



# The Economics of Enhancing the Marine Protected Areas of the Cayman Islands

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# The Challenge

**The proposed marine parks enhancement is a low-cost and low-risk investment with the potential to substantially improve overall human wellbeing in the Cayman Islands.**

Healthy marine ecosystems, such as coral reefs and mangrove forests, are critical to the economy and wellbeing of the residents of the Cayman Islands. In the last decades, local and global pressures have resulted in serious threats to these fragile ecosystems, potentially jeopardising the foundations of the local economy. To protect the marine environment from these looming threats, the Cayman Islands Department of Environment (DoE) has developed a proposal to enhance its marine protected areas (MPAs). To support well-founded decision-making around the proposed plans, it is crucial to understand how the marine environment contributes to the economy and human wellbeing. Therefore, this study aimed to assess the economic value and the societal importance of the marine ecosystems of

Grand Cayman, Cayman Brac and Little Cayman. By estimating the potential changes in the value of ecosystems over time, the socioeconomic effects of the proposed MPA enhancement were assessed. The results of this study will support the development of long-term policies that promote sustainable economic development in the Cayman Islands.

## HUMAN WELLBEING

***Human wellbeing*** encompasses the health of individuals and communities in economic, social, cultural and ecological terms. This concept goes beyond economic wealth and reflects interactions within communities and between communities and their environment

# Tools

From the outset of the study, stakeholders participated by facilitating the data collection process and this provided opportunities to simultaneously create support for the concept of ecosystem services. The study addressed the most relevant marine ecosystems and ecosystem services in the Cayman Islands and applied a variety of economic valuation tools to estimate their value. A wide range of existing economic data were used to assess the importance of natural capital for the public and private sectors. Furthermore, by surveying over 800 visitors and residents of the Cayman Islands, the study estimated the willingness to pay (WTP) of individuals to conserve ecosystem services provided by the marine environment. The WTP estimates obtained in this study represent the maximum amount that individuals are willing to sacrifice to enhance the protection of marine and coastal ecosystems, thereby avoiding a future decrease in the supply of ecosystem services. Based on the valuation results, the change in ecosystem services was modelled in a scenario analysis to assess the costs and benefits of the proposed MPA enhancement.

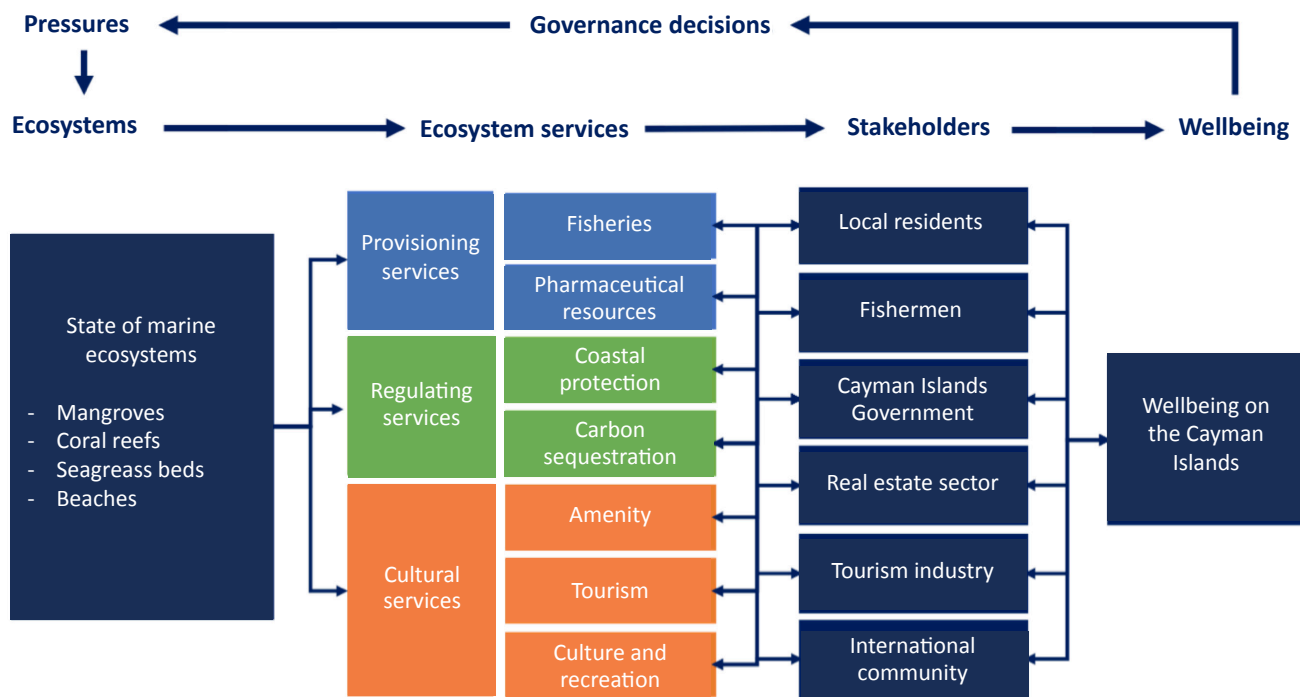


Figure 1 – Framework of this study. Based on the framework of analysis proposed by Daily et al. (2009).

## NATURAL CAPITAL AND ECOSYSTEM SERVICES

**Natural Capital** refers to the stock of natural resources, including living and non-living components of ecosystems. People benefit in various ways from Natural Capital. Marine ecosystems, such as coral reefs, mangroves, seagrasses and beaches provide a wide range of valuable goods and services to people and contribute to economic development. For example, reefs and mangroves protect shorelines, beaches attract tourism and fisheries provide food. These benefits are known as **ecosystem services**. While ecosystem services have been discussed implicitly by scientists for decades, the Millennium Ecosystem Assessment (MA), conducted by the United Nations, mainstreamed this concept in 2005. The MA introduced a standardised approach for the analysis of four different categories of ecosystem services, namely: provisioning services (e.g. food and water), regulating services (e.g. climate control and shoreline protection), cultural services (e.g. recreational benefits), and supporting services (e.g. nutrient cycles and pollination).



# Results

## Value of Marine Ecosystems

To assess the importance of marine and coastal ecosystems for human wellbeing in the Cayman Islands, the economic value of each key ecosystem service was estimated. The analysis focused on services obtained from coral reefs, mangroves, seagrasses and beaches. Together, the ecosystem services identified provide a total economic value (TEV) of **at least US\$179 million (CI\$147 million) per year**. It should be noted that this value reflects the services provided by the ecosystems as a whole. No benefits related to individual species are estimated.

## Tourism

The ecosystem services that support the tourism industry contribute most to the TEV. Although tourism arrivals vary over time, approximately 380,000 stay-over tourists and 1,600,000 cruise tourists visit the Cayman Islands each year. Many of these tourists choose the islands as their holiday destination because of the beautiful marine environment

(i.e. beaches, coral reefs and mangroves). As the natural environment adds value to the Cayman Islands as a tourism destination, this can be seen as an essential resource for the prosperity of the tourism industry. This study shows that around 40% of the added value that is created in the entire tourism industry (US\$180 million, or CI\$148 million, per year) can be attributed to the marine environment; this contribution amounts to US\$69 million (CI\$57 million) per year. Additional to this, the results of the survey used for the study indicate that tourists have an aggregate WTP for nature conservation of US\$94 million (CI\$77 million) per year. The high WTP of visitors for nature conservation suggests that the current environmental fees could be re-evaluated without having a substantial effect on the number of tourists visiting the islands. Together, the financial value and the WTP add up to a total economic value of nature for tourism of **US\$163 million (CI\$134 million) per year**.



# Results

## Local Residents

Many residents on the Cayman Islands engage in recreational activities, such as swimming, going to the beach and diving. Furthermore, a pristine natural environment is important to the cultural identity of Caymanians. To quantify the value of the marine environment to the residents of the Cayman Islands, the WTP for an enhancement of the MPAs was estimated through a household survey. Results indicate that, per year, local households would be willing to contribute a total of US\$5.6 million (CI\$5 million) for enhancing protected areas and thereby conserving the ecosystem services provided by the marine environment. The results of the household survey conducted in 2014, in support of this study, indicate that the enhancement plans are supported by at least 58% of the population on Grand Cayman, 63% of the population on Cayman Brac and 85% of the population on Little Cayman (Figure 2).

## Ecosystems as an Amenity to Houses

Marine ecosystems can also be an important amenity to properties in the Cayman Islands. In this study, the distance to natural areas was statistically analysed, in comparison to other attributes of residential properties, to assess the effect of this parameter on real estate

prices. Based on a large database with real estate transactions provided by CIREBA, it is estimated that the proximity to mangrove areas, beaches and waterfronts are all positively correlated to property prices (after controlling for other explanatory variables). This indicates that marine ecosystems contribute to higher property values in the Cayman Islands. The analysis of a scenario in which the distance of houses to mangroves decreases by 1,000 feet suggests that this change is associated with around 5% increase in the value of properties.

## Fisheries

The Cayman Islands are home to a small artisanal fishing industry. People in the Cayman Islands fish for recreation, subsistence and commercial purposes, and a single fisherman can be motivated by a combination of these reasons. Because the study focussed on the coastal and marine ecosystems of the Cayman Islands, only the catch of reef-related species is accounted for in the economic valuation of fisheries. It is estimated that the total reef-related catch is worth roughly **US\$2.3 million (CI\$1.9 million) per year.**

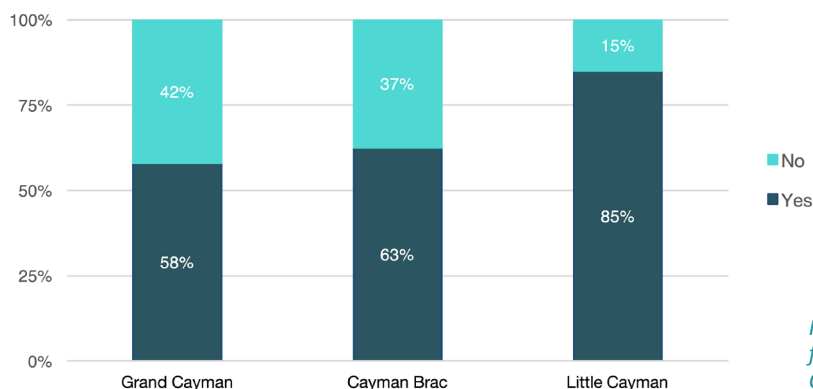


Figure 2 - Answers to the question: Are you willing to pay for better enforcement and expansion of MPAs in the Cayman Islands? Daily et al. (2009).



# Results

## Production of Cosmetic Products

Coral reefs are studied all over the world for their potential contribution to pharmaceutical products. Using Caribbean Sea Whips (*Plexaura homomalla*) harvested in the Cayman Islands, a cosmetic company discovered that this coral species could be used to produce black-sea rod oil (BSRO), which is subsequently used to produce a cosmetic eyelash growth and maintenance serum. The company reached an understanding with the Cayman Islands Government (Department of Environment) to harvest a sustainable amount of coral in exchange for Royalties. In addition to the value created through Royalties, this natural resource also creates revenues for the cosmetics company. The total economic value of this ecosystem service is estimated at **US\$1.6 - 13.6 million (CI\$1.3 – 11.2 million) per year.**

## Regulating Services

The marine environment also provides important regulating ecosystem services. On a local scale, coral reefs protect the shorelines of the Cayman Islands against open ocean waves, storms and hurricanes. This prevents erosion and flooding and the associated destruction of properties and infrastructure. If these reefs were to severely degrade,

their protective capacity would be lost. The damage that is avoided if the quality of coral reefs is maintained amounts to **US\$6 million (CI\$4.9 million) per year.**

On a global scale, the carbon sequestered by mangrove forests, sea grass beds and peat ecosystems contribute to climate regulation. Large mangrove and seagrass areas, such as those located on Grand Cayman, function as carbon sinks. In total, these two ecosystems are expected to hold a carbon stock of 3.5 million metric tons; this would amount to around 13 million metric tons of CO<sub>2</sub> emissions if their entire carbon stock were to be released to the atmosphere. In addition, these ecosystems additionally sequester around 16,000 metric tonnes of carbon per year (i.e. the equivalent of nearly 60,000 metric tons of CO<sub>2</sub> in the atmosphere). Based on a market price of US\$5 (CI\$4.1) per metric ton of CO<sub>2</sub>, obtained from existing carbon trading schemes, the annual sequestration of carbon by mangroves and seagrasses in the Cayman Islands can be valued at **US\$290,000 (CI\$238,000) per year.** Information provided by the DoE suggests that these carbon stock and sequestration estimates in the Cayman Islands would increase if the recently collected peat data were to be incorporated into the analysis.

# Economic effects of enhancing Marine Protected Areas

If current environmental degradation continues, the value of these ecosystem services will decrease. To prevent further degradation of, and conserve the benefits provided by, the marine environment, the DoE proposes to expand the coverage of and enhance the Marine Protected Areas (MPAs) in the Cayman Islands. These changes would result in an overall increase in coastal marine area under protection of 15%. Furthermore, by restructuring the different user zones within the MPAs, the total area classified as “no take” marine reserves would increase substantially. To analyse the socioeconomic effects of these plans, future changes in the ecosystem service values obtained in this study were compared in two policy scenarios: 1) maintaining the current network of MPAs; 2) expanding and restructuring the MPAs according to the plans proposed by the DoE (Figures 3, 4 and 5).

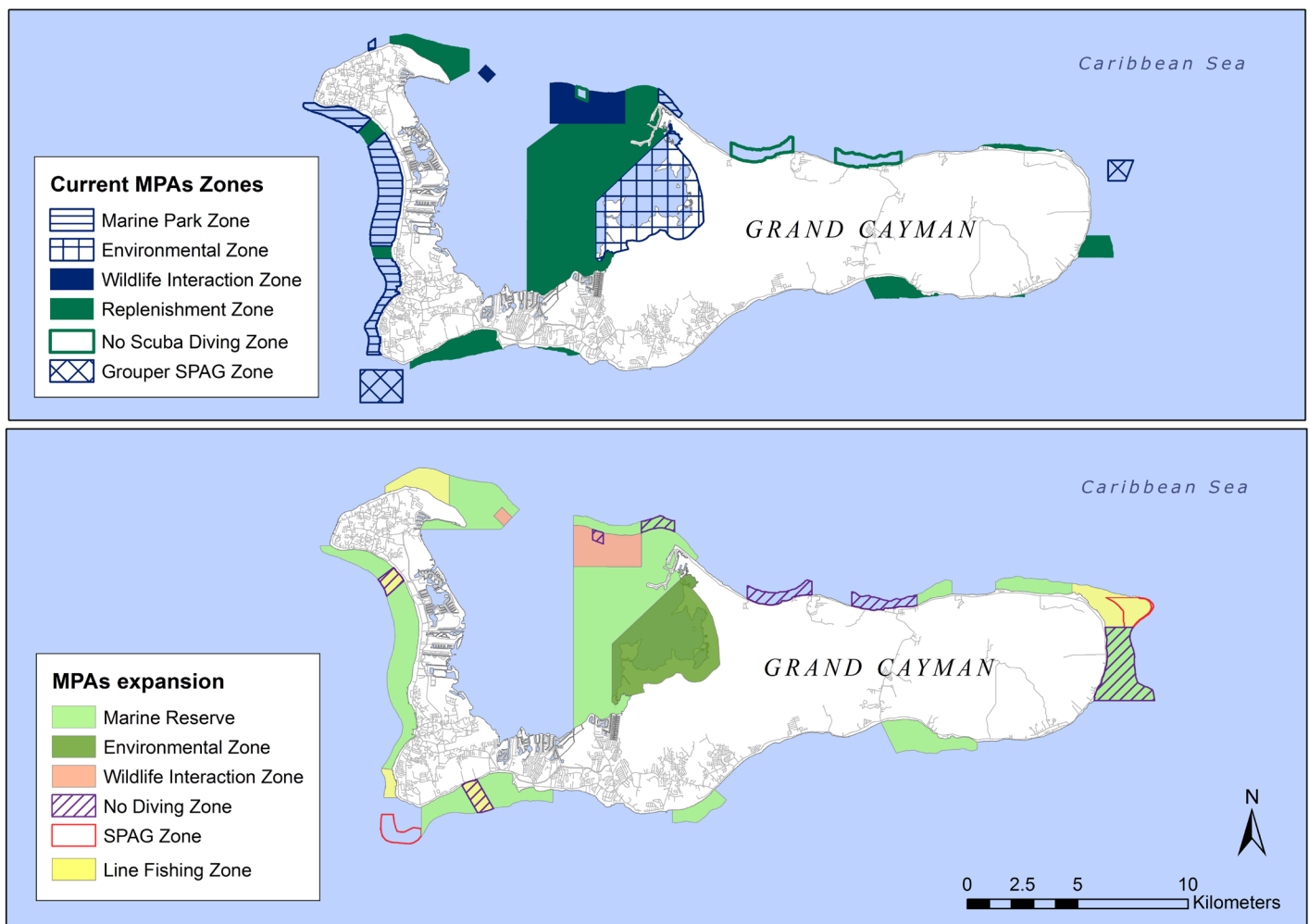


Figure 3 - Current MPAs (above) and proposed MPA enhancement (below) in Grand Cayman



# Economic effects of enhancing Marine Protected Areas

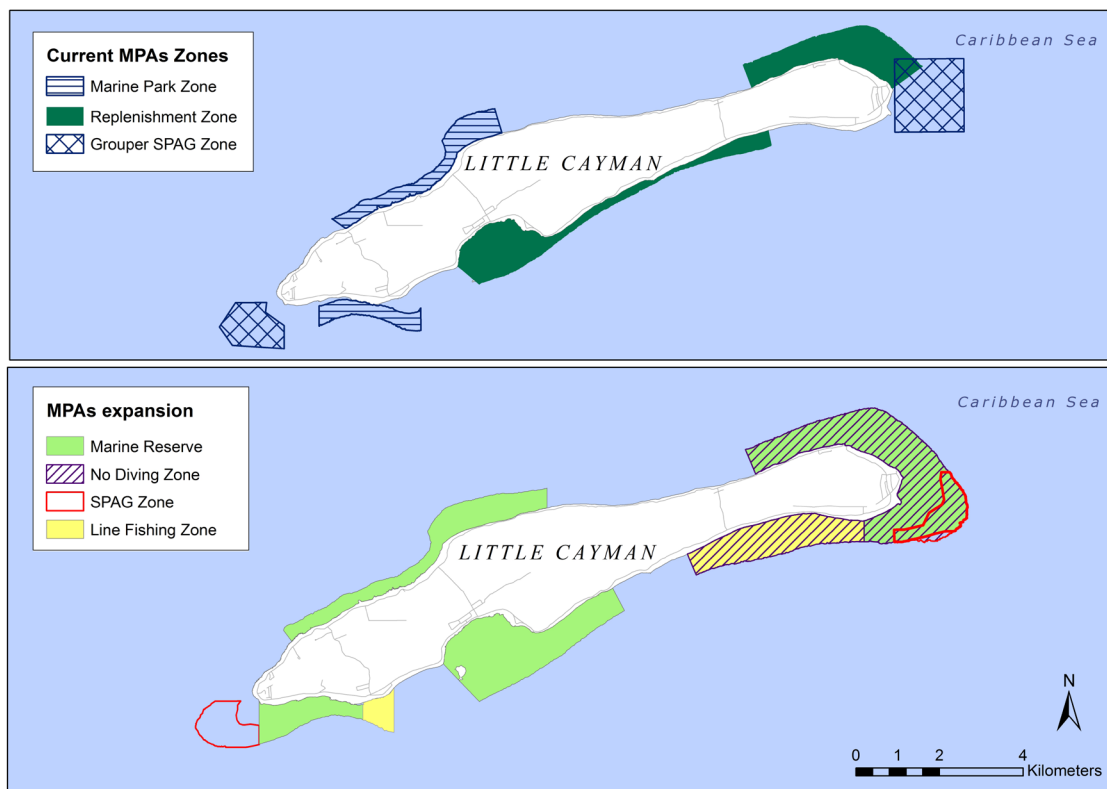


Figure 4 – Current MPAs (above) and proposed MPA enhancement (below) in Little Cayman

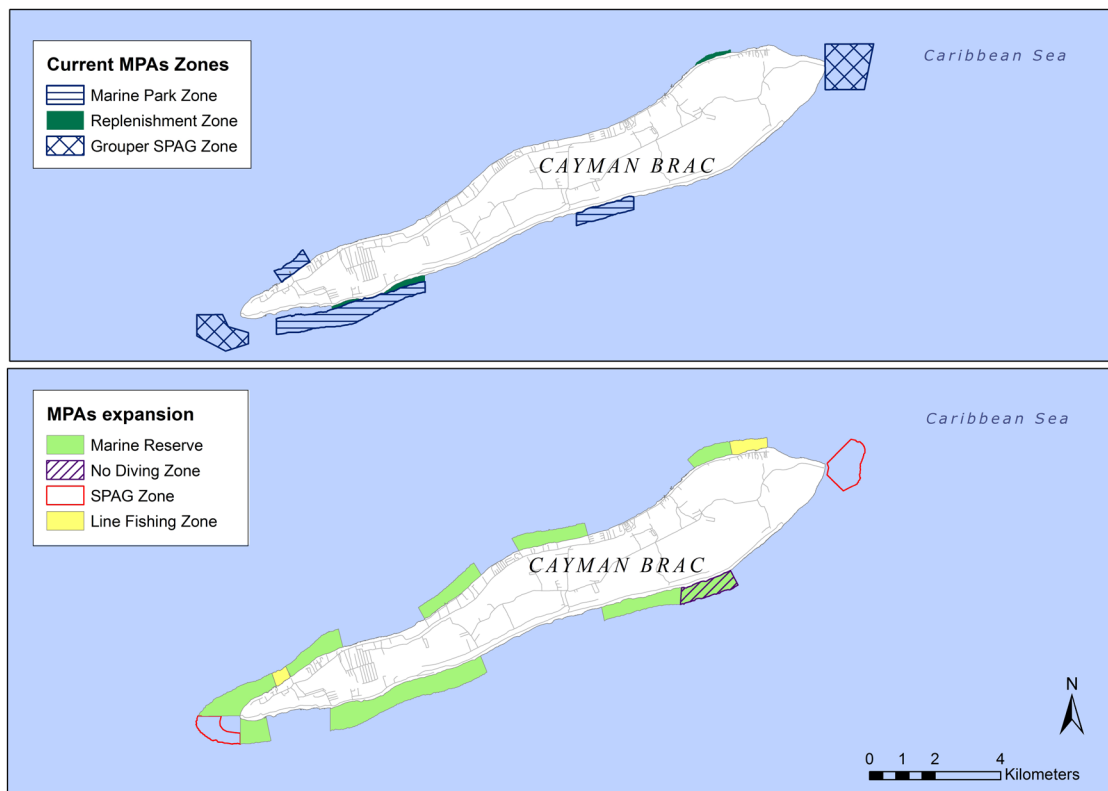


Figure 5 – Current MPAs (above) and proposed MPA enhancement (below) in Cayman Brac



# Economic effects of enhancing Marine Protected Areas

Considering the factors that were included in the economic valuation, the analysis of changes in ecosystem services over 25 years indicates that enhancing the MPAs leads to the highest economic value (Scenario 1 < Scenario 2; see Figure 6). In the last year of the analysis, the total net benefits are likely to be at least 7% higher in Scenario 2, with the MPA enhancement (US\$149 million, or CI\$122 million), than in Scenario 1, with existing MPAs (US\$139 million or CI\$114 million). The stakeholders that benefit most from improved ecosystem services in Scenario 2 (MPA enhancement) are those involved in the tourism industry and local households. Also, the benefits from fisheries and coastal protection are expected to benefit. Most importantly, none of the ecosystem services analysed in the study is expected to decrease in the scenario with the MPA enhancement.

A sensitivity analysis indicates that, even if MPA management proves to be ineffective in reversing the current rates of environmental degradation, the MPA enhancement is unlikely to lead to a loss in human wellbeing in the Cayman Islands (based on the ecosystem services analysed in this study). In other words, the society as a whole only stands to gain in overall economic benefits if the MPA enhancement is implemented. In addition, the DoE has stated that minimal funds are required to realise the enhancement plans.

**Given this information, it can be concluded that the proposed MPA enhancement is a low- cost and low-risk investment with the opportunity to substantially improve overall wellbeing in the Cayman Islands.**

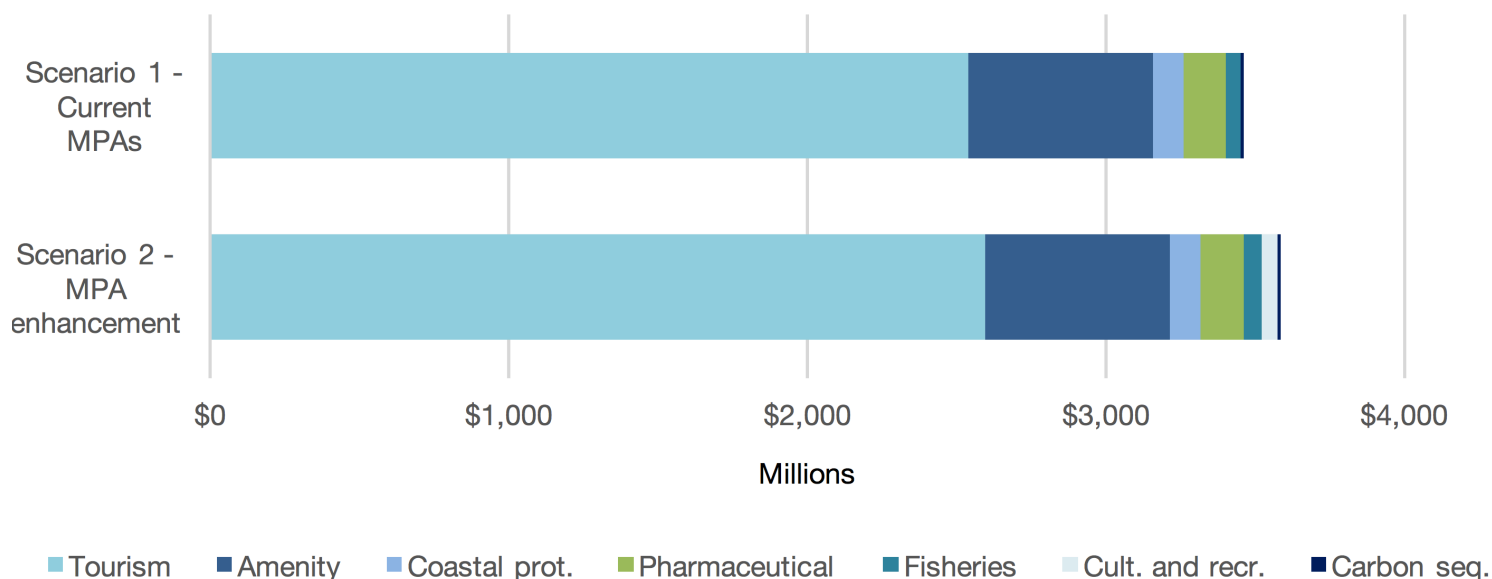


Figure 6 - Present value per ecosystem service in Scenario 1 – current MPAs and Scenario 2 – MPA enhancement (millions US\$; 2.5% discount rate; 25 year timeframe)

## Contact

For further information regarding the study, please contact Wolfs Company: [info@wolfscompany.com](mailto:info@wolfscompany.com)

## Reference to full study

Guzmán, A., Schep, S., van Zanten, B., van Beukering, P., Palacios Nieto, E., Hoogeveen, R., Luna Strangl, A., Schutter, M., Ebanks-Petrie, G. And Austin, T. (2017). The Economics of Enhancing the Marine Protected Areas of the Cayman Islands. Wolfs Company, IVM VU University Amsterdam, Department of Environment of the Cayman Islands Government

The report was commissioned by the Department of Environment of the Cayman Islands Government

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