts of the Indian Ocean

²⁶ See also: LC/LP and UNEP “Guidelines for the Placement of Artificial Reefs” (2009) and “Aquarius Coral Restoration and Resilience Experiments” of the USA in Report on NOAA Coral Reef Conservation Program activities from 2007-2009, p. 84

and Western Pacific, especially where direct stress is low, recovery is stalled or weak where there are substantial human pressures.

94. Further major efforts are therefore needed to diminish threats to coral reefs. Particularly, as appropriate actions can generate significant social, economic and environmental benefits.
95. In order to ensure coordinated and coherent action across the United Nations system with respect to coral reef protection, UN-Oceans as coordination mechanism on ocean and coastal issues could play an expanded role. The creation of a specialized Coral Reefs Task Force under its umbrella, comprising experts of its respective member organizations and collaborating with national Coral Reef Task Forces, could be considered.
96. Others recommendations for the protection of coral reefs for sustainable livelihoods and development at the global and local level are:
 - a. **Minimize global CO₂ emissions** as they are leading to ocean acidification and ocean warming thus destroying coral reefs. Urgent progress towards multilateral agreements and action to reduce carbon dioxide and other greenhouse gases responsible for climate change is essential for both short and longer-term efforts to reduce impacts of climate change on coral reef biodiversity and ecosystem services.
 - b. **Reduce unsustainable fishing practices** such as overfishing and destructive fishing by: (1) addressing their primary drivers (e.g. food insecurity, poverty) through appropriate measures (e.g. promotion of alternative livelihoods); (2) establishing sustainable management policies, practices and guidelines²⁷ for fisheries; (3) reducing excess fishing capacity; (4) combating illegal, unreported and unregulated (IUU) fishing - among others through enhanced port state control and Port State Measures (PSM); (5) eliminating unsound fishing subsidies; (6) prohibiting destructive fishing; and (7) enforcing fishing regulations.
 - c. **Decrease watershed-based sedimentation and pollution** through: (1) improved agriculture, livestock, and mining practices; (2) the minimization and control of industrial, urban and mining runoff as well as (3) the protection and restoration of vegetation (especially mangroves, seagrass beds). These measures can be supported by applying “payments for ecosystem services” (PES) and other incentive-based mechanisms.
 - d. **Reduce marine-based pollution and damage** by: (1) controlling and regulating ballast discharge from ships through protocols and conventions; (2)

²⁷ See also: FAO “Technical Guidelines for Responsible Fisheries”

improving waste management at ports and marinas; (3) designating safe shipping lanes and boating areas, including declaring “Particularly Sensitive Sea Areas (PSSA)” and (4) efficiently managing offshore oil and gas activities (including risk assessment, emergency plans).

- e. **Improve coastal development** through: (1) ecosystem-based management; (2) integrated coastal management; (3) ocean zoning; (4) linkage of terrestrial and marine protected areas; (5) prevention of unsound land development; (6) restriction or limitation of coastal development within specified distance from coast (“coastal development setbacks”); (7) adequate watershed management and (8) protection and recovery of critical coastal habitats and vegetation, (including reforestation measures). Adequate coastal development is especially important in view of the predicted population growth in coastal areas which will continue to outpace overall population growth.
- f. **Increase the coverage and effectiveness of marine managed (MMAs) and marine protected areas (MPAs), including the building of networks.** The provision of sufficient financial resources, adequate equipment and trained staff through resource mobilization and capacity-building measures is crucial in order to guarantee their effective functioning.
- g. **Reinforce regional and international collaboration in protection, resilience building, recovery, adaptation and conservation measures** through: (1) implementation of international agreements (e.g. UNCLOS, MARPOL); (2) establishment of transboundary collaboration and regional agreements; (3) improved international regulations regarding trade of coral reef products (particularly live coral reef organisms) and (4) enhanced regional and international climate change efforts.
- h. **Promote sharing** of successful approaches related to coral reef protection, recovery, resilience building, adaptation and conservation (best practices) as well as the **transfer of (new) technologies.**
- i. **Implement sustainable tourism and promote eco-tourism** as tourism is projected to continue to increase worldwide. The establishment of partnerships with the tourism industry and the use of incentives for coral reef protection (e.g. certification schemes, awards for eco-friendly hotels, dive or tour operators) can hereby play an important role.
- j. **Encourage data collection and scientific research** to further explore economic, social and environmental benefits of coral reefs to support decision-makers in developing measures to protect coral reefs, reinforce their resilience and enhance the ability of coastal communities to adapt to environmental changes and coral reef degradation. There is a particular need

to carry out assessments on the status and trends of cold-water coral reef ecosystems. In addition, the extension and/or establishment of **coral reef monitoring systems** (including socio-economic factors) should be supported.

- k. **Promote education and communication** on coral reefs in order to inform citizens, the private sector, government representatives and potential donors about current threats affecting coral reefs and the urgent need to protect them. Governments should encourage sustainable individual action of citizens by raising awareness of local laws and regulations as well as by promoting sustainable fishing practices, the purchase of sustainably caught seafood and the reduction of household waste and pollution.
- l. **Ensure the involvement of all stakeholders, especially local/indigenous communities**, in the development and implementation of national legislation, among others through partnership programmes.
- m. **A more sustainable future for coral reefs is achievable.** International cooperation on mapping out a vision and action plan could be considered to spur action on implementing policies to ensure the protection of coral reefs.