



Natural Heritage, Natural Wealth:

Highlighting the economic benefits
of
the Belize Barrier Reef Reserve System
World Heritage Site

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Foreword

The 2017 hurricane season is threatening the lifeblood of the Caribbean -- tourism. In the aftermath of Hurricane Irma, the devastated islands are particularly concerned about the effects of storm damages on the upcoming tourism season. Travel and tourism account for a higher share of the Caribbean's gross domestic product than any other region in the world, drawing more than 29 million tourists in 2016. Visitors are drawn to the Caribbean to experience its sandy beaches, lush forests, and, of course, the coral reefs. This is particularly true of Belize, where the Belize Barrier Reef Reserve System (BBRRS) is a World Heritage Site (WHS) and the second largest barrier reef in the world. However, nature's benefits for tourism, as well as for storm protection, fisheries and other services, are often taken for granted until they are lost. In fact, since 2009 the BBRRS has been on the list of World Heritage Sites in danger (at risk of losing the characteristics that made it a World Heritage Site) due to pollution, unsustainable development and the threat of oil exploration within the parks. To account for the importance of ecosystems to economic development and human well-being, governments, NGOs, multi-lateral development banks, and the private sector are increasingly valuing coral reefs, mangroves, and other ecosystems for the benefits they provide to people.

This report quantifies the tourism benefits that the BBRRS provides to Belize. It highlights the economic contribution of the BBRRS through a set of indicative monetary values that offer a sense of the scale and magnitude of the value of marine resources of the BBRRS, rather than a total economic valuation of these protected areas. The study found that the BBRRS provides a significant socio-economic contribution to Belize that reflects just a fragment of its total value (in the order of up to US\$19 million for tourism alone based on four of the seven protected areas). These monetary values shine a light on the importance of Belizean Marine Protected Areas for providing goods and services and the need to protect and invest in MPAs for the continued delivery of such benefits.

At the Natural Capital Project, we are developing tools and approaches for accounting for nature's benefits to people to enable leaders of countries, companies, communities, and organizations worldwide to make smarter decisions for a more sustainable future. We have



found that valuing ecosystem services – not just in monetary terms, but also in terms of jobs, visitation, flood reduction, and other metrics— is critical to incorporating ecological and human considerations into economic development decisions. Mapping and valuing ecosystem services now and under future management scenarios is also a powerful tool for informing coastal planning and biodiversity protection, such as in our work with the Belizean government to design the National Integrated Coastal Zone Management Plan. The authors of this report, Sara Nawaz and Nadia Bood, have extensive experience, through their current and previous work at the World Resources Institute and WWF, quantifying the social and economic importance of ecosystems for Belize and beyond.

The findings reported here can help to improve coastal resource management in Belize by providing decision makers with baseline information about the tourism values associated with the BBRRS. These results indicate the potential cost of habitat degradation for tourism in Belize and highlight the long-term benefits of investment in sustainable use and conservation of this World Heritage Site.

A handwritten signature in black ink, appearing to read "Katie Arkema", written in a cursive style.

Katie Arkema, PhD
Natural Capital Project, Stanford University

Executive summary

Coastal-marine ecosystems provide many important goods and services to Belize. They support artisanal fishing communities and stand at the centre of a vibrant tourism industry, drawing snorkelers, divers and sport fishermen from all over the world. Belize also boasts the longest barrier reef in the Western Hemisphere, part of the biologically rich Mesoamerican Reef complex, stretching from Mexico to Honduras. Despite their importance, these benefits are frequently overlooked or underappreciated in coastal investment and policy decisions. Unchecked coastal development, over-fishing, and pressures from tourism threaten the country's reefs and mangroves while additional threats of warming seas, fiercer storms, and other climate-related changes loom on the horizon. The government, NGOs, and private sector in Belize recognize the importance of coastal ecosystems to the economy. Nevertheless, the amount currently invested in protecting Belize's coastal-marine ecosystems - including the Belize Barrier Reef Reserve System World Heritage Site - is very small when compared to the contribution of these ecosystems to the national economy. According to Cooper et al 2009, "approximately 115,000 visitors were recorded by MPAs in 2007, spending an estimated US\$17 million on accommodation, recreation, food, and other expenses on days that they visited a reserve". This study was aimed at capturing some insight into Belize's natural wealth through an economic assessment of the contribution of the BBRRS to the economy.



World Heritage designation recognizes sites with *outstanding universal value* to the entire world. Gaining this recognition heightens the international profile of these sites and creates unique opportunities for economic returns. The BBRRS, designated a UNESCO World Heritage Site in 1996, consists of seven MPAs listed from north to south: Bacalar Chico National Park and Marine Reserve, Blue Hole Natural Monument, Half Moon Caye Natural Monument, Glover’s Reef Marine Reserve, South Water Caye Marine Reserve, Laughing Bird Caye National Park and Sapodilla Cayes Marine Reserve. The BBRRS was listed because of its superlative natural phenomena and natural beauty, ongoing biological and ecological processes, and biological diversity, including several threatened species. The BBRRS has one of the highest levels of marine diversity in the Atlantic (Gibson 2011). In 2009, the Site was added to the UNESCO’s List of World Heritage in Danger for several reasons: i) the sale and lease of public lands within the property, ii) the destruction of fragile ecosystems due to resort and housing development, and iii) the impact of introduced species. In 2010, another issue of concern was noted – the granting of offshore oil concessions. With the prospect of offshore oil exploration and drilling added to the existing threats to the Site, particularly to its coral reefs in this era of climate change, the future integrity of the BBRRS was even more at risk. In August 2017, after significant advocacy work by many organizations, primarily the Belize Coalition to Save Our Natural Heritage, the government of Belize announced that it will enact a legally binding “indefinite moratorium” on offshore oil exploration in Belize’s marine environment including its Exclusive Economic Zone (EEZ). Once enacted, this legislation will help to remove one of the critical threats to the BBRRS.

Protected areas, including World Heritage Sites, can act as conservation cornerstones as well as deliver a broad range of social and economic benefits. These crown jewels of conservation add significantly to national economies but, to foster their protection, there is often a need to make an economic case for investment in their conservation. One way of doing this is through economic assessment or economic valuation to understand the level of benefits they provide. For example, a 2009 WRI study of the Glover’s Reef Marine Reserve, part of the BBRRS, found that this MPA contributes up to US\$7.3 million per year to the national economy (Cooper et al 2009).

This report described the process taken to analyze the economic value of tourism in the MPAs in the BBRRS and discusses the key findings. The study provided estimates of the monetary value of goods and services from the MPAs, helping to promote the economic importance of managing the protected areas. The study focused on four of the seven MPAs that make up the BBRRS – Blue Hole & Half Moon Caye Natural Monuments (analyzed together due to co-management), Glover’s Reef Atoll Marine Reserve, and Laughing Bird Caye National Park. The remaining three protected areas were excluded due to data constraints, but could be included in a future study.

The study established that the four MPAs assessed provide up to US\$19M/yr in economic benefits from tourism recreation; Blue Hole & Half Moon Caye Natural Monuments combined can provide up to US\$5.8 million per year; Glover’s Reef Atoll Marine Reserve can provide up to US\$8.5 million per year; and Laughing Bird Caye National Park can provide up to US\$4.5 million. It



was also established that there is potentially much greater additional value associated with the MPAs through other benefits.

The study found that the BBRRS provides a significant socio-economic contribution to Belize, with greater investment needed to protect its *outstanding universal value* and the goods and services currently being provided. These estimates of economic benefit far exceed the annual costs of managing the respective protected areas, demonstrating that investing in biodiversity conservation can be cost effective.

Introduction

Ecosystems and the biological diversity contained within them provide a stream of goods and services, the continued delivery of which remains essential to our economic prosperity and other aspects of our welfare. The 2030 Agenda for Sustainable Development is a global confirmation of the critical role of natural resources in achieving sustainable development. The sustainable and efficient management of natural resources is required for at least 12 of the 17 United Nations Sustainable Development Goals (SDGs) to be achieved.

The concepts of ecosystem services and 'natural capital' have recently been developed to make explicit this connection between human welfare and ecological sustainability for policy, development and conservation initiatives. Ecological life support systems underpin a wide variety of ecosystem services that are essential for economic performance and human well-being. Nature or natural capital provides several benefits to humanity – from the food we eat, to recreation and cultural enjoyment, livelihoods, coastal protection, and, overall, a national economic safety net. Natural capital contributes significantly to national GDPs of countries across the globe, Belize being no exception. According to Spalding et al 2017, “30% of the world's reefs are of value in the tourism sector, with a total value estimated at nearly US\$36 billion, or over 9% of all coastal tourism value in the world's coral reef countries.”

Despite significant conservation efforts, global biodiversity continues to decline. Human-induced drivers of change are increasing the pressures on biological resources, which, in turn, are impacting the capacity of these resources to deliver ecosystem services that people depend on for their welfare and livelihoods. A key contributing factor to this may be a failure to fully recognize the causes of these drivers of change and how every socio-economic system is embedded within an ecological system.

One way of improving our understanding of the linkages between human and biophysical components and process is through economic assessment or economic valuation of derived benefits. Economic valuation of ecosystem services and biodiversity can make explicit to society in general and policy making in particular, that biodiversity and ecosystem services are scarce and that their depreciation or degradation has associated costs to society. If these costs are not considered, then policy would be misguided and society would be worse off due to misallocation



of resources. The estimation of economic value of ecosystem services can help to inform conservation and investment actions and improve the sustainable use of ecosystem services.

While a national economic assessment of Belize's coral reefs & mangroves found that they provide more than half a billion US\$ per year (US\$559 million) in goods and services through recreation, fisheries and coastal protection, we are yet to fully use economic analysis to inform resource protection and management (Cooper et al 2009). The MPAs which make up the BBRRS, undoubtedly contribute a significant percentage of this half billion-dollar figure. Cooper et al. 2009 estimated that Belize's MPAs can provide extremely good "value for money", generating economic benefits well beyond the quantity invested in their protection.

In the case of World Heritage Sites, UNESCO affirms that there are considerable economic benefits to gaining a World Heritage designation. An increase in tourism and global awareness that comes with designation allows local economies surrounding World Heritage Sites to benefit. "Conventional wisdom is that as a World Heritage designated site, there will be an increase in the level of public awareness which would in turn spark an increase in visitation to the area" (Kayahan and Vanblarcom 2012).

World Heritage Sites also provide jobs. Research by Dalberg Global Development Advisors, commissioned by WWF, found that over 90% of all natural World Heritage Sites provide jobs. In Belize, more than 50% of Belize's population, or 190,000 people, are supported by income generated through tourism and fisheries. Belize's reef-related tourism supports 28,800 jobs (Dalberg 2016). Given the potential level of economic benefits that can be derived from World Heritage Sites and the investment needed for their effective management, it is important to be guided by informed economic assessments. Once we know the potential economic benefit of a site, we are better able to manage and market them – thereby allowing for potentially greater returns on investment.

The study, discussed in this report, provides an indication of the scale and magnitude of the economic impact of a subset of the MPAs that make up the BBRRS. It provides good justification for greater investment in safeguarding the goods and services provided by these MPAs and the outstanding universal value they offer to the global society.

The Belize Barrier Reef Reserve System World Heritage Site

The Belize Barrier Reef, home to the BBRRS, is renowned as the longest barrier reef in the western hemisphere. BBRRS was inscribed as a UNESCO World Heritage Site in 1996, and contains seven MPAs; Bacalar Chico National Park and Marine Reserve, Blue Hole Natural Monument, Half Moon Caye Natural Monument, South Water Caye Marine Reserve, Glover's Reef Marine Reserve, Laughing Bird Caye National Park and Sapodilla Cayes Marine Reserve. The seven protected locations are dispersed across 235 km of the Belizean coast.

The BBRRS includes a variety of ecosystems including mangrove forests and sand cayes, and contains the famous Blue Hole Natural Monument, which is a 144 metre sinkhole surrounded by



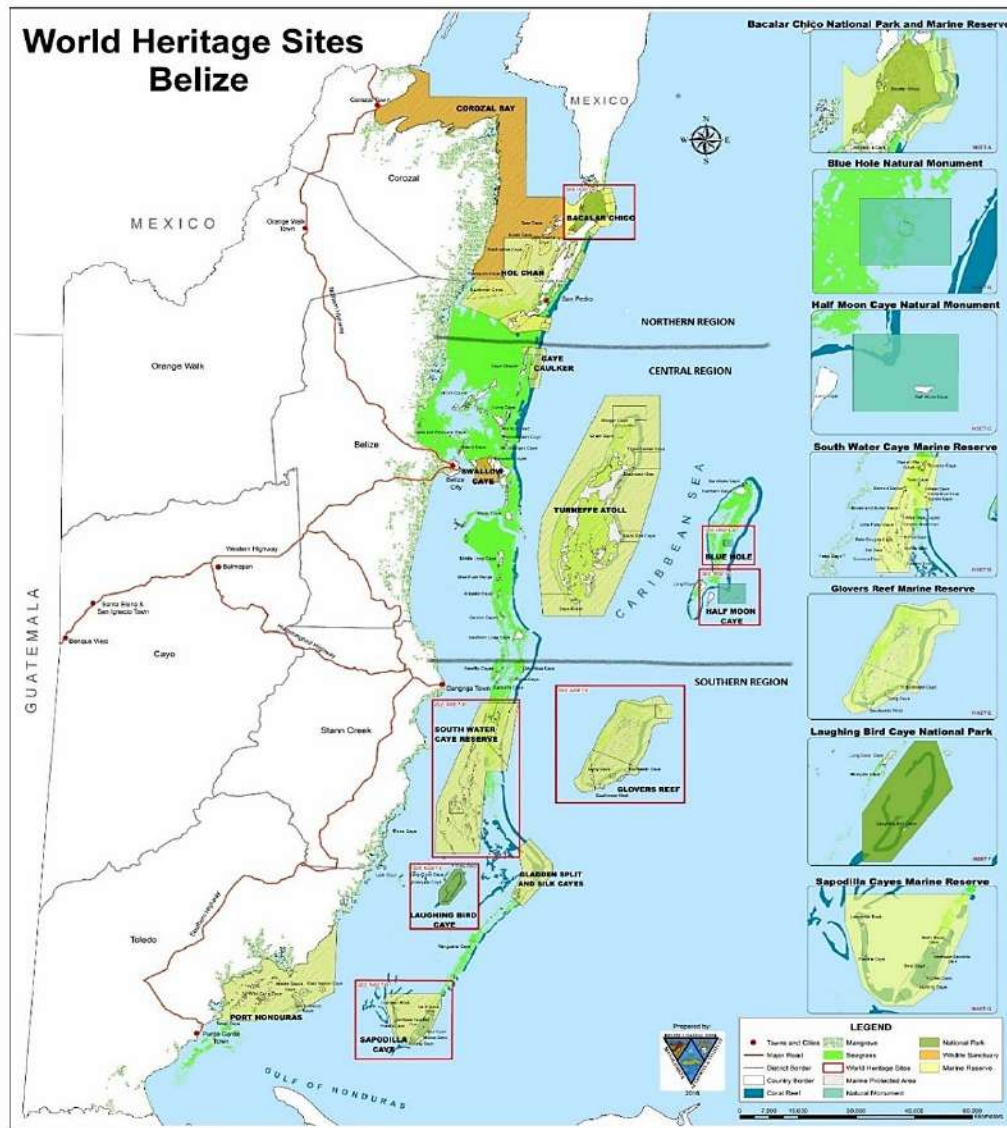
coral reef. At the time of its inscription on the World Heritage List in 1996, UNESCO recognized the BBRRS as “one of the most pristine reef ecosystems in the Western hemisphere”. However, in 2009, it was placed on the List of World Heritage in Danger.

The BBRRS provides an important habitat for a number of threatened marine species, including the West Indian manatee (*Trichechus manatus*), green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), loggerhead turtle (*Caretta caretta*), and the American crocodile (*Crocodylus acutus*) as well as endemic and migratory birds which reproduce in the forests along cayes, atolls and coastal areas. Major bird colonies include the red-footed booby (*Sula sula*) on Half-Moon Caye, brown booby (*Sula leucogaster*) on Man O’War Caye and the common noddy (*Anous stolidus*) on Glover’s Reef. Approximately 247 taxa of marine flora have been described within the reef complex and over 500 fish, 65 scleritian coral, 45 hydroid and 350 mollusc species have also been identified, in addition to a great diversity of sponges and crustaceans.

Initially, the importance of the reef to Belize from the economic perspective was mainly through the fishing industry. Since then the benefits of the reef have expanded to include the growing tourism industry, which is the country’s largest economic sector. 28,800 jobs are supported by Belize’s reef-related tourism sector . The fisheries sector continues to employ 2,400 registered fishers and an additional 15,000 persons in processing and exporting roles. Therefore, at least 46,000 people in Belize directly depend on the health of reef and mangrove ecosystems for their livelihoods and approximately 190 000 people in total if to include the support for their families. Tourism revenue from reef-related activities, such as snorkeling and sport fishing as well as accommodation, was estimated to be between US\$182 and 237 million in 2014. The contribution of coral reefs and mangroves to Belize’s fishing industry, through the provision of habitats for almost all commercially caught species, is estimated at US\$14-16 million per year (Dalberg 2016).

Coral reefs and mangrove forests also provide vulnerable coastal populations with natural protection against storm surges, hurricanes and erosion by absorbing and dissipating the energy of incoming waves. Mangrove forests cover about half of Belize’s mainland coast, while coral reefs protect two-thirds of the coastline. This natural barrier provides protection for the 40 per cent of Belizeans who live and work in the coastal zone. The combined value of this protection, in terms of avoided damage to coastal properties, is estimated at between US\$231 and 347 million per year (Cooper et al 2009).

The map below shows the location of the seven MPAs that make up the BBRRS World Heritage Site. The sites are highlighted in red boxes.



The Threats to the BBRRS WHS

In 2009, the BBRRS was added to the UNESCO's List of World Heritage Sites In Danger. The site was included initially due to the destruction of its ecosystems as a result of resort and housing construction within the property, which was often accompanied by large-scale clearing of mangroves. Continued threats that are preventing the site from being removed from the list



include land conversion, sale and lease of lands within the property, and offshore oil exploration within the area.

Since 1998, scientists estimate that 40 per cent of the reef has been damaged by activities including overfishing, agricultural run-off and unsustainable coastal construction (Gibson et al 1998). Overfishing of predatory species in Belize's waters has led to the growth of herbivorous species and the subsequent overgrazing of the coral. Poorly-managed construction on the coast and within the World Heritage Site has led to extensive mangrove clearance and marine dredging.

To date, the loss of mangrove cover within the reef is around 12,500 acres, or over 6,500 football fields. Further dredging has increased both in frequency and magnitude during the last decade. Both of these activities increase sedimentation across the reef, which smothers corals and slows their growth rates by clouding the water and reducing the light available. These problems are exacerbated by pollution from agricultural run-off which can create nutrient overloading in the water. This can lead to algal blooms in the reef, which block the sunlight required by marine plants for photosynthesis. A 2004 study suggested that, in total, almost 30 per cent of Belize's reef is highly threatened by sediments or pollution from inland activities.

Climate change is adding to the stress caused by industrial activities. Rising sea temperatures and natural disturbances have led to widespread coral bleaching events within the Belize reef system. In parts of the reef, this has led to an 80 per cent reduction in live coral cover over the last 20 years. Climate change, combined with industrial activities, is also threatening important marine turtle nesting sites. The number of nests in principal nesting sites declined by over 35 per cent between 1992 and 2012.

Although the Belizean government announced in December 2015 that it plans to introduce a policy to ban offshore oil exploration in the World Heritage property, the government allowed seismic testing to be undertaken in Belize's waters without legislating the announced ban. The test, however, was cancelled after much public outcry against the activity. On August 18th 2017, the Prime Minister announced that an indefinite moratorium on offshore oil in all of Belize's waters would be enacted. The legislation to underpin this moratorium is pending.

Oil exploration and extraction is incompatible with Belize's commitment to reduce its use of fossil fuels. In its contribution to the climate change targets set out by the Paris Agreement in 2015, Belize committed to shifting its "energy matrix away from fossil fuels (especially oil)". Investment in oil, rather than renewable energy, would undermine this commitment.

BBRRS WHS: significant contributor to Belize's economic growth through tourism

The tourism industry is already Belize's biggest source of foreign exchange, and its contribution to GDP is expected to grow by almost four per cent per year between 2015 and 2025. The majority of tourists in Belize take part in marine activities such as snorkeling, diving and sport fishing and 60 per cent of tourism revenues derive directly from coastal and marine activities.



However, degradation of the reef ecosystem and its marine life is likely to diminish Belize’s international attractiveness, and jeopardize the incomes of those who rely on reef-related tourism. Protection of the reef will therefore be vital to ensure that reef tourism can drive long-term sustainable development in the region. Sustainably-managed tourism can help to achieve this by minimizing environmental degradation, encouraging conservation, and providing current and future generations with sustainable sources of income.

While a national economic assessment of Belize’s coral reefs & mangroves was carried out in 2009, to date there has been only one other study that has looked specifically at the economic contribution of an MPA within the BBRRS. The remainder of this report presents a recent study on the economic contribution of four specific MPAs within the BBRRS which offers an understanding of the economic value of this WHS to the Belizean economy.

Methodology

The objective of the study was to determine the economic value of the BBRRS to the Belizean economy through the tourism industry. This information can then be used to support and promote the management of the seven MPAs that make up the BBRRS World Heritage Site. Four of the seven MPAs that make up the BBRRS were analyzed in the study; seven were targeted but only four had the most complete dataset to facilitate analysis. The study sets out to provide indicative values that offer a sense of the scale and magnitude of the value of marine resources, rather than a total economic valuation of these reserves. Together the four MPAs assessed make up about 38.5% of the entire area of the BBRRS.

The economic value of MPAs can be thought of as having two main components: use values and non-use values. Use values include direct uses such as fisheries and recreational tourism, and indirect uses such as coastal protection, as well as option values, which allow for future potential use. Non-use values include bequest values and existence values. Bequest values involve the transfer of intact assets to future generations, and existence values are the value of an ecosystem to humans irrespective of its functional use. Table 1, below, summarizes this breakdown of the economic value of MPAs.

Table 1: Economic value of MPAs (adapted from Cesar 2000)

Total economic value				
Use values			Non-use values	
Direct use values	Indirect use values	Option values	Bequest values	Existence values



<p>Extractive uses (e.g. fisheries, mariculture, pharmaceutical)</p> <p>Non-extractive uses (e.g. recreation/tourism, research/education, aesthetic value)</p>	<p>Biological supports (e.g. for sea birds, turtles, fisheries)</p> <p>Physical protection (e.g. coastal protection, flood control, storm buffer)</p> <p>Global life support (e.g. carbon storage)</p>	<p>Future direct and indirect uses</p>	<p>Species</p> <p>Habitats</p> <p>Traditional usage and “way of life”</p>	<p>Threatened species and habitats</p> <p>Charismatic species</p>
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The economic value of MPAs can be thought of as having two main components: use values and non-use values. The combined value is often referred to as the ‘Total Economic Value’ provided by an ecosystem or resource.

This study analyzes the economic impact of one form of direct use value in MPAs: tourism services. These services include not just revenues collected by the MPA from user fees but the broader impact on residents and businesses that depend on the MPA. The net tourism impact was calculated as a function of gross value minus the cost of MPA management, and uses a multiplier (i.e. 1.3 which is the national economic multiplier for Belize) to estimate the indirect economic impact of these activities. This analysis was conducted using the MPA Economic Impact Template (Beta Version 2.0) developed by the WRI as part of their study on the *Economic Impact of Coral Reefs and Mangroves in Belize*. While fisheries are included in the template, they are excluded from this study. This is because the MPAs included in this study did not have local fisheries catch data and it was also difficult to account for spillover effects.

In assessing direct use value of tourism, a production approach was used, in which the net tourism value was calculated (gross value minus the cost of MPA management). The calculation of the tourism value was conducted for each individual MPA, and included the following data points:

- Annual labour and non-labour costs of managing the MPA
- Number of recorded visitors to the MPA each year (foreign and domestic) and estimate of extent of under-recording of visits (%)¹
- Annual gross revenue from accommodation in the MPAs (hotels, liveaboards, yachts, cruise ships)*

¹ One of the management challenges facing Belize’s MPA system is a lack of clear, consistent data on visitor numbers. The quality of visitor records varies across the different MPAs. The tool developed by WRI includes a place for MPA managers to estimate the extent of underreporting in their MPA, allowing for a sensitivity analysis or error range to be applied to the estimates.



- Annual gross revenue from reef recreation (diving, snorkeling, sport fishing, kayaking)*

*Calculation of annual gross revenue from accommodation and reef recreation in the MPAs was dependent on the information that was available.

The existing costs for managing the MPAs were obtained directly from the MPA management entities.

MPAs	Non-labor Operating Cost (US\$)	Labor Cost (US\$)	Total Cost (US\$)	MPA Management Entity
Laughing Bird Caye National Park	11,697	25,641	37,338	Southern Environmental Association with Forest Department
Blue Hole & Half Moon Caye Natural Monuments	142,000	61,500	203,500	Belize Audubon Society with Fisheries and Forest Departments
Glover's Reef Marine Reserve	109,242	60,500	169,742	Belize Fisheries Department

The average estimated number of recorded visitors to the MPAs (inclusive of diving, snorkeling, kayaking, overnight stay) was also provided by MPA management entities.

MPAs	Upper estimate No. (2015)
Laughing Bird Caye National Park	9,931
Blue Hole & Half Moon Caye Natural Monuments	16,999
Glover's Reef Marine Reserve	12,931

Limitations in the study - Data gaps:

To address data gaps, estimates were made based on other MPAs. For example, when data was lacking in one MPA regarding the average price of renting snorkel equipment, values from the other MPAs were averaged to provide an approximate figure for the calculation. The data used should be understood as a range rather than a single specific figure, due to the paucity of data collection methods by the respective MPAs. To account for this, a 25% error range was



applied to all outputs. A list of the data gaps and the process used for filling them for each MPA involved in the study can be found in Appendix 2.

A number of additional assumptions and notes regarding the data were used. These include:

- Taxes were not included in data provided; they were added afterwards according to a set rate
- Operators do not include taxes in advertised trip prices
- Because it is customary for hotels to add a service charge, that charge was added to the base fee.

Results

The study looks at the economic benefits that the BBRRS provides to Belize through tourism. It highlights the economic contribution of the BBRRS through a set of indicative monetary values that offer a sense of the scale and magnitude of the value of marine resources of the BBRRS. Findings are presented as low and high estimates. This range is provided to emphasize that these figures are ballpark estimates rather than firm findings. It should be noted that the analysis was conducted using a simple average; a more complex weighting could potentially be applied at a later date should a greater variety of data (and data quality) become available. The results in this report are presented as the annual value of benefits.

The study found that the BBRRS provides a significant socio-economic contribution to Belize. Key findings for each MPA involved in the study are shown in the following section.

- Glover's Reef Marine Reserve recreational tourism economic value is estimated at up to US\$8.5 million (between US\$2.2 million and \$8.5 million)
- Half Moon Caye and Blue Hole recreational tourism economic value is estimated at up to US\$5.8 million (between \$2 million and \$5.8 million)
- Laughing Bird Caye recreational tourism economic value is estimated at up to US\$4.5 million (between US\$1.5 million and \$4.5 million)

The total economic contribution for the four MPAs is estimated to be up to US\$18.8 million per year based on 2015 data. This reflects only a fragment of the value of the BBRRS since this study is only focusing on tourism and a subset of the MPAs that make up the BBRRS. Many important benefits arising from fisheries, etc., are not included here. The overall additional benefits are much higher.

I. Blue Hole & Half Moon Caye Natural Monuments:

The Blue Hole & Half Moon Caye Natural Monuments combined can provide up to US\$5.8 million (between \$2 million and \$5.8 million) in economic benefits via direct tourism use. When the management cost is factored in and net tourism value calculated (net tourism value = gross value minus the cost of MPA management), the tourism value is up to US\$5.6 million.



Gross Tourism Value (US\$ high estimate)	Management Cost (US\$)	Net Tourism Value (US\$ high estimate)
5,815,276m	203,500	5,611,776m

II. Glover’s Reef Marine Reserve

Glover’s Reef Atoll Marine Reserve was analyzed by WRI in 2009. They estimated that it contributed up US\$7.3 million per year to the economy based on 2007 datasets (Cooper et al. 2009). During this study, conducted eight years later, the MPA is estimated to provide up to US \$8.5 million (between US\$2.2 million and \$8.5 million) in direct use through tourism to Belize’s economy. When the management cost is factored in and net tourism value calculated (net tourism value = gross value minus the cost of MPA management), the tourism value is up to US\$8.4 million.

Gross Tourism Value (US\$ high estimate)	Management Cost (US\$)	Net Tourism Value (US\$ high estimate)
8,521,933m	169,742	8,352,191m

III. Laughing Bird Caye National Park

Laughing Bird Caye National Park can provide up to US\$4.5 million (between US\$1.5 million and \$4.5 million) in direct use through tourism to Belize’s economy. When the management cost is factored in and net tourism value calculated (net tourism value = gross value minus the cost of MPA management), the tourism value is up to US\$ 4.5 million.

Gross Tourism Value (US\$ high estimate)	Management Cost (US\$)	Net Tourism Value (US\$ high estimate)
4,492,240m	37,338	4,454,902m

Conclusion

The BBRRS was the first marine World Heritage Site in the Caribbean and Mesoamerican regions when it was added to the World Heritage List in 1996. The BBRRS is recognized not only for its outstanding universal value but also due to the fact that half of Belize’s population, or about 190,000 people, are supported by incomes generated through reef-related tourism and fisheries linked to the BBRRS. The annual economic contribution of reef-related tourism, fisheries and scientific research is estimated at around 15 per cent of Belize’s gross domestic product (Cooper et al 2009).

The derived economic benefits from the BBRRS are large and far exceed the annual costs of managing the respective protective areas, demonstrating that investing in their conservation can be cost effective. The findings discussed herein provide sound justification for investing more in safeguarding the outstanding universal value of the MPAs that make up the BBRRS.



The economic estimates derived in this study can help to improve coastal resource management in Belize as it provides new, reliable information to key managers and decision makers on the current value of goods and services associated with the BBRRS, on potential losses that can result from the BBRRS's degradation, and on the long-term benefits of investment in sustainable use and conservation of the BBRRS. The realistic and replicable estimates of the economic value of goods and services derived from this study can be used by managers and policymakers to help guide conservation investment towards protection of the outstanding universal value of the BBRRS.

This report also provides a framework through economic valuation, which clearly shows the linkage between marine ecosystems to their goods and services and resulting benefits to Belizean society. This framework can enable better decision-making for ecosystem use, by demonstrating the economic costs implicit in trade-offs between decisions which degrade or preserve vital ecosystems. Better information, however, on its own will not bring about sustainable use of ecosystems. This will be achieved only if this information is used to address the drivers of ecosystem degradation.

Belize is currently at a crossroads. The BBRRS was added to the List of World Heritage in Danger in 2009 and to date remains on the UNESCO's *in danger* list based on threats related to the removal of mangrove cover, unsustainable coastal development, and, more recently, offshore oil prospecting. The time to act is now. Belize must choose sustainability and secure the long-term existence of the BBRRS World Heritage Site. Doing so would ensure that the BBRRS continues to support fisheries and tourism, provide coastal protection, and generate revenues for current and future generations.



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Appendices

Appendix 1: Description of ecosystem services provided by the BBRRS World Heritage Site and what is included in the study

Ecosystem services are the ecosystem-based benefits provided to humans. They fall into four broad categories:

- Provisioning: provide material or energy outputs, such as food, water, raw materials, or medicine
- Supporting: maintain habitats or genetic diversity
- Regulating: act as regulators – for example, by providing flood or disease control, maintaining soil fertility, etc.
- Cultural: provide touristic, recreational, spiritual, aesthetic or other benefits

ES Category	ES	Included in study? Which section?
Provisioning services	Food	No
	Ornamental resources	No
	Raw materials	No
	Genetic resources	No
	Medicinal resources	No
Regulating services	Carbon sequestration and climate regulation	No
Cultural services	Cultural heritage	No
	Spiritual and historical heritage	No
	Recreational activities	Tourism included (Part 1)
	Science and education	No



Supporting services	Primary production	No
	Coastal protection	No

Appendix 2: Background on methodological design

The study draws upon the toolkit developed by the WRI as part of the Coastal Capital project with the aim of assessing reef- and mangrove-related fisheries and tourism revenues. The toolkit consists of an Excel spreadsheet used to calculate economic value of reef-related fisheries and tourism, as well as an instruction manual designed to support the use of this tool. The direct use value of tourism in the MPAs in Belize was calculated using these resources.

The data for this project comes primarily from the MPA managers and partners via an Excel spreadsheet with a list of requested data. The lead Principal Investigator, Sara Nawaz, also provided some publicly available data, such as tax-related figures, through desktop research. Some data gaps remained despite best efforts to clarify any queries with MPA managers. In order to compensate for gaps in the data, estimates were made based on existing data from other MPAs. These estimates are listed in the table below, for each MPA.

Data estimates for the direct use valuation

MPA	Data gap	Estimation method
Glover's Reef	Average room rate inside the MPA	According to the MPA manager and the Operations Manager for WCS's Research Station, there are a variety of resorts located within the MPA, offering a range of prices. These range from \$US50 to \$US400. This figure was based on this range as well as the average accommodation price across other MPAs
	Number of MPA visitors on liveaboards per year	Estimate based on number of yacht trips to Blue Hole and Half Moon Cayes, adjusted for the relative number of visitors
	Proportion of total yacht trips spent in the MPA	Estimate was based on reports of other MPA managers
	Number of chartered yachts in the MPA per year	Estimate based on number of yacht trips to Blue Hole and Half Moon Cayes, adjusted for the relative number of visitors



	Price of chartering a yacht per day	Based on data provided by other MPA managers
	Number of 'day' dive trips to the MPA purchased per year	Based on data provided that 5% of visitors go diving
	Average price of dive trip sold inside the MPA	Based on average of data from other MPA managers
	Proportion of dive trips purchased at all-inclusive resorts inside the MPA	Estimate based on proportion of visitors staying at all-inclusive resorts
	Number of 'day' snorkel trips to the MPA purchased per year	Estimate based on data from MPA manager that 95% of visitors go snorkeling
	Proportion of snorkel trips purchased at all-inclusive resorts inside the MPA	Estimate based on proportion of visitors staying at all-inclusive resorts
	Average price of snorkel equipment rental	MPA manager provided data indicating that snorkel equipment was included in all trips
	Proportion of kayak trips sold in all-inclusive packages	Estimate based on qualitative data provided by MPA managers across several MPAs
Half Moon Caye & Blue Hole	Proportion of total yacht trip spent in the MPA	Data provided by multiple MPA managers indicated that seven-day trips are standard. This MPA manager reported that roughly 2-4 days are spent within this MPA
	Estimated proportion of snorkelers who rent equipment	Based on average of figures from Blue Hole and Half Moon Caye
Laughing Bird Caye	Average price of a 'day' dive trip	Estimate based on average of data for other MPAs
	Average price of equipment rental	Estimate based on data from other MPA managers



	Estimated proportion of snorkelers who rent equipment	Based on average of data from other MPA managers
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The data used should be understood as a range rather than a single specific figure, due to the lack of data. To account for this, a 25% range was applied to all outputs. A few additional assumptions and notes regarding the data were used: taxes were not included in data provided, they were added afterwards in accordance with a set rate; operators do not include taxes in advertised trip prices; because it is customary for hotels to add a service charge, that charge was added to the base fee.