Barbados Blue Economy Scoping Study

Stocktake and Diagnostic Analysis

July 2020
Barbados Blue Economy
Scoping Study:
Stocktake and Diagnostic Analysis

Prepared for the Ministry of Maritime Affairs and the Blue Economy
Under the UWI-UNDP Blue Economists Programme

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The authors would like to thank the United Nations Development Programme (UNDP) for Barbados and the Eastern Caribbean, the University of the West Indies (UWI) and the Government of Barbados (GoB) for providing the opportunity to undertake this blue economy scoping study. Special thanks must go to Mr. Rickardo Ward of the Ministry of Maritime Affairs and the Blue Economy for coordinating the arrangements on behalf of the Government of Barbados, Ugo Blanco on behalf of the UNDP and Pro Vice Chancellor Professor Stephan Gift on behalf of the UWI.

As part of the methodology used in this scoping study, interviews with key informants in various agencies and organisations were conducted and as such, we acknowledge the valuable information provided by these persons (listed in Annex F).

In addition, several individuals including members of the Project Steering Committee and participants in the validation session (listed in Annex F) provided comments on the first draft of the report and we would like to thank these persons for their valuable comments, suggestions and additional information which has led to improvements in the subsequent version of the report.

The authors are however responsible for the content and recommendations made in this study without implicating those who submitted comments and information to us. We hope that the agencies which commissioned this scoping study find it useful in sustainably developing the “blue economy” in Barbados.

Julian Roberts
Andrew Downes
Nikola Simpson
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EXECUTIVE SUMMARY

Overview

The economy of Barbados is highly dependent on the marine and coastal environment and the activities and resources it supports. Like many Caribbean islands, Barbados is exploring opportunities to diversify and strengthen its economy through *inter alia* strategies linked to the “blue economy” - an evolving development approach centred on creating greater value through sustainable utilisation of ocean resources.

The Government of Barbados clearly recognises the importance of a sustainable blue economy as a critical element of building a climate resilient economy and has articulated its aspiration:

> to maximise access to and use of the marine resources that fall under its jurisdiction, such that this becomes a significant contributor to the national economy, without jeopardising the health of the ecosystems that make up the marine environment.

A development strategy grounded in the blue economy will enable Barbados to promote the growth of existing productive sectors, expand into emerging blue industries, improve food security and potentially reduce dependence on imported fossil fuels.

In order to develop a long-term strategy aimed at achieving blue growth, however, Barbados requires comprehensive, robust and consistent analysis of possible future scenarios and policy options to support sustainable and inclusive blue growth from its ocean space. This Scoping Study, being delivered under the joint *UWI-UNDP Think Tank on Public Policy for a Blue Economy*, provides information on what areas of the blue economy Barbados is exploiting, those areas that are less well developed and approaches that could be adopted achieve more sustainable utilisation of the marine environment. In doing so, the study will provide an analysis of the current situation in Barbados as well as identify some initial actions to allow Barbados to further realise the range of opportunities under the blue economy.

In this regard, it is expected that this scoping study will provide one of several sources of information that can inform the development of the Blue Economy Roadmap being prepared by the Inter-American Development Bank (IADB) on behalf of the Government of Barbados.

**Barbados’ Blue Economy at a Glance**

The blue economy is not new to Barbados, with its development of fisheries, its reliance on international shipping to support trade, and its tourism industry. Today, tourism is the leading economic activity in Barbados, while fishing is an important sector from a socio-economic perspective. As such, the key economic activity relevant to the blue economy in Barbados at present is tourism, which directly contributes 12.9 percent of GDP and 62.1 percent of the country’s exports. This notwithstanding, Barbados, like all other SIDS, relies heavily on international shipping to support trade, with greater than 90% of all imports and exports being transported by sea.
Barbados – Blue Economy Indicators

<table>
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<tr>
<th>OCEAN ECONOMY IN CONTEXT</th>
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<tr>
<td>Land area (sq. km)</td>
<td>432</td>
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<tr>
<td>Coastline (km)</td>
<td>97</td>
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<tr>
<td>Exclusive Economic Zone (sq. km)</td>
<td>186,898</td>
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<tr>
<td>Shelf Area (sq. km)</td>
<td>342</td>
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<tr>
<td>Inshore Fishing Area (sq. km)</td>
<td>342</td>
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<tr>
<td>Population (2018 values)</td>
<td>286,641</td>
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<tr>
<td>Gross domestic product (2018 values)</td>
<td>US$5.145 billion</td>
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<tr>
<td>Human development index (HDI)</td>
<td>0.813 - high human development category</td>
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<td>(Barbados ranked 56 among 189 countries and territories in 2018)</td>
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<td>Key Blue Economy Sectors</td>
<td>Marine and coastal tourism</td>
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<td>Marine capture fisheries</td>
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<td>Ports and shipping</td>
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<td>Offshore petroleum exploration</td>
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<td>Desalination</td>
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<td></td>
<td>Aquaculture</td>
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<tr>
<td>Estimated value of Barbados’ blue economy</td>
<td>No overall figures have been estimated</td>
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<tr>
<td></td>
<td>Ex-vessel value of marine capture fish production</td>
</tr>
<tr>
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<td>= US$7.9 million (2016 figures)</td>
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<tr>
<td></td>
<td>Value added of fisheries = US$25 million</td>
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<tr>
<td>Marine protected area (percentage of EEZ)</td>
<td>2.2 sq. km - &lt;0.001%</td>
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<tr>
<td>Ocean health index (OHI)</td>
<td>58</td>
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<tr>
<td></td>
<td>(Barbados ranks 187 among 221 countries and territories)</td>
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<tr>
<td>Tropical Coral Reefs (sq. km)</td>
<td>100</td>
</tr>
<tr>
<td>Value of reef related tourism</td>
<td>Data not available</td>
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Implementing the Blue Economy

It is important to understand that the development of the blue economy in Barbados sits within the broader national framework for economic development. In the particular case of SIDS, the blue economy, as a macro-economy concept, involves every aspect of national governance, economic development, environmental protection and sustainability. The blue economy is an integration of sustainable development and green growth. It highlights an overall-planning and coordinated development between marine ecosystem and ocean and coastal zone economic system. Furthermore, socio-economic development planning in Barbados has already drawn heavily on the concept of the “Green Economy” and there is growing interest in the development of the “Circular Economy”.

It must be stressed that, particularly in a country the size of Barbados, these different “elements” of the economy cannot be viewed in isolation. Rather, the “blue,” “green” and “circular” economies should be seen as a single, interlinked economic system that encompasses the entire island system and its maritime waters. As such, the overarching aim for the Government of Barbados should be to define a

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1 The Ocean Health Index is the comprehensive framework used to measure ocean health from global to local scales. [http://www.oceanhealthindex.org/](http://www.oceanhealthindex.org/)
holistic approach to the sustainable exploitation of marine resources with consideration of the implications of current activities on the oceans, and the realization of future potential opportunities.

The realisation of such opportunities will require strategies that:

1. Strengthen the management and protection of Barbados’ maritime waters and the activities supported therein;
2. Further support and develop the following existing sectors: tourism and leisure; marine capture fisheries; and ports and shipping; and
3. Explore the potential opportunities to promote investment and innovation to support the development of new sectors.

In the context of Barbados, the major existing beneficial uses of the marine environment include:

- Fisheries (commercial, subsistence and recreational);
- Tourism (including cruise ships, recreational yachting and SCUBA diving);
- Shipping and port services; and
- The provision of marine ecological services that support social, environmental and economic benefits.

In terms of new and emerging uses of the ocean, aquaculture, marine renewable energy and “blue” biotechnology have been identified as possible development opportunities that can contribute to the development of the blue economy. However, while potential exists, there is only limited development experience in Barbados. Many of these future opportunities have an essential technological component that will, in some cases, require substantial capital investment.

The UNDP project team recommends that a phased approach be applied to the rolling out of the blue economy as follows:

1) **Deepen/Upgrade existing mature areas** via the use of technology (tourism, ports and shipping) – product deepening. These could be commenced immediately;

2) **Support growth areas** with assistance from development partners (fishing, aquaculture, coastal development) - product widening. These would typically have a short to medium-term development horizon (1-10 years); and

3) **Explore new areas** (widening). These would typically have a long-term development horizon (15-20 years).

Underpinning this phased approach should be the development and implementation of a comprehensive and integrated **enabling environment** that can support growth of the blue economy by reducing risks to people and the environment and to those willing to invest private capital in blue economy sectors in Barbados.

If successfully implemented a number of economic development outcomes would be achieved for Barbados:

1) Increased investment in existing ocean-based economic sectors and new technologies to realise greater value and efficiency from the existing resource base;

2) Increase the number of businesses operating and the number of people employed in the blue economy;
3) Utilise rents from existing sectors (e.g. tourism, fishing and maritime sectors) to invest in and stimulate development of new economic sectors based on existing marine resources;

4) Achieve greater protection for Barbados’ ocean space and resources through strengthened coordination across different sectors, application of protective measures and greater use of surveillance and enforcement tools; and

5) Generate new research, innovation and knowledge about the country’s ocean space and management needs to facilitate more informed decision-making.

In developing a sustainable blue economy, all activities should promote inclusiveness in the sector including support to women’s participation and ensuring that their contribution isn’t overlooked. This includes increased opportunities for decent work for women in the blue economy sector and thus a potential reduction in poverty at the household/micro level. In order to achieve this, the role of women in the sector must be better understood to ensure policy making takes into account both the challenges and opportunities experienced. This can be done for example by building on previous work such as the CERMES led gender in fisheries team (GIFT) project. Furthermore, the impact of COVID – 19 on women must be taken into account and how the blue new norm can better support those women suffering consequences of the COVID – 19 recession.

Blue Economy Opportunities and Interventions

While a number of development opportunities could be pursued within specific marine economic sectors, a more sustainable long-term strategy would be for Barbados to embark on the development of a blue economy development framework that recognises and provides for the broad range of environmental and socio-economic services provided by the marine environment. Throughout the report, a broad range of issues and opportunities are identified as well as a corresponding set of high level recommendations, (summarised below), with the aim of creating both the enabling environment to support implementation of the blue economy in Barbados as a number of development opportunities that could be initiated as a way to catalyse future investment into a broad range of ‘blue’ sectors.

Recommendations

**Developing the Enabling Environment to Support Blue Growth**

1) The Government should transition to a single Blue Economy Advisory Committee that oversees all future maritime activities and decision-making. Such a committee would be overseen by the MMABE, reporting to the Minister responsible.

   Consideration should also be given to whether the MMABE should take on the overall responsibility for the planning and coordination of activities across Barbados entire maritime space.

2) The Government should consider the development of a single, overarching National Ocean (Blue Economy) Policy setting out the strategic direction and objectives for development of Barbados’ maritime waters.

   Such a policy should not be seen as a replacement for existing sector-specific policies, which are still required. Rather, it should be an overarching framework, providing the broad policy direction under which all future sector-specific policies and planning should be developed.

3) A more comprehensive and integrated environmental assessment and management (legal) framework is required that responds to the broad range of activities that are, or are likely to be, undertaken in the EEZ and the continental shelf.
In developing such a regime, the following recommendations should be considered:

- prepare a new legal instrument that deals primarily with protection, planning and management of the marine environment (to include Barbados’ entire maritime waters);
- develop new regulations under the Petroleum Act; and
- introduce new legislation controlling access and benefit sharing (ABS) from the use of marine genetic resources.

In addition, a number of existing legal instruments need to be updated.

4) It is strongly recommended that Barbados embarks on the development of a comprehensive EEZ-wide MSP framework.

5) A comprehensive approach is needed to address the full range of threats to the marine environment, in particular coral reefs. Such an approach must ensure that any future national blue economy development framework addresses the full range of threats to the marine environment including land-based sources of pollution, unsustainable fishing practices and physical damage to marine habitats. Only when these issues are adequately managed will the blue economy be able to thrive in Barbados.

Furthermore, future policy and planning decisions need to avoid impacts accumulating through multiple and potentially incompatible activities taking place in a particular space, thereby preventing both land-base and marine activities from damaging the functioning of the marine ecosystem and the benefits it provides.

6) The expansion of the existing marine reserves to include a system of representative habitat types should be seen as a priority. Not only will this provide direct benefits in terms of improvements to fish stocks, but it will also help to build the resilience of those natural systems to better protect them against the inevitable impacts of climate change. They will also contribute to the natural capital which underpins the tourism sector.

Further additional areas of Barbados’ maritime space should also be assessed for greater protection.

7) The increasing risks associated with climate change must be recognised and managed through the incorporation of appropriate adaptation and resilience building strategies into sustainable development, conservation and governance actions if Barbados is to realise its vision for a blue economy.

8) Opportunities exist to increase the flows of revenue received from the various maritime activities in Barbados.

To this end, it is recommended that the Government undertake a comprehensive review of the various existing fees, levies and charges that are received from marine related activities, especially cruise shipping, fishing and yachting. Such a review should include a benchmarking exercise to compare the level of fees and levies with international norms as well as examining areas where no fees are currently collected.

As an initial step in this regard, the Government should review and revise the existing schedule of visitor fees charged in respect of the Barbados Marine Reserve.

9) As one of its first tasks, the Blue Economy Advisory Committee (recommendation 1) above) should establish a task force (with co-opted members from the private sector and academia) to engage with the private sector and oversee the issues associated with MSME growth and development in the blue economy — inter alia scuba, coastal cruisers, diving, fishing, cottage industries associated with blue economy resources etc.
10) If Barbados is to progress the development of the blue economy, better data on progress with these activities is needed to measure and monitor the progress of activities in the blue economy.

This should include a focus not only on the value of economic sectors but a broader approach to valuing the natural capital that supports these sectors.

11) The potential to develop a centralised multi-user platform through which marine data can be stored, accessed and used by multiple agencies should be considered by the IADB as one of the critical elements of the Blue Economy Roadmap, given the critical need and multiple applications of such a platform (including EEZ-wide MSP).

12) The Government should pursue a data discover process to identify and secure all offshore data that relates to its maritime waters. Once obtained, it will then need to determine what skills, equipment and other resources will be required to process and interpret such data.

13) A more coordinated focus between the existing research and educational facilities is essential to support the development of new research clusters aimed at supporting and furthering key marine sectors.

Identifying and defining ongoing strategic marine research and information needs, in an inclusive and adaptive manner, together with the appropriate funding resources and mechanisms, is essential for achieving economic development through a blue economy framework.

This requires the development and implementation of a clear strategy relating to marine scientific research and data.

14) Emphasis should be placed on sensitising the population on coastal environmental issues, introducing relevant subjects through the school curriculum by involving the Ministry of Education, as well as capacity building especially for office bearers for effective implementation of the policies and activities.

15) There is a need for Barbados to enhance its capability to identify threats to its maritime space in a timely manner by sharing and integrating intelligence, surveillance, and navigation systems into a common operating picture.

Applying the Blue Economy in Barbados

1) Opportunities should be identified to develop partnerships with local tourism operators, fisherfolk and Government agencies to develop locally owned and operated marine management areas.

Such projects could be packaged as Corporate Sustainability products for the companies and could also provide a vehicle for tourism education and awareness campaigns.

2) Ensure that the development of the cruise tourism sector considers not only the economic benefits but also long-term impacts and socio-economic and environmental risks to Barbados which are in line with the Barbados Port Inc’s master plan and vision of becoming the most innovative and green maritime hub by 2030.

3) The Government should engage with the yachting sector to assess the economic potential and feasibility of expanding this sector through the provision of additional marine facilities and extending the existing supply chain.
4) There is a need to better understand the likely trajectory for key marine species (in terms of diversity, distribution and abundance) under different future climate change scenarios supporting the ability to better plan for future fisheries development.

5) A process to better understand and value the total contribution of the fisheries sector, as a critical component of Barbados’ blue economy, is required. Such an analysis should not only assess the direct upstream and downstream linkages of capture fisheries, but also the wider social and cultural benefits.

As a critical first step, the Government should implement a robust data recording and reporting system to ensure that catch/landing data are treated in a consistent manner thereby ensuring that the Government of Barbados always works with a single consistent data set for fisheries landings.

6) Given that the nearshore reef fishery represents a major contribution to local livelihoods and food security, opportunities to implement fishery management measures, to improve the health of these stocks, should be explored. The implementation of Fisheries Management Plans (FMPs) is recommended; these are detailed management plans that align fishing effort and specific regulations with (1) scientific guidance regarding the health of the stock and (2) economic objectives.

7) Given the current uncertainty, a strategy to improve selective targeting of high value tunas should be pursued as a way to increase harvests of these species. Such a strategy would be consistent with recommendations made by the FAO.

8) The IADB project should consider in more detail how the existing fishery can be diversified through the diversification of the existing fishery resource base to sustainably exploit deeper offshore species and nearshore species that are currently not fished.

9) There is a need to maximise the value that can be derived from fish waste, while at the same time reducing the need to dispose of waste to the environment.

This could be achieved through further expansion of existing initiatives such as the MMABE / Embassy of Argentina / FAO / BGI fish waste silage project and the UNDP Accelerator Lab biofuel project, or could require additional projects that could be evaluated further through the IADB project.

10) There is a need to develop the capacity of the national maritime administration into a fully formed and dedicated unit with oversight of Flag, Port and Coastal States rights and obligations for shipping.

11) In order to fully understand, mitigate and manage operational risks to the port of Bridgetown it is recommended that Barbados Port Inc undertake a comprehensive risk assessment of the existing and future planned port facilities.

12) Barbados Port Inc. could further explore options for integrating renewable energy sources (particularly solar and wind) with its facilities to generate power for port consumption and, where excess exists, to provide shore-based power for ships alongside.

13) Although the Offshore Petroleum Regulations contain provisions relating to environmental procedures, it is recommended that the Government should consider development of a comprehensive and dedicated environmental management regime for the offshore petroleum sector. Such a regime (to be developed under the under the Offshore Petroleum Act) should address, as a minimum inter alia:
• appropriate discharge quality standards in accordance with international best practice;
• appropriate atmospheric emissions standards including with regard to venting and flaring of associated gas;
• environmental management planning requirements including with respect to waste management;
• requirements for offshore installation (Tier 1) marine oil spill contingency plans;
• selection, use and management of hazardous substances;
• requirements relating to conservation and protection of marine biodiversity
• Functions powers and duties of different regulatory agencies vis-à-vis management of the health, safety and environmental aspects of offshore petroleum activities.

14) In the context of a broader blue economy development framework, the provision of coastal areas that are protected and able to support the installation and operation of future desalination facilities, particularly with respect to protection of the source water catchment, requires particular attention.

15) In order to develop new and emerging areas of the blue economy, there is a need for government and non-government stakeholders to determine the areas of priority interest on which they wish to focus. This could then be followed by undertaking the necessary feasibility studies and possibly pilot projects to better assess the feasibility of specific development opportunities.

The UNDP project team therefore recommends that these, and other potential opportunities, be considered more thoroughly during the development of the IADB-supported Blue Economy Strategic Roadmap.

More specifically, the analysis included in this report identifies a total of eight (8) critical enablers (encompassing a total of 21 enabling policy interventions) and thirteen (13) development opportunities that could be pursued by the Government of Barbados as an initial step to implementing a blue economy-based development strategy. While some of these opportunities are sector-specific, others create synergies and linkages across different maritime functions that operate within Barbados.

These opportunities and policy interventions have been developed further into an Initial Action Plan, which provides a preliminary framework to allow Barbados to further identify a range of opportunities under the blue economy.

It should be recognised that the action plan is by no means exhaustive but rather captures the key issues and opportunities that were identified during this assignment, thereby highlighting a number of specific opportunities that the Government of Barbados could pursue in its efforts to develop the blue economy, these efforts cannot occur in isolation.

The UNDP project team notes that Barbados is already undertaking (or planning to undertake) a broad range of activities that naturally fall under the umbrella of the blue economy. Through this Scoping Study and the Initial Action Plan, UNDP has sought to recognise these “complementary” activities and to propose interventions that will provide specific support for the development of key economic sectors in Barbados. If undertaken in conjunction with the other initiatives being pursued by the Government of Barbados, the Action Plan can enable Barbados to develop its ocean-based economic sectors in a more integrated manner thereby contributing to inclusive, environmentally sustainable, economic growth.

This report and the associated Initial Action Plan should, therefore, be considered as one element of a broader set of activities being undertaken in Barbados to strengthen and support the management of Barbados’ maritime space.
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<tr>
<th>THEMATIC AREA</th>
<th>ACTION AREAS</th>
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<td>1. Enabling Environment</td>
<td>Action Areas:</td>
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<td>1.1 Integrated approaches to ocean governance</td>
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<td>1.2 A healthy, resilient &amp; productive marine environment</td>
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<td>1.3 Sustainable finance &amp; investment</td>
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<td>1.5 Human capacity development</td>
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<td>1.6 Research &amp; marine information</td>
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<td>1.8 Maritime surveillance, monitoring &amp; enforcement</td>
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<td>2. Tourism &amp; Leisure</td>
<td>Action Areas:</td>
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<td></td>
<td>2.1 Create linkages between the tourism sector and marine conservation</td>
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<td>2.2 Further develop the cruise sector to account for its long-term risks and impacts to the marine environment and other users as well as its direct economic contribution</td>
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<td>2.3 Undertake an assessment, in conjunction with the yachting sector, to determine the potential opportunity and feasibility of expanding the existing leisure yacht facilities to cater for more recreation (cruising) yachts</td>
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<tr>
<td>3. Marine Living Resources</td>
<td>Action Areas:</td>
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<td></td>
<td>3.1 Improve the understanding of fishery management requirements undertaking future climate change projections for the Caribbean</td>
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<td>3.2 Review existing and develop new metrics for recording and reporting landings of marine fish in Barbados</td>
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<td>3.3 Develop ‘Fisheries Management Plans’ for key reef fish species</td>
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<td>3.4 Develop strategies to better utilise existing fish stocks and to diversify the existing fisheries to include new or underutilised fish species</td>
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<td>3.5 Expand the current focus on fish silage to determine other options for creating value from the waste generated from fish processing and other biological material</td>
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<tr>
<td>4. Ports &amp; Shipping</td>
<td>Action Areas:</td>
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<tr>
<td></td>
<td>4.1 Specifically include an assessment of the Maritime Affairs function under Component 2 of the IADB blue economy initiative, taking into account Flag, Coastal and Port state rights and obligations</td>
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<td></td>
<td>4.2 Prepare and implement a Port Safety Management System for the Port of Bridgetown</td>
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<td>4.3 Invest in renewable energy sources to provide low carbon shore-based power for visiting ships</td>
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<tr>
<td>5. Non-living Resources &amp; Energy</td>
<td>Action Areas:</td>
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<tr>
<td></td>
<td>5.1 Undertake a comprehensive review of the existing environmental regulatory functions that relate to the offshore petroleum sector with a view to developing a new set of Offshore Petroleum (Environmental Management) Regulations</td>
</tr>
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<td></td>
<td>5.2 Ensure the security of future desalination capacity</td>
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**ABBREVIATIONS AND ACRONYMS**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>BSDP</td>
<td>Barbados National Sustainable Development Plan</td>
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<tr>
<td>BERT</td>
<td>Barbados Economic Recovery and Transformation</td>
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<tr>
<td>BGI</td>
<td>Blue-Green Initiative</td>
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<td>BMR</td>
<td>Barbados Marine Reserve</td>
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<tr>
<td>CBD</td>
<td>Convention on Biological Diversity</td>
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<td>CBMP</td>
<td>Carlisle Bay Marine Park</td>
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<td>CLME</td>
<td>Caribbean Large Marine Ecosystem</td>
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<td>CPUE</td>
<td>Catch Per Unit Effort</td>
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<tr>
<td>CRFM</td>
<td>Caribbean Regional Fisheries Mechanism</td>
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<tr>
<td>CZMA</td>
<td>Coastal Zone Management Act</td>
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<tr>
<td>CZMU</td>
<td>Coastal Zone Management Unit</td>
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<tr>
<td>NRD</td>
<td>Natural Resources Department</td>
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<tr>
<td>EAA</td>
<td>Ecosystem Approach to Aquaculture</td>
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<tr>
<td>EEZ</td>
<td>Exclusive Economic Zone</td>
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<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
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<tr>
<td>EU</td>
<td>European Union</td>
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<tr>
<td>FAO</td>
<td>United Nations Food and Agriculture Organization</td>
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<tr>
<td>FMP</td>
<td>Fishery Management Plan</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
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<tr>
<td>IADB</td>
<td>Inter-American Development Bank</td>
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<tr>
<td>ICCAT</td>
<td>International Commission for the Conservation of Atlantic Tunas</td>
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<tr>
<td>ICMP</td>
<td>Integrated Coastal Management Plan</td>
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<tr>
<td>IMF</td>
<td>International Monetary Fund</td>
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<tr>
<td>IMO</td>
<td>International Maritime Organization</td>
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<tr>
<td>MMA</td>
<td>Marine Management Area</td>
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<tr>
<td>MMABE</td>
<td>Ministry of Maritime Affairs and the Blue Economy</td>
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<tr>
<td>MRE</td>
<td>Marine Renewable Energy</td>
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<tr>
<td>MSP</td>
<td>Marine Spatial Planning</td>
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<tr>
<td>NBSAP</td>
<td>National Biodiversity Strategy and Action Plan</td>
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<tr>
<td>NCSD</td>
<td>National Commission on Sustainable Development</td>
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<td>NCC</td>
<td>National Conservation Commission</td>
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<tr>
<td>OHI</td>
<td>Ocean Health Index</td>
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<tr>
<td>Abbreviation</td>
<td>full form</td>
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<tr>
<td>PDP</td>
<td>Physical Development Plan</td>
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<tr>
<td>SCUBA</td>
<td>Self-Contained Underwater Breathing Apparatus</td>
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<tr>
<td>SDG</td>
<td>Sustainable Development Goal</td>
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<tr>
<td>SIDS</td>
<td>Small Island Developing States</td>
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<tr>
<td>SME</td>
<td>Small and Medium Sized Enterprise</td>
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<tr>
<td>Sq. km</td>
<td>Square Kilometre</td>
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<tr>
<td>SOLAS</td>
<td>International Convention for the Safety of Life at Sea</td>
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<tr>
<td>TMP</td>
<td>Tourism Master Plan</td>
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<tr>
<td>UNCTAD</td>
<td>United Nations Conference on Trade and Development</td>
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<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
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<tr>
<td>UNIDO</td>
<td>United Nations Industrial Development Organization</td>
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<tr>
<td>UWI</td>
<td>University of the West Indies</td>
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<tr>
<td>WTTC</td>
<td>World Travel and Tourism Council</td>
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PART I: BACKGROUND AND SCOPE
1 | INTRODUCTION

1.1 Background

The idea of using the sea for economic gain is not a new concept. Island nations, in particular, have benefitted from their ocean resources for centuries, with marine uses and activities contributing significantly to their development and overall economies. These include a wide range of maritime activities essential to both current and future economic development, including: capture fisheries; maritime transport and ports; coastal tourism; mineral exploitation; as well as the marine ecosystems and resources that support them. What is new, however, is the growing appreciation of the critical role that the ocean plays in sustainable economic growth and, as a result, a growing appreciation of the need to better manage and protect coastal and marine ecosystems and resources that are the fundamental basis for that growth.

Many small island developing states (SIDS) have jurisdiction over globally significant ocean areas, which typically far exceed their terrestrial footprint and are therefore dependent to a large extent on ocean resources and the sectors that they support. Barbados’ maritime waters, for example, extend to approximately 187,000 sq. km. As such, many coastal and island nations, including Barbados, are increasingly looking to their marine waters to bolster slowing growth in their terrestrial economies by exploring new opportunities for investment and employment.

Since 2012, the emerging concept of the ‘blue economy’ has been embraced by many SIDS as a mechanism for realising sustainable growth centred on an ocean-based economy. In that time the blue economy has emerged as a key component of a new global dialogue about the role of coastal and ocean waters in sustainable development. For small states in particular, the concept of the blue economy presents itself as a promising avenue for economic diversification and growth embedded in fundamental principles of environmental sustainability.

The blue economy is, however, strongly dependent on a quality environment for the sustained supply of those goods and services. Unfortunately, recent economic development has been at the cost of the ocean’s environmental balance, threatening its ability to sustainably provide quality ecosystem functions and services for future generations. Increasing pollution, overfishing, invasive species, unsustainable coastal development and climate change all contribute significantly to the loss of biodiversity and ecosystem services, and to the decline in the environmental health of our oceans.

These factors present both Governments and ocean users with significant challenges in terms of ensuring that development goals, strategies, and projects do not operate at cross purposes with the vast range of human activities affecting the ocean. The challenge is where to start in order to alter course to achieve a blue economy and, in so doing, to develop or strengthen social, economic and environmental linkages and reform current governance arrangements.

In this regard, the Government of Barbados has signalled its desire to implement the blue economy concept as a framework to foster an integrated consideration for sustainable development programmes. In support of this aspiration, in 2018, the Government of Barbados created the Ministry

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2 For the purposes of this report the term “maritime waters” includes all those waters measured from the baseline to the limits of the exclusive economic zone (EEZ) and the extended continental shelf as defined under the United Nations Convention on the Law of the Sea, 1982.
of Maritime Affairs and the Blue Economy (MMABE) to consolidate the government’s approach in prioritizing the strategic and sustainable use of its maritime waters.

1.2 Purpose of this Scoping Study

In order to develop a long-term strategy aimed at achieving blue growth, there is a need for the Government of Barbados to better understand the range of possible future scenarios and policy options required to support the transition to sustainable and inclusive blue growth from its maritime waters. This Scoping Study, being delivered under the joint UWI-UNDP Blue Economists Programme, aims to analyse the potential ocean-based development opportunities available in Barbados. As a preliminary assessment, it will provide information on: (i) those areas of the blue economy Barbados is currently exploiting; (ii) those areas that are either less well developed or do not currently exist, that present future development opportunities for Barbados; and (iii) approaches that could be adopted to achieve more sustainable utilisation of the marine environment. In doing so, the study provides an analysis of the current situation in Barbados as well as identify some initial actions to allow Barbados to further realise a range of opportunities under the blue economy.

The Scoping Study is being undertaken noting the consideration by the MMABE to detailed elements in the 2016 World Bank Study on the Caribbean Blue Economy, such as the relationship between ocean services and blue economic sectors (Patil et al., 2016). In addition, consultation to identify synergies between the Blue Economy Roadmap being prepared by the Inter-American Development Bank (IADB) has been conducted, as it is expected that this scoping study will provide one of several inputs that can inform the development of that roadmap, as well as other outputs that the IADB’s technical assistance programme will support.

1.3 Scope and Elements of the Report

In accordance with the Terms of Reference (Annex A), this Scoping Study consists of the following three (3) outputs:

Output 1: Stocktake to assess the full range of blue economy related activities currently undertaken in Barbados and the range of resources utilised

The transition to a blue economy must start with a broad understanding of the current state and use of the marine environment, to inform effective policy and integrated planning. The first output of this Scoping Study is, therefore, a high level stocktake analysing the current status of the key ‘blue’ sectors in Barbados, that:

- Identifies current activities, their arrangements and practices;
- Identifies environmental systems, resources they hold and their dynamics; and
- Documents how existing governance processes inform management practices, and the efficacy of those practices in relation to the above.

This knowledge provides an overview of the characteristics of the ocean space including, where possible, specifics on existing resources and their use; current trends, threats and risks in patterns of use and exploitation of space and resources; and, importantly, the space and resources not currently being used or exploited.

It should be noted that a number of assessments of Barbados’ marine sectors (primarily fisheries, coastal zone management and coastal tourism), and their contribution to the economy and livelihoods have previously been undertaken. While this Scoping Study aims to synthesise and summarise much of this information, it may also duplicate some of the previous work which is necessary in order to present
a comprehensive overview of the current situation with which to formulate future strategies for a transition to a blue economy. In doing so, the Scoping Study will also present a brief overview of the broad range of existing “complementary” blue economy-related activities that are either currently underway or are being planned in Barbados.

Output 2: Rapid diagnostic analysis setting out development options based on both the stocktake and knowledge of new and emerging marine sectors that could be developed

While many countries are pursuing blue growth strategies, it is not always clear what a sustainable blue economy might look like, and under what conditions it is most likely to develop. The second output from the Scoping Study is therefore a high-level diagnostic analysis (a “rapid assessment”) of the potential opportunities for their future development and major policy and regulatory obstacles to the development of a blue economy. The realisation of these opportunities will require strategies that:

1. Further support and develop those sectors that currently support the economy of Barbados;
2. Promote investment and innovation to support the development of new sectors; and
3. Strengthen the management and protection of Barbados’ maritime waters (“enabling environment”).

Outputs 1 and 2 will inform development of a shared understanding on the governance and capacity gaps as well as fiscal and other reforms that need to be addressed.

Output 3: Initial ‘Action Plan’ identifying the most pressing priorities to initiate transition to a blue growth development strategy

It is beyond the scope of this study to address the range of strategic measures that will be required to implement the blue economy in Barbados. This will be comprehensively addressed through the IADB-supported initiative to develop an Integrated Blue Economy Policy Framework and Strategic Action Plan.

It is not the intention of this Scoping Study to duplicate the effort of the IADB. However, it is acknowledged that the Scoping Study should inform the IADB initiative. As such, this Scoping Study aims to highlight the most pressing priorities, actions and opportunities that should be considered for the development of the roadmap including inter alia:

1. identifying key data gaps for operationalizing a blue economy and development of cost-effective solutions;
2. identifying needed policy, fiscal or administrative reforms;
3. identifying ways to generate more value from one or more blue sectors sustainably, including showing how public and private finance could be aligned for transformational change; and,
4. suggesting how a multi-sector or integrated planning approach to balancing interests and setting priorities could be adopted by the government.

This document represents the first two of these three outputs as a single consolidated Scoping Study Report. The third output (Initial Action Plan) is presented as an accompanying document to be read in conjunction with this Scoping Study Report.

This report is divided into three main parts and a total of ten sections, as set out below.
Part I: Background and Scope

- Following Section 1, which provides an introduction to this the Scoping Study report, Section 2 provides a brief introduction to the concept of the blue economy, and sets out the case of Barbados to transition to an ocean-based economy;

Part II: Stocktake

- Section 3 describes the current environmental context including Barbados’ maritime waters and the critical habitats supported therein;
- Section 4 provides information relating to the current economic situation in Barbados including key indicators of economic performance and a brief overview of the national development framework and development priorities;
- Section 5 provides an overview of the various ocean-based economic activities currently undertaken in Barbados and, where this has been possible, their importance to Barbados;
- Section 6 provides a review of the existing ocean governance arrangements in place with specific reference to the existing policy, legal and institutional arrangements;

Part III: Diagnostic Analysis

- Of critical importance, Section 7 describes a range of policy measures that should be pursued in order to strengthen and develop the governance arrangements (enabling environment) relating to the management of Barbados’ maritime space, thereby supporting development of the blue economy in Barbados
- Section 8 provides some initial thoughts on a range of possible development opportunities that could be pursued by the Government of Barbados in order to transition towards a more integrated blue economy-based development framework;
- Section 9 presents some initial thoughts on how the Government of Barbados could implement the blue economy concept as an integrated part of the overall national development framework, taking into account the range of existing and planned initiatives relating to the blue economy; and
- Section 10 presents a summary of the key areas for development and recommendations highlighted in this report as a precursor to the development of the Initial Action Plan.
2 | THE CASE FOR A BLUE ECONOMY TRANSITION

2.1 Economic Contribution of the Oceans

According to the World Bank, the ocean, and the economic activities it supports, is estimated to contribute approximately 2.5 percent to the world’s GDP per annum, a monetary value of approximately US$1.5 trillion. Marine services, such as tourism and shipping, provide the largest proportion (US$880bn), followed by sectors categorised under marine resources (US$377bn) and marine manufacturing (US$107bn). Globally, approximately 350 million jobs are linked to the oceans through fishing, aquaculture, coastal and marine tourism and research activities. Moreover, in excess of one billion people depend on fish as their primary source of protein (Patil et al, 2016).

For small islands and coastal developing states, the ocean’s role as an important generator of subsistence and income is magnified. Perhaps nowhere is this more relevant than in the Caribbean Sea, where, although it covers less than 1 percent of the world’s ocean area, the Caribbean Sea directly supports the economies of 37 coastal and small island countries and territories. This includes a wide range of ocean industries essential to both current and future economic development, such as tourism, fisheries, shipping and ports as well as the provision of environmental goods and services that more broadly support livelihoods. With recent advances in technology, potential blue economy growth areas have also increased and now include aquaculture, ocean-based renewable energy, deep seabed minerals and marine biotechnology.

2.2 The Blue Economy Concept

The blue economy is an approach put forward by the international community to take into account the health of the oceans and seas as it strives to balance the three dimensions of sustainable development: economic, social and environmental. This concept promotes economic growth, social inclusion and improved livelihoods at the same time as ensuring the environmental sustainability of oceans and seas (UNDP, 2018).

The concept considers the ecological systems that provide so many of the services linked to the ocean as underlying and sometimes invisible natural capital assets (for example, fish stocks, coral reef systems, beach and water quality, mangroves, and so on), which help support the more visible economic outputs such as employment and wealth creation. The blue economy seeks to emphasise the connection between the ocean’s ecological systems and ocean-based economic activity (sometimes referred to as the “ocean economy”). In doing so, the blue economy concept recognizes that some activities in the ocean economy depend on the status of the underlying ecological systems (referred to in this instance as “natural capital”), while all activities have the potential to degrade them (Patil et al, 2016).

The World Bank illustrates the concept of the blue economy through a conceptual framework (Figure 1) through the interaction between the broad range of ocean economic activities and the inputs received by those activities from the underlying natural capital. As figure 1 illustrates, there is a “circular interaction” between economic sectors and the marine environment. For example, use of the ocean for waste disposal and the resulting impacts on reefs, beaches, and mangroves and their services generate negative inputs to sectors such as tourism and recreation (Patil et al, 2016).
Figure 1: Conceptual Blue Economy Framework. Source: Patil et al (2016).

If properly managed, many of these natural capital assets are renewable and capable of yielding a sustained flow of benefits. For example, fish stocks are a living resource that provides a flow of inputs into the production of seafood in the ocean economy. Alternatively, ocean economic activities may provide outputs or impacts on the ecosystems and ecosystem processes, for example, coastal development leading to construction or expansion of ports, marinas, harbours, or channels for shipping that change or convert ecosystems such as sea grass beds and mangroves (Patil et al, 2016). Central to the blue economy approach, therefore, is the de-coupling of socio-economic development from the degradation of the marine and other aquatic environment and ecosystems. This approach demonstrates the potential synergy between socio-economic development and marine ecosystem conservation and rehabilitation (UNDP, 2018).

While there is no single accepted definition of the blue economy, the following definitions, used by the World Bank, will be applied throughout this report:

**Ocean Economy** - The economic activities that take place in the ocean, receive outputs from the ocean, and provide inputs to the ocean (Park and Kildow, 2014)

**Blue Economy** - A sustainable ocean economy, where economic activity is in balance with the long-term capacity of ocean ecosystems to support this activity and remain resilient and healthy (Economist Intelligence Unit, 2015)

Based on these definitions, one general interpretation is that the blue economy can maximise the economic value of the marine environment in a sustainable manner that preserves and protects the ocean's resources and ecosystems.
2.3 The Case for a Blue Economy Transition in Barbados

The blue economy is not new to Barbados, which has benefitted from its ocean resources for centuries, with its development of fisheries, its reliance on international shipping to support trade, and its tourism industry that has developed tremendously over the past four decades. There are also strong cultural linkages to coastal resources and their uses.

While a number of blue economy-related initiatives can be highlighted within Barbados, some are still in their infancy with a great potential for increased scope and scale, as formal recognition of the blue economy as an economic driver becomes further established. A development strategy grounded in the blue economy will enable Barbados to promote the growth of existing productive sectors, expand into emerging blue industries, improve food security (through better managed and diversified fisheries), and potentially reduce dependence on imported fossil fuels (through the increasing use of renewable sources of energy, including those derived from the ocean).

Immediately, this addresses different aspects of at least six of the 17 Sustainable Development Goals (SDGs), with the potential to drive progress in several others:

- **Goal 2: Zero Hunger** through the critical role living marine resources play in food security;
- **Goal 7: Affordable and Clean Energy** through the contribution marine renewable sources play in energy security;
- **Goal 8: Decent Work and Economic Growth** through the diversification and growth of marine-based economic sectors; and
- **Goal 13: Climate Action** through the implicit link between the oceans and climate change, and the adaptive measures countries can take to maintain ocean integrity and resilience.
- **Goal 14: Life Below Water** through identifying risks to the marine environment, especially to marine living resources, and proposing strategies that mitigate those risks; and
- **Goal 16: Strong Institutions** through establishing robust national marine regulators and incorporating participatory processes in decision-making about marine management issues.

Moreover, such an economy will be more diversified and less vulnerable to external shocks.

2.4 Priorities for the Blue Economy in Barbados

In developing any national blue economy framework, the MMABE has articulated its aspiration that Barbados wishes to:

> Maximise access to and use of the marine resources that fall under its jurisdiction without jeopardising the health of the ecosystems that Barbados’ maritime space supports, such that this becomes a significant contributor to the national economy.³

In addition, the Minister responsible for Maritime Affairs and the Blue Economy, the Honourable Kirk Humphrey, has defined the following four pillars resting on a foundation pillar that he wishes to address through the development of a national blue economy framework.⁴

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³ Based on comments received from the Ministry of Maritime Affairs and the Blue Economy during the preparation of this report.

⁴ Articulated to the UNDP Project Team during a meeting with Minister Humphrey during the January Scoping Mission to Barbados.
PILLAR 1 - HEALTH: Addressing both health and wellbeing of human populations and the quality and status of the marine environment and the resources it supports. This also takes account of some of the obvious linkages between environmental quality and human health;

PILLAR 2 - TRANSPORT: Including both international and domestic shipping as well as the critical role of port facilities and infrastructure;

PILLAR 3 - PHYSICAL DEVELOPMENT: Addressing physical development needs that both respond to the growth needs of Barbados, while ensuring that all future physical development is climate resilient;

PILLAR 4 - BIO-FUTURE: Addressing the critical role of biological resources (particularly fisheries) to the economy and social fabric of Barbados, while encouraging the development and growth of novel sectors such as aquaculture and marine bio-technology; and

FOUNDATION PILLAR - RENEWABLE ENERGY: As a key driver to decarbonise the economy and increase economic and climate resilience through reducing dependence on imported fossil fuels.

These pillars are also broadly addressed in the Ministry’s strategic goals in its estimates of expenditure for the fiscal year 2020-2021 namely:

1. Improved Transportation - the construction of berths and jetties to facilitate the operation of sea travel along the coastline;
2. Fisherfolk Empowerment - training and skill development in boat building and related areas; enhancement of coastal and marine infrastructure and fish market;
3. Sargassum Seaweed and Fish Silage Utilisation - development of biotechnology products and energy production;
4. Enactment of Legislation - updating of shipping and fisheries legislation; enactment of new legislation governing the activities associated with the blue economy (e.g. plastics ban); and
5. Housing and Hospitality - extension of the south coast boardwalk design and the finalisation of the Coastal Zone Management Plan.

Given the MMABE’s articulated aspiration for the blue economy, if such a framework is developed in Barbados, the following outcomes of the blue economy, identified by the Caribbean Development Bank (CDB, 2018) could be realised:

- Sustainable and inclusive growth and development;
- Reversing the effects of over exploitation and methods of extraction/usage of the ocean’s resources that are either inherently unsustainable or where the impacts of these activities are unknown/uncertain;
- Enhancing the welfare of coastline communities in terms of economic opportunities and social protection; and
- Ensuring resilience of countries to natural disasters and the impact of climate change.
PART II: STOCKTAKE
3 | GEOGRAPHIC AND ENVIRONMENTAL CONTEXT

With a land area of about 432 sq. km and a coastline of 97 km, Barbados is the most easterly of the Caribbean islands. It is located at latitude 13° 10’ N and longitude 59° 35’ W, less than 200 nautical miles from neighbouring islands in the north, west and south. Eighty-five percent of the island is capped by a coral limestone formation which gives the landscape a gently rolling topography, interrupted at points by deep gullies and a series of almost vertical cliffs that are old coral reef formations. The gullies extend from the central upland region to the coastline and form an integral part of the island’s natural drainage system (Government of Barbados, 2010).

On its eastern side Barbados is exposed to the Atlantic Ocean, while the west coast is bounded by the Caribbean Sea. This coastline (along with the southern coastline) is backed by inland limestone cliffs and is the focal point of the island’s tourism industry as well as a large residential population. Lying in the path of the prevailing North-east Trade Winds, the island has a moderate tropical marine climate.

Barbados has an estimated population of approximately 286,600 persons⁵ making it one of the most densely populated countries in the Western Hemisphere, with a density of 663 persons per sq. km (Moore et al 2014). The majority of Barbados’ population is settled along the south-east, south and west coasts of the island, predominantly in the coastal areas of the parishes of St. Philip, Christ Church, St. Michael, St. James, and the southern reaches of St. Peter. The ‘suburbanization’ phenomena emerging from the capital, Bridgetown is expected to continue, leading to the gradual increase in densities to the northwest, north and east of Bridgetown, while most other areas will remain relatively constant.

3.1 Barbados’ Maritime Space

Pursuant to the 1982 United Nations Convention on the Law of the Sea (LOSC) Barbados has claimed a 12 nautical mile territorial sea and a 200 nautical mile exclusive economic zone (EEZ). Barbados has also settled all maritime boundaries with neighbouring countries, agreeing their boundaries with France - in respect of Martinique - in 2009, with St Vincent and the Grenadines in 2015 and with St Lucia in 2017. Barbados’ disputed boundary with Trinidad and Tobago was decided in 2006 by an Arbitral Tribunal constituted pursuant to Article 287 and in accordance with Annex VII of the LOSC. Barbados also shares a small Joint Cooperation Zone with Guyana, in the portion of overlapping international maritime boundary between the two countries.

This gives Barbados jurisdiction and rights over a maritime area of approximately 186,898 square km – approximately 430 times its land area (Figure 2).

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Figure 2: Barbados’ maritime space.

In addition to its extensive EEZ, Barbados has also claimed an area of extended continental shelf to the east of its existing EEZ boundary (Figure 3). This gives Barbados jurisdiction over additional potential seabed mineral resources, although at this stage there is no indication of what these may be.

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6 Barbados received its final recommendations for an extended continental shelf in 2012 but no legislation has been enacted, no maps or charts drawn in respect of Barbados’ extended continental shelf.
3.2 Marine Habitats and Resources

Barbados is, for the most part, surrounded by a narrow shelf of only 342 sq. km, with the 200 m isobath lying between 1.5 and 5 km offshore (Mohammed et al. 2015). The coastline can be divided into five sections, west, southwest, southeast, east and north, each with its own characteristics. The deeper and broader sections of this narrow insular shelf occur off the northeast and northwest coasts.

Barbados' nearshore waters can broadly be divided into two discrete sub-regions: (i) the north, east and south-east coasts (windward side), with high energy environments exposed to the Atlantic Ocean; and (ii) the west and south-west coasts (leeward side), exposed to the more sheltered and shallower waters of the Caribbean Sea.

The south and west coasts are relatively calm and is characterised by a sloping shelf, which supports the greatest diversity of marine habitats in Barbados, including coral reefs (fringing, patch and bank reefs), banks of stony corals, algal reefs, limited areas of seagrasses, and a variety of rocky and sandy habitats.

The north coast has a rock terrace which extends seaward out to a depth of 40 - 60m. At the end of this is a ridge, which runs parallel to shore, and further seaward is another terrace and isolated ridges and mounds. The north-west coast in particular is well sheltered and supports the most extensive and diverse hard coral reefs on the island.
Due to the presence of sustained strong wave and wind energy, as well as to high levels of sedimentation derived from soil erosion along the east coast, the Atlantic coast has less reef development than the Caribbean coast. It is, however, characterised by large areas of limestone pavements, which are dominated by beds of soft corals and associated benthic fauna.

3.3 Coastal and Shallow Reef Habitats

3.3.1 Coral reefs

Coral reefs play a critical role in fostering the productivity of the tropical oceans and are often compared with tropical rainforests in terms of their importance as habitat and the biological diversity they harbour. However, coral reef quality in the Caribbean has been steadily declining over time because of various human activities and environmental changes. Coral reef communities are of immense ecological and socio-economic importance to Barbados: they provide an important habitat and nursery fisheries thereby supporting local fishing communities; they are a vital natural barrier to the erosive action of the sea through reducing onshore wave action; and, they support Barbados’ tourism industry, providing beaches and sites for underwater viewing (including snorkelling, SCUBA diving, glass bottom boats and the single submarine operation on the islands, Atlantis).

A recent mapping of coastal habitat types has been completed by Baldwin et al (2019) (Figure 4). This shows a broad range of different shallow habitat types around the coast of Barbados with nearshore fringing reefs extended for much of the south east and west coasts (between Ragged Point and Harrison Point). Nearshore, fringing reefs extend 300 m out from the beach and to a depth of 10m. The fringing reefs generally have three (3) distinct zones - inner reef (reef flat), the reef crest and the outer (fore) reef.

Extending from these reefs are the patch reefs, which terminate at 30m and seaward of the patch reefs are two bank barrier reefs, which run approximately parallel to the shore and area characterised by a narrow crest and steep landward and seaward slopes (Government of Barbados, 2002).

The inner bank reef is found 700-900 m offshore and the outer bank reef between 1.0-1.3 km (Government of Barbados, 2002). The bank reefs support rich and diverse colonies of hard and soft corals, a high density of sponges and a low density of macroalgae. The bank reefs are generally considered to be healthier than the fringing reefs and patch reefs, although all corals in Barbados exhibit signs of stress, due to physical and sediment damage, groundwater pollution and over-exploitation.
Evidence from Barbados suggests a declining trend in the coral reef health and cover since the 1970s (Jackson et al, 2014). This decrease in reef health has been documented on both the south and west coasts. The decline has affected both the fringing and the bank reefs. More specifically, hard coral abundance, the number of hard coral species, and the abundance of encrusting coralline algae, which acts as a settlement cue for coral recruits, decreased significantly between the 1982 and the 1992 monitoring (Government of Barbados, 2010). Coupled with the degradation of coral reef habitats is the loss of fish biomass and diversity (Schuhmann, Skeete and Waite, 2017).

On the patch reefs there has been a significant loss of area covered by mono-species hard coral, while multi-species hard coral has shown signs of damage from boat moorings, bleaching and sediment smothering in several areas. Surveys have also indicated that multi-species soft coral patch reefs along the southwest coast are being seriously degraded and fish abundance has declined. This is attributed to deteriorating water quality and to over-fishing. It is notable that the practice of harvesting of corals (and other sea life) for sale as curios persists in Barbados despite the practice being illegal (Mahon, 2019).

If these trends continue unchecked, the future viability of coral reefs in Barbados, the activities they support and the benefits they provide looks in serious doubt.
3.3.2 Seagrass

Seagrass meadows are important indicator species of the overall health of coastal ecosystems, as they have high biodiversity and are sensitive to changes in water quality. Typically distributed along the coast in shallow water where sunlight penetration is adequate to facilitate photosynthesis, seagrasses perform many significant functions:

- as primary producers in the food chain of the reef community;
- in fixing nitrogen and storing atmospheric carbon;
- in providing habitats – feeding, breeding, recruitment sites and nursery grounds – for juveniles and adults of reef organisms including the major commercial species;
- in reducing sediment movement in nearshore waters and removing sediments from the water column;
- in decreasing turbidity of the water; and
- in stabilizing the coastline.

Four species of seagrasses have been reported for Barbados namely: turtle grass, manatee grass, shoal grass and tape grass. Seagrass beds have been reported along the west coast at Shermans, Six Men’s Bay, Speightstown and Brighton; along the southwest coast at Carlisle Bay, St Lawrence, Dover, Maxwell, Welches, Oistins, Enterprise and Atlantic Shores; and along the east coast at Bath and Conset Bay.

No estimates of seagrass coverage were found during this scoping study. However, surveys undertaken at St. Lawrence during the last decade indicate that seagrass beds once located in the shallow lagoon have become severely depleted as a result of long-term anthropogenic stress (in this case poor water quality) acting synergistically with acute extreme disturbance events (over-grazing by an exceptionally strong recruitment of sea urchins followed by subsequent storms in 2004 and 2005). After 7 years, this lagoon has shown only minimal recovery, with just a few impoverished turtle grass in areas of coral rubble and a very sparse vegetation of shoal grass appearing in the sand areas (Van Tussenbroek, 2014). This lagoon was the only area with significant sea-grass cover on the west, southwest and southeast coasts of the island. As such, this loss is significant in terms of representative (productive) coastal habitats in Barbados.

3.4 Offshore Ecosystems

Beyond the narrow shelf areas, the waters of Barbados contain extensive deep-water areas, particularly to the east on the Atlantic side where depths of 2,000m or more can be found within 5 nautical miles of the coast. Several banks rise above the general shelf floor, most notably an isolated off-shore bank, locally known as the ‘London Shallows’, off the southeast coast. Several shallow features are also identifiable to the north east of the island (see Figure 5).

From the literature, and from discussions with officials at CZMU, it appears that Barbados’ offshore marine habitats are not well described.

Coastal pelagic habitats in Eastern Caribbean are known to be quite productive, although data on upwelling areas is scarce. This notwithstanding, the waters are known to support extensive stocks of migratory pelagic species such as tuna, dolphinfish and billfishes. Fish landing data support this conclusion, with increased landings of both tuna and billfishes (although catches of dolphin have declined in recent years (Government of Barbados, 2016).
3.5 Marine Species and Biodiversity

3.5.1 Marine mammals

The marine mammal biodiversity around Barbados is largely anecdotal. Information on live sightings primarily comes from commercial and sport fishers and indicates that a variety of species are sighted frequently on fishing trips. Over the past five years, there appears to have been an increase in land based sightings of the migratory humpback whale. Strandings data are collected through the Barbados Marine Mammal Stranding Network and maintained in a database at UWI. There is an opportunity through the CARI’MAM project to conduct acoustic marine mammal surveys. This involves deployment of a hydrophone to determine abundance and diversity. These results will ascertain the potential for sustainable whale watching in the waters of Barbados.

3.5.2 Sea turtles

The three most common species of sea turtles found in Barbadian waters and that nest on the shores of the island are the hawksbill turtle, green turtle and leatherback turtle. The Barbados Sea Turtle Project of the University of the West Indies Cave Hill has been engaging in active conservation, monitoring and research on sea turtles for over 2 decades.
4 | ECONOMIC CONTEXT

4.1 Current Economic Conditions

Since the 1960s, Barbados has made significant progress with its economic development. Barbados is regarded by the World Bank as a “high income” non-OECD country with a per capita income of US$15,410 in 2018. The UNDP Human Development Index (HDI) which combines indicators of a long and healthy life, access to knowledge and a decent standard of living ranks Barbados as a “very high human development” country with a value of 0.8 and a rank of 56 out of 189 countries in the 2020 report.

The World Economic Forum’s Global Competitiveness Index (GCI) which combines indicators of performance in such areas as institutions; infrastructure; ICT adoption; macroeconomic stability; health; skills; product market; labour market; financial system; market size; business dynamism; and innovation capability ranks Barbados at 77 out of 141 countries with a value of 58.9 out of a maximum of 100 in 2018.

The World Economic Forum (WEF) has also identified three stages of development through which countries pass: the factor-driven stage (in which competitive advantage is based mainly on the use of low-wage labour and unprocessed natural resources); the efficiency or investment driven stage (in which competitive advantage is based on producing products and services in a highly efficient manner supported by investment in infrastructure, supportive government administration, investment incentives and skilled labour) and the innovation-driven stage (in which competitive advantage is based on the ability to produce innovative goods and services using advanced technology which is available on the global market) [see World Economic Forum, 2001]. The WEF’s Global Competitiveness Report notes that Barbados has made the transition from the “efficiency or investment” stage of development to the “innovation” stage of development with a focus on unique and new products. It is expected that the development of the blue economy would contribute to the production of “unique and new products”.

As a small island developing economy with a population of approximately 287,000 persons in 2018 and a land area of 166.4 square miles (432 square kilometres), Barbados faces several economic challenges associated with limited land-based natural resources, small domestic markets for a range of goods and services and weak inter-sectoral linkages. Up to the 1950s, the production and export of sugar was the main economic activity and accounted for the main sources of employment and foreign exchange earnings. The adoption of development planning in the 1950s resulted in policies to diversify the economy. Initial attempts at diversification and the creation of jobs especially for young females started with the promotion of light export manufacturing in the late 1950s. The limited scale of such activity gradually saw a push towards the development of the tourism industry especially from the 1970s. The tourism industry has emerged as a dominant area of economic activity in recent years as Barbados shifted its orientation from a goods-based economy to a services-based economy. The 1980s saw the emergence of an international business sector as a complementary foreign exchange generating activity and the employer of highly skilled persons (see for example, Downes (2001); Worrell (2020)).

Over the years the economy has had to weather various external economic shocks such as oil price increases and recessions in the country’s main trading partners. Although the country has not suffered, like other Caribbean countries, from the shocks associated with natural disasters such as hurricanes, earthquakes and volcanic eruptions, it has had occasional adverse effects arising from floods associated with passing storms. In recent times, the effects of climate change in the form of sea level rise have gradually impacted on the coastline upon which the tourism industry depends heavily. Economic development planning has therefore had to take several of these challenges into consideration as the
country seeks to expand economic activity through diversification in order to improve the livelihoods of the population.

An examination of the economic growth performance over the past two decades (2000 to 2018) shows that Barbados recorded an average growth rate of under 1 percent. During the period, the economy experienced shocks associated with the September 11, 2001 terrorist attack in the USA and its aftermath and the Great Recession (occasioned by the global financial and economic crisis) over the period December 2007 to June 2009 which resulted from the bursting of the USA housing bubble and its associated global contagion effects. While the economy was able to recover rather quickly from the effects of the terrorist events, the economy has experienced little or no growth in real GDP since 2007 (Figure 6). The growth performance since 2007 point to the vulnerability of the economy to external shocks and the challenge of building resilience in a small developing economy.

![Graph showing GDP growth rate 2000-2018](image)

Figure 6: Barbados real GDP growth rate 2000-2018 (%). Source: Central Bank of Barbados.

An examination of the economic structure of the economy since 2000 indicates a continual decline of the contribution of the agricultural and manufacturing sectors to overall production and a growth of the services sectors led by distribution, business and general services, government and tourism (Table 1).
Table 1: Barbados distribution of real GDP (1974 prices) for selected years 2000 to 2017 (%).

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<td>Sugar</td>
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<td>6.0</td>
<td>4.7</td>
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<td>4.0</td>
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<td>9.4</td>
<td>6.1</td>
<td>5.2</td>
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<td>22.0</td>
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<tr>
<td>Business/General Services</td>
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<td>20.5</td>
<td>21.3</td>
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<td>14.0</td>
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<td>16.3</td>
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<tr>
<td>TOTAL</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
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The creation of jobs to employ a labour force of over 144,000 persons has been a challenging issue in Barbados. Unemployment especially among the youth has been a pressing socio-economic problem facing the country. Data on the unemployment over the period 2000 to 2018 indicate that the overall unemployment rate varied between 8.1 and 12.3 percent, with the female rate being higher (between 8.5 and 12.8 percent) than the male rate (between 6.4 and 12.3 percent) (Figure 7). The unemployment of 9.7 percent in 2018 translated into 6,100 males and 7,500 females (13,600 persons) being unemployed on average during the year.

Figure 7: Barbados unemployment rate 2000-2018. Source: Barbados Ministry of Labour website.
The sectoral distribution of the employed labour force largely reflects the distribution of output with tourism, distribution, government and business services being the main contributors.

An interesting feature of the Barbados labour market is the increase in persons reporting themselves as being "self-employed". Between 2000 and 2018, the number of self-employed increased from 15,900 in 2000 to 23,000 in 2018. The number of private sector employees fell from 84,900 in 2000 to 77,500 in 2018, while the number of government employees also fell from 27,300 in 2000 to 23,600 in 2018. Another interesting feature of the labour market is the high percentage of persons without any form of certification although schooling is compulsory up to the age of 16 years. In 2003, 48 percent of the employed labour force (62,000) had no certification (that is, did not pass any certificate awarding exams), while in 2018 the value was 36.5 percent (46,100). Most of these persons are classified in "elementary occupations" and service occupations. Coupled with a very high percentage of the unemployed labour force having no certification, Barbados has been seeking to address this labour supply problem to meet the demand of the modern age. There has however been an increase in employed persons with university degrees, from 11,900 in 2003 to 20,500 in 2018.

One of the socio-economic objectives of developing the blue economy is to raise incomes and thus reduce the degree of poverty in the country. Available data on poverty in Barbados indicate the household poverty rate increased from 8.7 percent in 1996/7 to 15 percent in 2010 and 17.5 percent in 2016/17. The individual poverty rate increase from 13.9 percent in 1996/7 to 19.3 percent in 2010 and 25.7 percent in 2016/7 (see IADB, 1998, SALISES, 2012 and IADB, 2018). There was however a reduction in extreme household poverty from 6.8 percent in 2010 to 3.4 percent in 2016/7. While the high levels of poverty during the 2010 and 2016/7 periods can be attributed to the significant declines in economic activity associated with the Great Recession (see Figure 6), there are systemic factors underlying poverty in Barbados. The conclusions of the aforementioned studies indicate that poverty in Barbados is largely associated with low levels of human capital (education and training), large households which are female headed and with a high proportion of dependents (children and the elderly) and unemployment or low paying jobs amongst those of working age. The development of the blue economy would therefore be expected to provide training and skill development for new jobs and hence increased incomes for employed labour force.

As indicated above, the economic environment has been very challenging over the 2000 to 2018 period. Macroeconomic management has been a component of the government’s economic programme as it sought to respond to various economic shocks. The inflation rate was relatively high during the 2006 to 2012 ranging from between 3.6 and 9.4 percent. There was some dampening in inflation between 2012 and 2016 but it started to creep up after 2016.

The government’s fiscal accounts were under pressure with a rise in the fiscal deficit as a percentage of GDP between 2006 and 2016. This resulted in a growth of the public debt and a rise in the government interest payments as a percentage of GDP. Declining foreign exchange reserves lead to a reduction in import cover from 20 weeks in 2007 to 5.3 weeks in 2017 (Table 2).
The government sought to manage the deterioration with a series of policy measures as outlined in the following documents:

- Medium Term Fiscal Strategy 2010-2014 (January 2010);
- Medium Term Development Strategy of Barbados 2010-2014 (February 2011);
- Revision of the Medium Term Fiscal Strategy 2010-2014 (November 2011);
- Barbados Growth and Development Strategy 2013-2020 (2012);
- Barbados Sustainable Recovery Plan 2018 (December 2017);
- Budgetary Proposal and Financial Statement (various years)

With a change in administration of the government in May 2018, the decline was halted with the implementation of a Barbados Economic Recovery and Transformation (BERT) programme in association with the International Monetary Fund (IMF). This programme which is being implemented in three (3) phases has 3 key elements: upfront fiscal adjustment to realise a primary fiscal surplus of 6 percent of GDP by the end of the fiscal year 2019/2020; the reform of state-owned enterprises and the implementation of structural reforms to support economic growth.

Several specific measures have been implemented under the BERT programme: increases in a range of taxes and fees, reduction in government expenditure especially transfers and subsidies, the

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**Table 2: Barbados macroeconomic indicators 2006-2018.**

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<td>4.0</td>
<td>8.1</td>
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<td>5.8</td>
<td>9.4</td>
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<td>1.8</td>
<td>1.8</td>
<td>-1.1</td>
<td>1.5</td>
<td>4.5</td>
<td>3.7</td>
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<td>Gross Foreign Reserves (BDS$sm)</td>
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<td>1549.9</td>
<td>1343.3</td>
<td>1477.4</td>
<td>1423.7</td>
<td>1414.8</td>
<td>1510.3</td>
<td>1203.6</td>
<td>942.6</td>
<td>878.0</td>
<td>640.0</td>
<td>411.4</td>
<td>999.6</td>
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<td>Foreign Reserves Cover (wks)</td>
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<td>20.9</td>
<td>16.2</td>
<td>20.9</td>
<td>18.3</td>
<td>17.7</td>
<td>18.1</td>
<td>14.6</td>
<td>11.6</td>
<td>11.2</td>
<td>8.2</td>
<td>5.3</td>
<td>12.8</td>
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<tr>
<td>BOP Current Account (% of GDP)</td>
<td>-8.2</td>
<td>-5.4</td>
<td>-10.6</td>
<td>-6.7</td>
<td>-5.5</td>
<td>-12.0</td>
<td>-9.0</td>
<td>-10.1</td>
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<td>-6.1</td>
<td>-4.3</td>
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<tr>
<td>Gross Public Sector Debt (% of GDP)</td>
<td>79.8</td>
<td>81.8</td>
<td>90.9</td>
<td>104.0</td>
<td>96.7</td>
<td>106.1</td>
<td>118.2</td>
<td>128.5</td>
<td>132.1</td>
<td>141.6</td>
<td>151.2</td>
<td>148.4</td>
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<td>06/07/08/09/10/11/12/13/14/15/16/17/18/19</td>
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<td>07/08</td>
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<td>09/10</td>
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<td>12/13</td>
<td>13/14</td>
<td>14/15</td>
<td>15/16</td>
<td>16/17</td>
<td>17/18</td>
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<tr>
<td>Fiscal Deficit (% of GDP)</td>
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<tr>
<td>Fiscal Current Account (% of GDP)</td>
<td>1.7</td>
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<td>-3.1</td>
<td>-6.6</td>
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<td>-3.0</td>
<td>-2.8</td>
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<tr>
<td>Revenue (% of GDP)</td>
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<td>28.3</td>
<td>25.3</td>
<td>25.6</td>
<td>29.3</td>
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<td>Expenditure (% of GDP)</td>
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<td>34.7</td>
<td>33.1</td>
<td>33.4</td>
<td>29.6</td>
</tr>
<tr>
<td>Govt Interest Payments (% of Revenue)</td>
<td>14.7</td>
<td>13.9</td>
<td>15.3</td>
<td>18.8</td>
<td>22.3</td>
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<td>26.9</td>
<td>26.9</td>
<td>12.9</td>
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restructuring of government debt to reduce interest payments and lower annual repayments, the closure or amalgamation of some state-owned agencies, the provision of special financial measures to promote small business activity and the enactment of legislation and other measures to ease the process of doing business in Barbados. The specific creation of ministries to promote the creative business sector (the orange economy) and the blue economy can be viewed as the implementation of structural reforms to diversify the economy and support economic growth which has been anaemic over the past decade.

4.1.1 Impacts of COVID – 19 on the Barbados economy

The International Monetary Fund (IMF) predicts a 7.8% decline in Barbados’ GDP in 2020, and a 7.1% rebound in 2021. The IMF’s baseline scenario assumes that the COVID-19 pandemic fades globally during the second half of 2020 and allows the global economy to unwind the restrictions on economic activity. The prediction is for a 3% contraction in global economic activity and a 5.8% recovery in 2021.

A more detailed analysis of the likely impact on the key tourism industry is revealing. Under the realistic scenarios for a shorter lockdown of the domestic economy, a reopening of tourism in August would lead to a 13% decline in total output, while a reopening of tourism in November would lead to a much steeper 17% decline in total output.

The worst-case scenarios stem from the possibility that the immunity from COVID-19 does not last for a very long time, meaning that significant portions of the population in highly urbanised countries can become re-infected. This can lead to multiple waves of the COVID-19 virus. In this case, it is assumed that the tourism sector is unable to reopen by the end of 2021. In the case of a 5-week lockdown and no reopening of the tourism sector, GDP could fall by as much as 18% in 2020. In the case of a much longer domestic lockdown lasting 23 weeks, and no return of tourists, the worst case scenario is for a 25% decline in GDP in 2020 and only a small recovery of 8% in 2021.

Women’s employment is generally concentrated in less cyclical sectors, like healthcare and education. While during “standard” downturns (i.e. 2008 financial crisis) this shields women from being heavily affected, it means that women will suffer greater consequences in the COVID-19 recession. The women working in essential sectors like healthcare have to keep working, which they will find increasingly difficult as their childcare duties also increase (due to school closures). Women also tend to be more heavily represented in services occupations, like restaurants and hospitality. The women working in this sector are likely to be out of a job for a potentially long time, especially for occupations that rely on tourism.

Fiscal Revenue is expected to be impacted by a fall in economic activity which comes as a direct result of a near 100% fall in tourist arrivals and the spill-over effects this major decline would have on employment and overall aggregate demand. At the same time, expenditure will be impacted as Government-announced measures to smooth demand and support the most vulnerable will be partially-funded from central government budget.

It is expected that without a vaccine to resolve the covid-19 pandemic, the character of the tourism and leisure aspect of the blue economy will change. The Government of Barbados has established a Jobs and Investment Council to identify ways in which new investment can be mobilized and jobs created in a covid-19 environment. The Council is expected to make submissions on transforming the Barbadian economy to create 20,000 jobs within two years, training persons for the new jobs especially in the services and creative sectors, providing for food security, enabling housing infrastructure, facilitating trade and supply logistics and infusing the country with digital technology. With respect to the blue economy, it is expected that protocols will be developed to govern the operation of the tourism and leisure sector which is highly labour- and service-oriented. These protocols can reduce the demand for tourism services and hence adversely affect the growth of this component of the blue economy.
4.2 National Economic Development Framework and Development Priorities

The current discussion about the blue economy is part of an evolutionary economic development process in Barbados. Most elements of the blue economy have been part of general economic activity over the decades - fishing, boat building and repair, port operations and shipping and maritime tourism. As a small island economy it is expected that some forms of maritime activity would be part of the economic landscape.

Insofar that a critical aspect of the blue economy is concerned with the sustainable use of ocean and coastal resources, the discussion on sustainability started in the early 1990s with the preparation of the *Barbados National Report to the United Nations Conference on the Environment and Development* in 1992 (the Rio conference) and the hosting of the global conference on the sustainable development of small island developing states in Bridgetown, Barbados, 25 April to 6 May 1994. Although these discussions centred on land-based economic activity, for SIDS, ocean based activities and their effects on the environment were of critical concern.


These early policy documents provided the basis for the inclusion of a specific goal in the *National Strategic Plan of Barbados 2006 to 2025*, published in 2007, on “Building the Green Economy - Strengthening the Physical Infrastructure and Preserving the Environment”. This goal makes specific reference to protecting the “coastal waters and coastline” and the “fragile marine ecosystem “and transforming the economy of Barbados into a “more environmentally sustainable one”. Reference is also made in the Plan to the exploitation of the natural resources within Barbados’ maritime space for the development of fisheries, hydrocarbons and other seabed minerals.

The discussion continued with the development of a “green economy” for Barbados with the establishment of a working group to undertake a scoping study of the green economy for Barbados. The group’s report was finalised in 2014 and included several aspects which now contribute to the “blue economy” (Moore et al 2014). Fisheries and tourism were identified as key sectors which can contribute to the transition to a green economy in Barbados. Policy recommendations with respect to these sectors referred to “strengthening the fisheries development and management regime to ensure sustainable levels of catch”, “establishing a marine management agency and code of conduct for responsible fisheries” and “establishing new heritage and nature-based tourism sites”. The development of renewable forms of energy and appropriate systems of waste management were also considered to be critical aspects of the “blue economy”.

The *Barbados Growth and Development Strategy 2013-2020* also makes reference to the development of a “green economy” in the context of restructuring the economy and mitigating and adapting to the effects of climate change. As in previous policy documents, elements of the blue economy are included in the range of green economy initiatives especially as it relates to the tourism sector and fisheries. Some of these initiatives included:

- Strengthening the Fisheries Division and harmonising the supporting legislative framework;
- Creating a business framework for the development and management of marine protected areas
• Designing fiscal incentives to promote the use of fish waste in the agricultural sector;
• Promoting investment in marine protected areas such as the Folkstone Redevelopment Programme

With the change in government administration in May 2018, there was a concerted effort to fully establish a “blue economy” while still having a commitment to the building of a “green economy”. The government established a Ministry of Maritime Affairs and the Blue Economy with responsibility for:

• Preserving the country’s coastline, marine environment, the health of the reefs and the habitats of the marine plants and animals;
• Ensuring the sustainable use and development of fisheries, marine assets, resources, minerals and species for both sustainable recreation and decent livelihoods.

The Ministry is expected to develop the policy framework which would allow Barbados to fully exploit its marine space within the country’s EEZ. Such a policy framework would contribute to the economic diversification process, the creation of jobs both directly and indirectly and the generation of foreign exchange.

A green economy-blue economy governance committee has been established to develop an integrated approach to the development of the two aspects of the economy in keeping with the principles of sustainable development.

In the Throne Speech delivered on June 5, 2018, the new administration of Government outlined a new Five-year economic and social transformational agenda in line with the BERT programme. This broad framework provides the setting within which the blue economy would be developed over the coming five years (2018 to 2023).

The key elements of the economic transformation framework include:

1. **The Creation of New Frontiers of the Economy** - the Green Economy, the Blue Economy, the Creative or Orange economy and the Digital economy. There would be linkages among these “economies” as the government seeks to diversify the Barbadian economy in such a way to expand the range of goods and services, create employment and generate foreign exchange.

2. **The Establishment of Special Economic Zones linked to the new “economies”** - Bridgetown (Creative and Digital); Speightstown (Creative and Blue); Holetown (Creative and Blue); St Lawrence Gap (Creative); Oistins (Blue) and Six Roads (New Industrial).

3. **The Development of New Financial Instruments to support the new sectors** - Trust loans, Sovereign Wealth Fund, Special Purpose Instruments, Capital Market Development.

4. **The Promotion of Innovation and Entrepreneurship** - the provision of special awards and special funds.

5. **Social Development Initiatives to support the economic transformation process** - human resources development in terms of educational reform and training for skills development, and improving the health and wellness of the population.

6. **Governance Arrangements to improve human security and the empowerment of the population.**

The Government’s role in the transformation process is to facilitate private sector development by easing the process of doing business in Barbados, restructuring and modernising public sector operations to reduce the costs of providing public services, enacting the necessary legislation and regulations to bring order and certainty to various transactions and to empower the population to
become more involved in the development of the country. Where necessary, the Government would engage in limited direct economic activity as part of a “crowding in” process.

The blue economy would therefore play an integral role in the transformation process by forging linkages with other sectors or “economies” being developed in the country. Its development would be facilitated through the provision of finance to operators (both domestic and foreign), the education and training of the labour force and the establishment of the legislative and regulatory framework to ease the process of doing business in the “economy”. Given the nature of the “blue economy” it is expected that collaboration with other countries which form the CARICOM Single Market and Economy will occur. Indeed, some joint agreements have already been established to explore and exploit the resources within the exclusive economic zone. In addition, Barbados would have to draw on the resources of the development partners and foreign direct investors to fully exploit the resources within the “ocean economy” surrounding the country.
5 | OCEAN-BASED ECONOMIC ACTIVITIES IN BARBADOS

Marine uses and activities already contribute significantly to the overall economy of Barbados, through direct economic activities, indirect support to service industries and the provision of environmental services. The list of sectors relevant from a maritime perspective is very wide. Applying the World Bank definition, the economic activities that make up the ocean economy (and thereby support the blue economy) can be represented by a series of ‘maritime functions.’ For the purposes of this Scoping Study, the project team has identified the following five core functions that broadly reflect the sectors that support the blue economy in Barbados:

- **Tourism and leisure** - including all forms of maritime tourism, recreation and amenity use.
- **Harvesting of marine living resources** - including capture fisheries, aquaculture and a broad range of applications under the heading of “biotechnology” relating to nutrition, health and well-being.
- **Ports and shipping** - including international and domestic shipping and port infrastructure.
- **Extraction of non-living resources and energy generation** - including petroleum, mineral resources and ocean-based renewable energy.
- **Ocean health and ecosystem services** - including marine ecosystem services and the management measures needed to ensure their long-term sustainability.

5.1 Tourism and Leisure

From an economic perspective, the tourism sector remains one of the island’s primary and most consistent income generators. Total tourism receipts for 2016 were estimated at BDS 2,090 million, (Government of Barbados, 2016) accounting directly for 12.9 percent of GDP and 62.1 percent of the country’s exports.

Tourism is also a major generator of employment with 17,500 workers directly depending on tourism for their living. This includes employment by hotels, travel agents, airlines and other passenger transportation services. The overall contribution of this sector to employment, including wider effects from investment, the supply chain and induced income impacts is even higher, accounting for some 52,000 jobs in 2017 (40.5 percent of total employment) (Dal and Fernandez-Stark, 2017). Barbados ranks ahead of the regional average in terms of the relative contribution of tourism to the overall economy in many key indicators. Table 3 below provides a summary.

Tourism does not only generate economic activity and provide employment for many individuals but also makes an indirect contribution to economic activity in other industries such as agriculture, distribution and construction (Francis et al, 2016). Visitors to Barbados fall into two broad categories – stay-over visitors and cruise visitors. A third category, yacht tourists, also contributes to overall tourist numbers but it has not been possible to discern the numbers of yacht tourists visiting the island during this Scoping Study. Recent trends in these main categories are illustrated in Table 4 below.

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>BARBADOS</th>
<th>CARIBBEAN AVERAGE</th>
<th>GLOBAL AVERAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct contribution to GDP</td>
<td>12.9</td>
<td>4.7</td>
<td>3.1</td>
</tr>
<tr>
<td>Total contribution to GDP</td>
<td>39.9</td>
<td>14.9</td>
<td>10.2</td>
</tr>
<tr>
<td>Direct contribution to employment</td>
<td>13.3</td>
<td>4.2</td>
<td>3.6</td>
</tr>
<tr>
<td>Total contribution to employment</td>
<td>39.8</td>
<td>13.4</td>
<td>9.6</td>
</tr>
<tr>
<td>Share of total investments</td>
<td>23.3</td>
<td>12.3</td>
<td>4.4</td>
</tr>
<tr>
<td>Percentage of total exports</td>
<td>62.1</td>
<td>20.7</td>
<td>6.6</td>
</tr>
</tbody>
</table>

Table 4: Visitor arrivals by main category. Source: Barbados Tourism Marketing Inc – Annual Statistic Reports.

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stay-over Tourists</td>
<td>519,635</td>
<td>591,872</td>
<td>631,513</td>
<td>680,269</td>
</tr>
<tr>
<td>Cruise Visitors</td>
<td>586,615</td>
<td>594,096</td>
<td>681,211</td>
<td>675,789</td>
</tr>
</tbody>
</table>

Figures from the World Travel and Tourism Council (WTTC, 2018) suggest that stay-over visitors to the island spent an estimated total of US$ 1.1 billion in 2018, 84 percent of which came from three markets (UK, USA and Canada). This equates to an average visitor daily spend of US$182.88. In contrast, the contribution from cruise ship passengers was only US$35.1 million in 2018, which represents only 0.3 percent of the total visitor spend. This equates to an average spend per cruise passenger of US$59.16.\(^7\)

5.1.1 Cruise ships

Cruise tourism represents approximately 50 percent of total visitors to Barbados, although this number has fallen in the last few years. The cruise sector in Barbados is seasonal, with the peak cruise season being between October and April. All cruise ships visiting Barbados currently berth at the Port of Bridgetown, although plans are underway to develop a dedicated cruise berth facility at Sugar Point.

Cruise tourism’s contribution to the broader tourism portfolio depends on the metric used to measure it. In 2018 it provided more than half of the country’s overall visitors, while at the same time the number of port calls reached a recent historical apex. On the other hand, the evidence suggests that, in general, cruise ship tourists spend considerably less in the destination than stay over tourists. Thus, while the total number of cruise passengers arriving in the Bridgetown port has increased in recent years, the average amount of money they are spending has declined. According to Daly and Fernandez-Stark, (2017), the total number of onshore visits from cruise customers increased 67 percent in the period from the 2005/06 cruise season to 2017/18, from 405,300 to 675,789, whereas the average expenditure per passenger fell 47 percent during that same period, from US$111.82 to US$59.16.

A similar analysis, undertaken by Business Research and Economic Advisers (BREA) (2015) estimated average passenger spending in 2015 to be US$78.03. Crew expenditure represents a similarly modest contribution with the average crew members spending US$34.00 on shore (BREA, 2015). Other cruise

\(^7\) Figures published by the Barbados Tourism Marketing Inc. 2018 Annual Statistical Data.
related income is also modest. In addition, Barbados receives revenue from port fees as well as wharfage, bunkering and fuel charges. In addition to net payments to local tour operators, cruise lines also provided data for two other categories: 1) payments to ports for passenger taxes and port services, such as navigation and utility services, and 2) payments to local businesses for supplies and services, such as food and beverages and other stores. Moreover, cruise tourism only accounted for roughly 9% of total tourism employment.

Whatever the true figure, the total cruise tourism spend remains one of the highest overall for countries in the eastern Caribbean, with the exception of St Kitts and Nevis (Table 5).

Table 5: Total cruise tourism expenditures ($US millions) by destination (Figures based on 2014/2015 Cruise Year). Source: BREA (2015).

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>TOTAL CRUISE TOURISM EXPENDITURE (US$ MILLION)</th>
<th>AVERAGE PASSENGER EXPENDITURE (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antigua and Barbuda</td>
<td>43.9</td>
<td>64.88</td>
</tr>
<tr>
<td>Barbados</td>
<td>57.3</td>
<td>78.03</td>
</tr>
<tr>
<td>British Virgin Islands</td>
<td>26.2</td>
<td>69.43</td>
</tr>
<tr>
<td>Dominica</td>
<td>14.2</td>
<td>50.81</td>
</tr>
<tr>
<td>Grenada</td>
<td>12.2</td>
<td>46.55</td>
</tr>
<tr>
<td>Guadeloupe</td>
<td>38.2</td>
<td>90.06</td>
</tr>
<tr>
<td>Martinique</td>
<td>22.7</td>
<td>68.99</td>
</tr>
<tr>
<td>St Lucia</td>
<td>57.2</td>
<td>78.44</td>
</tr>
<tr>
<td>St Kitts and Nevis</td>
<td>84.3</td>
<td>111.30</td>
</tr>
</tbody>
</table>

Homeporting (air-to-sea), on the other hand, has been performing well and recorded solid growth in both the number of homeporters and their average per passenger spend, which rose dramatically from US$85.94 per passenger in 2015 to US$144.78 in 2018. The Government has made a focussed effort to increase the contribution from home porting and, it would appear, this has paid off.

This notwithstanding, the future of the cruise sector remains challenging. The National Cruise Development Commission (NCDC, 2019) has identified the following key challenges, contributing to the underperformance of the sector in Barbados:

1) An aging and aesthetically limited Port infrastructure;
2) An uncompetitive and unappealing shopping environment;
3) A limited number of tourism attractions and the absence of new products;
4) Too much consolidation of cruise sector-related representation and product distribution;
5) Limited implementation of strategic objectives by government institutions; and
6) The need for Barbadian SMEs to raise their game [sic] (NCDC, 2019).

One of the key constraints continues to be the suitability of the existing port facilities as a cruise terminal and plans have been developed to construct a dedicated cruise terminal at Sugar Point. However, the cost of financing the venture still needs to be resolved.
5.1.2 Recreational yachting

Barbados has historically been a popular stop-over for sailing vessels cruising the Caribbean, since it is the most seaward of the islands in the Eastern Caribbean. However, in recent years anecdotal evidence suggests that Barbados has been unable to compete with other, more favourable, destinations such as Antigua, St. Bart’s, St. Lucia and the Virgin Islands.

During this Scoping Study, the UNDP project team were unable to identify data on the precise numbers of yachts visiting Barbados and it is therefore not possible to determine the contribution of this sub-sector to the overall economy of Barbados. However, what is clear is that, compared to a number of other islands in the region, Barbados has limited facilities for visiting yachts, and those that are available tend to target large expensive yachts.

Caribbean marinas offer ostensibly five business services: (i) wet storage and anchorage; (ii) charter services; (iii) boat servicing, repairs, and chandlery; (iv) accommodation and recreational amenities; and (v) hurricane shelter. Wet storage is the main revenue generator, and many Caribbean facilities provide standard electricity and drinking-water hook ups at all berths, in addition to cable television and wireless internet connectivity. Increasingly, marinas also provide visitor accommodation in addition to bars, restaurants, gift shops, showers and laundry facilities (Phillips, 2014).

Generally speaking, the yachting sector is likely to only employ a small number of people, but the sector consumes goods and services such as fuel, food, landing & docking fees, maintenance and repair services, harbour fees, souvenirs and land-based tourism services such as accommodation, taxis, car hire, restaurants and diving. Furthermore, unlike cruise ship visitors, who stay for a matter of days, the yachting tourist (and yachts) generally stay longer, provided the services and facilities are adequate. In this regard, Barbados does offer a number of world-class marina and yachting facilities, especially on the north-western coast of the island:

- Bridgetown Port - Careenage Marina
- Port St Charles - six mega-yacht berths that can accommodate yachts up to 250ft. Two offshore anchoring mooring buoys that can accommodate yachts in excess of 250ft.
- Port Ferdinand 120 fully serviced yacht berths
- Barbados Yacht Club –100 moorings in Carlisle Bay with a draught max of five meters. Facilities limited to beach haul-out and hard standing only

In addition, the visiting yachting tourist can, and frequently will, spend time at different anchorages and moorings, therefore the number of yachts within a given location is variable and subject to change.

According to a study by ECLAC (Phillips, 2014) the yachting and marina services sub-sector is widely regarded as having significant economic potential across the Caribbean region.

While opportunities may exist to further develop the recreational yachting sector in Barbados, little, if any information is available with respect to the current contribution of this sector or, more importantly, the opportunities to develop and expand this sector.

5.1.3 Underwater viewing

The tourism sector supports a number of different activities that can be classified as “underwater viewing”. These include snorkelling, SCUBA diving, glass bottomed tour boats, run by a number of operators along the West Coast, and submarine safari tours operated from Bridgetown by Atlantis Submarines. Due to the narrow shelf and limited coral cover around the island, in addition to the coral reefs along the west coast, this sector relies on an extensive collection of wrecks, at various stages of maturity, six of which are situated in Carlisle Bay.
Although there are negative impacts associated with mass coastal tourism, underwater viewing activities have the potential to generate substantial revenues. However, balancing the requirements of reef conservation with the needs of local host economies represents a considerable challenge to managers and policy makers (Kirkbride-Smith, Wheeler and Johnson, 2013).

In the absence of formal statistics for diving in Barbados, Schuhmann et al. reported between 30,000 and 50,000 divers visiting the island per year (Schuhmann, Casey and Oxenford, 2008). Of these, over half were return visitors, with some individuals having over thirty previous visits to Barbados.

The SCUBA sector in Barbados broadly reflects the sector in other Caribbean countries although, in a recent study on diver preferences, it was found that divers to Barbados were older in comparison to other studies conducted worldwide, a fact that is likely to be a function of cost. It should be noted that there is an increasing global trend for female divers to be more represented (In the Barbados study 40% were women). The provision of well-conceived artificial reef diving sites, such as those situated within the Carlisle Bay area, appears to be a factor in the decision of some divers to visit Barbados. As such, growth of this sector could be driven by a greater focus on the installation of new artificial reefs, including in deeper waters to attract more experienced and adventurous divers.

![Locations of artificial reef and natural reef diving sites and diving schools. Source: Kirkbride-Smith, Wheeler and Johnson (2013).](image)

While it is recognised that tourism is a significant economic sector, and relies heavily on the quality of the marine environment, no assessment of the economic value of tourism in terms of the blue economy is available. No information was identified by the project team to assess the potential economic value of these sectors. This notwithstanding, further efforts could be made to assess the relative contribution of this important sub-sector to the economy and, therefore, the extent to which tourism is dependent on the marine environment. This would start to provide a more accurate assessment of the “economic contribution” of the tourism sector in terms of the blue economy.
5.2 Marine Living Resources

5.2.1 Capture fisheries sector overview

Fishery resources in Barbados supply a range of goods and services, including food, recreation opportunities and ecosystem services. They generate direct market benefits by way of jobs, income and other tax revenue, as well as foreign exchange through exports and foreign exchange savings from reduced food imports (Moore et al, 2014). Notwithstanding this broad range of benefits derived from fisheries, the contribution of fishing to Barbados is usually referred to in terms of the economic contribution - usually cited as ranging between US$12-16 million per annum, based on the ex-vessel (the value of landed raw fish delivered by a fisher) and retail prices collected at the major markets, which is an approximate contribution to GDP of 0.15 percent.

However, Mahon et al (2007) note that this value is only 20 percent of the total value of the fishing industry, when value-added is considered. In 2006, for example, the overall value added for different local fisheries was estimated at over US$ 25 million compared with the ex-vessel GDP estimate of US$ 7.5 million. The value added component ranges from 0 percent in the case of sea eggs (which have restricted harvesting periods) to 88 percent of the total value in the case of flyingfish, and is higher for offshore catches, which are either processed and exported, or are cooked and served at fish frys and restaurants, than it is for inshore catches, which are most often sold directly to consumers. Hence, the normal metrics for the value of the fisheries sector probably significantly undervalue its true economic contribution.

According to the Government of Barbados, in 2016 an estimated total of 1,436 tonnes of fish was landed, representing a 47.5 percent decline from the estimated total landings of 2,735 tonnes in 2013 and representing a fluctuating trend in the long term average landings (Table 6) (Government of Barbados, 2016).

Thus, while the fisheries sector contributes a small share of GDP in Barbados, the broader socio-economic benefits of fisheries are more significant and include the value of the support services to the fishing industry, the value of fishing and fish products in attracting visitors to the island, the value of fish as food in maintaining the health of Barbadians and therefore reducing health costs, and the value of fisheries in the culture and identity of Barbadians. The true economic value of fisheries resources is for the most part unknown in Barbados (Moore et al, 2014).

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8 According to UNCTAD, the value of marine capture fish production in 2016 was US$7,910,852.
Table 6: Fish landings by type (Tonnes). Source: Government of Barbados (2016).

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Flyingfish</td>
<td>2,424</td>
<td>908</td>
<td>354</td>
<td>1,909</td>
<td>1,314</td>
<td>378</td>
<td>469</td>
</tr>
<tr>
<td>Dolphin</td>
<td>465</td>
<td>505</td>
<td>459</td>
<td>514</td>
<td>278</td>
<td>373</td>
<td>405</td>
</tr>
<tr>
<td>Kingfish</td>
<td>29</td>
<td>27</td>
<td>26</td>
<td>22</td>
<td>21</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>Billfish</td>
<td>27</td>
<td>44</td>
<td>46</td>
<td>46</td>
<td>55</td>
<td>83</td>
<td>76</td>
</tr>
<tr>
<td>Tuna</td>
<td>117</td>
<td>114</td>
<td>184</td>
<td>178</td>
<td>211</td>
<td>247</td>
<td>307</td>
</tr>
<tr>
<td>Snapper</td>
<td>28</td>
<td>10</td>
<td>19</td>
<td>14</td>
<td>11</td>
<td>21</td>
<td>31</td>
</tr>
<tr>
<td>Reef Fish</td>
<td>20</td>
<td>10</td>
<td>39</td>
<td>9</td>
<td>16</td>
<td>43</td>
<td>43</td>
</tr>
<tr>
<td>Shark</td>
<td>8</td>
<td>9</td>
<td>12</td>
<td>8</td>
<td>11</td>
<td>19</td>
<td>13</td>
</tr>
<tr>
<td>Swordfish</td>
<td>10</td>
<td>19</td>
<td>16</td>
<td>12</td>
<td>16</td>
<td>22</td>
<td>16</td>
</tr>
<tr>
<td>Other Varieties</td>
<td>98</td>
<td>127</td>
<td>145</td>
<td>23</td>
<td>19</td>
<td>48</td>
<td>63</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,226</strong></td>
<td><strong>1,773</strong></td>
<td><strong>1,300</strong></td>
<td><strong>2,735</strong></td>
<td><strong>1,952</strong></td>
<td><strong>1,246</strong></td>
<td><strong>1,436</strong></td>
</tr>
</tbody>
</table>

According to the Caribbean Regional Fisheries Mechanism (CRFM), the sector provides employment for approximately 8,800 persons, both directly and indirectly. This includes those who catch, sell, process and distribute fish. The harvest sector is made up of fishers and boat owners. Fishers make up 63 percent of the harvest sector and boat owners 37 percent. Overall, 78 percent of the primary stakeholders (including boat owners) are active fishers (CRFM, 2016). The post-harvest sector is made up predominantly of boners and vendors, along with processors. Additional livelihoods include cooks and servers at fish frys (community-based grilling events) and restaurants. Numerous others make a living by supporting the industry through supporting services such as boatbuilding, and the sale and maintenance of boats, boat engines, fishing tackle and electronic equipment (Moore et al, 2015). According to the FAO, while landed catches have clearly declined, in recent years the post-harvest sector has exhibited steady growth. Vendors and boners make up the majority of the primary post-harvest stakeholders (FAO, 2016).

Fisheries are regulated pursuant to the Fisheries Act 1995 and the Fisheries Management Regulations 1998.

These instruments provide for a range of management mechanisms including spatial and temporal closures and controls of gear modifications. All vessels fishing commercially are registered and required to have licenses. In Barbados, the fisheries sub-sector has developed a framework for the management of fisheries resources and associated habitats that has embraced a dynamic multi-stakeholder approach to management. This framework ensures that non-state actors are integrated into several levels of management and decision-making. The Government is currently consulting with stakeholders on the development of a comprehensive new Fisheries Policy.

According to the Green Economy Scoping Study (prepared in 2015), the Government’s objective, with respect to fisheries, is to promote co-management within the fisheries sub-sector so that stakeholders are involved in implementing measures aimed at protecting and preserving fisheries resources. The framework facilitates the strengthening of fisher-folk organizations through technical and developmental assistance and actively promoting co-management and community-based management approaches. The multi-sectoral Fisheries Advisory Committee, which counts the Chief Fisheries Officer as an ex-officio member, is mandated by law to advise the Minister on matters relating to fisheries (Moore et al, 2014).
5.2.2 Structure of the fishery and fishery resources

Fisheries in Barbados is characterized as open access, multi-species and multi-gear. The fisheries resources are grouped into nine categories for management by the Barbados Fisheries Division. Two of these categories relate to offshore resources, the large pelagic fishery targeting dolphin fish, tunas, kingfish and billfish with longlines, troll lines or longlines, and the flyingfish fishery targeting mainly the four-winged flyingfish with gillnets, handlines and dip nets. The inshore fishery is comprised of the shallow shelf reef fishes, the deep slope fishes, coastal pelagics, sea urchins, lobsters and conch (Mohammed et al, 2015).

5.2.2.1 Inshore fishery

The shallow-shelf reef fishery occurs on nearshore coral reefs and targets species such as parrotfishes, grunts, surgeonfishes and triggerfish. Fishing methods include pot (trap) fishing, handlines and spear fishing, the latter two conducted from either small, outboard powered boats (moses) or from shore.

The deep-slope and bank reef fishery mainly targets snappers. The primary vessel type used is the mose or day boat which mainly uses handlines and traps. Fishing of these reef/slope fish is most intense when pelagics are scarce annually between July and October but some of the reef fisheries are conducted year-round. Reduced catch per unit effort and fish size has been reported on the south and west coasts of the island.

The coastal pelagic fishery mainly targets jacks, herrings, silversides, anchovies, scads, barracuda, garfish, small tunas and sharks. These species are used mainly as bait for other fisheries, although some may be used as food. Day boats are mainly used in the coastal pelagic fishery. They employ boat seines and cast nets (mainly on the south and west coasts). There are concerns that use of seine nets on living reefs physically damages them and has overall negative impacts on reef communities.

The lobster fishery is a minor one in Barbados with the potential for increased importance through links to tourism. The primary methods and gear used to harvest lobsters are the use of free or SCUBA diving using spears or gloves for capture. Currently, there is no data collection and therefore no catch and effort data available but anecdotal information suggests that recently there has been a possible increase in abundance.

Similarly, conch is harvested from moses or small open day boats or from the shore and mainly harvested by free divers and by SCUBA divers and is perceived to be small scale and artisanal. The status of the conch fishery in Barbados is currently unknown, however anecdotal and baseline information suggests that local conch populations are typically much smaller than those in neighbouring islands (Oxenford, 2007).

A well-established and economically important sea urchin (sea egg) fishery has existed for more than a century. Sea eggs are mainly harvested using moses and small open day boats but some divers go from shore. However, as a result of significant overexploitation, in recent years strict access controls have been imposed on this fishery.

5.2.2.2 Offshore fishery

In recent years, fishing effort directed at the large pelagics has increased due to an increase in the number of iceboats and the growth of the longline fleet in numbers. Most of the target species of this fishery – tuna, wahoo, billfish, dolphinfish, swordfish, which are highly migratory. Longliners and iceboats are the main vessels used to target large pelagics, with about 30 active vessels currently operating in the fishery. Day boats and ice boats are used to harvest dolphin and wahoo, either by trolling or lurk lining but take other large pelagic species occasionally. There are approximately 35 sport fishing vessels, the majority of which are charter vessels carrying out tourists to target large pelagics (Table 7).
Catches of dolphin have decreased substantially in recent years. The suspected increase in number of juveniles in the catch is of concern and may be partially explained by the increase in sargassum, in which the juveniles hide and are thus being taken.

Barbados is a contracting party to the International Commission for the Conservation of Atlantic Tunas (ICCAT) which reports many large tuna species as being fully exploited or overexploited, but the status of most other tuna-like species in the western Atlantic and Caribbean is uncertain.

Table 7: Fishing fleet by vessel type. Source: Government of Barbados (2016).

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Moses</td>
<td>587</td>
<td>615</td>
<td>622</td>
<td>588</td>
<td>607</td>
<td>672</td>
</tr>
<tr>
<td>Day-boats</td>
<td>249</td>
<td>235</td>
<td>237</td>
<td>230</td>
<td>230</td>
<td>234</td>
</tr>
<tr>
<td>Ice boats</td>
<td>187</td>
<td>191</td>
<td>191</td>
<td>175</td>
<td>179</td>
<td>193</td>
</tr>
<tr>
<td>Longliners</td>
<td>39</td>
<td>42</td>
<td>40</td>
<td>41</td>
<td>43</td>
<td>47</td>
</tr>
<tr>
<td>Total</td>
<td>1,062</td>
<td>1,083</td>
<td>1,090</td>
<td>1,034</td>
<td>1,059</td>
<td>1,146</td>
</tr>
</tbody>
</table>

### 5.2.2.3 Flyingfish fishery

The most important fishery for Barbados is for flyingfish. The four-winged flyingfish comprises more than 90 percent of the flyingfish catch, which accounts for almost two-thirds of total landings in most years. The fishing effort directed at flyingfish increased through the 1980s but in recent years it has levelled off due to a slowing in fleet expansion and conversion of some iceboats to longliners. The fishery is economically important with over 2,000 fishermen and 500 vendors seasonally employed in the fishery. In addition, over 200 persons are employed as scalers or boners at fish markets and approximately 125 are employed at fish processing plants, where flyingfish account for a large percentage of the production of these plants. According to the FAO, over 6,000 people (2,000 directly and 4,000 indirectly) are involved in this fishery (FAO, 2016).

An estimated 410 boats are in the fishery consisting of day boats and iceboats. The method employed to catch flyingfish is the use of surface gillnets, handlines and dipnets after often being lured near the boat with fish attracting devices. The fishing season is from November to July. Total flyingfish landings amounted to 1,314 tonnes in 2014, representing a 31.2 percent decrease from the previous year.

Flyingfish landings have fluctuated greatly in recent years, which may be partly explained by the sargassum influx making it more difficult for fishermen to access and harvest the resource at sea.

### 5.2.3 Status of fisheries in Barbados

The Barbados fishery is characterised as open access and there are limited conservation measures in place. While few stock assessments have been undertaken for Barbados’ marine fishery, the status of the commercially exploited fish stocks varies from stable, in the case of dolphinfish and kingfish, to overexploited in the case of the many reef species that are harvested for food (Mahon, 2019). Many coastal resources are known to be over-exploited, having been depleted for a long time by a range of different practices (Mahon, 2019). While some local (e.g. sea eggs) and regional (e.g. flyingfish and dolphinfish) stock assessments and monitoring work are being conducted (e.g. by the CRFM), the basis of current status estimates is data that is collected on fishing effort and landings which is then used to
estimate fisheries production. This allows for catch per unit effort (CPUE) to be calculated but is not sufficient to determine stock size or fishing mortality rates.

Landings data is collected at various sites around the island including the Bridgetown Fisheries Complex, the Oistins Fisheries Complex (Berinda Cox market), Weston Market, Conset Bay and Payne's Bay, seven secondary sites and at least ten tertiary sites of a possible seventeen. Data are recorded at primary and secondary sites five days per week. It is assumed that most of the landings at the primary and secondary sites are captured and recorded in the CFRAMP data management system.\(^9\)

Landings for most species have remained relatively stable over the past five-year period with slight fluctuations, notably with flying fish. Of worthy note is the increase in almaco jacks (local name: amber fish) observed during the periods of sargassum seaweed influx (UNCTAD, 2020). As illustrated in Table 7 above, in 2016, flying fish remained the major contributor to the island’s fish catch. Among the large pelagic species, catches of dolphinfish increased from 2015 to 2016 but are still below the average annual catch reported over the past ten-year period (Figure 9). The recorded landings of tunas showed an increase from 309 tons in 2015 to 383 tons in 2016. Most of these were comprised of yellowfin tuna while other tuna species landings appeared to be marginal. However, skipjack has recorded an increase in landings over the past two years (Figure 10) (UNCTAD, 2020).

![Figure 9: Capture fish landings by species for Barbados (2010 - 2016). Source: UNCTAD (2020).](image)

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\(^9\) According to FAO a raising factor of between 1.2 and 1.6 is applied to recorded catches of all species, except tuna and swordfish, for which it is believed that a total census of landings is taken.
5.2.4 Aquaculture

According to the FAO fishery and aquaculture country profile for Barbados, inland aquaculture production has been practiced and recorded in Barbados since 2006. Red tilapia had the greatest production, followed by the red claw crayfish. These were produced in a shore-based re-circulating aquaculture farm by Adams Aqualife. As of 2020, Adams Aqualife is only producing tilapia. The aquaculture production by culture environment in 2018 was 25 tonnes which supplies the local market. There is currently only one known aquaculture producing farm operating in the island (FAO, 2016) with a few individuals practicing on a smaller scale and combining with aquaponics.

An Aquaculture Pilot Project: The Greenland experimental fish farm was set-up by the Fisheries Division with support from USAID in the early 80’s, to rear the Nile tilapia. The idea was to assist interested farmers to start their own operation but the project was closed in 1989 due to inadequate water supply, frequent fish thefts and poor commitment to the management of the project.

One initiative of note for its potential to catalyse a broader aquaculture sector in Barbados is the shrimp farming project currently being trialled by Blue-Green Initiative (BGI). Under this demonstration project, which combines aquaculture and hydroponics, BGI aims to breed four harvests of shrimp in the first year. The projects includes training and capacity development, as well as developing an understanding of the technical and environmental issues related to the farming of shrimps in Barbados. The demonstration project is being used to build capacity and awareness of the potential of the sector.

The FAO Blue Growth Project has supported the development of the sector through the development of an aquaculture / aquaponics training farm, where training began in 2019.

5.2.4.1 Mariculture

The cultivation of marine plants in Barbados has been relatively successful (FAO, 2002).
Seamoss\textsuperscript{10} has also been cultivated in Barbados, although at present, no coastal aquaculture activities are being undertaken in the country. Experimental cultivation was initially started by the Fisheries Division in 1989 with a local strain of seamoss being cultured using floating rafts on the West Coast. A community based sea moss project was run in Barbados from 1997 – 2000, which involved small business training for the local community group formally established to manage the project. Unfortunately efforts to trial seamoss in Barbados have all suffered from vandalism and theft resulting in the failure of previous attempts. This notwithstanding, preliminary results do indicate that seaweed grows well under the prevailing conditions on the west coast of the island. Furthermore, Conset Bay on the East coast has also been identified as a feasible location for cultivation of sea moss (UNCTAD, 2020). The future development of seamoss farming will require some form of spatial planning and zoning to be undertaken to avoid future conflicts between the mariculture, fisheries and tourism sectors.

5.3 Ports and Shipping

5.3.1 International shipping

Barbados, like most island nations, is almost entirely dependent on shipping for imports and exports. In line with many other Caribbean SIDS, it is likely that over 95 percent of imports by weight arrive to Barbados by sea. While not busy by global standards, a significant number of vessels do transit Barbados’ EEZ each year. This includes cruise ships, vessels transiting from Europe en route to/from the Panama Canal, and vessels transiting from the east coast of the USA (Figure 11). In addition to the cruise ship visits discussed above, in 2019 the port received 966 vessel calls – an average of over 18 each week (Table 8). These included general cargo carriers, bulk carriers, product carriers delivering refined product and LNG, container ships, reefers and vehicle carriers.

![Figure 11: Voyage routes to and from Barbados (2007-2008). SOURCE: RAC/REMPEITC-Caribe.](image)

\textsuperscript{10} Seamoss is not an explicit term, and, depending upon the locale, refers to one or more species in several genera. The most common of which is \textit{Gracilaria}.
Table 8: Vessel calls to the Port of Barbados – 2018. Source: Barbados Port Inc.\textsuperscript{11}

<table>
<thead>
<tr>
<th>VESSEL TYPE</th>
<th>VESSEL CALLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cruise</td>
<td>422</td>
</tr>
<tr>
<td>General cargo – Deep water harbour</td>
<td>477</td>
</tr>
<tr>
<td>General cargo – shallow draught</td>
<td>110</td>
</tr>
<tr>
<td>Cargo – bulk handling facility</td>
<td>11</td>
</tr>
<tr>
<td>Bulk sugar</td>
<td>1</td>
</tr>
<tr>
<td>Molasses</td>
<td>5</td>
</tr>
<tr>
<td>Cargo – cement plant</td>
<td>104</td>
</tr>
<tr>
<td>Tankers</td>
<td>155</td>
</tr>
<tr>
<td>Other vessels</td>
<td>103</td>
</tr>
<tr>
<td><strong>Total Calls</strong></td>
<td><strong>1,312</strong></td>
</tr>
</tbody>
</table>

The main import commodities include refrigerated products, food and drink, construction materials, vehicles and machinery and petroleum products. The main export commodities include cement, sugar and alcoholic beverages. As such, international shipping and associated infrastructure is vital to the economy of Barbados.

5.3.2 Barbados Maritime Ship Registry

Barbados currently operates a modest shipping registry that currently includes approximately 170 vessels - mostly general cargo ships, bulk carriers and tankers with a small number of large yachts.\textsuperscript{12} This compares with the Bahamas registry (some 16,000 vessels generating revenue of around US$14 million/year) and the Antigua and Barbuda registry (some 850 vessels generating revenue of around US$5 million/year). No estimate of the current revenue generated by the Barbados registry was available to the project team during the scoping exercise.

Barbados Maritime Ship Registry, the body in charge of registering internationally trading vessels, has its main offices in London (where the Principal Registrar is located), with Registrars around the world who also deal with registrations. Although the registry sits within the MMABE, it appears that the current technical capacity within the Ministry to deal with ship registration is extremely limited. The Chief Technical Officer of the MMABE does hold the statutory function of Director of Maritime Affairs but it is not clear whether the post holder operates in a technical or simply administrative capacity.

An IMO Member State Audit Scheme (IMSAS) audit was carried out by the IMO in 2018 pursuant to the IMO Member State Audit Scheme (which came into effect in January of 2016 and concluded that although Barbados had been following the requirements under various IMO instruments there was no formal structure in place and very little legislative implementation. Therefore, a corrective action plan based on the findings and recommendations of the audit is currently being crafted for approval by Cabinet and subsequent submission to the IMO.

While the Government has expressed an interest in developing the Registry further, this must be considered in the context of the large number of other countries that already operate similar Registries, some of which are sizeable. There is a relatively stable number of international vessels to register and

\textsuperscript{11} https://www.barbadosport.com/statistics

\textsuperscript{12} Personal communication with Simon Ogley, Principal Registrar (Acting), Barbados Maritime Ship Registry
hence to grow the Registry will require attracting business away from existing Registries. Hence, it is not clear to the UNDP study team what potential exists to capitalise on this opportunity.

5.3.3 Port facilities

Barbados has one main port in Bridgetown, with several smaller loading facilities supporting the transfer of petroleum products and cement respectively. The port has seen several administrative changes since its establishment. The original Deep Water Harbour was opened in 1961 and the port facilities were significantly expanded in 1978 to cater for the increasing volume of containerised imports and export (primarily to service the agricultural export sector). Since then, some improvements have been made but the Port is extremely limited in the number and size of vessels it can handle.

The Barbados Port Authority was formed in 1979 as a Statutory Board. At the end of 2003 the organization was converted into a corporatized company now known as Barbados Port Inc (BPI), registered under the Companies Act of Barbados. The BPI is the provider of terminal services with key elements of these provided by third parties under short-term contracts.

The limits and facilities of the BPI are defined pursuant to the First Schedule of the Barbados Port Inc. (Transfer of Management and Vesting of Assets) Act (CAP. 285B). BPI has administrative jurisdiction over an area of the territorial sea which extends west of Needhams Point light house to a maximum of approximately 4 km (Port Limits). Within this area the Port regulates shipping activities, controls pilotage and has responsibility for the safety of navigation and aids to navigation.

The port is equipped to handle all major categories of cargo and handles all of the country’s international bulk ship-based trade and commerce:

- Containers (incl. imports and exports of food and beverage products, consumer goods such as furniture, appliances, etc.). The container wharf has recently been upgraded with the installation of a third gantry crane.
- Liquid bulk (incl. petroleum, molasses, etc.)
- Dry bulk (incl., grain, cement, gravel etc.)
- Break-bulk (incl. agricultural produce, and other goods intended for the manufacturing, processing and distribution sectors)
- Automobiles

In addition to international-shipping the Deep Water Harbour is the port of entry for cruise ships.
Table 9: Existing facilities in the Port of Barbados. Source: Barbados Port Inc.\textsuperscript{13}

<table>
<thead>
<tr>
<th>BERTH</th>
<th>LENGTH (Metres)</th>
<th>DEPTH (Metres)</th>
<th>PRIMARY TYPE OF VESSEL ACCOMMODATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakwater</td>
<td>522</td>
<td>11.5</td>
<td>Cruise vessels tankers, naval.</td>
</tr>
<tr>
<td>Sugar Berth</td>
<td>307</td>
<td>9.75</td>
<td>Bulk sugar, molasses tankers, cruise vessels.</td>
</tr>
<tr>
<td>Berth #1 (Cross Berth)</td>
<td>152</td>
<td>9.75</td>
<td>Naval, auxiliary vessels.</td>
</tr>
<tr>
<td>Berth #2</td>
<td>183</td>
<td>11.0</td>
<td>Cruise vessels.</td>
</tr>
<tr>
<td>Berth #3</td>
<td>183</td>
<td>11.0</td>
<td>Bulk vessels, container vessels, cruise vessels.</td>
</tr>
<tr>
<td>Berth #4</td>
<td>184</td>
<td>11.0</td>
<td>Container vessels, cruise vessels.</td>
</tr>
<tr>
<td>Berth #5</td>
<td>65</td>
<td>11.0</td>
<td>Container vessels, cruise vessels.</td>
</tr>
<tr>
<td>Shallow Draught</td>
<td>156</td>
<td>6.8</td>
<td>Inter-island cargo vessels (breakbulk).</td>
</tr>
<tr>
<td>Bulk Facility</td>
<td>183</td>
<td>11.5</td>
<td>Dry bulk vessels, cruise vessels.</td>
</tr>
<tr>
<td>Oistins</td>
<td>172</td>
<td>10.0</td>
<td>Petroleum tankers.</td>
</tr>
<tr>
<td>Spring Garden</td>
<td>103</td>
<td>4.9</td>
<td>Petroleum tankers.</td>
</tr>
<tr>
<td>Arawak Jetty</td>
<td>121</td>
<td>9.0</td>
<td>Dry bulk tankers</td>
</tr>
</tbody>
</table>

In late 2010, BPI issued a Request for Proposals to finance, design and build a new cruise ship pier (two berths) adjacent to the existing port. The primary objectives of the project envisioned by BPI in the RFP were as follows:

- Ease congestion in the existing port;
- Separate cruise and cargo operations.

Once completed, the facility at Sugar Point will function as a means to separate cruise-traffic to the country from the containerised-traffic which will remain at the deep water harbour. The move should help to mitigate delays which effect container-ships to Bridgetown which at times must have idle offshore for Cruise ships to make available a berth as cruise ships are given preference at the Harbour.

An initial design concept has been prepared but, at present, the project remains on hold due, largely, to the inability to secure finance to progress the project.

5.4 Non-living Resources & Energy Generation

5.4.1 Petroleum exploration and production

Commercial hydrocarbon exploration and production began in Barbados during the late 1800s. In the early 1900s, exploration activities led to the discovery of the island’s first commercial oil field, Woodbourne, in the south east of the island. Exploitable reserves of oil were found onshore in the 1960s. To date, over 250 wells have been drilled, with nearly 100 active wells operating. Currently the daily onshore production is approximately 600 barrels of crude oil and 1.9 million cubic feet of associated gas per day.

\textsuperscript{13} https://www.barbadosport.com/statistics
Little interest has been shown in offshore oil and gas development in Barbados until recently. The international oil company Conoco was granted an offshore oil and gas concession licence in 1996 and conducted extensive geological and geophysical studies in the licence area culminating in the drilling of the Sandy Lane 1/1Z well 130 km south-east of Barbados in 2002. Conoco subsequently relinquished its licence in 2004.

According to the most recent estimates from the US Geological Survey, the Barbados Accretionary Prism may contain undiscovered resources of petroleum totalling 150 million barrels of crude oil and 15,000 billion cubic feet of natural gas. While these may not be globally significant resources, if translated to proven and recoverable resources, this would be a significant resource for Barbados. Recent acquisition of 2D seismic data indicates that the area may well be prospective and this has attracted the interest of international oil companies.

Figure 12: Existing offshore license blocks on the Barbados continental shelf. Source: White (2020).

To promote its offshore waters to potential investors, the Government of Barbados established the Barbados Offshore Petroleum Programme in 2007. To date, this programme has established offshore petroleum acreage comprising more than 70 000 sq. km, subdivided into 26 blocks with 24 blocks offered for bidding (Figure 12). Two of these blocks are currently held by BHP Billiton with a further block being awarded to Repsol. To date, BHP Billiton has completed the EIAs for its two (2) licensed

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14 Based on mean estimates.
blocks and was issued with effective licenses on January 27th, 2020. Repsol has yet to commence work on its EIA. BHP plans to undertake further geophysical investigations during the initial phase of its exploration license period (Years 1 to 5) in hopes of identifying a target to drill.

At this stage no dates have been confirmed for the drilling programme but the Ministry does not expect that any wells will be drilled in the period between 2020 and 2021. A further offshore licensing round is expected to commence this year.

The Governments of Barbados and Trinidad & Tobago recently signed a Memorandum of Understanding (MoU) to advance their cooperation in energy matters governing natural gas exploration at the overlapping nautical point of their respective EEZs. The MoU is essentially the first step in tidying-up the legal framework for oil companies interested in investing in petroleum wells owned by the two countries, facilitating the process of Unitization across the maritime boundary between the two states.

5.4.2 Freshwater security

5.4.2.1 Current context

The efficient management of water resources and services is a concern in many Caribbean SIDS, with growing concerns over the ability of governments in the region to ensure the good management and provision of water without jeopardizing economic growth and the maintenance of social well-being.

Recent climate modelling work for the Caribbean indicates changes in temperature between 2–2.5 °C for the eastern Caribbean for the time period 2075–2099. This warming is likely to correlate with a decrease in annual precipitation of 10–30 percent by 2080 (Cashman, 2014). These projections are particularly troubling given that there are already serious gaps between available supply and demand of fresh water resources in many Caribbean countries.

Barbados is classified by the United Nations Commission on Water as a "water scarce" country, just ahead of desert countries in the Middle East on per capita water availability. Barbados relies heavily on groundwater resources with approximately 90 percent of the supply coming from groundwater and is currently utilizing close to the available 100 percent of its available water resources noting the significant leakage of water from distribution lines.

In terms of trends in water demand, it can be expected that there will be increases in domestic and hotel consumption. In the first instance, this is due to increasing living standards and in the second, it would be related to the increase in number of stay-over tourists (Moore et al., 2014). As noted in section 5.5 above, the impacts of climate change and sea-level rise may all lead to increased saline intrusion to existing freshwater aquifers, thereby exacerbating this situation. In addition, Barbados’ groundwater resources are also impacted by land-based pollution (e.g. from agriculture) which may further impact future water availability. As such, the government is evaluating options to secure additional freshwater resources to both account for any future deficit and to support future economic growth.

To supplement its existing groundwater supplies, and to provide a degree of redundancy against drought conditions, Barbados currently utilises desalination as a source of supply. The desalination plant, which was opened in 2000, takes brackish water from ten 80-foot wells located near its St. Michael operation and the water is pre-treated and then desalted to produce potable water. Treating 30,000 cubic meters (7.9 million gallons) of water per day, the plant provides fresh, potable drinking water to 44,000 people – around one-sixth of the island’s population. The Government of Barbados has clearly identified the future expansion of existing desalination capacity as one option in a portfolio of future measures to build resilience in its potable water supply.

5.4.2.2 Future considerations for desalination

Most desalination plants use sea water or brackish water as their sources. This presents a challenge to plant operators and utility companies since the quality of the source water (the catchment) is of critical
importance to ensure that the treated water meets minimum health guidelines. Issues such as chemical contamination (e.g. petroleum hydrocarbons), sediment and suspended solids (e.g. from land run-off) elevated bacterial load and the chemical composition of the water can, depending on the specific desalination technology employed, affect both the operation of the plant itself and the quality of the water produced.

Similarly, wastes from desalination plants include concentrated brines, backwash liquids containing scale and corrosion salts and antifouling chemicals, and pre-treatment chemicals in filter waste sludges. Depending upon the location and other circumstances including access to the ocean and sensitive aquifers, concentrations of toxic substances etc., wastes could be discharged directly to the sea, mixed with other waste streams before discharge, discharged to sewers or treated at a sewage treatment plant, lagooned and dried and disposed in landfills (Cotruvo, 2004).

Desalination is an energy intensive technology and, at present, relies heavily on fossil fuel generated energy. Given Barbados stated commitment to transition to a renewable-based energy supply by 2030, any expansion of desalination needs to be balanced against the energy requirements. As a result, there is growing interest in smaller scale, community-based, desalination plants that use renewable energy (Cashman, 2014).

In the context of a broader blue economy development framework, these factors will require careful consideration in terms of the location and operation of future desalination facilities, particularly with respect to protection of the source water catchment.

5.4.3 Dredging and coastal aggregate mining

Dredging is not a significant activity in Barbados since there is generally a limited requirement for maintenance dredging of the ports. The exception to this appears to be related to recent sand build up at the mouth of the Careenage in Bridgetown that has required maintenance dredging to maintain an open channel. This notwithstanding, a number of capital dredging programmes have been undertaken in support of recent expansion of the port facilities, and to deepen the existing channels and deep-water berths, in order to accommodate the ever increasing size of international vessels.

In many SIDS, the coastal area has historically been an important source of aggregates for construction, with sand, gravel and coral rubble being extracted. The unregulated extraction (mining) of sand from beaches and dunes has been a particular problem in many countries. In Barbados, however, the unregulated extraction of sand does not appear to have been a major problem due to operation of the Walkers Sand Quarry, which has provided a long-term supply of construction grade silica sand for over five decades. This notwithstanding, there is evidence that, at certain points along the east coast, quarrying operations have encroached upon adjacent beach areas and actually mined the sand dunes themselves, with remaining dunes being scraped of stabilising vegetation by trucks and heavy equipment. Efforts to manage these impacts have been implemented by the CZMU and the matter appears to be under control.

One issue that was raised by some stakeholders during the Scoping Study exercise, however, was that there is an increasing lack of sand for construction projects in Barbados. This notwithstanding, plans are being discussed to construct a number of offshore islands to support future tourism development along the coastline. These demands may well increase pressure on the existing sand resources, which will need to be carefully managed. According to the Ministry of Energy and Water Resources, a consultancy is currently underway to identify and quantify alternative onshore sources of silica sand in Barbados. If viable sources cannot be identified, work has been done to identify silica sand suppliers from within the region with sand resources of comparable quality and competitively priced. The idea
of dredging offshore for such resources is not being considered due to concerns regarding quality, environmental sustainability, and cost.\(^\text{15}\)

### 5.5 Ocean Health and Ecosystem Services

#### 5.5.1 Ecosystem services and the marine environment

As previously discussed in section 2.2 of this report, underpinning the global ocean economy are the ecosystems and their natural resources and ecological systems that function in economic terms as the ocean economy’s natural resource base. These include: (a) living resources (that is, renewable stocks) that are harvested for use such as fisheries, (b) non-living resources (that is, non-renewable stocks) harvested for use such as minerals from the seabed, and (c) ecosystems and ecosystem processes that represent the interaction between the living and non-living environment as a functioning unit (for example, coral reef ecosystems, mangrove ecosystems, seagrasses etc) (Patil et al, 2016).

As a general insight, any effort to plan for the long-term development of the blue economy must recognise that no economy can sustain its prosperity if this natural resource base is systematically being degraded. Since it is widely accepted that human activities are leading to changes in the oceans’ ecosystems that will significantly impact societies and well-being, it must be acknowledged that this will undoubtedly have a direct impact on current and future economic growth of ocean-facing countries and small island developing states around the world (including Barbados) unless comprehensive efforts are taken to address declines in the resource base and quality of the marine environment.

This link between nature and the economy is often described using the concept of ecosystem services, providing a framework to recognise the many benefits of nature – by maintaining stocks of this natural capital we can allow the sustained provision of flows of ecosystem services, and thereby ensure future human well-being. The Millennium Ecosystem Assessment provides a useful four category framework within which to view ecosystem services that contribute to human well-being, each underpinned by biodiversity:

- **Provisioning services** – for example wild foods, crops, freshwater and plan derived medicines;
- **Regulating services** – for example filtration of pollutants by wetlands, climate regulation through carbon storage and water cycling, pollination and protection from disasters;
- **Cultural services** – for example recreation, spiritual and aesthetic values, education; and
- **Supporting services** – for example soil formation, photosynthesis and nutrient cycling.

The sustained supply of goods and services from the marine environment is central to the future wellbeing and prosperity of the islands. This supply depends not just on the presence, but also the quantity and quality of marine biodiversity (Commonwealth Secretariat, 2013). A recent study on *The Economics of Ecosystems and Biodiversity* (TEEB) (TEEB, 2008) expressed this by stating that, in addition to the diversity of species, genes and ecosystems, it is the sheer abundance of individual animals and plants, as well as the extent of ecosystems that are critical components of ‘natural capital’ and key determinates of the scale and nature of the benefits derived.

#### 5.5.2 Issues and threats facing the marine environment

Throughout the literature (for example, a ‘Transboundary Diagnostic Analysis’ of the Caribbean Large Marine Ecosystem and adjacent regions (CLME, 2011) and a recent assessment undertaken by the World Bank of Pollution in the wider Caribbean (Diez et al, 2019) there is strong evidence that the

\(^{15}\) Memorandum from the Permanent Secretary of the Ministry of Energy and Water Resources in response to the draft Scoping Study Report (Version 2.0) dated 04/05/2020.
Caribbean Sea’s natural capital is being depleted, largely due to the anthropogenic drivers of overfishing, coastal development, pollution, introduction of invasive species and the impacts of climate change (CLME Project 2011). Such depletion represents a significant risk to the economic benefits generated by the region’s ocean economy, and likely to future growth prospects. (Patil et al, 2016). These impacts, threaten to diminish the quality and productivity of Barbados’ coastal resources, directly impacting the various environmental and socio-economic services they support.

Though historical changes in the quality of coastal and marine resources are difficult to measure, evidence suggests that many aspects of marine quality are declining over time. For example, it is widely understood that beaches in Barbados are dynamic, with the volume of sand changing over time. Yet evidence from the Coastal Zone Management Unit (CZMU) in Barbados suggests that most beaches on the south and west coasts of the island are eroding over time, with beach widths diminishing at an average rate of 15 metres per 100 years, or approximately 15 centimetres per year (Government of Barbados, 2010).

In addition to these specific threats, climate change is likely to disproportionately impact SIDS, due to the small land mass and the vulnerability of already degraded coastal habitats to the various effects of climate change. With respect to SIDS, the Intergovernmental Panel on Climate Change has identified three critical impacts of climate change:

1) Sea level rise presents the biggest challenge for small island states leading to island abandonment, exposure to storm surges, damage to coastal economies and infrastructure;

2) Meeting the demand for water in small island states will be strongly compromised under most of the climate change scenarios; and

3) Changes in the ocean and coastal marine environment (such as elevated sea surface temperatures, ocean acidification) will disrupt critical ecosystem services, for example coral reefs and fisheries, on which small islands depend upon for food and economic development.

Climate change and sea level rise will result in a broad range of impacts including but not limited to: loss of beaches due to erosion and inundation; salinization of fresh water aquifers, compounding Barbados’ existing fresh water vulnerability; increasing stress on coastal ecosystems - particularly coral reefs; physical damage to coastal infrastructure from storm events, and the overall loss of amenities.

Because of its geography and small land mass, the coastal region of Barbados, compared to other parts of the country, is the most important and economically most valuable both from development and environmental points of view. Throughout Barbados coastal towns and infrastructure will be at risk, given their location at or near present sea level and their proximity to the coast. Relocation or fortifying coastal infrastructure for coastal protection will become financially burdensome for the Government.

5.5.2.1 Vulnerability associated with coral reefs

Caribbean coral reef ecosystems are severely degraded due to human overfishing, pollution, climate change, and the synergies among them. Coral cover has reportedly declined by more than 80% since the 1970s, virtually all the large fishes, sharks, and turtles have declined or are entirely absent in all countries, raising serious questions about the future of Caribbean coral reefs (Jackson et al 2014). Climate change is already impacting coral reefs, through coral bleaching, disease outbreaks, ocean acidification and physical damage from stronger hurricanes. Coral bleaching is the most visible, widespread and iconic manifestation of climate change on reefs, with major events in the Caribbean in 1998, 2010 and 2015/16. In 1998, Barbados faced a bleaching event that affected 65 percent of its coral reefs. Further analysis found that 20 percent of the coral did not survive on the west coast of the island. This was not an isolated case. In 2005, a much stronger event impacted Barbados’ reefs. Surveys of six reef habitats between mid-September and October 2005 showed severe coral bleaching in all reef habitats,
with 59-86 percent of all hard coral colonies showing some bleaching. Inshore reefs were more severely affected than offshore reefs.

Numerous studies have shown that healthy corals that are not degraded are more resilient to the impacts of coral bleaching, enabling them to withstand elevated temperatures and recover more quickly than those corals that are impacted by other pressures (such as pollution from land-based sources and groundwater contamination, physical damage and poor diversity of reef associated fish species) (See for example Carilli et al, 2009; Obura, 2005).

Another serious threat for Caribbean corals is disease, an issue that has already significantly altered the community composition of reefs in the Caribbean, and is projected to result in increasing frequency of outbreaks as seas warm (McField, 2017). Since 2014, a highly lethal, new disease, called stony coral tissue loss disease (SCTLD), has impacted many reef-coral species in Florida, where it first appeared. By 2019, SCTLD had spread along the Florida Keys and had appeared elsewhere in the Caribbean Sea (notably The Bahamas and the Mexican Caribbean. The disease completely destroys the soft tissue of many species of stony coral, killing them within weeks or months of becoming infected. The causal agent is unknown but is suspected to be a bacterium. The degree of susceptibility of a coral, the symptoms, and the rate of progression of the disease vary between species. To date it does not appear to have impacted corals in Barbados, although this situation is likely to change in the future.

Throughout the Caribbean small islands, ocean acidification effects could be exacerbated due to local processes within coastal zones. In addition to the effect on living organisms, ocean acidification is likely to diminish the structural integrity of coral reefs through reduced skeletal density, loss of calcium carbonate, and dissolution of carbonate cements which help to bind the reef. This would make coastal areas of the Caribbean small islands increasingly more vulnerable to the action of waves and storm surge (Melendez and Salisbury, 2017).

If the effects of climate change and human activity are not mitigated, these events are expected to become more frequent and severe. By 2040–2043 projections are for the onset of annual severe bleaching, which would likely result in significant coral mortality. In the future, sea level rise can be expected to have adverse impacts on the protective function of coral reefs, except where reef growth is fast enough to maintain wave energy attenuating functions at existing levels. Disease outbreaks are predicted to become annual events several years earlier. Projections for future ocean acidification result in ocean carbonate saturation levels potentially dropping below those required to sustain coral reef accretion by 2050 (McField, 2017).

### 5.5.2.2 Marine pollution

Chronic levels of pollution are evident in coastal waters throughout Barbados, particularly enclosed bays along the Caribbean coast. Deteriorating near-shore water quality has been identified as one of the primary causes of coral reef degradation and as a potential cause of seagrass declines. The main sources of marine pollution are terrestrial, and the primary pathways for pollutants to the marine environment are surface water runoff, groundwater discharge, and direct discharge or dumping (Table 10). Furthermore, land-based solid waste pollution of the beaches and near-shore reefs through direct littering and/or dumping is apparent at a number of beaches and popular picnic sites. Land-based solid waste pollution of coastal waters through polluted river and drainage runoff also occurs along the west and south coasts.

The implications of these pollutants for coastal ecosystems are significant, resulting in everything from localized death of marine systems near outfalls, to damage from the overgrowth of algae and smothering by sediments (Mahon, 2019). Human health can also be negatively impacted by the contamination of near-shore water with bacterial contamination due to stormwater run-off and off-

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shore disposal of sewage from treatment plants and potential episodic impacts on coastal recreational areas including heightened risk to the public health of sea bathers/recreational users. The wider implications of increased human health risks in the marine environment include loss of aesthetic and recreational value of beaches and near-shore water, loss of tourism potential in the coastal zone, loss of potential yield from near-shore fisheries, and increased public health costs (Delcan, 1993).

Table 10: Major sources of marine pollution in Barbados coastal waters. Source: Delcan (1993).

<table>
<thead>
<tr>
<th>POLLUTANT TYPE</th>
<th>PRIMARY SOURCE</th>
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| Nutrients      | • Terrestrial erosion and surface water runoff  
                  • Industrial and domestic sewage and waste water effluents  
                  • Nutrient enriched ground water discharge  
                  • Agricultural area surface water runoff |
| Sediment       | • Terrestrial erosion and surface water runoff  
                  • Industrial and domestic sewage and waste water effluents  
                  • Coastal construction, dredging and land reclamation |
| Chemicals      | • Industrial and domestic waste water effluents  
                  • Surface runoff and ground water discharge from intensive agricultural areas  
                  • Surface runoff and ground water discharge from urban areas  
                  • Accidental spillage and routine discharge from marine shipping |
| Pathogens      | • Surface runoff and groundwater discharge from residential areas  
                  • Domestic sewage effluents |
| Solid waste    | • Surface runoff from urban areas  
                  • Direct littering of beaches and nearshore water  
                  • Garbage disposal from marine shipping |

In conclusion, these drivers of change in the status of the Caribbean Sea’s natural capital assets constitute an important constraint and significant risk to the potential growth of the region’s ocean economy, similar to the risks to the global ocean economy (OECD, 2016). In some cases the decline of these assets may prevent sectors and industries from reaching their potential in the region, for others it may create regulatory uncertainty that also presents a significant risk. For example, impacts of coastal development and pollution on coral reef ecosystems can directly impact the tourism sector of the region’s ocean economy, and reduce the net benefits that it can generate for poverty reduction and economic growth. (Patil et al, 2016).

5.5.3 Marine conservation activities

Barbados currently has one marine management area (MMA) designated: (i) the Barbados Marine Reserve (Folkestone); and is in the process of designating (ii) the Carlisle Bay Marine Park. The Barbados Marine Reserve is currently managed by the National Conservation Commission (NCC), a statutory body established pursuant to the National Conservation Commission Act (CAP 393). NCC controls, maintains and develops public parks, gardens, beaches and caves, as well as maintaining public access to all beaches. However, management of the existing marine reserve is in the process of being transferred to MMABE.

17 http://www.coastal.gov.bb/content/folkestone-marine-protected-area
5.5.3.1 Barbados Marine Reserve

The Barbados Marine Reserve (BMR), commonly known as the Folkestone Reserve, is located centrally on the west coast of Barbados. The BMR was established in 1981 by the Designation of Restricted Areas Order 1981, and the Marine Areas (Preservation and Enhancement) (Barbados Marine Reserve) Regulation, 1981. As presently defined, the marine reserve covers an area of just 2.2 sq. km no-take marine reserve comprising four zones (Figure 13):

Scientific Zone (Zone A) designated for marine research: No motor power craft access unless permitted for research or enforcement, and then speeds are limited to 5 knots.

Northern Water Sports Zone (Zone B) and Southern Water Sports Zone (Zone C) designated or fast speed watercraft use: All motorised watercraft must operate at speeds less than 5 knots/no wake within 75m from shore, and speed boats can operate at higher speeds within 75 - 200m from shore. Jet skis must maintain speeds of less than 5 knots within 200m of shore and can operate at higher speeds beyond 200m from shore.

Recreational Zone (Zone D) designated for recreation, including swimming, snorkelling and fishing: There are no restrictions on watercraft entry, however, speed restrictions apply.

![Figure 13: Current boundary and zones of the Barbados (Folkestone) Marine Reserve. Source: Kirkbride-Smith et al (2016).](image)

The BMR runs along the shoreline of the Holetown area for about 2.6 km and extends seaward to the edge of the island shelf. Thus, the BMR lies in one of the most heavily used areas of marine space in Barbados. Furthermore, the largest watersheds on the west coast enter the sea in the Holetown area.
The BMR 0.32 sq. km of accessible fringing, patch and bank reef and nesting sites of the endangered hawksbill turtle. Fish abundance is low due to historical over-fishing and poor habitat quality. Sand areas separate the three reef types within and beyond the boundaries of the Reserve (Cumberbatch, 2001). A small artificial reef consisting of a disused barge (approximately 8 m long), that provides a site for instructor-led dives and for snorkellers, is situated within the reserve. Encompassing just 11% of the coastline, the reserve attracts multiple stakeholders and represents the most heavily used recreational space in Barbados, including approximately 7,000 scuba divers using the Folkestone reefs per year (Kirkbride-Smith et al., 2016).

A 1997 feasibility study concluded that the existing BMR was “not large enough to accommodate the range of existing commercial and recreational uses and still provide adequate protection for representative marine habitats and ecosystems of the West Coast of Barbados” (Mahon and Mascia, 2001). The proposal that emerged from the study was for a MMA that was substantially larger than the original BMR. The new proposed MMA would extend from Weston south to Fitts Village. The new MMA, to be called the Folkestone Marine Management Area, would comprise seven types of zones in a complex mosaic (Figure 14).

![Diagram of proposed MMA extension](image)

**Figure 14:** Proposed extended Barbados Marine Reserve: Source: Mahon and Mascia (2001).

### 5.5.3.2 Carlisle Bay Marine Park

The Carlisle Bay Marine Park (CBMP) is located on the south western coast of Barbados and is a calm, sheltered area where a variety of recreational activities occur on a daily basis. The bay is popular for bathing, diving, snorkelling, and the anchoring and sailing of yachts.
The marine biodiversity in Carlisle Bay is extremely rich, with more than 350 species of tropical flora and fauna identified. Among these are organisms such as the frog fish, which is rare in Barbados, and a rare species of sea horse. These, and other organisms, live on the scattered patch reefs and artificial reefs in the form of sunken ships which make up the primary ecosystems in the area. At present there are five major wrecks in the bay: the Berwyn, the Fox, the C-Trec, the Bajan Queen and the Eillon, which attract more than 40 dive boats and glass bottom boats on a weekly basis.

The idea of protecting Carlisle Bay was first proposed by the Professional Association of Dive Operators as long ago as 1993, as a result of a deterioration of the marine ecosystems in the area attributed to anchor damage, pollution from land-based sources and from heavy use of the area by visitors and locals. Coupled with the uniqueness of the area, it seemed essential that the bay be protected in order to preserve and possibly rehabilitate the systems in the area. The CZMU firmly supported the suggestion that Carlisle Bay be designated as a protected area. As a result, the CZMU currently maintains demarcation lines that indicate the northern and southern limits of the protected area as well as a number of mooring buoys within this area.\(^{18}\)

The overall management objective devised for Carlisle Bay was “to manage the offshore facilities and marine biota as an underwater recreation, interpretation and education park, while promoting local interest and involvement in the marine environment through enhancement of recreational facilities and interpretive programmes along the foreshore.”

A number of consultations were held with primary stakeholders with a view to achieving consensus on the desirability of establishing the marine park, and more importantly, to define the perimeter of the designated area. After some consultation with the users of the area (primarily coastal cruise operators and divers) it was agreed that the zone to be recommended for designation as a protected site should be established in an area of approximately 46,625 sq. m.

In 1997, the Environmental Special Projects Unit (ESPU) implemented a project to establish an area in Carlisle Bay as a Marine Park. This three-year project resulted in the development of a comprehensive draft management plan for protected marine areas.\(^{19}\) In contrast to the Barbados Marine Reserve, which was legally established in 1981, the Carlisle Bay Marine Park does not have a similar legal basis, but remains a “paper park” with limited implementation and no operational management plan.

The Government of Barbados committed to achieve the Aichi Targets by 2020. Target 11 requires that, by 2020 inter alia 10 percent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

Currently, Barbados has fully protected 2.2 sq. km which, even taking into account the Carlisle Bay Marine Park, represents less than 0.001 percent of Barbados EEZ. Given that more ambitious protection targets are now being proposed it is clear that Barbados has a considerable way to go before it meets even the minimum targets established under the 1992 Convention on Biological Diversity (CBD).

### 5.5.4 Marine spatial planning

Barbados, along with many other countries has a well-developed framework for planning and management of the coastal zone that has operated for many years as a mechanism to address the management of conflicts among different coastal resource users. As demand for coastal resources

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19 http://www.mpatlas.org/mpa/sites/67706802/.
increases, however, more efficient ocean use strategies are needed that balance economy, environmental protection and social demands.

In implementing the blue economy, there is a need to fully understand the values and limits of each stakeholder with an interest in Barbados’ maritime space (government, private and public), and how to align government objectives with global goals. Ultimately, the blue economy must deliver acceptable benefits both to those making investments to harness the oceans’ resources and to local people and communities (Figure 15). This will inevitably require trade-offs to be made where space is limited and the combination of all activities is not feasible.

Figure 15: Needs and interests of different stakeholder groups.

During recent years, marine spatial planning (MSP) has been promoted as one tool that can help address complex conflicts in coastal and marine areas, particularly in heavily used marine areas. Moreover, while the focus of CZM is generally limited to a narrow coastal strip, MSP normally applies throughout the entire EEZ.

MSP is a planning process that enables integrated, forward looking, and consistent decision-making on the human uses of the sea and the interactions between those uses. MSP also provides a way to balance demands for development with the need to protect marine ecosystems, and to achieve social and economic objectives in an open and planned way. In this regard, MSP is increasingly being applied to develop marine zoning and allocation plans that address multiple-use conflicts.

MSP is not a plan, but rather a planning process often utilizing spatial planning tools. The principal output of MSP is a comprehensive spatial management plan for a marine area or ecosystem (Figure 16). It sets out priorities for the area and defines what these priorities mean in time and space. The comprehensive marine spatial plan is often implemented through tools such as ocean zoning and mapping, permit systems, education and encouragement as well as having an institutional framework, which links planning, policies and regulations.
Figure 16: Outputs of marine spatial planning. Source: Ehler and Douvere (2009).

Using zoning as the principal tool with which to implement marine spatial planning is not essential, and in some countries MSP has been implemented without zoning. In fact, some activities are better managed using other spatial and temporal tools, including:

- Permits, often tied to specific areas within zones
- Enforceable management plans
- Site plans/special management areas
- Other spatial restrictions, e.g., defence training areas.

To date, Barbados has not embarked on the development of an EEZ-wide MSP process but has indicated a desire to pursue MSP to support development of the blue economy. As a critical tool for the implementation of the blue economy, MSP should, therefore, be seen as a critical priority for the long-term planning and development of Barbados maritime space, since it links the blue economy with the broader development planning framework (e.g. economic development planning and land-use planning) and with other sectors of the economy.

A review of the relevant literature suggests that the key elements on which to base MSP could include:

- A well-functioning institutional and legal framework;
- Knowledge (data) about current uses, activities and pressures for change, including future trends;
- Access to marine and coastal information for decision support purposes, in particular knowledge and data about offshore marine areas is required;
- Mechanism for stakeholder involvement;
- Identification of the shared values of the region, including environmental, economic, social and cultural (heritage) values;
• Conflict resolution tools and cumulative impact assessment;
• Strategic environmental assessment (SEA) for the marine area as a whole; and
• Coherence of MSP with terrestrial spatial planning and sound management and control of the seas.

5.6 The “Value” of the Blue Economy in Barbados

The “blue economy” is a relatively new concept within the Barbadian economic landscape. Given the specification of the activities undertaken with the blue economy, some of these activities can be carved out from the existing data available to get a sense of the current size of the blue economy for Barbados. More formally, the blue economy should be measured through the adoption of satellite accounts, which are special accounts within the overall system of national accounts designed to measure special features of a particular sector or set of activities. To date, Jamaica is the only Caribbean country that has preliminary estimates for the blue economy [see Ram et al 2019]. Based on the traditional elements of the blue economy (visitor accommodation, fishing, tourism and recreation services and maritime transport), Ram et al (2019) obtained a “measurable and direct impact of 6.9 percent of GDP in 2017 and an average contribution of 6.7 percent for the period 2012 to 2017.” There is no comparable data for Barbados to measure the contribution of the “blue economy to the overall economy”. There are estimates of some of the indicators of the blue economy activities in Barbados (Table 11).


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<tbody>
<tr>
<td>Total fisheries production (metric tons)</td>
<td>3,282</td>
<td>1,829.5</td>
<td>1,371.5</td>
<td>2,991.5</td>
<td>2,228.5</td>
<td>1,519.5</td>
<td>1,760.5</td>
</tr>
<tr>
<td>Capture fisheries production (metric tons)</td>
<td>3,280</td>
<td>1,819</td>
<td>1,361</td>
<td>2,977</td>
<td>2,208</td>
<td>1,499</td>
<td>1,735</td>
</tr>
<tr>
<td>Aquaculture production (metric tons)</td>
<td>2</td>
<td>10.5</td>
<td>10.5</td>
<td>14.5</td>
<td>20.5</td>
<td>20.5</td>
<td>25.5</td>
</tr>
<tr>
<td>Container port traffic (TEU: 20 foot equivalent units)</td>
<td>80,430</td>
<td>77,051</td>
<td>72,163</td>
<td>74,923</td>
<td>78,432</td>
<td>86,508</td>
<td>105,326</td>
</tr>
<tr>
<td>Liner shipping connectivity index (maximum value in 2004 = 100)</td>
<td>11.88</td>
<td>9.7</td>
<td>7.52</td>
<td>7.45</td>
<td>7.77</td>
<td>7.71</td>
<td>8.46</td>
</tr>
<tr>
<td>Quality of port infrastructure, WEF (1=extremely underdeveloped to 7=well developed and efficient by international standards)</td>
<td>5.54</td>
<td>5.6</td>
<td>5.6</td>
<td>5.6</td>
<td>5.3</td>
<td>5.3</td>
<td>5.3</td>
</tr>
<tr>
<td>Marine protected areas (% of territorial waters)</td>
<td>0.006</td>
<td>0.006</td>
<td>0.006</td>
<td>0.006</td>
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As in the case of Jamaica, the main activities in the blue economy of Barbados are marine tourism and port operations and transport. As indicated earlier, the overall tourism sector, which is concentrated along the coastline, accounts directly for 14 percent of GDP and totally for over 40 percent of GDP. Given the high degree of foreign trade taking place between Barbados and the rest of the world, port operations and shipping plays a vital role in the Barbadian economy. Over the period 2010 to 2016 container port traffic is estimated to have increased by 30 percent. Fisheries and other activities account for very small percentages of GDP.
While there are no macroeconomic data to fully measure the “value” of the blue economy, there have been microeconomic studies which provide some idea of the value of some aspects of the blue economy for various users. Dharmaratne and Brathwaite (1998) first estimated the value of the Barbados west and south coastlines to tourists during the 1993 to 1994 season. They found that the aggregate net benefit from using the beaches was US$24m with visitors willing to pay between $51 and $62 to use the beaches in the form of an access fee or beach pass. They also found that the financial benefits of improving the water quality along the beaches may be worth about US$ 13m annually.

More recent research by Schuhmann et al (2017) found that visitors were willing to pay US$275 more for a one week stay where beaches relatively wide and US$800 less for narrow beaches; US$640 more where coral reef quality allowed for more marine life and US$1,000 less for poor reef quality and US$1,500 for improved sea-water quality. In essence, visitors valued the width of beaches, the quality of the coral reef and sea water very highly in making a decision to use the beaches in Barbados. They also found that approximately 80 percent of the visitors were willing to pay an environmental fee of US$5 to help fund a long-term protection of the coastal and marine resources in Barbados. These estimates point to the importance of maintaining a high quality of blue economy resources for an important users who would not return if there was any deterioration.

The implications of these research studies, all point to the fact that the Government could impose additional/higher user fees for visitors and users of the coastal amenities without prejudicing the sector, thereby offering an additional revenue stream that could be channelled towards supporting and improving coastal ecosystems.

Corral and Sling (2017) evaluated the impact of a coastline stabilization programme on economic growth in Barbados. They found that by preventing the retreat of the shoreline and enhancing beach amenities along the west and south coasts, economic growth was positive in the short and medium runs. Further research by Banerjee et al (2018) indicated that the benefits of shoreline stabilization in Barbados. They found that an investment of US$24.2m on coastal infrastructure along the west and south coasts generated significant benefits to both locals and visitors by reducing property damage and beach erosion.
6 | EXISTING GOVERNANCE ARRANGEMENTS

6.1 Policy Setting

At the national level, Barbados has yet to develop a comprehensive policy for the utilization of the EEZ that embraces diverse sectors such as fisheries, energy, communications, transport, environment, national security, biotechnology etc. Hence, with the exception of the Integrated Coastal Management Plan (1998), the Fisheries Sector Development and Management Policy (2013) and the Fisheries Management Plan (2004-2006), no specific plans or policies for development of marine resources and activities in Barbados exist. However, the regional fisheries policy, the Caribbean Community Common Fisheries Policy (CCCFP), (2014) focusses on the cooperation and collaboration of Caribbean people, fishermen and their governments in conserving, managing and sustainably utilising fisheries and related ecosystems. The development of a National Blue Economy Roadmap will need to be framed against the relevant regional and international treaties and conventions the country is party to, as well as the broader national policy framework.

6.1.1 International Framework

The international ocean governance framework comprises a complex network of international and regional agreements, intergovernmental and civil society organisations and economic/market-based drivers.

The overarching framework governing the management of the oceans is provided by the 1982 United Nations Convention on the Law of the Sea (LOSC). The Convention contains an internationally agreed framework of principles and rules governing the use of ocean space and resources. This includes rules on the determination and delimitation of certain maritime zones, together with rules concerning the exercise of various rights by States, balanced by adherence to certain obligations.

In addition to the LOSC, there are a number of other global and regional agreements that supplement the LOSC regarding specific activities or regions, including the 1995 UN Fish Stocks Agreement, the Convention on Biological Diversity (CBD) and Chapter 17 of Agenda 21. Of these, the CBD is especially relevant as an international treaty that calls for conservation of all biodiversity.

Chapter 17 of Agenda 21 is devoted to the protection of the ocean, seas and coastal areas as well as the protection, rational use and development of their living resources. It proposes a plan of action and how to implement the principle of sustainable development that governments and local authorities can use.

More recently, the post-2015 development agenda, adopted by the UN General Assembly in September 2015, included a broad framework which reflects the multifaceted nature of development. Of particular importance to the discussion on the blue economy are the Sustainable Development Goals (SDGs), adopted as part of the post-2015 agenda. They include, in Goal 14, a specific reference which articulates the link between oceans and sustainable development in a way that has previously not been explicitly stated.

Numerous sector-specific instruments have also been adopted under the auspices of relevant governing bodies such as the International Maritime Organization (IMO) for shipping and the International Whaling Commission.

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In terms of fisheries, Barbados is a party to the 1993 FAO Compliance Agreement and the 2009 FAO Port State Measures Agreement. The country has also acceded to the 1995 UN Fish Stocks Agreement.

A list of some of the main international agreements Barbados has acceded to or ratified, that are relevant to the marine environment is provided in Annex B.

6.1.2 Regional governance arrangements

Over 30 different regional and sub-regional organisations with some level of engagement in governance of the ocean and its resources operate in the region and support these arrangements. They include UN organisations and regional intergovernmental organisations, oriented towards all aspects of ocean governance and marine resource management. A number of key organisations are listed below:

- Caribbean Environment Programme and the Cartagena Convention
- Caribbean Sea Commission
- Caribbean Large Marine Ecosystem Project
- CARICOM - Caribbean Regional Fisheries Mechanism
- Western Central Atlantic Fishery Commission (WECAFC)

6.1.3 National policy initiatives

Although Barbados has no overarching national policy on the management of its maritime space, a number of national and sector specific policies have been prepared (or are in preparation) that are highly relevant to the management of marine resources.

6.1.3.1 Barbados National Sustainable Development Policy

The Barbados National Sustainable Development Policy (BSDP) was approved by Parliament in 2004 following the work of a Cabinet-appointed National Commission on Sustainable Development (NCSD) that was convened in response to the Global Conference on the Sustainable Development of Small Island Developing States in 1994. The BSDP has as an overarching goal “to ensure the optimization of the quality of life for every person by ensuring that economic growth and development does not occur to the detriment of our ecological capital.” The major objectives of the plan are:

1) to formulate a national definition of sustainable development;
2) to provide a national framework for decision-making based on our principles of sustainable development;
3) to promote principles of sustainable development and encourage all persons to adopt and apply these principles in every aspect of decision-making; and
4) to sensitize and educate all persons in Barbados about key issues and conflicts between development and environment and the need to make wise consumption and production choices.

The policy defined for Barbados overarching principles of sustainable development namely: conservation of resources, economic efficiency, quality of life, equity and participation. The BSDP is divided into two main parts. The first section of the document centres on the policy aims and objectives, in addition to placing the principles of sustainable development within a Barbadian context.

The second part of the BSDP focuses on presenting an Action Plan. It articulates detailed sector focused policy recommendations supporting sustainable development and a further shift towards more sustainable consumption and production patterns (Government of Barbados, 2013).

With specific reference to the blue economy, these sectors include:
- Freshwater resources
- Fisheries
- Energy
- Biotechnology
- Natural resources
- Disaster management
- Coastal and marine preservation and Sustainable tourism development

6.1.3.2 Barbados’ Fisheries Sector Management and Development Policy

The Barbados Fisheries Sector Management and Development Policy (2015) was approved by Cabinet in 2015 and sets out the course of action of the then government to guide the sustainable use of local fisheries resources and the responsible development of the local fisheries sector.

The purpose of the policy is stated as:

*To set standards and guidelines for the acceptable conduct (behaviour) in the exploitation, management and handling of the fisheries resources, in addition, to the development of the fishing sector in an effort to generate sustainable nutrition and food security, and economic benefits for these involved in the fisheries both now and in the future.*

As well as setting out a series of guiding principles for fisheries management in Barbados, the policy addresses five key thematic areas, namely:

- Resource sustainability;
- Livelihood sustainability;
- Infra-structure development;
- Legislative reform, and
- Greening fisheries.

Each thematic area includes specific policy guidance and the broad measures required to implement each of the thematic areas. In this regard, the policy aims to provide the foundation for action and decision-making in the fisheries sector although detailed actions required for the management and development of each fishery are to be identified in individual Fishery Management Plans (FMP). It should be noted, however, that since the adoption of the policy in 2015, no FMPs have been adopted by the government.

6.1.3.3 The Fisheries Management Plan (2004-2006) and the Fisheries Policy (2013)

The Fisheries Management Plan, first published in 1997 and subsequently revised in 2001 and 2004, contains the schemes for the management and development of fisheries in the territorial waters of Barbados as required by law under the Fisheries Act. The FMP contains information on the status of the local fishing industry and the planning processes used in developing the plan. It outlines strategies for the development and management of the fishing industry to ensure its sustainable contribution to the nutritional, economic and social wellbeing of Barbadians.

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21 Section 3.2 of the Policy.
22 Section 1.2. of the Policy.
The 2004-2006 FMP, which was developed with full consultation of all stakeholders, contains nine fishery-specific plans that were intended to ensure the sustainable use of the Barbados' fisheries resources for the benefit of the people of Barbados. The FMP does not present an overarching goal or objective for the fishery sector but, instead, presents individual visions for each of the nine fisheries that are described in the plan.

The Fisheries Division, with support from the FAO, is currently undertaking consultations over the development of a comprehensive new fisheries policy for Barbados.

**6.1.3.4 Integrated Coastal Management Plan**

Integrated coastal zone management has been practiced comprehensively in Barbados for several decades and is one of the best governed/managed areas relating to marine management. Pursuant to the *Coastal Zone Management Act*, the Government (through the CZMU) has prepared the *Integrated Coastal Management Plan* (ICMP), a comprehensive three-volume plan that addresses the full range of coastal uses and their management in Barbados.

The overarching strategic objectives set out in the ICMP are:

- Sustainable use of the coastal zone management area by implementing policies which maintain, and where possible enhance, environmental quality while enabling economic development;

- Through an effective legal, institutional and administrative structure to implement integrated coastal management.\(^{23}\)

The plan sets out detailed actions necessary for the implementation of these objectives throughout Barbados in the context of a legally defined Coastal Zone Management Area (CZMA). The CZMA is not a zone in which all development is prohibited but rather one in which planning permission may only be granted if proposals are consistent with the policies set out in the Plan.

The CZMA extends along the entire coastline of Barbados, and allows the CZMU to influence the many of the main activities and uses which affect the coastal environment. The jurisdiction defined by the CZMA works in tandem with other island wide policies and programmes such as the Physical Development Plan (PDP) and by necessity will be linked with any future ocean governance policies developed for Barbados' EEZ.

The extent of the CZMA is illustrated in Figure 17 below and extends from a landward boundary to the 100 meter isobath or 200 meters seaward of the outer edge of the bank reef, whichever is further seaward. This includes the critical sand reserves and the reef environment which produce them, as well as the coastal waters which are directly influenced by terrestrial discharge.

The plan provides for the conservation and management of coastal and marine biodiversity. It also provides for the designation of marine reserves, which may include submarine areas along with adjacent land that is ecologically linked, as restricted areas. In addition, the ICMP provides for the conservation and management of Natural Heritage Conservation Areas and Coastal Landscape Protection Zones established under the 1998 Physical Development Plan. The ICMP also articulates the following policies:

- Preservation of existing vegetation by landowners through encouragement from the CZMU;

- Protection and rehabilitation guidelines for coastal and marine habitats including coral reefs, seagrass beds, ravines and other freshwater ecosystems and littoral vegetation;

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\(^{23}\) Source: Integrated Coastal Management Plan: Volume 1: The Barbados Policy Framework
• Cooperation between the CZMU and the Fisheries Division in implementing the CZMP provision for regulating shallow-shelf reef and coastal pelagic fisheries, and for managing coastal habitats such as coral reefs and sea grass beds;
• Protection and management of turtle nesting sites, and
• Determination of threshold levels for marine water quality.

Figure 17: Coastal zone management areas under the CZMP.

6.1.3.5 National Physical Development Plan (PDP)

The Draft National Physical Development Plan (PDP), revised in 2017 provides a vision for sustainable growth and development of the nation by setting out policies to guide relationships among land uses, built form, mobility, community facilities and physical infrastructure. It is also intended to be a framework to facilitate and guide investment, both public and private, in Barbados to the year 2035.

The purposes of the PDP are:

• Foster the economic, environmental, physical and social well-being of the residents of Barbados;
• Address the critical impacts of climate change on Barbados as a Small Island Developing State (SIDS) through policies and strategies that enable the people of Barbados to thrive and remain resilient under changing climatic conditions;
• Establish a vision to guide the future form of development with respect to land use, settlement patterns, food production, infrastructure and environmental management;
• Guide the future form of development on the island and inform the public, business and government sectors as to the nature, scope and location of both development and protection areas for core assets; and
• Provide a clear and accessible investment framework for private and public works and actions which impact the social, economic and environmental health of the nation.

The Plan has several focus areas, including:

• Promoting Sustainable Development
• Protecting Core Assets (food resources; natural heritage; water; national parks; and cultural heritage);
• Promoting Food Security
• Protecting Natural Heritage Systems and Introducing Disaster Risk Reduction
• Greening the Economy

6.1.3.6 Tourism Master Plan

The Barbados Tourism Master Plan 2014-2023 (TMP) was developed to guide tourism development over a ten-year period and was intended to provide the basis for enhanced coordination and collaboration between and within Government, stakeholders, and the people of Barbados.

Given the importance of tourism to the overall economy of Barbados, the TMP places the concept of “tourism” in its broader, more modern context of the “Visitor Economy”. The TMP sets out pathways for ensuring that the following vision:

“to deliver an unmatched experience that is truly Barbadian, created by warm, welcoming, friendly people, ensuring benefits to the entire nation”

The overarching goal of the TMP is “to grow the Barbados Visitor Economy sustainably and responsibly in consideration of the people, the economy, and the natural environment”.

To achieve this, the TMP addresses 12 strategic imperatives as the critical aims that must be the focus of the stakeholders within the BE. With respect to the blue economy, these include inter alia:

1) Enhance the visitor experience through natural heritage; and
2) Mainstream environmental management.

Each strategic imperative is to be accomplished through the achievement of a set of strategies and corresponding priority actions.

The Tourism Master Plan is very explicit about the critical importance of environmental sustainability to the continued viability of the tourism industry, with an entire volume of the report series devoted to environment


The most recent version of the National Energy Policy establishes a comprehensive policy for Barbados in areas relating to the supply and consumption of energy across all associated sectors. The policy spans all aspects of the energy sector, and provides a framework for moving Barbados from a fossil fuel based economy to one completely based on renewable energy sources. The overarching policy goal for Barbados, with respect to energy, is to achieve the 100% renewable energy and carbon neutral island-state by 2030. These include:

• Provision of reliable, safe, affordable, sustainable, modern and climate friendly energy services to all residents and visitors;
• Zero domestic consumption of fossil fuels economy wide;
- Export of all hydrocarbons produced both on land and offshore;
- Maximising local participation (individual and corporate) in distributed renewable energy (RE) generation and storage (democratisation of energy);
- Minimise the outflow of foreign exchange; and
- Creating a regional centre of excellence in RE research and development.

Although no specific reference is made to offshore/marine renewable energy sources, with respect to the implications for the blue economy, two specific policy objectives are particularly relevant, namely:

**Objective 1:** Increasing the amount of renewable energy sources used in the energy mix to 100%;

**Objective 6:** Increasing the extent of renewable energy resources used in Barbados that are obtained from indigenous sources.

In parallel, the policy also recognises the important economic potential of petroleum resources and provides specific support to the Government’s efforts to gain more fossil fuel resources through offshore drilling and exploration activities.

It is clear that the Government is considering offshore/marine sources of renewable energy within the overall portfolio of indigenous sources of renewable energy and a number of studies are currently underway to assess potential technologies that could be deployed in Barbados in fulfilment of this requirement. These are discussed in more detail in section 7.2.3 below.

**6.1.3.8 National Biodiversity Strategy and Action Plan (NBSAP)**

Prepared in 2002, the National Biodiversity Strategy and Action Plan (NBSAP) is a strategic plan designed to guide implementation of the Convention on Biological Diversity in Barbados by systematically addressing what were regarded as the main threats and key priority areas for action. The NBSAP is one of several sectoral plans which have been prepared in the past few years with a view to achieving a comprehensive framework for the sustainable development of natural resources in Barbados.

The NBSAP aims to integrate biodiversity management and conservation aspects of the various existing sectoral plans and serves to minimise overlap and increase the efficiency of use of human, financial and equipment resources. The NBSAP comprises twelve objectives, all relevant in some way to management of the marine environment. However, the marine environment is only directly referenced in objective 9 (To establish effective In situ and Ex situ biodiversity conservation measures) and Objective 12 (To promote the conservation and sustainable use of biodiversity in various sectors (agriculture, health, fisheries and tourism).

This notwithstanding, there is further strong support for greening the fishing industry, and other blue economy sectors, within the vision statements of the NBSAP for the specific goals for the role of biodiversity conservation in the development process in Barbados – sustainable development, environmental preservation, responsible economic decision-making and protection of national biological heritage. Although the NBSAP should be a vital strategic document for guiding biodiversity and its ecosystems conservation, sustainable use and development, according to the fifth National Biodiversity Report to the CBD (Government of Barbados, 2016), resource and capacity constraints have made implementation progress far from ideal. Although some of the priority actions and recommendations have been completed by various agencies, the NBSAP document does not appear to be widely utilised consistently referenced during the planning process.

**6.1.3.9 National Climate Change Policy**

The Government of Barbados has drafted a National Climate Change Policy Framework that provides the country’s overarching approach to climate change adaptation and mitigation. The primary goal of
this policy framework is to “establish a national process for adapting to climate change effects and minimising greenhouse gas emissions over the short, medium and long term, and to do this in a manner that is coordinated and consistent with the broader sustainable development aspiration.” Its objectives are to:

- Establish and appropriate mechanism for responding to challenges to climate change;
- Engage in regional and international climate change negotiation, planning and response mechanisms;
- Effect full stakeholder engagement in the development and execution of domestic climate change mitigation and adaptation actions; and
- Conduct climate change research.

The policy acknowledges that climate change will affect both the natural environment as well as the social and economic stability of the country. The priority sectors assessed for climate change vulnerability and adaptation include inter alia water resources, human health, coastal resources and human settlement, tourism and fisheries. As such, the Government has signalled its intention to focus on building resilience to climate change across diverse sectors as well as reducing its level of contributions to global GHG emissions.

This has important implications for the blue economy, both in terms of building resilience to external shocks through climate proofing coastal infrastructure etc, but also in terms of building resilience in coastal ecosystems to better withstand the future projected impacts of climate change on natural systems.

6.1.3.10 Sustainable Development Policy

The over-arching goal of the Barbados Sustainable Development Policy is to ensure the optimisation of the quality of life for every person by ensuring that economic growth and development does not occur to the detriment of Barbados’ ecological capital. The main objectives of this policy are:

- To formulate (or provide) a national definition of Sustainable Development and identify national principles for the pursuit of Sustainable Development;
- To provide a national framework for decision-making based on our principles of Sustainable Development;
- To promote principles of Sustainable Development and encourage all persons in Barbados to adopt and apply these principles in every aspect of decision-making; and
- To sensitise and educate all persons in Barbados about key issues and conflicts between development and environment and the need to make wise consumption and production choices.

The policy recognises the need to take into account the bio-physical "limits to growth" when decisions are made with regards to resource use. These limits include the: finite supply of some resources; natural carrying capacity of ecosystems; fragility and vulnerability of some ecosystems; finite resilience of ecosystems to resist and recover from man’s impacts; limited waste assimilation capacity of the natural environment.

The policy further recognises that natural resources should not be exploited to the extent that it inhibits the ability of future generations to meet their own needs. In the context of the blue economy, this is particularly relevant for fisheries.
6.2 Institutional Arrangements

At least 20 government/parastatal agencies have been identified as having some form of statutory or functional mandate relating to management of ocean resources and the development of the blue economy. Furthermore, there are numerous sectorial sub-divisions and different hierarchical levels in each governmental structure.

The numerous organizations that have competence in this area are located within a governmental structure, which leads to mostly top-down and segmented decision-making processes and, in some cases, gaps in the overall administration of ocean affairs.
Table 12: Summary of government institutions with responsibility for elements of the blue economy in Barbados.

<table>
<thead>
<tr>
<th>PARENT MINISTRY</th>
<th>OPERATIONAL DEPARTMENT</th>
<th>FUNCTIONS RELEVANT TO THE BLUE ECONOMY</th>
<th>RELEVANT LEGISLATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Agriculture and Food Security</td>
<td>Meteorological Department</td>
<td>• To transform and re-position the Agricultural Sector in Barbados through the promotion of an Agri-business approach to farming, with particular attention being paid to the effective use of resources, as well as the adoption of appropriate technology and sound management practices in order to achieve internationally competitive production, processing and marketing enterprises, which contribute significantly to social and economic development and food security, as well as to the sustainable management of the natural resource base of the country. • Monitoring and prediction, data processing, weather services, climate services, hydrological services and international activities. • The provision of weather services to the public and other specific user groups such as aviation, shipping, recreation and tourism, has been paramount over the years. • Flood, severe weather and other special weather warnings are provided as a public good exercise. • Public weather forecasts.</td>
<td>Barbados Caribbean Meteorological Organization Act (CAP. 15C)</td>
</tr>
<tr>
<td>Agency/Stakeholder</td>
<td>Description</td>
<td>Legislation</td>
<td></td>
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</table>
| Veterinary Services Department | • Responsible for maintaining animal health through surveillance and the control of animal diseases, and by preventing the introduction of exotic diseases.  
• Promote the economic development of Barbados by minimising the effects of animal disease to livestock producers and exporters of animals.  
• Provide export certification for food health/animal health standards (specifically relates to exports of fish and fish products).  
• Support inspection to assess the health of aquaculture fishery products. | *Animals (Diseases and Importation) Act*, Cap 253 |
| Ministry of Education, Technological and Vocational Training | Technical & Vocational Education and Training Council | • To make Barbados more competitive through the development of its workforce.  
| Ministry of Energy and Water Resources | Barbados National Oil Company Limited | • Onshore exploration and production of Barbados' hydrocarbon resources.  
• Potential to hold interests in offshore license blocks.  
• Imports and exports petroleum products.  
• Supplies diesel and fuel oil to the bunkering sector. |
<table>
<thead>
<tr>
<th>Agency/Office</th>
<th>Functions</th>
<th>Legislation</th>
</tr>
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</table>
| Barbados Water Authority              | • Supplying the island with potable water as well as the provision of wastewater treatment and disposal services to the sewered areas of Bridgetown and the South Coast.  
  • Responsible for the monitoring, assessment, control and protection of the water resources in the public’s interest – this includes desalinated water. | Barbados Water Authority Act, CAP274A                |
| Natural Resources Unit                | • To promote the development of all local natural resources, situated both on-shore and within Barbados’ marine jurisdiction, including the Exclusive Economic Zone, in an economically and environmentally sustainable manner.  
  • Managing the Barbados offshore petroleum programme.  
  • Marine planning and licensing beyond the coastal zone. | Offshore Petroleum Act                                |
| Ministry of Environment and National Beautification Environmental Protection Department | • To promote and facilitate the sustainable use of resources by encouraging the involvement of all citizens and the integration of environmental considerations into all aspects of national development.  
  • Regulation of land-based sources of pollution (including sewage and waste water)  
  • Setting environmental quality and pollution discharge standards. | Marine Pollution Control Act                          |
<table>
<thead>
<tr>
<th>Organization</th>
<th>Responsibilities</th>
<th>Relevant Legislation</th>
</tr>
</thead>
</table>
| Natural Heritage Department | • Water quality monitoring programmes.  
• Responding to oil spills and other pollution incidents. | Natural heritage provisions contained in the Physical Development Plan |
| National Conservation Commission | • To promote the conservation of special and unique biomes of Barbados through effective management of a network of terrestrial and marine protected areas. | National Conservation Commission Act, CAP 393 |
| Sanitation Services Authority | • Management and preservation of public beaches and national interest sites.  
• Preservation and management of beaches, public parks and gardens, places and structures of national interest, marine reserves. | Sanitation Service Authority Act, CAP 382 |
| Ministry of Foreign Affairs & Foreign Trade | • Responsible for infrastructure relating to domestic and industrial wastewater management systems (including here are wastewater treatment plants), solid waste management systems and storm water drainage systems. | Marine Boundaries and Jurisdiction Act (CAP 387) |
| Ministry of Maritime Affairs and the Blue Economy | Barbados Port Inc. | • Control of activities within the port limits (Port of Barbados) |
| Fisheries Division | To promote the optimum utilization of the fisheries resources in the waters of Barbados for the benefit of the people of Barbados through management and development.  
• Manages the fishery resource and prohibits certain methods of fishing that are detrimental to the resource and to the marine environment. | Fisheries Act (CAP 391)  
Coastal Zone Management Act |
|-------------------|-------------------------------------------------------------------------------------------------|--------------------------------------------------|
| Coastal Zone Management Unit | To develop and implement a National Coastal Zone Management Plan and to work to ensure that the coast retains its vital and pivotal role in the economic, social and physical development of Barbados.  
• Preparation and revision of coastal management plans.  
• Execution and enforcement of the Coastal Zone Management Plan (CZMP).  
• Control of development in the Coastal Zone Management Area  
• Marine research and regulation of research.  
• Coral reef protection and monitoring.  
• Consultation with Town & Country Planning office.  
• Review design of coastal projects |
| Ministry of Tourism and International Transport | • As a key economic driver, the Ministry of Tourism represents a repository for policy and regulation best practices.  
• In the face of the COVID pandemic, this sector provides all stakeholders with an opportunity for renewal through creative... |
| Director of Maritime Affairs | • Coastal engineering design for shoreline stabilization and enhancement and coastal ecosystem mapping  
• Regulating safety, security and maritime pollution aspects of shipping  
• Coordinates with other Government agencies and institutions, namely, the Coast Guard, the Barbados Port Inc and the Police with regard to enforcement and regulations.  
• Registration of ships and flag state implementation.  
• Pollution from ships  
• Focal point for the IMO and international maritime conventions to which Barbados is party and, therefore, has oversight of matters pertaining to SOLAS and MARPOL among others.  
• Leads the Maritime Inter-Agency Committee, established in 2006 to assist the Minister with the cross sectoral aspects of shipping and maritime affairs.  
• Controls on maritime tourism and water sports activities.  

*Shipping Act*  
*Shipping (Oil Pollution) Act*
and increasingly sustainable policy and regulatory actions, built upon a Blue Economy ethos.

- The Division of International Transport creates an environment that provides a high degree of safety and economic viability in respect of the operations of the civil aviation and maritime sectors, strategically using these sectors as major vehicles for the expansion and further social and economic development of Barbados.

| Ministry of Health and Wellness | To promote and manage health and ensure environmental concerns are considered in all aspects of national development, through the provision of comprehensive, coordinated and integrated care, supported by appropriately trained staff, national leadership and standards of excellence.  
- Public and environmental health relating to the port and cruise ship passengers.  
- Responsibility for food safety including all edible marine products. | Health Services Act, CAP 44 |

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<tr>
<th>Prime Minister’s Office</th>
<th>Prime Minister’s Planning Office for specialized applications</th>
<th>The Barbados Coast Guard</th>
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</table>
| Primary surveillance and enforcement agency for Barbados’ maritime space.  
- CG officers are authorized to act as enforcement officers under a number of ices of legislation including the Fisheries Act, Coastal Zone Management Act and Shipping (Oil Pollution) Act. |
6.2.1 Coordination of maritime activities in Barbados

As can be seen from the table above, numerous agencies have a role to play in management of Barbados maritime space. For the moment, no single agency has responsibility for the environmental management of the EEZ beyond the territorial sea and there is still a need to clearly differentiate the respective roles and responsibilities of the various agencies.

To assist with this, the Government has established a number of advisory committees (e.g. Fisheries Advisory Committee, Ocean Governance Committee). If Barbados is to transition to a more integrated blue economy development framework, the existing sector-specific approach to decision making needs to be replaced with a more integrated mechanism that coordinates across the various functions and considers both land and marine developments and activities as one.

6.3 Legal Framework

Barbados does not possess a specific piece of legislation dealing with the entire maritime space and no legislation dealing specifically with activities in the EEZ. Currently, relevant regulation is found in diverse sectoral and ad hoc legislation. In some instances, the legislation is outdated and requires review and careful consideration to ensure conformity with the broad range of international agreements that Barbados is a party to. The main instruments are listed in Table 13 below and are discussed in more detail in Annex C.

Table 13: Summary of key legal instruments

<table>
<thead>
<tr>
<th>Maritime Claims and Legislation</th>
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<tbody>
<tr>
<td>Barbados Territorial Waters Act, 1985</td>
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<tr>
<td>Marine Boundaries and Jurisdiction Act, 1995</td>
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<tr>
<th>Marine Resource Management</th>
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<tr>
<td>Fisheries Act, 1995</td>
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<tr>
<th>Planning, Conservation and Environmental Management</th>
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<tbody>
<tr>
<td>Coastal Zone Management Act, 1998</td>
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<tr>
<td>Planning and Development Act, 2019</td>
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<tr>
<td>Marine Pollution Control Act, 1998</td>
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<tr>
<th>Maritime Transport and Port Facilities</th>
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<tbody>
<tr>
<td>Shipping Act, 1994</td>
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<td>Shipping (Oil Pollution) Act, 1995</td>
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<tr>
<th>Energy</th>
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<tr>
<td>Offshore Petroleum Act, 2007</td>
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<td>Offshore Petroleum Regulations, 2013</td>
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PART III: DIAGNOSTIC ANALYSIS
7 | CREATING THE ENABLING ENVIRONMENT FOR BLUE GROWTH

As more and more countries look to the ocean as a new economic frontier and new source of industrialization and growth, the ecosystems upon which many ocean economic activities depend are changing at an unprecedented rate, and not necessarily for the better. While the concept of the blue economy links economic growth with the conservation of ocean ecosystems, it seems clear that, in many examples, neither the conservation or sustainability component is the primary nor even necessarily the ultimate goal.

A sustainable blue economy, however, offers a path for considering economic development and ocean health as compatible propositions. It does not have to be a choice between growth and sustainability. Properly planned and managed ocean spaces should mobilize public- and private-sector investment and generate strong returns and ecosystem benefits. The advantages of such an approach mean that a diversity of activities, from traditional ocean sectors to new businesses focused on ocean health, can be managed in a co-ordinated way, within a comprehensive framework of ecosystem-based management (based on balancing growth with the capacity of the ocean for it). Thus, maintaining and restoring ocean the functions and integrity of these ecosystems (i.e. ‘ocean health’) must be considered as synonymous with growing ocean wealth.

At present it appears that the capacity to fund the scale up of blue economy activities in the public sector in Barbados is low. For the blue economy to flourish, therefore, there is a need for further engagement with development partners and, in particular, the private sector. However, it must be acknowledged that responsible private capital cannot be expected to mobilize in support of the blue economy at scale until the risks are reduced through reliable information, clear policies and improved governance (tenure, fiscal, financial, legal, etc.).

Government can help bridge this gap by designing policy mechanisms to allow new and sustainable marine activities to succeed, and can help populate a pipeline of projects for willing investors. Between these different roles and activities, it seems as though a framework is needed to allow for high-level coordination between the public and private sectors to unlock blue economy investment. In order to achieve a sustainable blue economy, one in which both the economy and ecosystems thrive, a comprehensive and integrated governance framework, with supporting conditions, needs to be present. These include good laws and regulations, strong institutions and multi-agency co-operation, inclusive decision-making processes involving all stakeholders (including business) along with evidence-based support (Economist Intelligence Unit, 2015). Moreover, clear coordinated institutional mechanisms for integrated ocean management established and implemented across all maritime sectors will be essential to accommodate and resolve conflicts between the vast range of marine-related interests and values.

Building on work previously undertaken by the Commonwealth Secretariat (Roberts and Ali, 2014) and further developed by the World Bank (Patil et al, 2016), this analysis identifies eight critical enablers - each of which will be realised through a series of recommended policy interventions (presented in section 7.1 below). If pursued with the support of development partners such as UNDP, these eight enablers can help transform the promising concept of the blue economy into a sustainable process of implementation, thereby supporting development of the various opportunities identified in this report and the accompanying Action Plan.

24 https://www.woi.economist.com/a-framework-for-the-blue-economy/
7.1 Enabler 1: Integrated Approaches to Ocean Governance

7.1.1 Situation and findings

Although the creation of the MMABE creates an umbrella organisation with an overarching responsibility for the key maritime sectors and activities in Barbados, the existing management and planning arrangement for maritime space in Barbados remains largely a conventional sector-specific approach. As a generalisation, governmental attempts to mitigate or adapt to particular resource uses on a sector-by-sector basis normally prove ineffective and fail to respond to the cumulative and synergistic impacts and pressures from human activities. These arrangements give rise to a number of institutional challenges, all of which are evident in Barbados to some extent:

- Limited communication between the various authorities responsible for individual activities resulting in poor coordination and national oversight for the management and utilisation of marine space;
- A spatial and temporal overlap of human activities and their objectives, causing potential conflicts;
- Impacts from one (or more) activities adversely affecting other users of the marine environment;
- Limited consideration of the cumulative effects of multiple activities on the marine environment and other users;
- Limited connection between marine activities and the resource use and onshore communities that are dependent on them;
- Lack of adequate protection of biologically and ecologically sensitive marine areas.

As Barbados develops its maritime sectors further, value-based conflict between competing interests can also be expected to increase. Without a more comprehensive and integrated approach to marine planning and decision-making, which recognises the interactions and the interdependent nature of the various uses and resources, it will be difficult to resolve such conflicts.

Of particular concern for small islands is the high degree of interconnectedness between land-based activities and the marine environments. In many regards, in SIDS the entire economy of the island should be considered to be the “blue economy” due to this high degree of interconnectedness. Barbados has recognised this to a degree, with the integration of integrated coastal management planning with land-based planning. Applying a more integrated blue economy development framework will allow greater consideration of the interactions between land-development and the marine (both inshore and offshore) environment.

The Government’s Roofs-to-Reefs Initiative is expected to address the need for greater coherence between land planning and development and the blue economy however this will only be achieved if the arbitrary boundary between land and sea is removed and a whole of island development approach is adopted.

Governance is therefore an overarching theme that is an essential part of the blue economy.

The components of a more effective governance system can be summarized as:

1. A broad institutional framework that creates the administrative mechanisms for integrated planning, decision making and management of the ocean (these may either be formal or informal);
2. **Policies and regulations** needed to govern the use and allocation of ocean resources and space, including policies relating to land-based activities and their impacts on the marine environment as well as the capacity to enforce compliance with access and use rules; and

3. **Tools and techniques** to achieve the implementation and coordination of integrated ocean policy frameworks (for example, marine spatial planning and spatial management mechanisms).

### 7.1.1.1 Institutional mechanisms

It is clearly recognised that the MMABE has the mandate from Government to coordinate activities at the national level. However, within the MMABE, some functions are still separated with policy being developed at the sectoral level (e.g. the Fisheries Policy).

Implementation of an integrated blue economy will require, and lead to, institutional changes. Notwithstanding the critical role of the MMABE, all relevant agencies should be involved, particularly those with responsibility for economic development planning and land-use planning and management that may not have traditionally had a significant role to play in marine management in Barbados. While the Government has addressed this need, to some extent, through the establishment of a number of advisory committees (e.g. Fisheries Advisory Committee, Ocean Governance Committee), if Barbados is to transition to a more integrated blue economy development framework, the existing sector-specific approach to decision making needs to be replaced with a more integrated mechanism that coordinates across the various functions and considers both land and marine developments and activities as one. An important first step will be the establishment of an **effective multi-sectoral coordination mechanism** to progress the implementation of the blue economy and to ensure clear coordination between the numerous blue economy-related initiatives that are currently underway or planned in Barbados.

*It is therefore recommended that the Government transition to a single Blue Economy Advisory Committee that oversees all future maritime activities and decision making. Such a committee would be overseen by the MMABE, reporting to the Minister responsible.*

*Consideration should also be given to whether the MMABE should take on the overall responsibility for the planning and coordination of activities across Barbados’ entire maritime space.*

### 7.1.1.2 Policy framework

Ensuring the implementation of policy objectives for a healthy, resilient, and productive marine environment is critical to support the blue economy. Many countries (including those in the Eastern Caribbean) are establishing National Ocean Policy frameworks to provide high level strategic guidance for the management of their maritime space.

Such policies should explicitly reflect the principle that the health of the oceans is inextricably linked to the sustainability of economic livelihoods for coastal communities and the economy generally. Among the critical components necessary for the success of such a policy framework are, therefore, allowances for:

- Sustainable economic development;
- Integrated approaches;
- Knowledge-based industries;
- Property rights that enable access to opportunities;
- Regulatory frameworks that attract investment; and
- The need to balance between future economic development and protection and conservation of the natural values of the marine environment that sustains Barbados.
Barbados should consider the development of a single, overarching National Ocean (Blue Economy) Policy setting out the strategic direction and objectives for development of its maritime waters.

Such a policy should not be seen as a replacement for existing sector-specific policies, which are still required. Rather, it should be an overarching framework, providing the broad policy direction under which all future sector-specific policies and planning should be developed.

7.1.1.3 Legal framework

There is currently a lack of overarching national legislation dealing with environmental management in Barbados, with a number of functions split across different instruments and administered by different agencies. As such, the current statutory basis for environmental planning and protection of the marine environment is fragmented across different legal instruments administered by various agencies. A review of existing legislation relevant to the management and conservation of Barbados’ maritime space therefore identifies the need for a legal regime to be developed which would give a comprehensive response to the requirements for the protection of the entire area under Barbados’ jurisdiction and for all activities undertaken therein. In particular, the concept of the protected area, as developed in international instruments to which Barbados is a party, including the CBD, requires better articulation in statute, as does the basic tool of the management plan designed to achieve specified conservation objectives. These measures must find expression in a comprehensive environmental enactment that would include existing natural resources legislation.

Moreover, those legal instruments that currently do address the assessment of environmental risks and impacts and their management are either linked to specific sectoral activities (e.g. offshore petroleum) or only apply within the 12 nm limit of the territorial sea.

A more comprehensive and integrated environmental assessment and management (legal) framework is required that responds to the broad range of activities that are, or are likely to be, undertaken in the EEZ and the continental shelf. In developing such a regime, the following recommendations should be considered:

- Prepare a new legal instrument that deals primarily with protection, planning and management of the marine environment (to include Barbados’ entire maritime waters). Such an overarching piece of legislation would not remove the need for sector/activity specific policies and legislation but would rather provide an overarching harmonisation framework under which all other activities would be developed. This would have similar authority to the Planning and Development Act but apply specifically to maritime activities in the EEZ (such as dumping at sea, non-petroleum mineral extraction, installation of pipelines and cables, the erection of installations and other structures, conservation of marine biodiversity (including indigenous and endangered species and critical habitats). The legislation would also provide the legal basis for undertake marine spatial planning in Barbados;

- Develop new regulations under the Petroleum Act to provide a comprehensive regime for environmental management, including prescriptive discharge quality standards and giving effect to relevant international instruments (e.g. MARPOL 73/78). Regulations should also be promulgated to provide for the establishment of exclusion zones around offshore installations and subsea pipelines25;

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25 It is acknowledged that the Ministry of Energy & Water Resources is in the process of completing a set of Environmental and Social Impact Assessment (ESIA) Guidelines which will assist interested IOCs in completing their respective environmental impact assessments required under the legislation for the pursuit of an exploration licence.
• Introduce new legislation controlling access and benefit sharing (ABS) from the use of marine genetic resources taken from Barbados’ maritime waters. This could also cover the development of biotechnology products and related products.

In addition, a number of existing legal instruments need to be updated:

• Update the Shipping Act to ensure that Barbados can give full effect to Coastal and Port State rights and obligations in addition to their obligations as a Flag State;

• Update the legislation relating to the authorisation of marine scientific research in the EEZ and territorial sea;

• Update the Fisheries Act in line with the soon to be developed Fisheries Policy. This should include specific provision for aquaculture development and create a much clearer link between no take fishing zones and marine reserves established under the Coastal Zone Management Act;

7.1.1.4 Multi-use marine planning

While there is a need to assess activities throughout the entire EEZ, it is clear that most activities are focussed in the relatively narrow coastal zone. The lack of information for offshore waters makes detailed planning more difficult, and it is clear that those areas that are subject to greater activity, and therefore pressure, warrant greater scrutiny.

This notwithstanding, the absence of a comprehensive national blue economy development framework makes may result in un-anticipated consequences from planning decisions and potentially impact the ability to develop new and emerging sectors in the future (e.g. marine renewable energy). The undertaking of a national EEZ-scale MSP process would help to address this gap and provide guidance on those national development priorities that must consider at the local planning level.

The lack of a national scale marine spatial plan is a barrier to the future development of the maritime tourism sector and the blue economy in general. Little data exists to identify, to other marine users, which activities take place in which geographic locations or the relative importance of different areas to specific sectors. As a tool for the implementation of the blue economy, MSP should, therefore, be seen as a critical priority for the long-term planning and development of Barbados maritime space, since it links the blue economy with the broader development planning framework.

Accordingly it is strongly recommended that Barbados embarks on the development and implementation of a comprehensive EEZ-wide MSP framework.

7.1.2 Recommended policy interventions

| Intervention 1: | Establish a single Blue Economy Advisory Committee that oversees all future maritime activities and decision making provide a coordinated institutional mechanism for integrated marine management across all relevant sectors. |
| Intervention 2: | Develop a National Ocean Policy (NOP) to establish a strategic framework for integrated marine planning and management of a nation’s marine space and the activities that occur within it. |
| Intervention 3: | Undertake a comprehensive review of the existing legal framework to address gaps, reduce duplication and strengthen the rules for management of the marine environment. |
| Intervention 4: | Establish a national marine spatial planning and zoning programme to undertake marine spatial planning and prepare marine plans to provide strategic oversight for future marine uses and activities. |
7.2 Enabler 2: A Healthy, Resilient and Productive Marine Environment

7.2.1 Situation and findings

The blue economy is dependent on a healthy ocean environment to sustain the supply of goods and services it provides. The interconnected nature of ocean and coastal environments means that exploitation of one type of marine resource and also other human impacts on marine ecosystems, have the capacity to affect the status of other exploitable resources and the health of the wider marine environment. Despite their importance to the economy of Barbados, coastal and marine resources are under intense pressure from a range of factors.

The health of coral reefs and associated biodiversity, in particular, are of critical importance from both an environmental and economic perspective due to Barbados’ strong reliance on the tourism and fisheries sectors. A number of activities have been highlighted as causing damage to habitats, including destructive fishing practices, anchor damage from yachts and the discharge of sediment and pollution to coastal waters (particularly land-based sources of pollution such as sewage).

Thus, effective management of the marine environment and the maintenance and restoration of ecosystem health and integrity is fundamental to a sustainable blue economy and must receive a high priority. It is particularly important to understand key pollutants that enter water bodies, identify pollution hotspots, and their impacts on marine biodiversity, fisheries, and human health.

A comprehensive approach is therefore needed to address the full range of threats to the marine environment, in particular coral reefs. Such an approach must ensure that any future national blue economy development framework addresses the full range of threats to the marine environment including land-based sources of pollution, unsustainable fishing practices and physical damage to marine habitats. Only when these issues are adequately managed will the blue economy be able to thrive in Barbados.

Furthermore, future policy and planning decisions need to avoid impacts accumulating through multiple and potentially incompatible activities taking place in a particular space, thereby preventing both land-based and marine activities from damaging the functioning of the marine ecosystem and the benefits it provides.

The government has committed to achieving the Aichi targets for protected area coverage but at this stage is a long way from achieving those targets. MPAs present significant opportunities for preserving the environment that underpins much of the Caribbean coastal and marine attractions. In addition to the Barbados Marine Reserve and the Carlisle Bay Marine Park and their planned expansion, a number of other coastal and offshore sites should be explored as candidate MPA sites, particularly where the limited seagrass beds and healthy stands of coral exist, taking into account the ongoing conversations with key actors such as the Nature Conservancy.

A comprehensive review of existing conservation commitments and future conservation needs is required. Such a review should include the broad range of stakeholders and take a multi-user approach to determining areas of greatest value that would benefit from greater protection. In doing so, Barbados should strive towards achieving protection of 20 percent of its entire maritime waters.

The expansion of the existing marine reserves to include a system of representative habitat types should therefore be seen as a priority.

Not only will this provide direct benefits in terms of improvements to fish stocks, but it will also help to build the resilience of those natural systems to better protect them against the inevitable impacts of climate change. They will also contribute to the natural capital which underpins the blue economy in Barbados.
Further additional areas of Barbados’ maritime space should also be assessed for greater protection.

The viability and security of Barbados’ maritime space and the resources therein, will undoubtedly be affected by the impacts and effects of climate change. Sea level rises, increased flooding and coastal erosion will lead to increased vulnerability for development and significant change along parts of the Barbados coast. This will influence the development and ‘value’ of the blue economy both now and in the future. Understanding the impacts and effects of climate change and other stressors is key to maintaining a healthy environment and supporting development of the blue economy. This will influence how we use and value our coasts and seas both now and in the future. Adaptation, including in the marine environment, is necessary to deal with the potential impacts of these changes which are already in train.

The increasing risks associated with climate change must therefore be recognised and managed through the incorporation of appropriate adaptation and resilience building strategies into sustainable development, conservation and governance actions if Barbados is to realise its vision for a blue economy.

### 7.2.2 Recommended policy interventions

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention 1:</td>
<td>Conserve and enhance the overall quality of the marine environment through protection, maintenance or restoration of habitats and the sustainable use of marine resources.</td>
</tr>
<tr>
<td>Intervention 2:</td>
<td>Strengthen or establish systematic monitoring to quantify the sources, flows, fate and extent of industrial, agricultural and municipal wastes and effluents. The results from such monitoring should be used to inform decision-making for improved waste management and pollution control.</td>
</tr>
<tr>
<td>Intervention 3:</td>
<td>Expand the current system of marine protected areas, with a view to achieving at least the 10% Aichi target, taking into account the need to better protect key coastal habitats and the resources they support.</td>
</tr>
<tr>
<td>Intervention 4:</td>
<td>Address increased risks of climate change through integration of appropriate adaptation and resilience building strategies into sustainable development, conservation and governance actions.</td>
</tr>
</tbody>
</table>

### 7.3 Enabler 3: Sustainable Finance and Investment

#### 7.3.1 Situation and findings

Advancing the blue economy will require investments in infrastructure, conservation, research and development, institutional and human capacity development, as well as information-sharing and knowledge-building (Caribbean Development Bank, 2018). Considering the level of investment that will be needed to achieve these objectives, countries in the Caribbean must find new and innovative ways to finance investments in the blue economy.

The opportunities to leverage domestic resources by blending official concessional finance with other international resources for the blue economy, are promising. Opportunities also exist for increasing available public resources as well as private sector finance and investment for blue economy initiatives. Increasing the resource envelope to finance blue economy initiatives also requires new approaches to draw upon the existing pools of development finance. It may also require the development and piloting of new instruments (Caribbean Development Bank, 2018).
According to the Friends of Ocean Action (FOA), at the macro-level, some of the most prominent forms of mainstream finance include bank loans and project bonds as well as more innovative structures for financing ocean conservation and impact (such as conservation trust funds, impact bonds and crowd financing). These are organised as impact-only, debt, equity and hybrid models. Other noteworthy investment models include seed investment in promising start-ups, impact investing in commodities, and the development of conservation trust funds for more natural capital-focused projects. These models are all gaining in popularity as the need and opportunity for finance in the blue economy becomes increases (FOA, 2020).

Figure 18: Alignment between major types of financing and example investments into sectors of the blue economy. Source: Friends of Ocean Action (2020).

In emerging sectors of the blue economy, which require new investment capital, the overwhelming source of existing funding continues to be philanthropy (over US$8 billion in the last 10 years) and official development assistance (ODA, US$5 billion in the last 10 years). However, growing appetite in the venture capital and impact investment communities for ocean investments has resulted in the establishment of a number of new funds in recent years. In established areas of the blue economy, a key trend is the redirection of commercial capital – flowing towards sustainable activity such as fisheries reform or low-carbon shipping (FOA, 2020). Figure 18 above illustrates the alignment between major types of financing covered in this paper and example investments into sectors of the blue economy, for an average compatibility of scale, risk and risk tolerance, and return potential. It provides some indication as to the best models for investment for different types of projects in different sectors.

Under the Resident Coordinator’s Office of the UN System in the Eastern Caribbean, UNDP as lead agency in collaboration with FAO and UNEP have submitted a proposal to the UN Sustainable Development Goals Fund for Blue Invest: A Facility for Caribbean SIDS’ Financial Expansion. This Joint Programme will support three Eastern Caribbean countries: Barbados, Saint Vincent and the Grenadines (SVG) and Grenada to achieve SDGs by catalysing available finance in the region and facilitating implementation of bankable investment projects in the blue economy.
Blue Invest is a technical assistance and investment facility (TAIFAA) to accelerate project identification, formulation, financing and implementation. It will fill the capability gap in the technical and financial structuring of an investment pipeline of blue economy projects, ensuring that this pipeline will be financed by leveraging (a) existing grant programs from development partners, (b) development finance institutions financing, and (c) its own financial instruments and incentive schemes to crowd-in private capital.

In addition, a particular focus for resource mobilization could be to support the development of emerging sectors (such as ocean-based renewable energy and “blue biotechnology”) by bridging the gap between the high upfront costs and uncertainty associated with such emerging sectors and the likely delayed financial returns that might be an impediment to companies investing in these sectors.

While there are several well documented global challenges to scaling up finance for the blue economy, two key barriers that are specific to the Caribbean may be identified:

1. A low ease of doing business and a weak culture of entrepreneurialism for many of the Caribbean’s countries, making deal-making difficult to accomplish

2. A lack of scale, due to the smaller size of many of the Caribbean islands, notably in the eastern Caribbean.

At a more granular level, opportunities exist to increase the flows of revenue received from the various maritime activities in Barbados.

To this end, it is recommend that the Government undertake a comprehensive review of the various existing fees, levies and charges that are received from marine related activities, especially cruise shipping, fishing and yachting.

Such a review should include a benchmarking exercise to compare the level of fees and levies with international norms as well as examining areas where no fees are currently collected.

As highlighted in section 5.6 above a number of studies have shown that visitors are willing to pay additional fees for high quality environmental services. The implications of these research studies, all point to the fact that the Government could impose additional/higher user fees for visitors and users of the coastal amenities without prejudicing the sector, thereby offering an additional revenue stream that could be channelled towards supporting and improving coastal ecosystems.

As an initial step in this regard, the Government should review and revise the existing schedule of visitor fees charged in respect of the Barbados Marine Reserve

7.3.2 Recommended policy interventions

**Intervention 1:** Work collaboratively with regional development partners and financial institutions to examine a range of emerging innovative finance options that could be applied in Barbados.

**Intervention 2:** Undertake a comprehensive review of the various existing fees, levies and charges that are received from marine related activities, especially cruise shipping, fishing and yachting. Such a review should include a benchmarking exercise to compare the level of fees and levies with international norms as well as examining areas where no fees are currently collected.

**Intervention 3:** Reform and further expand the existing visitor fees payment system for marine protected areas/marine reserves to ensure that users of marine reserve contribute a fair amount to the maintenance and upkeep of the marine reserves.
7.4 Enabler 4: Business Development

7.4.1 Situation and findings

The government has identified the need to diversify economic sectors, including with a focus on marine-based activities. Thus, the blue economy is seen as a mechanism for diversifying the economy and creating jobs. The realisation of these opportunities will require strategies that:

1. Further support and develop existing sectors;
2. Further develop the backward and forward linkages in the value chains of existing sectors; and
3. Promote investment and innovation to support the development of new sectors.

In Barbados, perhaps the greatest potential for value addition and job creation lies with the development of micro, small and medium-sized enterprises (MSMEs) within the blue economy value chains. Finance for MSMEs will be a key aspect of this enabler. There is, therefore, a need to examine the mechanisms available to government to encourage start-up MSMEs and to assist with capacity and technology development and to define the pathway to an effective BE investment promotion strategy.

To this end, there is a need to reduce impediments for private sector investment & secure innovative and sustainable finance. The government including the MMABE, the Ministry of Small Business, Entrepreneurship and Commerce and other relevant Ministries would need to work with the business sector—Small Business Association, the Private Sector Organisation, and other sectoral associations—to identify and develop investment opportunities. This collaboration would focus on resolving the major challenges facing the MSMEs in the blue economy—marketing, product development, operational management and finance. A key focus should be on how support pioneer investors through fiscal incentives and de-risking (e.g. through seed-funding to catalyse investment, the provision of needed infrastructure, or by developing the skills of workers and capabilities of local suppliers)?

As one of its first tasks, the Blue Economy Advisory Committee (recommended under 7.1 above) should establish a task force (with co-opted members from the private sector and academia) to engage with the private sector and oversee the issues associated with MSME growth and development in the blue economy — inter alia scuba, coastal cruisers, diving, fishing, cottage industries associated with blue economy resources etc.

One critical issue that was highlighted during the scope study is the lack of robust data with which to accurately measure the blue economy in Barbados. Limited data appears to be available regarding the importance and contribution of specific sub-sectors (e.g. yacht tourism and SCUBA diving). Moreover, the level of aggregation of data collected on coastal tourism limits any comprehensive analysis or understanding of economic benefits and costs associated with coastal tourism. Given that tourists are clearly motivated to visit Barbados by the natural marine assets, it seems prudent to understand this market better. New approach needed for data aggregation and analysis.

While there are a number of indicators (or surrogates) that provide some estimate of the value of Barbados’ blue economy, a comprehensive and disaggregated data set does not currently exist.

If Barbados is to progress the development of the blue economy, better data on progress with these activities is needed to measure and monitor the progress of activities in the blue economy. This should include a focus not only on the value of economic sectors but a broader approach to valuing the natural capital that supports these sectors.
7.4.2 Recommended policy interventions

<table>
<thead>
<tr>
<th>Intervention 1:</th>
<th>Engage with the private sector (both domestic and international) to promote the blue economy as an attractive investment and business development opportunity.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention 2:</td>
<td>Examine the mechanisms to reduce investment risk and to improve local business engagement in the blue economy through <em>inter alia</em> streamlining of regulation and procedures, improved access to technology and innovation, affordable finance, training and support for local entrepreneurs.</td>
</tr>
<tr>
<td>Intervention 3:</td>
<td>Streamline, harmonise and standardise blue economy statistics (e.g. GDP contributions direct and indirect from blue economy sectors), employment, social and environmental datasets to inform decision-making and develop standardised data collection, analysis, methodologies and reports consistent with global environmental and socio economic indicators (e.g. World Bank, World Economic Forum, SDGs) to facilitate tracking progress on implementation of blue economy.</td>
</tr>
</tbody>
</table>

7.5 Enabler 5: Human Capacity Development

7.5.1 Situation and findings

The institutional capacity gap is a common theme across all blue economy sectors and requires strong public leadership, backed up with a coherent top to bottom planning and management regime.

Caribbean countries, the region as a whole and development partners supporting this process can work collectively to devise new ways of working that leverage greater capacity from current systems to make change happen through for example increased regional cooperation, sharing of costs and public/private partnerships. As suggested earlier in this paper, there may be particularly strong opportunities for development partners support to this process.

The existing Social Partnership could be used as a vehicle to address three practical issues can help support the development of institutional and human capacity to act.

Firstly, through *sharing and creating joint capacity*. Many governments, including a large number of Commonwealth Caribbean member governments have made commitments to sustainable growth and resource protection and management, not just at national and global scales, but often at the regional level. A key ‘short cut’ to implementing the blue economy is to identify like-minded governments and share capacity on issues of critical concern in a creative, effective and politically appropriate manner.

Secondly, through *increasing cooperation and coordination on ocean issues of common concern*. Increased cooperation on issues that are common across the region, coupled with greater coordination across governments can help reduce costs and speed up the transition to more sustainable governance and management arrangements. Governments can analyse current actions and commitments and identify and implement new opportunities at regional and global scales for closer cooperative and coordinated working in making the transition to a blue economy.

Thirdly, a specific measure which could help catalyse the institutional capacity to act, which could be supported either directly or indirectly by development partners, comprises the conduct of a *Caribbean cross-sectoral skills gap analysis for the blue economy*, which can be followed by a strategy to address the revealed skills gaps. This initiative could be supported through partnership with all Caribbean countries, other coastal and developing country SIDS and regions, other developing countries, development partners, academic partners and others. This initiative would be in the context of the free
movement of skilled persons within the CSME and the granting of national and Caribbean vocational qualifications (NVOs and CVOs) by educational institutions.

In the context of Barbados, the Samuel Jackman Prescod Institute of Technology (SJPIT) offers specific programmes in maritime operations and marine diesel engineering along with a range of other general courses and programmes which would be relevant to the blue economy. The Barbados Port Inc has a working relationship with the Caribbean Maritime University in Jamaica which was originally established to train professional seafarers and has now extended its reach globally and is today recognized as “a centre of excellence for tertiary maritime and logistics education in the Caribbean”. An articulation arrangement for training persons in the range of skills needed for the blue economy in Barbados can be made between the tertiary institutions in Barbados (SJPIT and the Barbados Community College (BCC)) and the wider Caribbean such as the UWI, The University of Technology in Jamaica and the University of Trinidad and Tobago.

The private sector also has an important role to play in developing the capacity to support the blue economy. In this respect, a key component of the Offshore Petroleum Programme is building local capacity through a comprehensive local content policy. Through assistance from the Commonwealth Secretariat, the Ministry is currently developing a policy that will lead to institutional strengthening, capacity building and local business development through participation in the offshore petroleum sector.

The Ministry of Energy & Water Resources, through its negotiations with BHP Petroleum as part of the exploration license process, has secured a commitment from the company with regards to financial obligations which will go towards areas such as institutional strengthening within the relevant agencies and ministries; funding for the University of the West Indies; training programmes; funding for coastal and marine research and the acquisition of hardware and software. Emphasis has also been placed on local business participation in the company’s exploration activities where possible. It is envisioned that such an approach will allow local businesses to develop and acquire the international certifications and standards that will allow them to work beyond Barbados’ shores. The ministry plans to use this approach for all future licensing rounds. This policy can be further discussed in the validation sessions.

The development of this human capacity must move in sync with the planned development of the blue economy given the time to produce skilled persons for the economy.

### 7.5.2 Recommended policy interventions

The UNDP project team notes that Component 2 of the IADB-supported project “Strategic Roadmap for the Blue Economy in Barbados” will comprehensively address institutional capacity building for the MMABE to improve its coordination capacities and ability to support blue growth in Barbados.

### 7.6 Enabler 6: Research and Marine Information

#### 7.6.1 Situation and findings

Knowledge of the marine environment is also a critical need for effective decision making toward a blue economy. To ensure effective governance of marine space, a whole array of information and knowledge will need to be called upon. Governance requires factual information about the ecosystems being governed. It requires knowledge of geographical occurrence and abundance of ecosystems as well as information on how human actions affect these ecosystems.

It is acknowledged that research and information concerning Barbados’ maritime waters is a critical need for the development of the blue economy. Barbados coastal waters are relatively well mapped and understood. There is, however, a paucity of marine data relating to Barbados’ offshore waters, particularly with respect to living and non-living resources.
The just concluded EIA process for BHP Petroleum has highlighted the need for Barbados (Government, Academic and NGO) to acquire as much baseline data as possible within the EEZ and beyond the nearshore environment. It has been customary of the Ministry of Energy & Water Resources, upon request from the Ministry of Foreign Affairs and Foreign Trade to require that copies of any data which is acquired within Barbados’ EEZ, either for commercial or academic purposes, should be made available to the relevant government entities and stakeholders in a format that allows it to be uploaded to any software platform and subsequently used. However, for this data to be of value, the relevant entities will need to have or acquire the appropriate software to manipulate the data. Discussions with the CZMU highlight both limited data and the lack of capacity to deal with the large volumes of data that are normally associated with large scale offshore surveys. To address this, initial discussions have been held among agencies to explore the feasibility of developing a centralised multi-user platform where marine data can stored, accessed and used by multiple agencies.

*It is recommended that the potential to develop a centralised multi-user platform through which marine data can stored, accessed and used by multiple agencies be considered by the IADB as one of the critical elements of the Blue Economy Roadmap, given the critical need and multiple applications of such a platform (including EEZ-wide MSP).*

Notwithstanding the above, the project team notes that opportunities do exist to access large amounts of marine data that do exist at little to no cost to Government. Many international research cruises are undertaken around the world each year with the purpose and application of the research varying on a case-by-case basis such as the recently concluded National Oceanic and Atmospheric Administration (NOAA) research in Barbados. In most cases the data acquired during the research cruises may be used for a number of different purposes. Under international law, such researchers are obliged, upon request, to provide copies of their data to the host country. However, this is rarely proactively shared and, in most cases, requires a formal request from the host country. **However, such a request can only be made if the host country is aware of data that may be available in respect of their waters.**

A very cursory search of databases with global data coverage indicates that a considerable amount of marine scientific research (MSR) activity has been undertaken in the Barbados EEZ and adjacent continental shelf, much of which was collected in support of Barbados’ submission to the UN Commission on the Limits of the Continental Shelf (see Figure 19 below). Whether the Government is aware of the extent of this activity, and whether it has received copies of the data acquired is, at this stage, unknown.

*It is therefore recommended that the Government pursue a data discover process to identify and secure all offshore data that relates to its maritime waters. Once obtained, it will then need to determine what skills, equipment and other resources will be required to process and interpret such data.*
Figure 19: Example coverage (non-exhaustive) of marine scientific expedition navigation tracks. (Data acquired ranges from single beam bathymetry to geophysical, seismic, gravity and magnetic data). Source: NOAA-NCEI (https://www.ngdc.noaa.gov/mgg/mggd.html).

Research and development and other knowledge-generating activities support sustainable economic growth and job creation through the development of new products and services; the generation of new knowledge about the marine environment; facilitation of better management and protection of marine ecosystems; and informing policy, governance, and regulation of the marine sector.

Translating new opportunities into productive sectors will require investment in research and development, building technical capacity, and creating the right environment to attract and retain outside investment as a fundamental principle of a blue economy. While indigenous marine research is not well developed in the eastern Caribbean, many overseas universities, research institutes and environment non-governmental organisations do undertake marine research in the region.

A more coordinated focus between the existing research and educational facilities will be essential to support the development of new research clusters aimed at supporting and furthering key marine sectors. Identifying and defining ongoing strategic marine research and information needs, in an inclusive and adaptive manner, together with the appropriate funding resources and mechanisms, is essential for achieving economic development through a blue economy framework.

This requires the development and implementation of a clear strategy relating to marine scientific research and data.

### 7.6.2 Recommended policy interventions

| Intervention 1: | Assess the options for collating and mapping existing baseline data in a centralised data management system. |
| Intervention 2: | Undertake an assessment of existing research data relating to Barbados’ maritime waters and held by overseas research institutions and commence a process of data repatriation. |
| Intervention 3: | Develop a clear marine research strategy that identifies key data requirements for decision making and supports investment for new and emerging opportunities. |
7.7 Enabler 7: Public Awareness and Engagement

7.7.1 Situation and findings

Public participation is key to promoting and instituting a duty of care for the marine environment. Local communities and local industries should further be encouraged to participate in planning and management strategies and share responsibility for the management of ocean resources.

All those who utilize the resources such as fishermen, tourists, sport fishers, dive operators, resort owners and the average citizen must be informed.

Raising awareness will assist in promoting understanding and stewardship by all stakeholders; ensuring that decision makers and members of the public are accountable for actions they take that affect marine resources. Awareness raising, public participation and consultation will also greatly assist in sensitising both local communities and visitors to the importance of the marine environment in the nation’s development as has been done in the past in Barbados.

Information and education are important to promoting such understanding and enhancing personal levels of responsibility.

Emphasis should be placed on sensitising the population on coastal environmental issues, introducing relevant subjects through the school curriculum by involving the Ministry of Education, as well as capacity building especially for office bearers for effective implementation of the policies and activities.

7.7.2 Recommended policy interventions

**Intervention 1:** Support and promote existing and new strategies to build public and visitor awareness of the importance of the sea and its resources and protection of the marine environment.

**Intervention 2:** Establish a process to identify and stimulate the engagement of local communities and local industries in stewardship initiatives and cooperating to find environmental and sustainable development solutions.

7.8 Enabler 8: Maritime Surveillance, Monitoring and Enforcement

7.8.1 Situation and findings

Creating the conditions needed for effective management of ocean space and future economic growth depends on an effective and efficient monitoring, surveillance and enforcement system.

Although legal frameworks exist for many marine activities, it is likely that there are regulatory gaps compared to the range of activities undertaken. In terms of future economic development, of critical importance is the fact that such frameworks often do not anticipate or provide an enabling environment for future uses of the marine environment.

Moreover, a critical concern that was raised by many stakeholders is that current regulations are not enforced robustly.

Thus, a key element of monitoring and enforcement is the effective surveillance of Barbados’ maritime space and an awareness of the activities undertaken in the maritime domain. While this exists already
for security reasons, the information is not more widely utilised for general compliance and enforcement activities.

*To this end, there is a need for Barbados to enhance their capability to identify threats to their maritime space in a timely manner by sharing and integrating intelligence, surveillance, and navigation systems into a common operating picture.*

Taking a regional approach to Maritime Domain Awareness in the Caribbean Sea will reduce duplication of effort and allow limited resources to be shared and more effectively deployed. There is currently an ongoing regional maritime surveillance project being implemented through the RSS.

One practical step to address this is to *deploy the latest technology to enhance maritime domain awareness* in the region. By combining satellite, drone and vessel tracking technology with innovative tracking and analysis tools, Eastern Caribbean countries could create a system that will help governments and inter-governmental organisations across the region close the gap on illegal fishing and related criminal activity. Such cooperation, coupled with greater coordination across governments, can help reduce costs and accelerate the transition to the integrated governance approaches needed for a blue economy.

### 7.8.2 Recommended policy interventions

<table>
<thead>
<tr>
<th>Intervention 1:</th>
<th>Establish a national maritime monitoring control and surveillance system to strengthen compliance with and enforcement of national legal requirements.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention 2:</td>
<td>Review options to strengthen maritime domain awareness in Barbados including the application of new technology and the option of sharing capability across a number of neighbouring countries.</td>
</tr>
</tbody>
</table>
8 | APPLYING THE BLUE ECONOMY IN BARBADOS

The blue economy aims to offer a mechanism by which marine-based industries and resources may coordinate to construct a future founded upon the principles of sustainability, resilience, and responsibility. As such, the overarching aim for the Government of Barbados should be to define a holistic approach to the sustainable exploitation of marine resources with consideration of the implications of current activities on the oceans, and the realization of future potential opportunities.

In addition to strengthening the enabling environment for improved management and protection of Barbados’ maritime waters and associated ecosystems, presented in chapter 7 above, the realisation of such opportunities will require strategies that:

1. Support and enhance the further development of those marine based sectors that currently support the economy of Barbados; and

2. Promote investment and innovation to support the development of new sectors.

If considered holistically, and developed in a strategic and coordinated manner, Barbados can achieve a significant transition to a more sustainable, ocean-based economy that addresses the blue economy pillars identified by the MMABE. While some of these opportunities are sector-specific, others create synergies and linkages across the different functions. The opportunities highlighted below are by no means exhaustive, but capture some of the key issues and opportunities that were identified during the scoping study.

8.1 Supporting and Developing Existing Sectors

8.1.1 Tourism and leisure

8.1.1.1 Situation and findings

Tourism is one of the major income earners for Barbados, and the success of the sector is based, in large part, on a healthy natural environment which includes healthy marine ecosystems: the critical role the marine environment generally, and coral reefs specifically, play in supporting economic activity in the Barbados is clearly highlighted in the scoping study. Whether this is adequately reflected in government policy is unclear but there is a clear need for the government to fully understand the value of such resources to the economy when considering costs associated with conservation and environmental protection.

The marine environment is under intense pressure from local and climate-related factors. Local factors such as overfishing, coastal overdevelopment, pollution, habitat damage and climate change, coupled with the degradation of coral reef habitats have led to the loss of fish biomass and diversity. These changes in coastal and marine quality should be viewed as direct threats to the viability of the tourism product and the economy of Barbados.

Given the importance tourists place on the marine environment, and the growing interest in sustainability there appears to be a need for further focus from the tourism sector on engaging tourists to the island directly in conservation initiatives.

*Opportunities should be therefore identified to develop partnerships with local tourism operators, fisherfolk and Government agencies to develop locally owned and operated marine management areas.*

*Such projects could be packaged as Corporate Sustainability products for the companies and could also provide a vehicle for tourism education and awareness campaigns.*

The large number of cruise tourists visiting the islands are exerting increasing pressure on limited and, in some cases, fragile coastal and marine resources. This has the potential to result in increasing conflict
between cruise tourism and other users of the coastal and marine environment. While it is acknowledged that a key focus for the Government is to convert cruise ship visitors into future long-stay visitors, at present it appears that a greater focus is placed on cruise ship tourism than those benefits that are derived from this sector would suggest is cost effective. The focus is on the economic benefits of mass cruise tourism rather than a more balanced view which includes the environmental cost of this sector.

While cruise passengers undoubtedly contribute directly to the economy of Barbados, this level of activity also comes with significant social and environmental risks. Cruise ships generate significant quantities of waste that must be disposed of on land. They also have significant demands for resources, such as fuel oil, water, fresh food etc to support their activities. Modern cruise ships may carry upwards of 4,000 passengers and include 1,000 – 2,000 crew. According to Barbados Port Inc, the schedule of cruise ship visits to the island for 2019 included a total of 422 ship visits. [It is noted that, for 2020, the number of cruise ships will be significantly reduced due to the ongoing global Corona virus pandemic].

The small size of Barbados, as with many other SIDS in the region, means that such large numbers of cruise tourists can place significant pressure on local tourist facilities and local amenities, the cost of which is not adequately reflected in estimates of the economic contribution made by this sector to the economy.

More broadly, such competition for limited space and resources can give rise to conflicts between the cruise ship sector and other users of the coastal and marine environment, including other sectors of the tourism industry.

If Barbados is to further develop its tourism sector in a sustainable manner and in the context of a blue economy development approach then more effective planning and management controls may be required to address the pressures exerted by cruise ships on coastal and marine resources. This would involve a balance of the economic costs and benefits with the environmental impact of the sector.

**Ensure that the development of the cruise tourism sector takes into account not only the economic benefits but also long term impacts and socio-economic and environmental risks to Barbados which are in line with the Barbados Port Inc’s master plan and vision of becoming the most innovative and green maritime hub by 2030.**

As noted in section 5.1.2 Barbados is a regular stopover for cruising yachts. However, in recent years, it appears that Barbados’ popularity has declined in favour of other major yachting centres in the Eastern Caribbean to rival English Harbour in Antigua or Rodney Bay in St. Lucia. A key constraint to growth in this regard appears to be the lack of marina and boat repair facilities, and only limited (but improving) chandlery and provisioning services for the average cruising yacht. If these constraints could be addressed, the marine and yachting market sector in Barbados represents an opportunity for development and its potential economic impact could be significant.

**It is therefore recommended that the Government engage with the yachting sector to assess the economic potential and feasibility of expanding this sector through the provision of additional marine facilities and extending the existing supply chain.**

**8.1.1.2 Sector-specific opportunities**

| Opportunity 1: | Create linkages between the tourism sector and marine conservation. |
| Opportunity 2: | Ensure that the future development of the cruise ship sector accounts for not only its direct economic contribution but also the long-term risks and impacts to the marine environment and other marine user groups. |
| Opportunity 3: | Undertake an assessment, in conjunction with the yachting sector, to determine the potential opportunity and feasibility of expanding the existing leisure yacht facilities to cater for more recreation (cruising) yachts. |
8.1.2 Marine living resources

8.1.2.1 Situation and findings

Development of the blue economy will require long-term planning and investment from both public and private sources. To this end, long term trends for key marine resources and sectors will be an important factor in determining investment priorities for the future. Due to the socio-economic importance of fishing in Barbados, some of the greatest challenges relate to the state of fishery resources and their current management. The pressure on the fishery is a result of numerous factors including:

- The need for a strengthened data collection system;
- Unknown status of stocks of many of the marine fisheries resources. There is a need for further research to be conducted on fish stocks to understand the current status and inform on management with regards to overfishing, especially in targeted or potentially targeted commercial species;
- Inappropriate harvesting methods;
- Suspected overfishing and overexploitation of certain species and resources (particularly reef fish);
- Lack of legislation or updated legislation surrounding fisheries, for example size limits and low enforcement capacity, as well as legislation, particularly for the purposes of facilitating international trade;

Additional constraints faced by the fishery sector include:

- Fluctuating catches of flying-fish with a decline in recent years, possibly linked to an increase in sargassum - the influx of sargassum is a national (and regional) issue that has affected the fisheries sector for the past nine years;
- Limited capacity (infrastructural, financial and technical), all of which are required to create a more sustainable fishing industry;

One of the most critical uncertainties facing the blue economy, particularly in SIDS, is the medium to long-term impact of climate change on key marine species such as reef fish, crustacea and molluscs and offshore pelagic species. While it is not possible to say with certainty what may happen, a number of robust models do exist that allow future scenarios to be mapped. Such scenarios could provide a useful input into future economic planning for the blue economy, providing a greater degree of certainty around key investments.

As such, there is a need to better understand the likely trajectory for key marine species (in terms of diversity, distribution and abundance) under different future climate change scenarios supporting the ability to better plan for future fisheries development.

During the scoping study the project team has observed that various estimates of catch and landing are available through different sources (e.g. FAO, CRFM, UNCTAD reports), many of which are inconsistent. This leads to uncertainties with respect to both catches and the economic contribution of fisheries to Barbados. Furthermore, using the value of landed catches as a proxy for the economic contribution of this sector significantly underestimates the overall importance of this sector in terms of its contribution to the economy, livelihoods and the social and cultural fabric of the islands. It also does not take into account the importance linkages and interdependencies between the fisheries and other sectors (e.g. tourism).

It is therefore recommended that a process to better understand and value the total contribution of this sector as a critical component of Barbados’ blue economy is required. Such an analysis should not only
asses the direct upstream and downstream linkages of capture fisheries, but also the wider social and cultural benefits.

As a critical first step, the Government should implement a robust data recording and reporting system to ensure that catch/landing data are treated in a consistent manner thereby ensuring that the Government of Barbados always works with a single consistent data set for fisheries landings.

The nearshore reef fishery has been subject to significant fishing pressure in the past. As such, there is a need to revise the current “open-access” system of fishing, to impose stricter access controls through inter alia: improve knowledge of the stocks to support decision making and more targeted application of spatial and temporal access controls and the allocation of species-specific quotas. These measures should be adopted through the development of fisheries management plans for key commercial stocks.

Given that the nearshore reef fishery represents a major contribution to local livelihoods and food security, opportunities to implement fishery management measures, to improve the health of these stocks, should be explored. The implementation of Fisheries Management Plans (FMPs) is recommended; these are detailed management plans that align fishing effort and specific regulations with (1) scientific guidance regarding the health of the stock and (2) economic objectives.

FMPs should aim to reduce effort in the most flexible and least onerous ways possible. They should be developed with the input of commercial and small-scale fishers, and be implemented for key commercial species groups. FMPs should be set over a 3-5 year period with a shorter cycle of management implementation and review at the operational level. Given many of these groups are already depleted, they will also incorporate a recovery or stock re-building process.

Barbados is presently under the quota set by the International Commission for the Conservation of Atlantic Tunas (ICCAT) for tunas and billfish. In theory, this provides the potential to increase production without overfishing of stocks, destruction of their habitats or adversely affecting the other users of the marine space. In addition, it provides a potential opportunity to expand the trade in tuna products and value-added products by developing existing markets and identifying new markets. Results from the preliminary assessment to determine the potential of developing a market and a sustainable fishery for these resources being conducted by UNCTAD and FAO will prove useful for this potential opportunity.

Given the current uncertainty, a strategy to improve selective targeting of highvalue tunas should be pursued as a way to increase harvests of these species. Such a strategy would be consistent with recommendations made by the FAO.

Several other species/stocks have been suggested for future exploitation (e.g. amber fish, deep-sea crab and squid).26 However, at this stage, data on the status of these stocks is limited or entirely absent and will require studies to determine the feasibility of developing these new fisheries.

The IADB project should consider in more detail how the existing fishery can be diversified through the diversification of the existing fishery resource base to sustainably exploit deeper offshore species and nearshore species that are currently not fished.

At the major market, the Bridgetown Fisheries Complex, approximately two to three tons of fish offal are produced daily, which, at present, is poorly utilised or, worse, dumped at the landfill. It is acknowledged that this waste can be used to increase earnings through further processing and a range of options are been explored for utilization of this material including supply to the poultry industry with feed (known as fodder), agribusiness with fertiliser or composting.

However, with the development of bio-technology techniques, this could provide opportunities to convert this waste into a far more valuable product, and to create the basis for a future technology driven sector that supports fisheries, aquaculture and possibly agriculture.

26 According to UNCTAD (2020), both deep-sea crab and squid have the potential as inputs for seafood processed products
Fish is also a highly perishable commodity and hence susceptible to high post-harvest losses. There is consistent evidence that these losses occur at all stages in the food/value chain (including: transport; storage; marketing and sales; and at the end consumer) and can be both quantitative and/or qualitative (i.e. economic and nutritional). Minimizing post-harvest losses is therefore a key strategy to increase revenues and food security without the need to increase production.

There is, therefore, a need to maximise the value that can be derived from fish waste while at the same time reducing the need to dispose of waste to the environment.

This could be achieved through further expansion of existing initiatives such as the MMABE / Embassy of Argentina / FAO / BGI fish waste silage project and the UNDP Accelerator Lab biofuel project, or could require additional projects that could be evaluated further through the IADB project.

Another significant barrier for Barbados’ future development relates to fresh water supply. As water security issues increase there will likely be a need for greater reliance on desalination technology. Barbados is classified by the United Nations Commission on Water as a "water scarce" country and relies almost entirely on groundwater resources. In future, the combination of reducing precipitation and salt water intrusion from sea level rise will compound the issue of insufficient water availability (through salinization of ground water aquifers). Hence this should be considered to be a critical aspect of the blue economy.

The government is evaluating options to secure additional resources to both account for any future deficit and to support future economic growth. One such option is to expand the current desalination capability, with the introduction of small-scale community based desalination plants.

In the context of a broader blue economy development framework, the provision of coastal areas that are protected and able to support the installation and operation of future desalination facilities, particularly with respect to protection of the source water catchment, requires particular attention.

8.1.2.2 Sector-specific opportunities

<table>
<thead>
<tr>
<th>Opportunity 1:</th>
<th>Improve the understanding of fishery management requirements undertaking future climate change projections for the Caribbean.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opportunity 2:</td>
<td>Review existing and develop new metrics for recording and reporting landings of marine fish in Barbados.</td>
</tr>
<tr>
<td>Opportunity 4:</td>
<td>Develop strategies to better utilise existing fish stocks and to diversify the existing fisheries to include new or underutilised fish species.</td>
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<tr>
<td>Opportunity 5:</td>
<td>Expand the current focus on fish silage to determine other options for creating value from the waste generated from fish processing and other biological material.</td>
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8.1.3 Ports and shipping

8.1.3.1 Situation and findings

The importance of shipping to island nations such as Barbados cannot be overstated, since they are almost entirely dependent on shipping for imports and exports. To benefit from the economic opportunities arising from the oceans, including trade, tourism, and fisheries, requires investment in transport infrastructure and services and transport policy measures in support of shipping. The existing port infrastructure is, in part, old and requires upgrading to support the modern fleet of international vessels. Failure to do so will risk Barbados not being able to remain competitive.
This is particularly critical given that the impacts of climate change pose serious threats to maritime transport infrastructure, services, and operations throughout the Caribbean. Given that Barbados’ port facilities are critical infrastructure, developing measures for these to adapt to the impacts of climate and building their resilience is imperative.

The national maritime administration is the state body responsible for carrying out the shipping responsibilities of the state, and tasked to administer national shipping and boating issues and laws within their territorial waters and for vessels flagged in that country, or that fall under their jurisdiction. In general, the main functions of such a body should include:

- Developing and administering government policy for ships and boating;
- Ensuring maritime safety in general, including setting and administering seaworthiness, safe construction and stability standards for shipping, safe manning, certificates of competency/licenses for crew and the health, safety and welfare of crew;
- Investigation of marine accidents;
- Policing dangerous goods being carried;
- Safety of navigation;
- Civil search and rescue; and
- Prevention and combating pollution and response.

The scoping study has highlighted that the Barbados Maritime Administration currently has a limited capacity and does not have a dedicated/full time Director of Maritime Affairs. If Barbados wishes to develop its shipping sector as a Flag State, there is a critical need to develop this capacity to fulfil the many requirements IMO imposes on Flag States. This is a recommended priority focus area under the IADB-funded Strategic Blue Economy Roadmap initiative.

There is, therefore, a need to develop the capacity of the national maritime administration into a fully formed and dedicated unit with oversight of Flag, Port and Coastal States rights and obligations for shipping.

The port is a critical piece of infrastructure for Barbados and may be subject to increasing risks posed by climate change and natural hazards. It is also not clear how well charted the approaches to the port, and any potential hazards, are. If a major incident occurred in or around the port, this could severely impact port operations, or even close the port entirely, which would have a significant economic impact on the whole of Barbados.

Many countries have now implemented port risk assessments (e.g. the UK and New Zealand have developed Port Marine Safety Codes to provide a structured process to identify and address risk to their ports). Such an assessment would address the broad range of threats including navigation safety, physical damage, climate related impacts, environmental risks such as oil spills and risks to personnel.

in order to fully understand, mitigate and manage operational risks to the port of Bridgetown it is recommended that Barbados Port Inc undertake a comprehensive risk assessment of the existing and future planned port facilities.

When alongside in ports, ships must continue to run onboard machinery to generate power. In more modern ports, the option of connecting to a shore-based power supply exists for ships. This has the dual benefit of reducing emissions from ships in the vicinity of the port and reducing fuel consumption onboard the ship: the cost of shore power is typically lower than generating the equivalent power using fuel oil.

Barbados Port Inc could further explore options for integrating renewable energy sources (particularly solar and wind) with its facilities to generate power for port consumption and, where excess exists, to provide shore-based power for ships alongside.
8.1.3.2 Sector-specific opportunities

Opportunity 1: Specifically include an assessment of the Maritime Affairs function under Component 2 of the IADB blue economy initiative, taking into account Flag, Coastal and Port state rights and obligations.

Opportunity 2: Prepare and implement a Port Safety Management System for the Port of Bridgetown.

Opportunity 3: Invest in renewable energy sources to provide low carbon shore-based power for visiting ships.

8.1.4 Non-living resources and energy

8.1.4.1 Situation and findings

Barbados is actively pursuing offshore petroleum exploration as a new economic activity. Blocks have been awarded to two international oil companies and further licensing rounds will be undertaken during 2020. One company, BHP, currently holds a licence to undertake exploration activities.

The UNDP project team notes that the current governance arrangements for offshore petroleum rests entirely with the Natural Resources Department (NRD) of the Ministry of Energy and Water Resources. As such NRD will de facto be the lead agency for all matters relating to the petroleum industry. However, in Barbados a number of agencies should have a statutory role to play with respect to the environmental regulation of the petroleum industry and in many cases existing agencies do have statutory responsibility to deal with some issues, such as marine pollution. One common area of conflict/confusion arises due to the application of a number of IMO instruments to offshore installations (which are normally administered by the Maritime Administration). This presents the risk of administrative confusion both for the agencies themselves and for the petroleum industry. In this regard, the project team have identified a number of critical needs:

- There is a need to ensure that gaps in the existing regulatory framework are identified and filled to ensure that any inter-agency conflict is minimised.
- There is a need to ensure that agencies that have statutory responsibilities for certain activities also have the relevant competence to perform those responsibilities. For example, while the Environmental Protection Department (EPD) may be the appropriate lead agency for environmental protection matters (including pollution), it is questionable whether it is the appropriate agency to deal with specific matters relating to the survey and inspection of ships and offshore installations that are governed under international maritime (IMO) instruments. This competence falls within the mandate of the MMABE as a result of their existing legislative mandate and role as the focal point for the implementation of IMO instruments.
- Statutory responsibilities and competences need to be aligned, either through capacity building of agencies, or more appropriately, by establishing Memoranda of Understanding between agencies with joint responsibility for certain functions. An inter-Ministerial committee could be formed with the Minister as its chair.
- While a number of pieces of legislation are already in force, in many cases these do not reflect the specific needs associated with offshore oil and gas operations. A number of crucial areas relating to environmental protection remain unregulated at a statutory level and this represents a significant risk.
- Given the emerging interest in offshore petroleum development in Barbados, no consideration seems to have been given to managing the potential conflict between shipping and offshore petroleum activities.
Although the Offshore Petroleum Regulations contain provisions relating to environmental procedures, it is recommended that the Government should consider development of a comprehensive and dedicated environmental management regime for the offshore petroleum sector. Such a regime (to be developed under the Offshore Petroleum Act) should address, as a minimum inter alia:

- appropriate discharge quality standards in accordance with international best practice;
- appropriate atmospheric emissions standards including with regard to venting and flaring of associated gas;
- environmental management planning requirements including with respect to waste management;
- requirements for offshore installation (Tier 1) marine oil spill contingency plans;
- selection, use and management of hazardous substances;
- requirements relating to conservation and protection of marine biodiversity
- functions powers and duties of different regulatory agencies vis-à-vis management of the health, safety and environmental aspects of offshore petroleum activities.

8.1.4.2 Sector-specific opportunities

| Opportunity 1: | Undertake a comprehensive review of the existing environmental regulatory functions that relate to the offshore petroleum sector with a view to developing a new set of Offshore Petroleum (Environmental Management) Regulations |
| Opporunity 2: | Ensure the security of future desalination capacity |

8.2 Future Economic Opportunities

It is generally difficult to appreciate the potential for new economic pursuits to generate value and national economic growth. However, what is important is to inform the crafting of a policy approach that will enable innovation to expedite value creation from whatever opportunities present themselves, subject to sustainability tests. Barbados’ potential maritime space is 430 times its land area, and has been subject to much less exploitation. However, while there is enormous potential, there is only limited development experience.

In terms of future uses of the marine environment and their contribution to a blue economy, renewable energy, aquaculture and marine biotechnology are among the activities identified as having potential here.

8.2.1 Aquaculture

Worldwide demand for fish and fishery products is expected to surge in the coming years across all continents. However, capture fisheries production is set to remain rather static, so that aquaculture has expanded rapidly to produce nearly half of all the fish people consume. To maintain the role of fish in diets, aquaculture production will have to more than double from current levels by 2050. Most of the future expansion in aquaculture production capacity will probably occur in the ocean, with some of it moving increasingly off-shore to escape the constraints of coastal waters.

Globally, aquaculture is already a multi-billion-dollar industry, but the Caribbean has yet to tap into its true potential to expand marine and fresh water aquaculture. This is because the aquaculture sector is not well developed in the region. The CRFM has identified the promotion and development of aquaculture as one of its priority programme areas, with the formulation of aquaculture development policy and legislation as key areas for attention. A recent FAO study suggests that aquaculture
development could increase total fish production in the CARICOM states by 30 percent within 10 years if essential investments are made in enabling aquaculture policy and legal frameworks, supported by applied research, capacity building, and information (FAO, 2014). Such sector growth could contribute to increased food production and security, improved rural income and employment, diversified farm production, and increased foreign exchange earnings and reduce the high food import bill.

8.2.1.1 Recommendations for fostering the development of an aquaculture industry within the blue economy

Listed below are a variety of strategic-level recommendations that could assist in the development of an aquaculture industry (Hughes et al, 2016):

**Initial sectoral prioritisation**

- The products of aquaculture are globally traded and it is unlikely that Barbados will be able to compete on the global market on the basis of price. Therefore, a decision needs to be made about what the objectives would be for aquaculture development in Barbados. For example, would it be to contribute directly to food security on the island or would it be to produce higher value products for the tourism market and export to the regional market?

- If the latter, which species would be the most likely to succeed?

**Creating a management and regulation framework based on the Ecosystem Approach to Aquaculture**

- At present, Barbados has no legal framework under which aquaculture could be developed. It is understood that this will be addressed in the new Fisheries Policy that is currently being developed with support from the FAO.

- A comprehensive aquaculture legal and policy framework, based on the ecosystem approach to aquaculture (EAA), should therefore be developed. This is the minimum requirement to create the enabling environment to support aquaculture development in Barbados. The EAA has to respond to three principles:

  (i) Aquaculture should be developed in the context of ecosystem functions and services (including biodiversity) with no degradation of these beyond their resilience capacity;

  (ii) Aquaculture should improve human well-being and equity for all relevant stakeholders; and

  (iii) Aquaculture should be developed within the context of (and integrated with) other relevant sectors.

- There are clear links between the aspirations of the blue economy and the three principles of the EAA. As the EAA framework is well developed and accepted at an international level, it is recommended that, if Barbados wishes to pursue aquaculture development within a blue economy framework, the EAA should be applied as the basis for that development.

**Developing in step with local capacity**

- There are options for basing aquaculture development on expertise, technology and investment from outside Barbados. While this is entirely possible, developing a new sector based solely on expatriate expertise poses risks for the sustainability of the sector. Allowing the industry to grow at a slower pace using indigenous capacity enables greater social acceptance of the enterprise and ensures that markets, infrastructure and technical expertise can all be developed within the SIDS, reducing the overall risk. Options should also be explored to establish partnership arrangements between local and foreign companies that would utilise expatriate expertise at the outset but would rapidly develop local capacity to sustain the future of the sector.
Investing in created institutional capacity and links between industry, academia and regulators

- With the exception of the ongoing initiatives by Adams Aqualive and the prawn farming pilot project being implemented by the Blue-Green Initiative, there appears to be limited research capacity in aquaculture. Local capacity should be addressed as a strategic issue requiring co-ordination across the blue economy and the economy as a whole, rather than within individual sectors. This capacity should be built with specific regard to making the outputs relevant to both industry and regulators, and resources should be used to ensure that there is direct access for regulators and industry to the research community. Access to technology can also be improved in the short term by establishing very demand-led and responsive relationships/structures (e.g., technology extension services delivery structures) that facilitate faster adoption of already available technology (which is more often times the challenge as opposed to research to generate virgin technology).

Coherent cross-policy activity

- The blue economy framework should be used to assist in the development of clear action plans and activities should be rationalised under different policy initiatives.

Integrating planning of sectors within the blue economy

- Considering the possibilities of multi-sector development in integrated scenarios will identify overlap in actions (e.g. in relation to research or local infrastructure), address possible conflicts and develop dialogue on the comparative costs and benefits, within the context of sustainable development.

8.2.1.2 Feasibility of an aquaculture sector in Barbados

The very limited existing aquaculture activities in Barbados do demonstrate that there is both an opportunity and a demand for farmed produce. However, future development and expansion of the sector will require strong regulatory, financial and technical support to make a success of it.

On that basis, it would be beneficial to start at the low-complexity end of the spectrum of development and to allow the aquaculture industry to grow organically (supported and facilitated by government via fiscal incentives and commercial policies) and to move up the complexity spectrum as local capacity and infrastructure develop. Table 14 below illustrates a number of groups of “low-trophic level” species that offer the potential for significant aquaculture operations in developing economies. In this regard, revisiting the concept of sea moss farming would be a logical entry point for aquaculture.

Of the many hundred species of seaweed found in the Caribbean, about 10 are used for food. The most popular are various species of *Gracilaria* and *Eucheuma*. Each of these produces a carbohydrate that dissolves in hot water and then thickens as a gel when cooled. In the case of *Gracilaria sp.*, the carbohydrate is agar. In the case of *Eucheuma sp.* the carbohydrate is carrageenan (Smith, 1997). Both are used widely in cooking.

Seamoss is successfully grown throughout the Caribbean but typically in small volumes for local consumption and some, limited export.

Another example of a suitable market for Barbados would be live coral culture. The culture of live coral could provide a double benefit by assisting with the recovery of coral ecosystems, since coral aquaculture/transplantation can improve coral cover, biodiversity, and structural heterogeneity of a degraded reef. It could also provide an interesting tourist experience. Similar initiatives in other countries (e.g., Australia, Fiji, Seychelles and Belize) have demonstrated the efficacy of the approach and could provide comprehensive lessons to Barbados in the event that this option was pursued.

Alternatively, if Barbados wishes to pursue the development of offshore sea cage rearing, this will require considerable investment in infrastructure, R&D, capacity and a range of technical assessment
and studies to inform the future development options. This will undoubtedly require a substantial investment partner.

Issues such as access to water and land space for farm development will need to be overcome and potential conflicts will existing marine users will need to be managed. This once again highlights the importance of comprehensive multi-use marine spatial planning that not only addresses existing uses but also anticipates and provides for future uses.

Table 14: List of possible low trophic-level aquaculture species groups that may offer aquaculture potential in Barbados. Source: Hughes et al (2016).

<table>
<thead>
<tr>
<th>GROUP</th>
<th>MARKET</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seaweeds</td>
<td>The global seaweed market is worth approximately US$6 billion annually; it is used mainly for direct human consumption or as a food ingredient.</td>
<td>Globally, most of the production comes from aquaculture. There are a number of species indigenous to SIDS for which both a market and cultivation techniques exist.</td>
</tr>
<tr>
<td>Sponges</td>
<td>Large specimens attract a premium for the bath sponge market, and take approximately 2 years to grow to size.</td>
<td>Sponges have a range of commercial uses, including in cosmetics, collagen and bioactive compound production, and are relatively simple to culture.</td>
</tr>
<tr>
<td>Sea cucumbers</td>
<td>A fishery for sea cucumbers exists globally in the tropics, but stocks have become severely depleted. Currently, China produces 10,000 tonnes per annum through aquaculture.</td>
<td>In many SIDS, there is an existing fishery for sea cucumbers, including Holothuria scabra, for which there is a well-established aquaculture industry in Asia.</td>
</tr>
<tr>
<td>Corals</td>
<td>The trade in live corals for aquariums has grown at approximately 9% per annum since 1990, and on average coral retails at $56 a piece in the US.</td>
<td>Aquaculture production is normally by fragmentation of donor colonies. In the beginning, these donor colonies are from wild coral colonies on reefs.</td>
</tr>
<tr>
<td>Aquacultured live rock</td>
<td>Traditionally, Fiji has been the main source of live rock for import to the US. The value of this trade is $50 million globally.</td>
<td>Live rock is much used in ornamental aquariums and can be easily cultivated.</td>
</tr>
</tbody>
</table>

8.2.2 Blue biotechnology

The term biotechnology is widely employed and has different connotations and meanings for different individuals. A useful and all-encompassing definition is provided by the OECD:

*The application of science and technology to living organisms, as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services.*

In ‘blue biotechnology’ the biological materials originate from the aquatic environment, freshwater and marine, and this has in recent years become synonymous with marine biotechnology. With the ongoing revolution in methodological development, the toolkit for developing commercially viable products and processes has expanded (Figure 20).
Marine biotechnology encompasses a wide range of activities and can include everything from bioprocessing of harvested materials (fish, algae, etc.) to cultivating marine microbes. Some examples include:

- On the health front, there has been increasing interest in marine microbes, particularly bacteria, with studies demonstrating that they are a rich source of potential drugs.
- Marine biotechnology has also displayed widespread commercial potential in industrial products and processes, and in the life sciences industry as a novel source of enzymes and polymers.
- On the energy front, algal biofuels appear to offer promising prospects. Within the last two years billions of dollars have been injected into alga-culture or algal farming right around the world.

Marine biotechnology encompasses a wide range of activities and can include everything from bioprocessing of harvested materials (fish, algae, etc.) to cultivating marine microbes or developing an innovative buoy system for monitoring ocean pollution. Figure 21 shows a range of different products and services that can be generated from marine resources, categorising them on the basis of their commercial value, from top-end pharmaceutical compounds to low-value bioenergy produced from organic waste (Day et al, 2016).
Figure 21: Value pyramid of products obtained from the marine environment. Source: Day et al (2016).

It is worth noting that special applications products are usually described as low volume, high value and, at the other end of the scale, base commodities are invariably high volume, low value. There is potential for individual SIDS, or SIDS collaborating closely, to produce compounds and products at certain levels in this value pyramid, but, given the costs involved in developing special applications, collaboration at an international level is likely to be required.

Marine biotechnology has also displayed widespread commercial potential in industrial products and processes, and in the life sciences industry as a novel source of enzymes and polymers. At the same time, marine bio-resources also provide a number of important ecosystem services for the planet and its inhabitants which must be maintained.

The technological journey involved in bioprospecting, from finding an organism with biotechnological potential to having a product that is marketable, can be a complex, time-consuming and expensive procedure (Figure 22). Opportunities should be explored for the Government to partner with the University of the West Indies (UWI) in developing its bio-technological potential especially with respect to research and product development.
Figure 22: Technical stages of development in marine bio-prospecting. Source: Day et al (2016).

In the case of bioprospecting for molecules with pharmacological activity, a minimum of 10-15 years and hundreds of millions of dollars may be required to take a product to market. However, for other, non-pharma, products the development pipeline may be much shorter, and, particularly for those products that can be manufactured using proven technologies and where there is a strong market demand, the period time from discovery to income generation may be as short as 2–5 years.

8.2.2.1 Recommendations for fostering the development of blue biotechnology

Listed below are a variety of strategic-level recommendations that could assist in the development of blue biotechnology.27

**Initial sectoral prioritisation**

- Focus on niche products, based on local biological resources, developed, produced and marketed worldwide. Although bioprospecting for pharmaceuticals is a possible option with the involvement of external partners, niche products, based on biological resources, developed, produced and marketed worldwide from any SIDS, provide a more realistic opportunity to generate high-value jobs and diversify the economy of the country.

**Scientific exploitation**

- Existing data should be systematically explored to inform and steer any future bioprospecting activity.

**Biological resource management**

- Ensure effective and simple implementation of the Nagoya Protocol's recommendations and establish a local biological resource facility. The establishment of a local collection facility will provide a resource that can be exploited nationally or internationally and form a foundation for future biotechnological exploitation.

**Development of critical mass**

- Develop a government-owned, or locally resourced, public–private independent research company as a focus for activity; build strategic alliances with national and international commercial and academic partners.

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27 Adapted from Day et al (2016).
Financing

- Finance activities through public-led partnerships with the private sector and secure international support.

Coherent cross-policy activity

- Use the blue economy framework to assist in the development of clear action plans and rationalise activities under different policy initiatives.

Developing scientific research capacity

- A national study into capacity for research and current international collaboration is supported, ensuring that, in addition to technical skills, it also considers social science and entrepreneurial aspects relevant to the development of and local ownership of blue economy activity.

Developing indigenous skilled capacity

- Address local capacity as a strategic issue requiring coordination across the blue economy and the economy as a whole, rather than within individual sectors.

8.2.2.2 Feasibility of a blue biotechnology sector in Barbados

Whereas the production of some biotech products, such as bulk chemicals and pharmaceuticals, may not be practical, because of lack of land availability, investment or infrastructure, the production of niche products such as cosmeceuticals and nutraceuticals could be commercially viable in Caribbean SIDS.

In the case of Barbados, one of the most promising opportunities appears to relate to the conversion of fish processing waste into higher value products. Fish waste includes a high percentage of protein that may, depending on the quality of the waste, be processed through bio-refining into a protein base product that could have multiple applications. A detailed assessment of the composition of the waste and the possible bio-refining options would need to be undertaken. It is noted that Barbados is already exploring opportunities for silage from fish waste. However, other potential applications of existing fish waste streams should also be evaluated.

An alternative area for development would be the development of health/cosmetic products from marine organisms (most likely marine algae and micro-organisms). This approach has been successful in Iceland, where cosmetics (skincare products and treatments) based on Icelandic algae grown in photo-bioreactors are marketed with reference to the ‘natural purity’ and ‘healing power’ of the Blue Lagoon.

Given the high commercial value of biotechnology products, it would also be feasible to investigate opportunities through mariculture focusing on low trophic species producing high value products and necessitating minimal space, an advantage for islands where land is scarce. Examples of such innovation can be learnt from other nations, for example Vanuatu community-based sea cucumber ranching for their compounds treating HIV/ AIDS and health supplements.

One application of biotechnology that is seen as having great potential in the eastern Caribbean is the utilisation of the large volumes of sargassum seaweed that regularly impact beaches in the region. The intrusion of pelagic sargassum on the west and south coastlines has been a major challenge for the Barbadian authorities in so far that it adversely affects the quality of the beach experience.

Thompson et al. (2020) have argued that in the case of Barbados the “bad” associated with the intrusion can be turned into a “good” and a range of novel applications are being developed and tested (including at the University of the West Indies in Barbados). Existing options include fertiliser, bioplastics and fabric for textiles which enhances the bio-technological aspect of the blue economy. Such activities can complement the use of fish waste in fertiliser production.
8.2.3 Marine renewable energy

With regards to Section 7.2.3 which examines marine renewable energy, the Ministry of Energy & Water Resources, through its Public Sector Smart Energy Programme, has embarked on identifying and developing the country’s marine renewable energy potential through several studies. A Technical Advisory Group on Barbados’ marine renewable energy potential was established in 2014 and was chaired by the CZMU. The strategic-level recommendations listed in Section 7.2.3 have all been considered under the Government’s Ocean Energy Roadmap. Recommendations were made to determine the way forward and the following key elements were identified; (i) the conducting of the GIS Mapping activities to determine the location of any Ocean Energy technologies which were being considered; (ii) completion of the draft Terms of References (TORs) for the various activities and (iii) environmental studies. This project can be discussed further during the validation sessions.

Sustainable energy provision is fundamental to the transition to a low-carbon economy, and the basis for progressing towards sustainable development globally. SDG 7 highlights the importance of sustainable energy and industrial development, with particular reference to SIDS (SDGs 7.b and 9.a). The ocean is a rich source of potential energy resources, and with growing concern over climate change and increasing global interest in renewable energy, investment in ocean-based energy is poised to grow over the next few decades. Considering the multiple benefits of marine renewable energy (MRE), in terms of energy security, environmental protection and socio-economic benefits, it is a win-win solution in terms of sustainable development and the blue economy.

Ocean sources of renewable energy can take many forms, and the feasibility varies according to each technology as they range in development status globally:

- Offshore wind (Floating and fixed)
- Wave energy
- Tidal (rise & fall, currents)
- Ocean currents
- Ocean Thermal Energy Conversion (OTEC)
- Sea Water Air Conditioning (SWAC)
- Salinity gradients (osmosis)
- Marine-based biomass, e.g. algae.

Given the rapid progress in the sector globally, MRE is a realistic medium- to long-term energy option for many SIDS; it would enable them to utilise locally available resources, reduce pressure for space on land and optimise the value of other marine activities within the blue economy. In addition to providing a further source of sustainable energy, MRE can supplement terrestrial renewable energy initiatives, and help in balancing the intermittency of these technologies in grid-connected energy systems (Johnson, McGlynn and Prado, 2020; Greenhill et al, 2016).

The development of MRE in the Caribbean can support achievement of renewable energy objectives and provide energy security through greater independence from imported hydrocarbons. Regional cooperation enables strategic use of capacity, mobilisation of donor resources and development of a stronger collaborative vision to support national-level action. There has been notable progress in this regard through CARICOM, resulting in the production of a Regional Energy Policy, followed by the Caribbean Sustainable Energy Roadmap and Strategy (C-SERMS), which aims to provide CARICOM member states with a coherent strategy for transitioning to sustainable energy.

However, there are also significant challenges facing the sector globally, as it is an emerging sector and demonstrated commercial success is not yet evidenced (Greenhill, 2014). Notable challenges include,
most significantly, access to financial capital, institutional capacity to plan and develop renewable energy projects, local infrastructure and human capacity for engineering works. For MRE, the added cost of the risk associated with early-stage technologies means that financial support, technology transfer and capacity-building are even more important than in the case of terrestrial options. However, the current costs of energy in SIDS mean that cost-competitiveness is more easily achieved, and, through coordinated and collaborative action, the hurdles can be addressed and the renewable energy ambitions of SIDS fulfilled.

8.2.3.1 Recommendations for fostering the development of marine renewable energy

Listed below are a variety of strategic-level recommendations that could assist in the development of marine renewable energy:

Clarify realistic local opportunities for MRE

- Refine understanding of opportunities through detailed resource assessment and in accordance with specific technology-developer requirements.

Ensure coherent, integrated policy and planning

- Develop integrated national action plans for renewable energy that include onshore and offshore options and options for grid and off-grid generation, as well as taking into account energy efficiency and demand.
- Demonstrate sustained, cross-policy support for stepwise progression of MRE to internal and foreign stakeholders, underpinning policy ambition with a comprehensive planning and regulatory framework.
- Integrate planning with other sectors to cost-effectively address barriers such as lack of data, skills and institutional capacity.

Use marine spatial planning (MSP) to support practical sector development

- Identify appropriate development areas, including opportunities for co-location with other sectors.
- Provide a stakeholder forum for negotiating and balancing multiple sectors and interests.
- Enable optimisation of the benefits obtained from the marine area in the blue economy, within ecological and social limits.

Build knowledge and share experience

- Connect globally, ensuring transfer of knowledge locally and influencing global forums on the specific needs of SIDS.
- Develop guidance for businesses, stakeholders, communities, prospective developers, investors, etc., on when and how to engage with the blue economy, and on opportunities in MRE.
- Develop a strategic research agenda to support continued improvement of understanding of the potential impacts of plans and projects.

Engage civil society early to use local knowledge and engender ownership

- Engender acceptance and ownership of energy projects through participation and capitalise on local knowledge in the design of innovative energy solutions.
8.2.3.2 Feasibility of developing marine renewable energy in Barbados

The UNDP project team notes that the Government has established a Public Sector Smart Energy Program (PSSEP) which is designed to promote and implement the use of viable renewable energy and energy efficiency measures in the public sector. While the primary focus of this programme is on solar photovoltaic and battery storage technology the Government is looking at other technologies.

In this context officials from the Energy Division recently undertook site visits to Europe, including visiting offshore/marine renewable energy projects in the Orkney Islands (Scotland). There is also interest in wind power technologies. However, according to the Energy Division of the Ministry of Energy and Water Resources, at this stage the existing information and models of wind resources in Barbados are insufficient to support feasibility studies.

While MRE is generally considered to be a realistic medium to long-term energy option for many SIDS, it is questionable whether MRE can be competitive against the existing options that are being considered (particularly wind and solar). While MRE should still be considered in the overall portfolio of renewable energy options for Barbados, further research on the cost effectiveness against other renewable energy options must be weighed.

This notwithstanding, a recent study undertaken by the IADB suggests that Barbados has good potential for floating offshore wind, wave energy, OTEC and SWAC (Johnson, McGlynn and Prado, 2020).

However, the report acknowledges that each technology is however at different stages of technological readiness and offer different value propositions. Further work is required to identify promising areas for development to take account of the level of electrical demand, grid capacity, other sea users and other technical parameters. The report concludes that both tidal and ocean current technology has very low potential for deployment (Johnson, McGlynn and Prado, 2020).

It should be noted that there appears to be an inherent tension between the government’s policy of actively developing offshore petroleum and its stated intention to become entirely powered by renewable sources of energy by 2030. While it is appreciated that the Government would use any revenue generated from offshore petroleum production to invest in future MRE development, this tension nonetheless needs to be recognised.

8.2.4 Sector-specific opportunities

While the UNDP project team recognises that the opportunities listed above present future development potential for Barbados, at this stage, with the possible exception of renewable energy, there is little indication of which of these developing sectors the Government may wish to pursue. Hence, it is premature at this stage to make specific recommendations for the development of new and emerging sectors. That said, a number of opportunities are clearly worth further investigation:

- MSP to include future development opportunities such as desalination, marine renewable energy, offshore petroleum.
- Develop an Innovation Accelerator within the UWI and development partners such as UNDP to further develop ideas and support development of new sectors.
- Convene a national Blue Economy Business Forum to promote the blue economy to private sector and identify government interventions to enable its development.
- Specific business development ideas could include:
  - fertiliser (fish ends and sargassum along with other products such as river tamarind, cane ends etc.);
  - pharmaceuticals and cosmetics (sargassum and other marine resources);
  - boat building, repair and servicing (marina and yachting);
- canned fish;
- by-products from desalination.

In order to develop any of these ideas further, there is a need for government and non-government stakeholders to determine the areas of priority interest on which they wish to focus. This could then be followed by undertaking the necessary feasibility studies and possibly pilot projects to better assess the feasibility of specific development opportunities.

The UNDP project team therefore recommends that these, and other potential opportunities, be considered more thoroughly during the development of the IADB-supported Blue Economy Strategic Roadmap.

8.2.5 UNDP’s Global Accelerator Labs

In today’s era where changes are happening at new speeds, UNDP is building the world’s largest and fastest learning network to address development challenges.

The Accelerator Labs are UNDP’s new way of working in development. Together with the core partners, the State of Qatar and the Federal Republic of Germany, 60 Labs serving 78 countries are working together with national and global partners to find radically new approaches that fit the complexity of current development challenges.

Embedded within the UNDP office, the Accelerator Lab will provide national partners with a set of new services to explore, test and grow solutions for complex sustainable development problems using approaches such as sense-making, collective intelligence, solutions mapping and a portfolio of interventions and experiments.

8.2.5.1 What is the Accelerator Lab for Barbados and the Eastern Caribbean?

The “Blue Economy Accelerator Lab” is part of UNDPs Global Accelerator Labs. The primary objective of the Lab is to promote out-of-the-box thinking and experimentation to support Small Island Developing States (SIDS), with a focus on Caribbean countries, in the sustainable development of its ocean-based economic sectors.

The Accelerator Lab has partnered with the public, private and third sectors, to identify a locally-sourced portfolio of solutions to challenges being faced in the blue economy. These innovative initiatives are being accelerated through further capital investment, technical assistance and partnership generation while contributing to strengthening the innovator network in the Eastern Caribbean.
 IMPLEMENTING THE BLUE ECONOMY IN BARBADOS

9.1 The Blue Economy in the Broader Context of Barbados’ National Development Framework

As outlined in Section 4.2. above, the development of the blue economy in Barbados sits within the broader national framework for economic development. In the particular case of SIDS, the blue economy, as a macro economy concept, involves every aspect of national governance, economic development, environmental protection and sustainability. The blue economy is an integration of sustainable development and green growth. It highlights an overall-planning and coordinated development between marine ecosystem and ocean and coastal zone economic system.

Thus, rather than seeing the blue economy as something separate from the existing national development framework, a better way to interpret the blue economy would be to consider how the utilisation of Barbados’ maritime space, and the various activities it supports, can contribute to the national development priorities currently being pursued by the Government of Barbados.

The Government of Barbados has already developed a comprehensive national Green Economy development framework, which, in turn, can be traced to the National Strategic Plan (2006-2025). A Green Economy development approach integrates the following elements into a holistic development proposition: a low carbon economy; a circular economy; sustainable consumption and production; green growth; and sustainable development.

These same elements apply to the blue economy and it is therefore critical that the Government does not seek to differentiate between the Green Economy, circular economy and blue economy, but rather seeks to ensure that its overall development approach integrates all elements into a single holistic framework.

The planned “Roofs-to-Reef” project can support achieving this holistic approach as it seeks to explicitly link the impacts of land-based activities, behaviours and consumption patterns with the health of the coastal and marine environments.

9.2 Developing the Blue Economy in Barbados

Within each of the maritime functions, a number of different economic activities may be identified. These may be categorised into three life-cycle stages namely: Mature Economic Activities, Growth-stage Activities and Pre-development Stage Activities.

Applying a modified version of this analytical framework, the major beneficial uses and key economic activities that are relevant to the Barbados blue economy can be categorised under the “maritime function” headings (Table 15 below).

With such a large portfolio of potential maritime activities, the blue economy can generate further growth. In the case of Barbados these would be the Growth phase activities and the Pre-Development activities where such activities have already experienced considerable growth in other countries and can therefore be readily transferred to new market.
Box 1. Maritime Function Development Stages

Mature economic Activities

These activities currently are the bedrock of Blue Growth and provide high levels of value addition and employment. The main challenge for these activities is to continue to perform in the light of strong external pressures and fierce competition from global players. Much will depend on the strategies and business models implemented and on the ability to adopt increasingly sustainable practices, and to export to global markets. Examples of mature stage activities in Barbados include the fisheries, the tourism industry, and international shipping. Innovation is key for these mature enterprises.

Growth-stage Activities

These are the maritime economic activities which already have critical mass at a global level, which have already grown during the last five years and which can further grow in the years to come. While these may create immediate employment opportunities, important investments and preconditions are required to achieve the full potential of these activities. Activities in this category may not have developed in Barbados but capacity and infrastructure may exist to support their establishment. An example of a growth stage activity in Barbados is offshore petroleum and the possible conversion of fish waste to higher value products.

Pre-development stage Activities

These are new and emerging activities that may still be at the R&D stage at a global level and where no capacity or infrastructure currently exists either in Barbados or in the region. These will take time and investment to develop and will require a long-term view.

The Government can deepen/upgrade existing mature areas via the use of technology (tourism, ports and shipping), support the growth areas with assistance from development partners (fishing, aquaculture, coastal development). However, the focus needs to be on those areas where the greatest growth potential exists. These could be short to medium run (1-10 years) activities. Longterm (15-20 years) would be the pre-development activities. Government would provide the incentives and regulatory system in place and seek the support of the development partners (CDB, IADB, EU etc).

As noted in Section 2.3 above, the MMABE has identified a number of pillars to be addressed through the development of a national blue economy framework (Figure 2), which broadly reflect the Ministry’s strategic goals as indicated in its estimates of expenditure for the fiscal year 2020-2021.

Annex D provides a simple analysis of how each of the maritime functions, and the different development stages discussed above can contribute to achieving those pillars. In some cases these maritime functions may have either/both a positive and a negative impact, depending on how each is developed and managed.
Table 15: Descriptions of the various maritime functions.

<table>
<thead>
<tr>
<th>MARITIME FUNCTION</th>
<th>DESCRIPTION</th>
<th>SUB-SECTOR</th>
<th>STATUS IN BARBADOS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tourism &amp; leisure</strong></td>
<td>This function covers those aspects of tourism and leisure directly supported by the ocean and the services it provides. The tourism component is of particular importance and covers economic activities related to coastal tourism.</td>
<td>Coastal (beach) tourism, SCUBA, yachting &amp; watersports, Cruise ships</td>
<td>Mature, Growth, Mature</td>
</tr>
<tr>
<td><strong>Marine living resources</strong></td>
<td>This function concerns the capacity of the marine environment to supply resources for direct consumption or for processing into food products or other consumer products. Historically, the fishing industry has been at the forefront of this function.</td>
<td>Capture fishing, Fish processing and marketing, Aquaculture, Biotechnology</td>
<td>Mature/Growth, Growth, Growth/Pre-development, Pre-development</td>
</tr>
<tr>
<td><strong>Ports &amp; shipping</strong></td>
<td>This function concerns the transport of goods by sea and the associated services.</td>
<td>Shipping, Ports</td>
<td>Mature, Mature</td>
</tr>
<tr>
<td><strong>Non-living resources &amp; energy</strong></td>
<td>This function covers the exploration and production of energy and of raw materials on and from the seas.</td>
<td>Petroleum, Desalination, Marine Renewable Energy, Marine aggregates and deep sea minerals</td>
<td>Growth/Pre-development, Growth, Pre-development, Pre-development</td>
</tr>
<tr>
<td><strong>Ocean health &amp; ecosystem services</strong></td>
<td>This function covers conservation, coastal protection and ecosystem services.</td>
<td>Marine conservation</td>
<td>Growth</td>
</tr>
</tbody>
</table>

### 9.3 Complementary Activities Supporting Development of the Blue Economy

While this report, and the associated Initial Action Plan, highlight a number of specific opportunities that the Government of Barbados could pursue in its efforts to develop the blue economy, these efforts cannot occur in isolation. A broad range of activities are currently being planned or even underway that are highly complementary to the interventions identified in the Initial Action Plan. The most relevant of these are described briefly in Annex E. Where appropriate, linkages to these initiatives have also been identified in the Initial Action Plan. In this regard, through this Scoping Study and the Initial Action Plan, UNDP has sought to recognise the various initiatives being undertaken in Barbados and across the region and to propose a range of complementary activities that will provide specific support for the development of key economic sectors in Barbados.

If Barbados is to fully benefit from the development of an ocean-based economy these complementary activities will require coordination and integration with each other. In particular, the development of any future blue economy initiatives should therefore be framed against the specific activities and outputs being delivered through the broad range of complementary activities.
The UNDP project team recommends that a phased approach be applied to the rolling out of the blue economy in terms of:

1) strengthening and upgrading existing activities using modern technology (product deepening);
2) developing aligned activities (product widening); and
3) exploring new areas (widening).

### 9.4 Measuring Success

While defining a future development strategy may be relatively easy, measuring the extent to which that strategy is achieved will require the definition of specific targets and measures to track progress towards achieving specific Goals. While it may be appropriate to set a high level, overarching target such as “double the contribution to GDP of the ocean-based economy” there is also a need to disaggregate this for key activities of the overall blue economy.

It should be noted that such targets should not be seen as the ‘boundary to ambition’ for the activities, but should be a realistic and achievable target. A number of indicative targets are suggested below but it should be understood that in defining the Initial Action Plan and any subsequent Blue Economy Roadmap, consideration will need to be given to determining a set of realistic and achievable measures and targets against which to track implementation, and that align to achieving the SDGs and the 2030 agenda, more specifically SDG 14, Life Below Water.
<table>
<thead>
<tr>
<th>Key Figure to be Measured</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contribution of existing sectors (tourism, fisheries, shipping, etc)</td>
<td>• % contribution of specific blue economy sectors to GDP (both directly and indirectly through extension of the existing value chains)</td>
</tr>
<tr>
<td></td>
<td>• Estimated contribution of emerging sectors</td>
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<td></td>
<td>• Number of sectors with Regulatory/policy frameworks implemented</td>
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<tr>
<td>Sustainability of blue economy sectors</td>
<td>• Sector management plans with resource use limits</td>
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<td></td>
<td>• Improved resource status</td>
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<td></td>
<td>• Increased resource rent and value of resource access rights</td>
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<td></td>
<td>• Elimination of subsidies</td>
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<td></td>
<td>• Increased resource efficiency</td>
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<tr>
<td></td>
<td>• Natural resource accounting (environmental wealth)</td>
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<tr>
<td>Participation in the blue economy / Education, skills development and employment / Business environment and MSMEs</td>
<td>• Increased youth employment rate within specific blue economy sectors</td>
</tr>
<tr>
<td></td>
<td>• Increased % of students achieving high education standards</td>
</tr>
<tr>
<td></td>
<td>• Number employed in specific blue economy sectors as a proportion of total work force</td>
</tr>
<tr>
<td></td>
<td>• Number and type of MSMEs related to specific blue economy sectors</td>
</tr>
<tr>
<td>Sustainable blue finance</td>
<td>• % Increase in public and private finance for blue economy</td>
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<tr>
<td></td>
<td>• % Increase revenue from domestic sources (taxes, fees and levies etc....)</td>
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<tr>
<td></td>
<td>• National investment priorities identified</td>
</tr>
<tr>
<td></td>
<td>• Transparent and effective resource allocation mechanisms for local and external investment in blue economy</td>
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<tr>
<td></td>
<td>• # of projects implemented with sustainable “blue finance”</td>
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<tr>
<td>Growth of the blue economy and its significance in the national economy</td>
<td>• Blue economy output</td>
</tr>
<tr>
<td></td>
<td>• Value added</td>
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<tr>
<td></td>
<td>• # employed and their share in the national economy</td>
</tr>
<tr>
<td>Environmental benefits from the blue economy</td>
<td>• % improvement in marine environmental health indicators</td>
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<tr>
<td></td>
<td>• Resilient strategies for coastal protection and ocean acidification</td>
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<tr>
<td>Conservation targets</td>
<td>• % cover of MPAs</td>
</tr>
<tr>
<td></td>
<td>• % protection of critical habitats</td>
</tr>
<tr>
<td></td>
<td>• Monitoring and enforcement records</td>
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<tr>
<td></td>
<td>• Increase in overall protection and quality of key coastal and marine habitats and resources</td>
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<tr>
<td>Research and Innovation</td>
<td>• % GDP allocated to marine scientific research by both the public and private sectors</td>
</tr>
<tr>
<td></td>
<td>• Increased research and development capacity</td>
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<td></td>
<td>• % Increase of new technology</td>
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<td></td>
<td>• Increased regional cooperation</td>
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<tr>
<td></td>
<td>• # of collaborations/partnerships established with overseas partners</td>
</tr>
<tr>
<td>Contribution to achieving the Sustainable Development Goals</td>
<td>• Related to achievement of the specific targets under each of the relevant SDGs</td>
</tr>
</tbody>
</table>
10 | RECOMMENDATIONS AND NEXT STEPS

This Scoping Study Report provides an initial understanding of the possible opportunities that the blue economy presents for Barbados. It provides a snapshot of the status and current utilisation of the marine environment in Barbados, as well as a range of possible opportunities that the Government may wish to consider.

While a number of sector-specific opportunities have been identified, there is clearly a need to facilitate the development of the blue economy concept as a whole, with the development of a comprehensive enabling framework that facilitates and complements sector-specific frameworks.

This report and the associated Initial Action Plan should, therefore, be considered as one element of a broader set of activities being undertaken in Barbados to strengthen and support the management of Barbados’ maritime space. These include, but are not necessary limited to the activities highlighted in Annex E.

To maximise the utility of this, and other initiatives, there is clearly a need for continued strong government leadership to coordinate the various initiatives and ensure that Barbados realises the maximum benefit from the support being provided by development partners. If effectively coordinated, these various activities will combine to create a strong enabling environment within which a blue economy-based development framework can be developed.

While a number of development opportunities could be pursued within specific marine economic sectors, a more sustainable long-term strategy would be for Barbados to embark on the development of a blue economy development framework that recognises and provides for the broad range of environmental and socio-economic services provided by the marine environment. Throughout the report, a broad range of issues and opportunities are identified as well as a corresponding set of high level recommendations, (summarised below), with the aim of creating both the enabling environment to support implementation of the blue economy in Barbados as a number of development opportunities that could be initiated as a way to catalyse future investment into a broad range of ‘blue’ sectors.

10.1 Recommendations

*Developing the Enabling Environment to Support Blue Growth*

1) The Government should transition to a single *Blue Economy Advisory Committee* that oversees all future maritime activities and decision-making. Such a committee would be overseen by the MMABE, reporting to the Minister responsible.

   Consideration should also be given to whether the MMABE should take on the overall responsibility for the planning and coordination of activities across Barbados entire maritime space.

2) The Government should consider the development of a single, overarching National Ocean (Blue Economy) Policy setting out the strategic direction and objectives for development of Barbados’ maritime waters.

   Such a policy should not be seen as a replacement for existing sector-specific policies, which are still required. Rather, it should be an overarching framework, providing the broad policy direction under which all future sector-specific policies and planning should be developed.
3) A more comprehensive and integrated environmental assessment and management (legal) framework is required that responds to the broad range of activities that are, or are likely to be, undertaken in the EEZ and the continental shelf.

In developing such a regime, the following recommendations should be considered:

- prepare a new legal instrument that deals primarily with protection, planning and management of the marine environment (to include Barbados’ entire maritime waters);
- develop new regulations under the Petroleum Act; and
- introduce new legislation controlling access and benefit sharing (ABS) from the use of marine genetic resources.

In addition, a number of existing legal instruments need to be updated.

4) It is strongly recommended that Barbados embarks on the development of a comprehensive EEZ-wide MSP framework.

5) A comprehensive approach is needed to address the full range of threats to the marine environment, in particular coral reefs. Such an approach must ensure that any future national blue economy development framework addresses the full range of threats to the marine environment including land-based sources of pollution, unsustainable fishing practices and physical damage to marine habitats. Only when these issues are adequately managed will the blue economy be able to thrive in Barbados.

Furthermore, future policy and planning decisions need to avoid impacts accumulating through multiple and potentially incompatible activities taking place in a particular space, thereby preventing both land-base and marine activities from damaging the functioning of the marine ecosystem and the benefits it provides.

6) The expansion of the existing marine reserves to include a system of representative habitat types should be seen as a priority.

Not only will this provide direct benefits in terms of improvements to fish stocks, but it will also help to build the resilience of those natural systems to better protect them against the inevitable impacts of climate change. They will also contribute to the natural capital which underpins the tourism sector.

Further additional areas of Barbados’ maritime space should also be assessed for greater protection.

7) The increasing risks associated with climate change must be recognised and managed through the incorporation of appropriate adaptation and resilience building strategies into sustainable development, conservation and governance actions if Barbados is to realise its vision for a blue economy.

8) Opportunities exist to increase the flows of revenue received from the various maritime activities in Barbados.

To this end, it is recommended that the Government undertake a comprehensive review of the various existing fees, levies and charges that are received from marine related activities, especially cruise shipping, fishing and yachting. Such a review should include a benchmarking exercise to compare the level of fees and levies with international norms as well as examining areas where no fees are currently collected.

As an initial step in this regard, the Government should review and revise the existing schedule of visitor fees charged in respect of the Barbados Marine Reserve.
9) As one of its first tasks, the Blue Economy Advisory Committee (recommendation 1 above) should establish a task force (with co-opted members from the private sector and academia) to engage with the private sector and oversee the issues associated with MSME growth and development in the blue economy — *inter alia* scuba, coastal cruisers, diving, fishing, cottage industries associated with blue economy resources etc.

10) If Barbados is to progress the development of the blue economy, better data on progress with these activities is needed to measure and monitor the progress of activities in the blue economy.

This should include a focus not only on the value of economic sectors but a broader approach to valuing the natural capital that supports these sectors.

11) The potential to develop a centralised multi-user platform through which marine data can be stored, accessed and used by multiple agencies should be considered by the IADB as one of the critical elements of the Blue Economy Roadmap, given the critical need and multiple applications of such a platform (including EEZ-wide MSP).

12) The Government should pursue a data discover process to identify and secure all offshore data that relates to its maritime waters. Once obtained, it will then need to determine what skills, equipment and other resources will be required to process and interpret such data.

13) A more coordinated focus between the existing research and educational facilities is essential to support the development of new research clusters aimed at supporting and furthering key marine sectors.

Identifying and defining ongoing strategic marine research and information needs, in an inclusive and adaptive manner, together with the appropriate funding resources and mechanisms, is essential for achieving economic development through a blue economy framework.

This requires the development and implementation of a clear strategy relating to marine scientific research and data.

14) Emphasis should be placed on sensitising the population on coastal environmental issues, introducing relevant subjects through the school curriculum by involving the Ministry of Education, as well as capacity building especially for office bearers for effective implementation of the policies and activities.

15) There is a need for Barbados to enhance its capability to identify threats to its maritime space in a timely manner by sharing and integrating intelligence, surveillance, and navigation systems into a common operating picture.

**Applying the blue economy in Barbados**

1) Opportunities should be identified to develop partnerships with local tourism operators, fisherfolk and Government agencies to develop locally owned and operated marine management areas.

Such projects could be packaged as Corporate Sustainability products for the companies and could also provide a vehicle for tourism education and awareness campaigns.

2) Ensure that the development of the cruise tourism sector considers not only the economic benefits but also long-term impacts and socio-economic and environmental risks to Barbados
which are in line with the Barbados Port Inc’s master plan and vision of becoming the most innovative and green maritime hub by 2030.

3) The Government should engage with the yachting sector to assess the economic potential and feasibility of expanding this sector through the provision of additional marine facilities and extending the existing supply chain.

4) There is a need to better understand the likely trajectory for key marine species (in terms of diversity, distribution and abundance) under different future climate change scenarios supporting the ability to better plan for future fisheries development.

5) A process to better understand and value the total contribution of the fisheries sector, as a critical component of Barbados’ blue economy, is required. Such an analysis should not only assess the direct upstream and downstream linkages of capture fisheries, but also the wider social and cultural benefits.

As a critical first step, the Government should implement a robust data recording and reporting system to ensure that catch/landing data are treated in a consistent manner thereby ensuring that the Government of Barbados always works with a single consistent data set for fisheries landings.

6) Given that the nearshore reef fishery represents a major contribution to local livelihoods and food security, opportunities to implement fishery management measures, to improve the health of these stocks, should be explored. The implementation of Fisheries Management Plans (FMPs) is recommended; these are detailed management plans that align fishing effort and specific regulations with (1) scientific guidance regarding the health of the stock and (2) economic objectives.

7) Given the current uncertainty, a strategy to improve selective targeting of high value tunas should be pursued as a way to increase harvests of these species. Such a strategy would be consistent with recommendations made by the FAO.

8) The IADB project should consider in more detail how the existing fishery can be diversified through the diversification of the existing fishery resource base to sustainably exploit deeper offshore species and nearshore species that are currently not fished.

9) There is a need to maximise the value that can be derived from fish waste, while at the same time reducing the need to dispose of waste to the environment.

This could be achieved through further expansion of existing initiatives such as the MMABE / Embassy of Argentina / FAO / BGI fish waste silage project and the UNDP Accelerator Lab biofuel project, or could require additional projects that could be evaluated further through the IADB project.

10) There is a need to develop the capacity of the national maritime administration into a fully formed and dedicated unit with oversight of Flag, Port and Coastal States rights and obligations for shipping.

11) In order to fully understand, mitigate and manage operational risks to the port of Bridgetown it is recommended that Barbados Port Inc undertake a comprehensive risk assessment of the existing and future planned port facilities.

12) Barbados Port Inc could further explore options for integrating renewable energy sources (particularly solar and wind) with its facilities to generate power for port consumption and, where excess exists, to provide shore-based power for ships alongside.
13) Although the Offshore Petroleum Regulations contain provisions relating to environmental procedures, it is recommended that the Government should consider development of a comprehensive and dedicated environmental management regime for the offshore petroleum sector. Such a regime (to be developed under the under the Offshore Petroleum Act) should address, as a minimum inter alia:

- appropriate discharge quality standards in accordance with international best practice;
- appropriate atmospheric emissions standards including with regard to venting and flaring of associated gas;
- environmental management planning requirements including with respect to waste management;
- requirements for offshore installation (Tier 1) marine oil spill contingency plans;
- selection, use and management of hazardous substances;
- requirements relating to conservation and protection of marine biodiversity
- Functions powers and duties of different regulatory agencies vis-à-vis management of the health, safety and environmental aspects of offshore petroleum activities.

14) In the context of a broader blue economy development framework, the provision of coastal areas that are protected and able to support the installation and operation of future desalination facilities, particularly with respect to protection of the source water catchment, requires particular attention.

15) In order to develop new and emerging areas of the blue economy, there is a need for government and non-government stakeholders to determine the areas of priority interest on which they wish to focus. This could then be followed by undertaking the necessary feasibility studies and possibly pilot projects to better assess the feasibility of specific development opportunities.

The UNDP project team therefore recommends that these, and other potential opportunities, be considered more thoroughly during the development of the IADB-supported Blue Economy Strategic Roadmap.

10.2 Initial Action Plan

This report identifies a total of eight (8) critical enablers (encompassing a total of 21 enabling policy interventions) and thirteen (13) development opportunities that could be pursued by the Government of Barbados as an initial step to implementing a blue economy-based development strategy. While some of these opportunities are sector-specific, others create synergies and linkages across different maritime functions that operate within Barbados.

These opportunities and policy interventions have been developed further into an Initial Action Plan, which provides a preliminary framework to allow Barbados to further identify a range of opportunities under the blue economy. It should be recognised that the action plan is by no means exhaustive but captures the key issues and opportunities that were identified during this assignment (see Table 16 below for a summary of the Initial Action Plan elements). If undertaken, in conjunction with the other initiatives being pursued by the Government of Barbados, the Action Plan can enable Barbados to develop its ocean-based economic sectors in a more integrated manner thereby contributing to inclusive, environmentally sustainable, economic growth.
Specifically, the Initial Action Plan aims to create a revitalization process that results in healthy ecosystems that are able to sustain growth in a number of economic sectors. Over time this revitalization will support the development of new sectors attracting greater investment and financial support to the blue economy resulting in a greater number of businesses supported by the blue economy. This revitalization will be supported by capable management institutions, focused on sustainable development, and enabled by an innovative and skilled private sector.

Table 16: Summary of Initial Action Plan elements and actions.

<table>
<thead>
<tr>
<th>THEMATIC AREA</th>
<th>ACTION AREAS</th>
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<tbody>
<tr>
<td>1. Enabling Environment</td>
<td><strong>Action Areas:</strong></td>
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<tr>
<td></td>
<td>1.1 Integrated approaches to ocean governance</td>
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<td></td>
<td>1.2 A healthy, resilient &amp; productive marine environment</td>
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<td></td>
<td>1.3 Sustainable finance &amp; investment</td>
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<td>1.4 Business development</td>
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<td>1.5 Human capacity development</td>
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<td>1.6 Research &amp; marine information</td>
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<td>1.7 Public awareness &amp; engagement</td>
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<td></td>
<td>1.8 Maritime surveillance, monitoring &amp; enforcement</td>
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<tr>
<td>2. Tourism &amp; Leisure</td>
<td><strong>Action Areas:</strong></td>
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<tr>
<td></td>
<td>2.1 Create linkages between the tourism sector and marine conservation</td>
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<td></td>
<td>2.2 Further develop the cruise sector to account for its long-term risks and impacts to the marine environment and other users as well as its direct economic contribution</td>
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<td></td>
<td>2.3 Undertake an assessment, in conjunction with the yachting sector, to determine the potential opportunity and feasibility of expanding the existing leisure yacht facilities to cater for more recreation (cruising) yachts</td>
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<td>3. Marine Living Resources</td>
<td><strong>Action Areas:</strong></td>
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<td></td>
<td>3.1 Improve the understanding of fishery management requirements undertaking future climate change projections for the Caribbean</td>
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<td></td>
<td>3.2 Review existing and develop new metrics for recording and reporting landings of marine fish in Barbados</td>
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<td></td>
<td>3.3 Develop ‘Fisheries Management Plans’ for key reef fish species</td>
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<td></td>
<td>3.4 Develop strategies to better utilise existing fish stocks and to diversify the existing fisheries to include new or underutilised fish species</td>
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<td></td>
<td>3.5 Expand the current focus on fish silage to determine other options for creating value from the waste generated from fish processing and other biological material</td>
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<tr>
<td>4. Ports &amp; Shipping</td>
<td><strong>Action Areas:</strong></td>
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<tr>
<td></td>
<td>4.1 Specifically include an assessment of the Maritime Affairs function under Component 2 of the IADB blue economy initiative, taking into account Flag, Coastal and Port state rights and obligations</td>
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<td></td>
<td>4.2 Prepare and implement a Port Safety Management System for the Port of Bridgetown</td>
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<td></td>
<td>4.3 Invest in renewable energy sources to provide low carbon shore-based power for visiting ships</td>
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<tr>
<td>5. Non-living Resources &amp; Energy</td>
<td><strong>Action Areas:</strong></td>
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<tr>
<td></td>
<td>5.1 Undertake a comprehensive review of the existing environmental regulatory functions that relate to the offshore petroleum sector with a view to developing a new set of Offshore Petroleum (Environmental Management) Regulations</td>
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<tr>
<td></td>
<td>5.2 Ensure the security of future desalination capacity</td>
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</table>
REFERENCES


Inter-American Development Bank (2020). Climate-Resilient Integrated Coastal Zone Management Performance Indicators, World Resources Institute, IDB Technical Note; 1848, January.


Smith (1997). *Seamoss Cultivation in the West Indies*. Caribbean Natural Resources Institute Guidelines Series. (Caribbean Natural Resources Institute (CANARI)).


UNCTAD (2020). *Economic and Trade Aspects of Fisheries and Coastal and Marine Environmental Services Sectors in Barbados*.


ANNEX A: TERMS OF REFERENCE

1. Background

Caribbean Community (CARICOM) countries continue to be highly vulnerable to shocks caused by natural disasters that are now exacerbated by Climate Change. The International Monetary Fund (IMF) estimates that between 1990 and 2014, the Caribbean lost between 1.8 - 2% of Gross Domestic Product (GDP) annually as a result. Losses have exceeded 100 percent of GDP in many instances, as demonstrated in the cases of Hurricanes Ivan (Grenada, 2004), Matthew (Haiti, 2016); Irma (BVI, 2017), (Barbuda, 2017); Maria (Dominica, 2017).

Since the hurricanes of 2017, the ongoing recovery efforts have revealed some major challenges in the region with the most critical being the imperative of building climate resilience through economic diversification and the use of innovative approaches that are apt for the region being a priority. In this regard, several Governments in the Region have initiated discussions on optimizing the potential of the “Blue” or Ocean economy.

The emerging concept of the ‘blue economy’ presents a promising development opportunity for Caribbean SIDS and the wider Caribbean. This approach is centred on the promotion of economic growth and diversification, social inclusion and securing coastal livelihoods while ensuring environmental sustainability of ocean and coastal areas.

An integrated ‘blue economy’ approach can create a new vision in a way that both supports economic development and maintains healthy and productive oceans and is directly relevant to the achievement of many of the targets set out in the Sustainable Development Goals (SDGs). An effective blue economy, supported by the protection and sustainable utilization of marine ecosystem services, should map across several of the SDGs including

- Goal 2: Zero hunger through the critical role living marine resources play in food security;
- Goal 7: Affordable and clean energy through the contribution marine renewable sources play in energy security;
- Goal 8: Decent work and economic growth through the diversification and growth of marine-based economic sectors; and
- Goal 13: Climate action through the implicit link between the oceans and climate change, and the adaptive measures countries can take to maintain ocean integrity and resilience.
- Goal 14: Life Below Water through identifying risks to the marine environment, especially to marine living resources, and proposing strategies that mitigate those risks; and
- Goal 16: Strong Institutions through establishing robust national marine regulators and incorporating participatory processes in decision-making about marine management issues.

To realize such an economy, it will be important to: (i) support countries to better understand the real environmental and potential economic value of their ocean resources; (ii) identify ways to sustainably realize this potential value, thereby generating more value from one or more blue sectors; (iii) identify potential partners and financing windows to help advance climate resilience and develop the blue economy; and (iv) identify the steps needed to build resilience against future climatic changes.

UNDP has already supported Dominica and BVI with Blue Economy Scoping Studies and is in the process of supporting other countries in the Eastern Caribbean.
In 2018, the Government of Barbados created the Ministry of Maritime Affairs and the Blue Economy, signaling the country’s commitment to becoming a global leader in the Blue space. With an exclusive economic zone that is over 400 times larger than its land space, Barbados is seeking to explore the potential opportunities that the blue economy can offer. As a long-established partner of Barbados and of the region with access to global policy expertise, UNDP is well positioned to respond to Barbados’ request for the preparation of a Blue Economy scoping study.

This Blue Economy Scoping Study for Barbados will be conducted under the Blue Economists Programme of the University of the West Indies, Cave Hill Campus, in conjunction with a technical team from the UNDP. The joint team of research/policy advisors and experts will work along with colleagues at the Inter-American Development Bank (IADB) and the MMABE for peer review.

2. Objectives and Outcomes

The overall objective of this consultancy is to undertake a rapid assessment that can help build a baseline of Barbados’s current blue wealth and productivity, policy and institutional framework, the constraints to developing a more productive blue economy, and assess the potential for generating greater value, creating better blue jobs, and improving climate resilience. It will also

- include a stakeholder mapping exercise by preliminarily identifying key actors in pre-identified sectors.
- provide a situation analysis and the basis to develop a national Blue Economy Strategy, through which, a range of future development opportunities can be pursued.

The consultancy will be undertaken noting the proposed consideration by the Ministry of Maritime Affairs and the Blue Economy to detailed elements in the 2016 World Bank Study of the Caribbean Blue Economy such as the relationship between ocean services and blue economic sectors. In addition, continued consultation to identify synergies between the Blue Economy Strategic Roadmap being prepared by the IADB will be conducted as it is expected that this scoping study will produce valuable inputs that can be incorporated into the various Blue Economy outputs (which include a Blue Economy Roadmap and Action Plan) that the IADB’s technical assistance program with the Ministry of Maritime Affairs and the Blue Economy will be supporting.

The Scoping Study will consider the following economic sectors: fisheries, aquaculture (including maricultural), pharmaceuticals, seabed mining, oil and gas, off-shore/marine renewable energy, desalination, shipping, port infrastructure and services, tourism, coastal development, Blue carbon, habitat protection and restoration, solid waste and wastewater, and protection of species and habitats.

This exercise will provide information on what Blue Economy areas Barbados is currently exploiting, areas that are not being considered yet but have potential for supporting a Blue Economy development pathway and those that are currently being pursued but could be expanded or improved. Furthermore, the Scoping Study will serve as an input for the IDB’s exercise, especially in areas related to inter-ministerial coordination, stakeholder involvement and consultation, focus areas of the MMABE, existing capacities and future needs, among others.
The following critical activities will be undertaken:

**Stakeholder identification, engagement and consultation**

The consultant will identify all relevant stakeholders in the priority economic sectors described above, build the linkages between key stakeholders both at the national and regional level including the Government of Barbados, CARICOM, regional Development Banks, private sector and regional ocean governance agencies. In addition to bilateral discussions, a consultation session will be organized with all relevant stakeholders.

**Assessment of current Blue Economy sectors active in Barbados**

Critical to achieving growth in the Blue Economy will be to ensure full inclusion of all maritime sectors, through value chains and life cycle approaches. Understanding where these opportunities lie will require a comprehensive understanding of the nature and extent of current “blue sectors” in Barbados and an identification of where opportunities for growth exist within these sectors. While the IDB’s initiative will look into regulatory frameworks at depth, this Scoping Study will attempt to do preliminary identification and assessment of relevant policy and legislation for each sector as permitted by available information and stakeholder engagement/contribution.

**Analysis of potential ‘new’ areas for blue investment with a high likelihood of success**

The consultant will undertake an analysis of relevant overseas blue economy models and an identification of key lessons learned that could be applied to Barbados in order to identify potential opportunities for future development within the Blue Economy and new areas for blue investment.

**Analysis of existing enabling environment**

In order to support growth in the identified blue growth sectors, there is a need to develop a comprehensive understanding of the existing enabling environment, including governance arrangements, infrastructure, capacity and administrative resources to support these sectors, their incubation in Barbados and, more importantly, to determine the future infrastructure and capacity needs that will be required to support growth in the identified areas.

**Identification of potential partners and funding windows**

The team will also identify potential funding windows and development partners to support the efforts of Barbados in advancing the Blue Economy.

3. **Deliverables**

The consultant will prepare the following key deliverables:

1. A stock take document on Blue Economy in Barbados including brief fact sheets per economic sector, mapping of all relevant stakeholders and one (1) consultation session;

2. A ‘rapid assessment’ document setting out development options based on both the stocktake and knowledge of new and emerging marine sectors that could be developed; and

3. An initial ‘Action Plan’ identifying most pressing priorities to initiate transition to a blue growth development strategy.
ANNEX B: INTERNATIONAL MARINE ENVIRONMENTAL AGREEMENTS

- Convention on Biological Diversity, 1992
- Convention of International Trade in Endangered Species, 1972 (CITES)
- The Convention on Wetlands of International Importance, especially as Waterfowl Habitat, 1971 (Ramsar Convention)
- International Convention for the Conservation of Atlantic Tuna, 1966 (ICCAT)
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
- International Convention for the Regulation of Whaling 1948 ad 1959
- Convention on the Protection and Development of the Marine Environment in the Wider Caribbean, 1983 (Cartagena Convention)
- Protocol Concerning Cooperation in Combating Oil Spills in the Wider Caribbean, 1983
- Protocol Concerning Specially Protected Areas and Wildlife (SPAW) in the Wider Caribbean Region
- Protocol Concerning Pollution from Land-Based Sources and Activities, 1999.
- International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78) including Annexes I-VI
- International Convention on Civil Liability for Oil Pollution Damage, 1969 (CLC ’69)
- Protocol of 1992 to Amend the International Convention on Civil Liability for Oil Pollution Damage, 1969 (CLC ’92)
- International Convention relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969; (INTERVENTION Convention 69)
- Protocol to the International Convention relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1973; (INTERVENTION Protocol 73)
- International Convention on Civil Liability for Bunker Oil Pollution Damage, 2001 (BUNKER)
- International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001
- International Convention for the Control and Management of Ships Ballast Water and Sediment, 2004
ANNEX C: SUMMARY OF KEY LEGISLATION RELATING TO MARINE

Maritime Claims and Legislation

**Barbados Territorial Waters Act, 1985**

The *Barbados Territorial Waters Act* (CAP 386) defines the territorial waters of Barbados as existing within 12 nautical miles around the island. Section 3 (2) provides that these waters, including the underlying seabed and subsoil, form part of the territory of Barbados and are, therefore, subject to full territorial sovereignty.

Under this Act, foreign vessels have a right of innocent passage through the territorial waters but not if the captain or other person in charge of the ship engages in any calculated act of pollution or acts likely to cause harm to Barbados' resources or its marine environment.

Section 11 of the Act provides that the Minister may make regulations *inter alia*:

- a) For the safety of navigation and the regulation of maritime traffic;
- b) For the conservation of the living resources of the sea;
- c) For the preservation of the marine environment of Barbados and the prevention and control of pollution thereto;
- d) For the regulation of fishing; and
- e) The grant of permits and the conditions to be attached thereto for fishing by nationals of foreign states and by means of foreign ships.

To date, no regulations have been promulgated under this Act.

**Marine Boundaries and Jurisdiction Act, 1995**

The *Marine Boundaries and Jurisdiction Act* (CAP 387) provides for the establishment of baselines and maritime zones in accordance with the provisions of the LOSC. In this regard, it should be interpreted in conjunction with the Barbados Territorial Waters Act. In accordance with Section 3(1) of the Act, Barbados has declared a 200 nm EEZ.

Pursuant to Section 5, the Act vests in the Government of Barbados:

- a) all rights in, and jurisdiction over, the Zone in respect of:
  - i. the exploration, exploitation, conservation, protection or management of the natural living and non-living resources of the sea-bed, subsoil and superjacent waters,
  - ii. the construction, maintenance or use of structures or devices relating to the exploration or exploitation of the resources of the Zone, the regulation and safety of shipping, or any other economic purpose,
  - iii. the authorisation, regulation or control of scientific research,
  - iv. the preservation and protection of the marine environment and the prevention and control of marine pollution,
  - v. all other activities relating to the economic exploration and exploitation of the Zone; and
- b) all other rights in, and jurisdiction over, the Zone recognised by international law.
Subject to Section 6 of the Act, no person shall:

a) explore or exploit any resources thereof;
b) carry out any search or excavation;
c) conduct any research;
d) drill in or construct, maintain or operate any structure or device; or
c) carry out any economic activity

within the EEZ, except under or in accordance with an agreement with the Government of Barbados or a permit granted by the Cabinet.

Barbados shares a number of maritime boundaries with neighbouring States, namely, Martinique St Lucia, St Vincent and the Grenadines, Trinidad and Tobago and Guyana. To date Barbados has signed bilateral Treaties with France - to agree on the delimitation of its northern boundary with Martinique - St Lucia and St Vincent and the Grenadines respectively. Barbados’ disputed boundary with Trinidad and Tobago was decided in 2006 by an Arbitral Tribunal constituted pursuant to Article 287 and in accordance with Annex VII of the LOSC. In additional, Barbados and Guyana have established a limited Joint Cooperation Zone at the seaward extent of their boundaries.

Pending issues to be addressed

In addition to the instruments described above, the Government of Barbados is currently considering a draft legal instrument to provide for the construction of offshore islands, pursuant to the LOSC. This includes a new Offshore Islands Policy.

Marine Resource Management

Fisheries Act, 1995

The Fisheries Act, 1995 (CAP 391) is the principal legislation governing fisheries management in Barbados and provides a general framework for the regulation of fishing and aquaculture in Barbados’ waters. The Act is supplemented by the Fisheries (Management) Regulations 1998 and subsequent amendments.

The Act has three substantive parts, with Part I dealing with management and development, Part II dealing with safety of commercial fishing vessels, Part III dealing with Enforcement respectively. Part IV is a general part providing for the making of regulations and other administrative matters.

The main management actions defined in Part I of the Act are vested in the Minister who, pursuant to section 4, may appoint a Chief Fisheries Officer (CFO) who is required to prepare and keep under review schemes for the management and development of fisheries. These fisheries schemes shall indicate the current state of fisheries, the objectives to be achieved and the management, development and licensing measures to be applied including the amount of fishing to be allocated to foreign fishing vessels. Each fisheries management plan shall be submitted to the Minister for approval. An existing fisheries scheme is discussed in more detail in Section 6.1.3.2 above.

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28 An exception is granted for fishing by citizens of Barbados I or from a Barbados vessel pursuant to Section 6(2).
30 See the Exclusive Economic Zone Co-Operation Treaty signed on 2 December 2003 in London.
31 Fisheries Act, section 4(1).
The Act provides the Minister responsible for fisheries with the power to prescribe management measures including *inter alia:* closed seasons, closed areas, gear specifications, fishing methods or gear types, specification of species sizes or other characteristics of aquatic organisms that are permitted or forbidden to catch, and schemes for limited entry into the fishery. The Minister is advised by a Fisheries Advisory Committee (FAC).

While the primary focus for the fisheries sector is on domestic fishing, the Act does provide for the negotiation of agreements for the allocation of fishing rights to foreigners and provides in general for foreign fishing in Barbados’ waters. Licences to foreign fishing vessels shall be granted only pursuant to an agreement except when the Minister determines that an agreement is not practical and the applicant provides sufficient financial and other guarantees for the fulfilment of obligations under this Act.

All vessels undertaking fishing activities are required to hold a valid licenced, issued by the Minister. This applies both to foreign and local fishing vessels but excludes sport fishing and fisheries research activities. Any licence issued under the Act for the use of a vessel, net or activity shall be subject to general operating and management requirements as the Minister may prescribe and such conditions that are endorsed on the licence.

The Act prohibits only a limited number of fishing methods, namely explosives and poison (Section 29). However, the *Fisheries (Management) Regulations* contain far broader prohibitions on gear selection as well as temporal controls of certain species.

Enforcement and related provisions of the Act are comprehensive. Section 27 as amended gives “authorised officers” the typical powers of stopping, boarding and searching any fishing vessel in Barbados’ waters as well as local vessels on the high seas. The Act also vests the power of seizure of vessels, its stores and cargo, fish and fishing gear; the power of hot pursuit; sale of seized fish or other perishable items; and, release of vessels on receipt of satisfactory bond or security. Although not included under the Fisheries Act, fishing is prohibited within a marine reserve consisting of four zones (Folkestone Marine Reserve) stretching along a 1.5 km length of the West Coast of the island (NCC, 2015).

It is noteworthy that the Act does not have any specific provisions to enable/allow for aquaculture, although it is understood that the new Fisheries Policy currently being developed with support from FAO will address aquaculture comprehensively and will result in regulatory reforms in the future.

**Planning, Conservation and Environmental Management**

Barbados has a limited number of legal instruments pertaining to biodiversity conservation, and, at the time of undertaking this assignment, no specific legislation dealing environmental management.

**Coastal Zone Management Act, 1998**

The *Coastal Zone Management Act* (CAP 394) provides a comprehensive statutory basis for integrated coastal management and planning in Barbados. It seeks to coordinate and update the existing fragmented....

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32 *Fisheries Act*, sections 6-7.
33 *Fisheries Act*, Section 8.
34 *Fisheries Act*, Section 11.
35 "authorised officer" means any fisheries, customs or police officer or any officer or soldier of the Barbados Defence Force serving as a member of the Barbados Coast Guard. In this regard, Barbados should have access to a range of enforcement officials to undertake fisheries enforcement activities.
statutes relevant to coastal management and makes provision for critical areas of concern not covered by current legislation. Section 3 of the Act provides the legal basis for the preparation of the ICMP (see section 6.1.3.3), which establishes and clearly sets out Government’s coastal management policy and technical guidelines for the use and allocation of coastal resources and for the delimitation of the extent of the coastal management area.

The Act does contain specific provisions relating to the protection of marine resources, for example destruction of corals and fouling of the foreshore. In this regard, both the management plan under this Act and the fisheries scheme established under the Fisheries Act apply to the living resources of the coastal zone outside a restricted area, although, in the case of any conflict between the scheme and the management plan, the fisheries scheme shall prevail.

It also encompasses the designation of “restricted areas” by the Minister for the following purposes:37

(a) the preservation or enhancement of the natural beauty of the areas;
(b) the protection or rehabilitation of the flora and fauna found in the areas;
(c) the protection of wrecks and other items of archaeological and historical interest found in the areas;
(d) the promotion of the enjoyment by the public of the areas; and
(e) the promotion of scientific study and research in respect of the areas.

The Act repeals the previous Marine Areas (Preservation and Enhancement) Act, which provided for inter alia the establishment of underwater parks. In this regard, in practice the Act provides for the establishment of marine protected areas and marine parks, but only within the limits of the territorial sea.

Enforcement and implementation of the Act is vested in the Director of the Coastal Zone Management Unit, a statutory position pursuant to the Act. The Director’s powers are broad and far reaching, with respect to the coastal zone and the Act provides substantial enforcement provisions for offences committed in respect of any area designated as a restricted area.38 More generally, the Act prohibits the harvesting of coral from within Barbados’ maritime waters or to trade in coral although an exception may be granted for the purposes of marine scientific research (Section 23).

Notwithstanding the extensive enforcement provisions under the Act, the Act does not provide for the authorisation of development in the coastal zone, this is a matter for the Planning and Development Act, 2019 (which recently replaced the older Town and Country Planning Act) and the relevant planning authority.

Planning and Development Act, 2019

The Planning and Development Act, 2019 repeals the previous Town and Country Planning Act. The legislation provides for a new Planning and Development Board that will consider complex applications while the majority will be delegated to the Chief Town Planner. A new Appeals Tribunal is also being established.

As with the previous Act, the new Act provides for the preparation of a Physical Development Plan by the Chief Town Planner (CTP) which may make provision for: (i) allocation of lands as open spaces, communal parks, bird and other sanctuaries, protection of marine life; (ii) preservation of sites of artistic, architectural, archaeological or historical interest; (iii) preservation or protection of forests,

37 CZM Act Section 15.
38 CZM Act Section 6.
woods, trees, shrubs, plants and flowers; (iv) regulation and control of the deposition of waste materials, refuse, sewage and the pollution of rivers, lakes, ponds, gullies and the seashore.

Given that the definition of “land” under the Act includes the seabed within the territorial limits it is arguable that the Act provides the planning framework for physical developments (but not necessarily activities) within the 12 nm limit of the territorial sea.

The Act also contains provisions requiring certain developments to prepare environmental impacts assessments (EIAs) and for a process of public consultation on EIAs submissions. It is in this regard that the input of other agencies can have the greatest impact, particularly with respect to the coastal management area.

**Marine Pollution Control Act, 1998**

The *Marine Pollution Control Act* (1998) focuses on the quality of the marine waters on the south and west coasts of the island. The legislation has been approved to help combat the steadily deteriorating coastal water quality in some locations that has resulted due to the increased physical development occurring along the coastline over the last three decades. As in all coastal island states dependant on marine resources, poor water quality poses a serious threat to human, fisheries and marine ecosystem health.

Overall, the legislation seeks to prevent, reduce and control pollution from its various sources. It recognizes that much of the marine pollution affecting coastal waters originates from land based sources and activities. In this regard, the Act:

a) prohibits the release of any pollutant into the environment in violation of any applicable standards, conditions or requirements specified under the Act or regulations thereunder, and provides that contravention of this provision constitutes an offence;\(^{39}\)

b) provides for the investigation and collection of data by the Director of the “Environmental Engineering Division” which is now the EPD as soon as practicable after the entry into force of the MPCA in respect of the extent of pollution and significant sources thereof from land based sources, seabed activities, dumping activities, and airborne sources affecting the environment generally as well as such premises as the Director deems necessary;\(^{40}\) and

c) provides for the Director to maintain a Register of Pollutants and to develop and implement with the approval of the Minister, a programme for prevention, reduction and control of pollutants, inclusive of registration of significant sources of ongoing or intermittent release of pollutants into the environment.\(^{41}\)

**Pending issues to be addressed**

In addition to the instruments described above, the Government of Barbados is currently considering a suite of instruments to address the preservation and management of marine cultural heritage. These include:

- *Maritime and Underwater Cultural Heritage Policy*;
- *Maritime and Underwater Cultural Heritage Act*;

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\(^{39}\) MPCA Section 3.

\(^{40}\) MPCA Section 4(1).

\(^{41}\) MPCA Sections 4(2) & (3).
• Regulations developed pursuant to the *Maritime and Underwater Cultural Heritage Act* dealing with wreck removal, salvage and access to marine genetic resources;

• National Policy on Plastics and Bio-Based Alternatives;

• Act to Establish the Marine Parks and Reserves Unit; and

• Amended plastics legislation.

**Maritime Transport and Port Facilities**

To date the government has enacted the following main instruments relating to shipping:

1. *Shipping Act, 1994*; and

2. *Shipping (Oil Pollution) Act, 1995.*

**Shipping Act, 1994**

The *Shipping Act, 1994* (as amended) is an extensive instrument consisting 350 Sections and 2 Schedules. It is the main instrument for regulating international and domestic shipping in Barbados and regulates conditions and other factors that affect ship safety and minimise the risk of pollution from ships contaminating the sea. The Act provides for the establishment of the national maritime administration for the purpose of operating an international ship registry and provides the basis for regulating Barbados registered ships wherever they may be.

The Act does not appear to provide any regulatory controls for international vessels within a port or within the territorial waters of Barbados. No other regulatory instrument giving effect to these international requirements could be identified in the course of this assignment. Thus, the legal basis for Barbados to establish and enforce Port State Control measures and conditions of port entry is unclear.

The Act consists of nine Parts, each giving effect to different aspects of ship registration and operations, giving effect to the various mandatory instruments of the IMO to which Barbados is a party.

Chapter I provides for the registration of ships and the appointment of a number of functional marine officers including the Director of Maritime Affairs and the ships registrars. Part I also deals with the documentary requirements for ship registration including vessel measurement and registration of bareboat charters.

Part II deals exclusively with crewing and manning requirements of ships flying the Barbados flag, thereby giving effect to the requirements of the International Convention for the Safety of Life at Sea (SOLAS).

Part IV deals substantively with safety of ships, giving effect to a number of IMO Treaty requirements including Load Lines, SOLAS, and Collision Regulations. It also addresses the requirements for vessel inspection, though in a cursory manner and enshrines the International Regulations for the Prevention of Collisions at Sea in domestic legislation.

PART V deals with wrecks, salvage and casualty investigations with maritime salvage and the investigation into maritime casualties. Interestingly, this Part has a sub-part (Part VA) which deals with the regulation of diving operations and small commercial vessels. These include the power to make regulations to address issues relating to small commercial vessel licensing, safety and crewing standards.

The Shipping Act also provides for marine resource protection at section 300A(2)(a) of the Act by making it an offence for any person involved in diving operations to damage any coral reef as a result of the operations, and expressly invoking the application of section 27 of the *Coastal Zone Management*
Act as if the offence was committed under that Act. Commission of this offence and contravention of any regulations made under section 300A(2)(a) is punishable on summary conviction by fine and/or imprisonment.

- Pursuant to Section 300C (1) of the Act, the Minister may by order prescribe the area within the EEZ of Barbados at which activities including watersports activities may be conducted; and
- set out the conditions which must be adhered to by persons engaging in activities including watersports activities.

While the UNDP project team notes that this is an unusual state under which to find such provisions, it establishes perhaps the only legal basis for undertaking and enforcement marine spatial planning in Barbados waters that applies to the entire EEZ.

Part VI deals with duties and liabilities of ship owners vis-à-vis carriage of goods and passengers at sea and establishes limits of liability for maritime claims.

Part VII gives full effect to those international maritime treaties to which Barbados is a party and provides, inter alia, that where the text of any of the listed treaties differs from or conflicts with the Act, the provisions of the Treaty shall prevail. This is an important provision since it recognises the speed with which the IMO adapts and develops its treaties, which makes it hard for small States to maintain their legislation in an up to date manner.

**Shipping (Oil Pollution) Act, 1995**

The *Shipping (Oil Pollution) Act* complements the *Shipping Act* since it gives effect to the various IMO instruments dealing with oil pollution and damage arising from accidental discharges of oil from tankers and cargo vessels. Specifically, the Act gives effect to MARPOL 73/78, the CLC Fund and the IOPC Fund. The Act applies to Barbados ships and to the discharge of oil from any ship into the maritime waters of Barbados (either from vessels, pipelines or storage facilities).

**Pending issues to be addressed**

In addition to the instruments described above, the Government of Barbados is currently considering a suite of instruments to address maritime transport. These include:

- *Shipping (Human Element) Policy*;
- *Shipping (Seafarers) Act*;
- *National Policy on Shipping (Matters of Concern): Towards Efficiency, Sustainability, Safety and Security in the Shipping Sector of the Blue Economy*;
- Revisions to the *Shipping Act*;
- Amended *Shipping (Small Commercial Vessels, Passenger Ferries and Watersports) Regulation*;
- *Shipping Liability and Compensation Act*;
- *Shipping (Ocean Protection) Regulations*;
- *Shipping (Maritime Safety) Regulations*;
- Revised *Ports, Harbours, Pilotage and Lighthouses Act*;
- Revised *Harbour Regulations*;
- Revised *Better Security of Shipping Act*;
- *Shipping (Maritime Security) Regulations*;
- Shipping (Climate Change) Act;
- Facilitation of Maritime Traffic Policy;
- Facilitation of International Maritime Traffic Act.

Natural resources extraction

Offshore Petroleum Act, 2007

Pursuant to section 5 of the Offshore Petroleum Act, (2007-30), all petroleum resources are vested in the Crown. However, in practice, Barbados does not have the capacity to exploit these resources directly and it therefore relies on international oil companies showing interest in undertaking exploration activities in Barbados waters. The overarching purpose of the Offshore Petroleum Act is therefore, the licencing of petroleum resources to third parties though the issuance of exploration licences, petroleum agreements or other agreements as appropriate. To this end, the Act addresses the licencing requirements and conditions for all stages of petroleum exploration and production lifecycle.

Responsibility for granting such licences rests with the Minister responsible for Energy (otherwise known as the Designated Authority for the purposes of the Act).

Part VII of the Act imposes general duties on all licensees including those relating to health, safety and environmental requirements and the requirement to ensure minimum levels of local content in their programmes. The Act also provides that the Crown may take a percentage stake in any concession granted to a licensee. This would presumably be through the involvement of the Barbados National Oil Company.

Part X of the Act sets out a schedule of fees and royalties that licensees are obliged to pay in respect of marine environmental research, annual training expenditure, area fees and royalties respectively.

The Act does not establish any prescriptive standards for safe operations. Instead these are established under the Offshore Petroleum Regulations.

Offshore Petroleum Regulations, 2013

The Offshore Petroleum Regulations augment the Offshore Petroleum Act by providing further detail and specificity to licence holders of their obligations under the Act. From the perspective of the management of the marine environment, Parts VI and VII are perhaps most relevant since these address environmental management and health and safety requirements respectively.

Pursuant to Regulation 36 all licensees are required to prepare a comprehensive Environmental Management System including an assessment of environmental risks, an EIA and an Environmental Management Plan. Similarly, Regulation 45 requires all licence holders to prepare and maintain a Health and Safety management System, the foundation of which should be a risk-based and installation-specific Safety Case.

These two requirements, and their related provisions are designed to ensure that all risks to personnel and the environment are identified an adequately managed.
## ANNEX D: THE CONTRIBUTION OF DIFFERENT BLUE ECONOMY SECTORS TO THE GOVERNMENT’S BLUE ECONOMY PILLARS

<table>
<thead>
<tr>
<th>HEALTH (HUMAN &amp; ENVIRONMENT)</th>
<th>TRANSPORT</th>
<th>PHYSICAL DEVELOPMENT</th>
<th>BIO-FUTURE</th>
<th>RENEWABLE ENERGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capture Fisheries</td>
<td></td>
<td></td>
<td></td>
<td>Offshore structures can enhance fisheries through providing offshore reeds/PFDs.</td>
</tr>
<tr>
<td>Unsustainable fisheries management contributes to declines in marine environmental health (e.g. habitat damage from wrong gear, pollution from vessels and fish processing, biodiversity impacts from by catch and catching non-target species).</td>
<td></td>
<td></td>
<td>Fishery research (particularly of offshore areas) leading to better understanding of offshore biodiversity and fishery development opportunities.</td>
<td>Invest in the value chain to develop higher value products.</td>
</tr>
<tr>
<td>&quot;Focus on green shipping can reduce environmental risks (air and water pollution).&quot;</td>
<td>Opportunities to increase capacity of port facilities and to make them more resilient to future climate change impacts.</td>
<td>Port development and upgrade projects can drive broader infrastructure upgrades and improvements.</td>
<td>Current management of fisheries is unsustainable and may impact the long-term opportunities to develop the &quot;blue bio-economy&quot; in Barbados.</td>
<td>May result in conflicts between capture fisheries and renewable energy where allocation of space is concerned.</td>
</tr>
<tr>
<td>Ports &amp; Shipping</td>
<td>Increased shipping activity at the port may lead to greater traffic congestion around the port area/Bridgetown</td>
<td>Opportunity to create inter-island links to diversify regional transport network.</td>
<td>Development of the port facilities could include development of a seafood landing and processing hub that could support development of the seafood value chain in Barbados</td>
<td>Port infrastructure and engineering facilities can provide the hub for renewable energy developments.</td>
</tr>
<tr>
<td>Tourism</td>
<td>Possible links to &quot;health-based/ wellness tourism&quot;</td>
<td>Coastal tourism sector can contribute to the development of new coastal infrastructure</td>
<td>Opportunity to create linkages between the tourism sector and coastal and marine conservation initiatives (e.g. turtle and coral conservation)</td>
<td>Opportunities to create local renewable energy solutions linked to tourism facilities (e.g. large hotels and resorts)</td>
</tr>
<tr>
<td>Tourism</td>
<td>Threats to coastal and marine environments from tourism and tourism development activities</td>
<td>Increases in tourism without commensurate upgrades to infrastructure will put pressure on existing port facilities.</td>
<td>The coastal environment is considered to be at capacity in terms of tourism numbers.</td>
<td>Possible conflict between certain types of renewable energy technology and coastal tourism due to impacts to the Barbados seascape.</td>
</tr>
<tr>
<td>Offshore Petroleum</td>
<td>Opportunities to use petroleum revenues to address pressing environmental challenges that will result in overall improvements to the quality and productivity of the marine environment.</td>
<td>Development and growth in the offshore petroleum sector will necessitate upgrading of maritime facilities (i.e. port facilities) which will benefit the ports and shipping sector more widely.</td>
<td>Opportunities to use petroleum revenues to support research into more sustainable future sectors.</td>
<td>Opportunities to use petroleum revenues to support development of renewable energy infrastructure.</td>
</tr>
<tr>
<td>Offshore Petroleum</td>
<td>Development partnerships with international oil companies to support and contribute to marine scientific research activities in Barbados' EEZ</td>
<td>Development partnerships with international oil companies to support specific development projects.</td>
<td>Development of infrastructure and engineering facilities to support the offshore petroleum sector can transfer into the renewable energy sector.</td>
<td>Support local capacity development in marine engineering and technology that can be applied to MRE.</td>
</tr>
<tr>
<td>NEW &amp; EMERGING ACTIVITIES</td>
<td>HEALTH (HUMAN &amp; ENVIRONMENT)</td>
<td>TRANSPORT</td>
<td>PHYSICAL-DEVELOPMENT</td>
<td>BIO-FUTURE</td>
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</tr>
<tr>
<td>Offshore Petroleum</td>
<td>Opportunities to use petroleum revenues to address pressing environmental challenges that will result in overall improvements to the quality and productivity of the marine environment.</td>
<td>Development and growth in the offshore petroleum sector will necessitate upgrading of maritime facilities (i.e. port facilities) which will benefit the ports and shipping sector more widely.</td>
<td>Opportunities to use petroleum revenues to undertake critical infrastructure development. Development partnerships with international oil companies to support specific development projects.</td>
<td>Opportunities to use petroleum revenues to support research into more sustainable future sectors.</td>
</tr>
<tr>
<td></td>
<td>Development partnerships with international oil companies to support and contribute to marine scientific research activities in Barbados’ EEZ.</td>
<td>May create over pressure on existing maritime facilities and create conflict with existing port users. Offshore installations may conflict with international shipping and will need to be managed accordingly.</td>
<td>May require development of specific coastal infrastructure to support the sector. Marine biodiversity may be at risk from offshore oil and gas activities, particularly physical impacts and marine pollution.</td>
<td>Security of marine living resources is critical to the future development of the blue bio-economy.</td>
</tr>
<tr>
<td>Monitoring, Control &amp; Surveillance</td>
<td>Monitoring and controlling harmful activities required to ensure healthy and productive marine ecosystems.</td>
<td>Ensuring safe maritime transport through effective monitoring of international and coastal shipping.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Management &amp; Desalination</td>
<td>Desalination can play an important part in the broader portfolio of measures to improve water supply and utilisation in Barbados.</td>
<td></td>
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<tr>
<td></td>
<td>Desalination and discharge of concentrated brine can result in localised impacts to coastal waters.</td>
<td></td>
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</tr>
<tr>
<td>Marine Ecosystem Services (including Marine Conservation)</td>
<td>Protecting and restoring marine ecosystem services is essential to ensuring healthy and diverse coastal and marine ecosystems.</td>
<td>Coastal habitats (particularly coral reefs) provide natural protection from storms events and should be considered as part of coastal protection infrastructure.</td>
<td>Protecting and restoring marine ecosystem services is essential to ensuring healthy and diverse coastal and marine ecosystems. Knowledge and valuation of MES will be an essential precursor to developing the blue bio-economy.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Damage to the marine environment and over exploitation of marine living resources will impact food security in the long run.</td>
<td>Damage to coastal habitats will exacerbate and contribute to coastal erosion.</td>
<td>Damage to the marine environment and over exploitation of marine living resources will impact the ability to develop the blue bio-economy in future.</td>
<td></td>
</tr>
<tr>
<td>Marine Scientific Research</td>
<td>Data and research is a critical need for decision making relating to management of the marine environment. Better knowledge will result in a better understanding of the health of the marine environment and the impacts of human activities.</td>
<td>Better hydrographic data will lead to improved mapping of the seabed and safer shipping. Hydrographic data is a requirement for future development of port facilities.</td>
<td>Marine research and knowledge is fundamental to understanding what new development opportunities exist (e.g. offshore fisheries resources). Without new knowledge it will be hard to diversify the existing fishery base and develop new fisheries.</td>
<td>Data and modelling will be a requirement to better understand what renewable resources can realistically be developed in Barbados (be that wind, wave or current energy).</td>
</tr>
<tr>
<td>Offshore Minerals &amp; Aggregates</td>
<td>Possible source of materials for construction projects to support capital development.</td>
<td>Possible source of materials for construction projects to support capital development.</td>
<td></td>
<td>Some seabed minerals (specifically rare earth metals) are critical to the development of new renewable energy technologies as well as broader decarbonisation technologies.</td>
</tr>
<tr>
<td></td>
<td>Reduced air emissions. Decarbonise the economy.</td>
<td>May require dedicated and increased shipping to import plant and equipment to support the sector.</td>
<td>May require the development of specific infrastructure to support the development of a renewable energy sector in Barbados. Marine structures (such as those for renewable energy) can provide artificial reefs that enhance and protect marine biodiversity.</td>
<td></td>
</tr>
<tr>
<td>Marine Renewable Energy</td>
<td>Siting of offshore structures can interact with shipping and coastal transport.</td>
<td>Siting of offshore structures may impact future offshore development options.</td>
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</tbody>
</table>
| - Reduce pressure on capture fisheries.  
  - Food security  
  - Promote a more healthy diet  
  - Diversifying the fishery base can reduce pressure on existing resources under pressure.  
  - Risk of introduction of invasive species and pathogens if not managed correctly  
  - Poorly managed aquaculture can result in adverse impacts to the environment including disease, pollution and visual impacts.  | - Siting of offshore structures can interact with shipping and coastal transport.  
  - Marine spatial planning should be a prerequisite for any offshore renewable installations.  | - Siting of offshore structures may impact future offshore development options.  
  - Marine spatial planning should be a prerequisite for any offshore renewable installations.  | - Aquaculture could be a new sector in Barbados that could contribute to both food security and trade/export development.  
  - Develop links between aquaculture, capture fisheries and biotechnology to broaden the resource base.  | - Aquaculture and marine renewable energy facilities can be colocated to reduce physical and space needs.  |
| Aquaculture | | | | |
| - Siting of offshore cage farms can interact with shipping and coastal transport.  
  - Marine spatial planning should be a prerequisite for any offshore aquaculture activity.  | | - Onshore aquaculture facilities will require the identification of dedicated sites and construction of specific facilities to support the sector.  
  - This may conflict with other development plans.  | - Need to manage risks associated with use of non-native species and disease.  
  - Siting of offshore cage farms may impact the future location of marine renewable energy infrastructure.  
  - Marine spatial planning should be a prerequisite for any offshore aquaculture activity.  | |
| Biotechnology | | | | |
| - Development of health, beauty and nutraceutical products  
  - Identify solution to environmental problems (e.g. utilisation of waste products from fish processing, sargassum, etc.) | | | - Investment in biotechnology could present Barbados with an entirely new area of research and economic development.  
  - Develop the existing research facilities at UWI.  | |
| Sustainable Blue Finance | | | | |
| - Finance initiatives can be developed that will help mobilise public and private capital to support fishery improvements and conservation projects.  | - Finance initiatives can be developed that will help mobilise public and private capital to support capital/infrastructure developments.  | - Finance initiatives can be developed that will help mobilise public and private capital to support capital/infrastructure developments.  | - Private sector investment may be needed to support future research and development of bio-based economic sectors.  
  - Finance initiatives can be developed that will help mobilise public and private capital to invest in decarbonising projects including renewable energy.  | |
ANNEX E: COMPLEMENTARY BLUE ECONOMY ACTIVITIES UNDERWAY IN BARBADOS

**Barbados Blue Economy Scoping Study**

**Barbados and the Eastern Caribbean**

**Blue Economy: Mapping of Initiatives in Barbados - 2020**

**Government of Barbados**

**Ministry of Maritime Affairs and the Blue Economy (MMAE)**

**Strategic Roadmap for the Blue Economy in Barbados**

The objective of this MMAE-supported project is to strengthen the institutional framework for growing the blue economy in Barbados.

- **Component 1.** Design of an Integrated Blue Economy Policy Framework and Strategic Action Plan.
- **Component 2.** Capacity Building Program.
- **Component 3.** Stakeholder Sensitization and Communication Program.

**Barbados Debt Conversion Project (The Nature Conservancy)**

The Debt Conversion Project includes:

- Establishment of a National Conservation Trust Fund (NCTF)
- Prepayment of a Marine Spatial Plan
- A Debt for Nature Conversion

The project is still in discussion with The Nature Conservancy (TNC). Consultations regarding the design and establishment of the NCTF (aka The Barbados Environmental Sustainability Trust - BEST) are ongoing.

**UNDP**

**The Accelerator Lab for Barbados & the Eastern Caribbean**

The Accelerator Lab’s objective is to promote out of the box thinking and implementation to support Small Island Developing States (SIDS) in the sustainable development of its ocean based economic sectors such as fisheries, biotechnology and waste management.

**Blue Economies Programme**

Through the Blue Economies Programme, the University of the West Indies (UWI) and UNDP are collaborating with the Ministry of Maritime Affairs (MMAE) and the Blue Economy to conduct a Blue Economy Scoping study. This preliminary assessment will identify current blue sector assets as well as potential opportunities for future sustainable development.

**Blue FINS**

**Financial Inclusion and Merchant Services: Sustainable finance in the Blue Economy**

**Blue Invest**

Technical Assistance and Investment Facility.

**Private Sector, Development and Infrastructure**

**Blue Green Initiative**

**Alternative Fisheries Project**

The objective of this project is to build understanding of solutions, implement solutions and ensure sustainability by undertaking a pilot activity of sustainable shrimp farming in Barbados.

**Fish Slagle – Production and Use**

The primary objective of the project is to make use of discarded fish offal and reduce the large percentage of fish thrown back into the near shore, which pollutes waters and creates an environmental concern.

**Barbados Tourism Marketing Inc. (BTMI)**

**Barbados Surf Pro**

The Surf Pro has run since 2017 and has steadily attracted an increasing number of visitors.

**Dive Fest Barbados**

Dive Fest Barbados’ ultimate objective is to promote and drive awareness around Barbados as a destination of choice for diving enthusiasts.

**Academia**

**CERMES, UWI**

Climate change & poverty nexus for enhancing resilient fisheries livelihoods and food security

**Ministry of Energy and Water Resources**

**Ocean Energy Under The Public Sector Smart Energy Program**

The PSSE Programme will use the promotion and implementation of renewable energy generation and efficiency technologies in the public sector to in an effort to reduce Barbados’ fossil fuel dependency, promote sustainable energy and therefore contribute to the country’s competitiveness. The project includes a focus on ocean energy options for renewable energy.

**Ministry of Creative Economy, Culture and Sports**

**Barbados World Heritage: Historic Bridgetown and its Garrison Site Management Plan**

Both the Management Plan and dossier for Historic Bridgetown and its Garrison have identified the buffer zone to Barbados World Heritage site to include the coastal area from a little before Carlisle Bay (inclusive of the Bay area) to Needham’s Point (inclusive of the Fort). As it relates to marine affairs and underwater cultural heritage, the Historic Bridgetown and its Garrison Management Plan deals specifically with the measures which would be taken to safeguard the site’s coastal buffer zone and its underwater cultural heritage.

**Cultural Industries Development Bill**

The Cultural Industries Development Act defines cultural heritage to include; amongst other things, ‘innovative cultural heritage such as buildings, monuments, archaeological sites’ and ‘underwater cultural heritage such as shipwrecks, underwater ruins and sites’, and makes provision for persons to apply to the National Cultural Foundation’s Cultural Industries Development Fund to finance cultural heritage projects inclusive of underwater endeavours.

**Voices of the Fisheries**

As part of ‘Vision 2030 We Gather’, the National Library Service has embarked on an oral history project on the fishing community in Barbados entitled ‘Voices of the Fisheries’ participation in Junior Rodeo and an art exhibition for senior art students of our secondary schools and the Barbados Community College.

**Ministry of Finance, Economic Affairs and Investment**

In the face of increased climate change, the government has launched the Thruf to Reef’s programme, which is intended to enhance the resilience of low- and middle-income households to extreme weather events.

**GEF-NEOs**

is a multi-focal, regional project that addresses the challenges faced by 10 Caribbean SIDS as they seek to preserve fragile marine and terrestrial ecosystems and ensure the sustainability of livelihoods.

**Inter-American Development Bank - Compete Caribbean Blue Tech Challenge**

The Blue Tech Challenge seeks to support business models that apply new technologies to deliver products or solutions that foster the long-term sustainability of the ocean economy in 14 target countries including Barbados. Ocean economy in the following 14 target countries including Barbados.

**Commonwealth Secretariat**

**Commonwealth Blue Charter**

Barbados is a member of the following Commonwealth Blue Charter Action Groups:

- Commonwealth Clear Ocean Alliance (CCOA) - Action Group on Marine Plastics - led by the United Kingdom and Vanuatu;
- The Marine Protected Areas Action Group - led by Seychelles;
- The Sustainable Blue Economy Action Group - led by Kenya;
- The Ocean Acidification Action Group - led by New Zealand;
- The Ocean and Climate Change Action Group - led by Fiji.

**Round Barbados Sailing Week**

Round Barbados Sailing Week, formally the Mount Gay Round Barbados Race, is an event that the BTME has supported ever since its inception.

“Sailing and Sailing” is a segment of Barbados’ Water Sport offerings continues to be an important niche, one which despite our infrastructural and capacity limitations, boosts the potential for driver growth.

www.bb.unpd.org
## UNDP Barbados and the Eastern Caribbean x Blue Economy Scoping Study Stakeholder Invitation & Consultation List

### UNDP

<table>
<thead>
<tr>
<th>Name</th>
<th>Agency/Organization</th>
<th>Contact e-mail</th>
</tr>
</thead>
<tbody>
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Barbados Blue Economy Scoping Study

Prepared for the Ministry of Maritime Affairs and the Blue Economy

Under the UWI-UNDP Blue Economists Programme

July 2020