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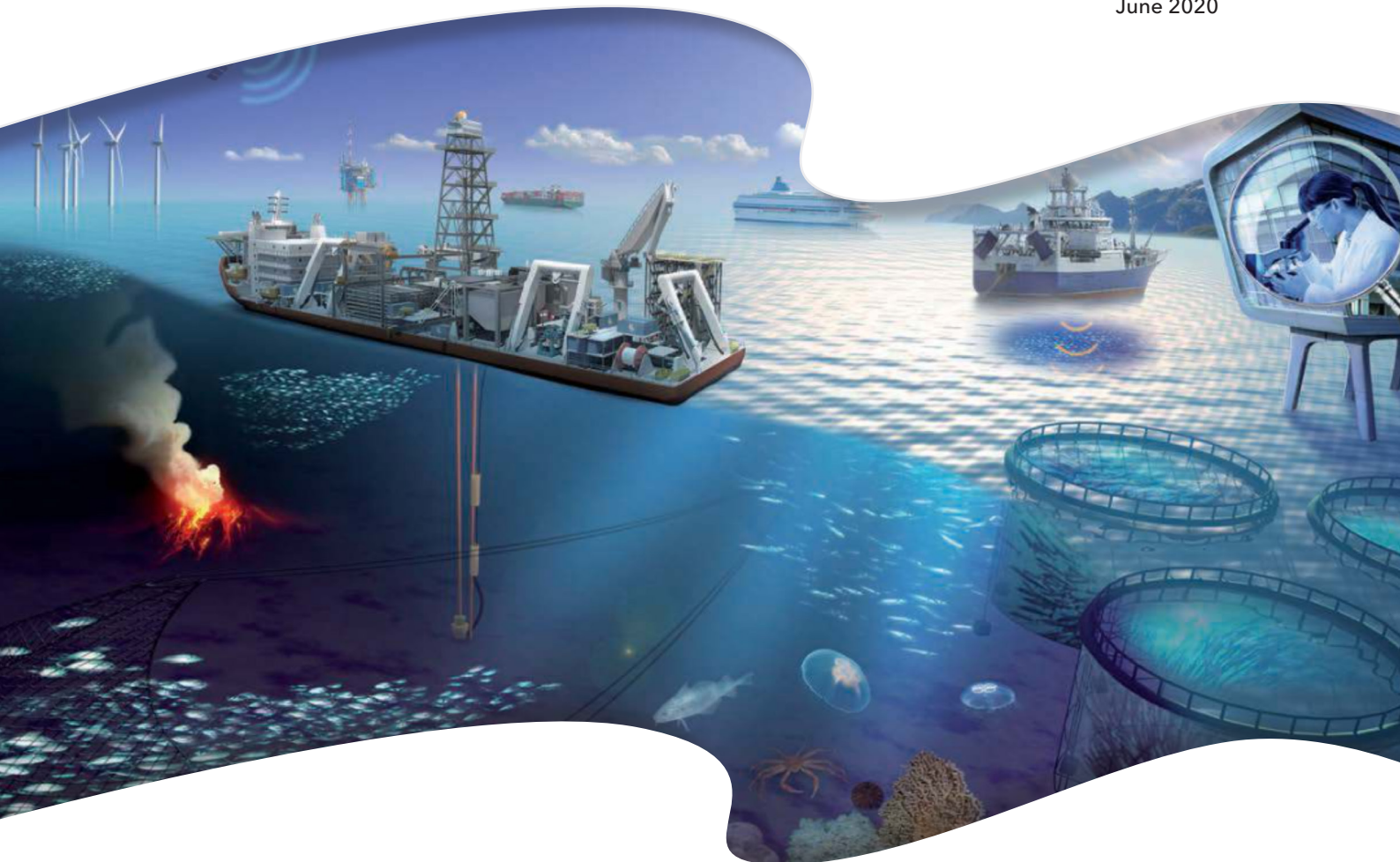
OPPORTUNITIES IN THE BLUE ECONOMY

Global Industrial Trends and Opportunities

Caribbean

Bahamas, Barbados, Guyana, Jamaica,
Suriname, and Trinidad and Tobago

EXECUTIVE SUMMARY

June 2020

WORLD OCEAN COUNCIL

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FUTURE of FISH

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Global Industrial Trends and Opportunities
CARIBBEAN
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Executive Summary

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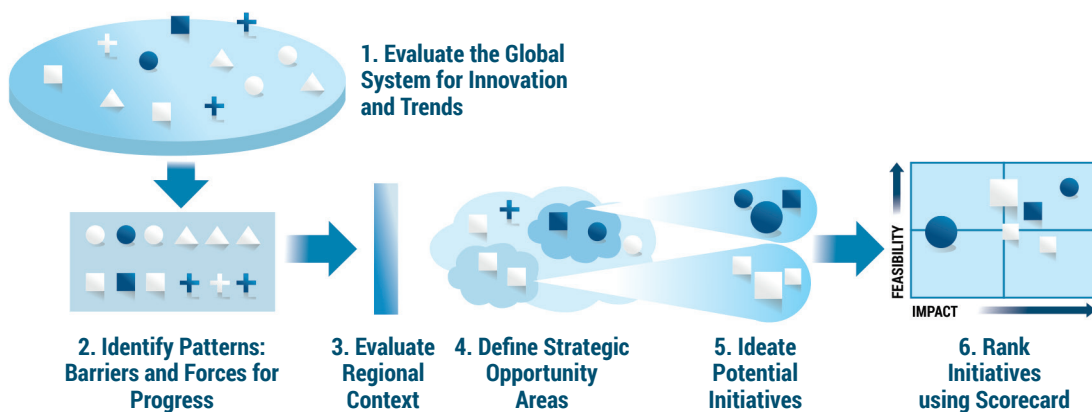Group, Inc. | **ETG**

FUTURE *of* **FISH**

Executive Summary

The promise of the blue economy—a marriage between sustainable development and green growth—cannot be overstated for the Caribbean. The World Bank estimates that the value of the ocean economy in the Caribbean to be US$ 407 billion.[1] For resource-limited SIDS (and SIDS-like coastal countries such as Guyana and Suriname), the ocean provides an unprecedented resource that continues to grow as new technologies provide greater access, and new models allow for smarter management and planning. Yet, in this region named for its sea, the blue economy remains largely uncharted waters.

This project seeks to support the development of blue economy growth in the Caribbean from a promise to a realized present. This report provides findings from Phase 1 of a two-phased approach. In this first phase, a series of foresighting analyses (**Figure 1**) was used to uncover trends in innovation and progress within the blue economy globally, and then apply this knowledge—in combination with regional and country analyses—to identify opportunity areas ripe for development, and specific country-level initiatives for six target countries: Bahamas, Barbados, Guyana, Jamaica, Suriname, and Trinidad and Tobago.

Figure 1: Overview of Six Stages of Foresight Process, including Series of Global and Regional Analyses and Rapid Assessment Tool to Rank Initiatives (see Appendix C for details).

1. Evaluate the Global System for Innovation and Trends

2. Identify Patterns: Barriers and Forces for Progress

3. Evaluate Regional Context

4. Define Strategic Opportunity Areas

5. Ideate Potential Initiatives

FEASIBILITY

IMPACT

6. Rank Initiatives using Scorecard

Summary of Key Findings

The results of Phase 1 include a diverse suite of findings, recommendations, and frameworks to support continued advancement of blue economy opportunities in the Caribbean region (**Table 1**).

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[1] http://documents.worldbank.org/curated/en/965641473449861013/pdf/AUS16344-REVISED-v1-BlueEconomy-FullReport-Oct3.pdf

Table ES1: Summary of Key Findings from Phase 1 Research on Global Trends that Support Advancement of blue Economy Growth in the Caribbean.

Development Stage	Key Observations
Blue Economy Project Rapid Assessment Tool	**A novel framework for rapidly evaluating blue economy initiatives** to determine their potential impact and feasibility within the Small Island Developing State context
17 preliminary Country-level blue economy Initiatives	**Candidate Blue Economy projects/initiatives have been identified**, with 2-3 each for the six target countries. Each of these initiatives has been selected based on its potential to achieve the following key objectives: • Address immediate livelihoods and employment needs for vulnerable populations, especially those most hard-hit by COVID-19; • Tackle one or more core underlying system barriers to blue economy growth, thereby helping to unlock change for multiple stakeholders; and • Leverage existing assets (including existing local champions wherever possible) and momentum in the region to increase likelihood of success.
Seven Caribbean-specific Opportunity Areas	**Categories of intervention that can guide future project ideation and direct limited resources towards development of initiatives.** These intervention categories are grounded in systemic barriers, which helps avoid the common challenge of chasing "shiny objects" or jumping on the next-big-thing, and instead roots efforts in tackling known, core stuck points using design principles that have proven track records for success.
Regional barriers and assets	**Regional assessment has identified how system barriers manifest in the Caribbean and key forces and conditions that can unlock progress within the region.** Application of this framework can identify future Opportunity Areas that may be ripe for development.
Global trends in innovation in blue economy industry and technology sectors	**Key trends in innovation within eleven industries and nine technology sectors have been evaluated and indicate potential directions for future blue economy growth.** These trends provide insight into forces that block and support blue economy development, including nine Systemic Barriers and eight Drivers, seven Enabling Conditions, and nine Design Principles, the latter three which together create forces for progress.

Opportunity Areas for Caribbean Blue Economy Development and Preliminary Country Initiatives

"Opportunity Areas reflect where to focus energy and resources to accelerate and maximize success of blue economy projects that lift up communities, improve local economies, and preserve and protect the underlying ocean ecosystem upon which the entire blue economy depends."

The project team identified seven areas of opportunity for the Caribbean blue economy (**Table 2**). These intervention categories are compelling because they are ripe for development and responsive to current and future pain points in the system, including the impacts of COVID-19 and climate change. The Opportunity Areas inform discussion and ideation of interventions at the project level, serving as a bridge between the trends at the global level and country-specific capacities on the ground.

Within each Opportunity Area, potential projects that currently exist and new initiatives that could be created have been identified (**Table 2**). Note, some of these project ideas are country-specific; others may work at a regional scale. Specific project ideas, and alignment with Opportunity Areas, is provided in the Country Profiles section.

Table ES2: Summary of Opportunity Areas and Initial Candidate Projects for the Six Countries.

OPPORTUNITY AREAS						
	Smart Tourism and Hospitality	**Fortifying Local Food Systems**	**Resilient Coastal Infrastructure**	**Turning Ocean Waste and Space into Profit**	**Research Clearing house and Capacity Building**	**Satellite R&D Hubs for Innovation and Biotechnology**	**Advance Waste Management Solutions for SIDS**
Bahamas					Low Carbon Freight Future		Port Waste Reception Facility
Barbados		Tuna Fisheries Sustainable Development		Caribbean Regional Research Clearing House		Offshore Seaweed Production	Sargassum Collection and Processing
Guyana	Barima Mora Passage Special Protected Area Women's Empowerment to Monitor Natural		Barima Mora Ecotourism Development				
Jamaica		Local Community Fishing Practice Improvement				Offshore Seaweed Production	Sargassum Collection and Processing
Suriname	Mangrove Corridor Restoration	Mangrove Honey					
Trinidad and Tobago		Fishers Engine Conversion	Scientific and Educational Ecotourism				

The diversity of candidate projects is both exciting and a challenge: with limited resources, how can governments, practitioners, and funders best determine which projects to progress?

The SIDS Blue Economy Project Rapid Assessment Tool was created to help solve this problem. The tool consists of a robust rubric for evaluating project-level initiatives across five Impact Criteria and five Feasibility Criteria (**Table 3**) in order to compare different kinds of projects according to their potential for change (impact) and their risk (feasibility).

Table ES3: Impact and Feasibility Criteria for Foresight Tool and Weights for Scoring.

Category	Criteria	Weight
IMPACT	Job Creation and Skills Upgrading	30%
	Vulnerable population Livelihoods and Resiliency	20%
	Institutional Strengthening and Sectoral Linkages	20%
	Local Economic Resiliency	15%
	Environmental Sustainability	15%
FEASIBILITY	Demand: Access to Viable Markets	25%
	Competitiveness of Production Factors	25%
	Adequacy of Institutional Factors	20%
	Geographic Vulnerabilities	10%
	Leadership Commitment for Implementation	20%

The Scoring Guide has been purposefully designed to support evaluation of blue economy projects in SIDS, with the ten criteria, and their weightings, reflecting known barriers particularly relevant for SIDS, and also COVID-19 pandemic economic recovery challenges. Consideration for all these challenges, and how an initiative specifically addresses them (the ranking) is critical to effective design and strategy creation (**Table 4**).

The following **Table 4** and **Figure 2** illustrate a demonstration of a ranking of candidate projects/ initiatives.

Table ES4: Screenshot of Master Scorecard showing Preliminary Test Scores for Eight Projects Generated by the Foresight analysis and currently under evaluation. Each project was scored by 1-4 reviewers independently, based on familiarity and knowledge of the project and country.

	ASSESSMENT OF INITIAL CANDIDATE PROJECTS/INITIATIVES								
	Impact Factors	Weight	Barbados C-Combinator	Guyana Drones for Mangroves	Suriname Mangrove Corridor	Barbados Tuna	Bahamas Virtual Tourism	Jamaica C-Combinator	Barbados Research Clearinghouse	Trinidad and Tobago Fisher Fuel Initiative
IMPACT ASSESSMENT	Job creation and skills	30%	4.0	2.0	3.5	2.3	2.7	4.0	3.3	3.0
	Vulnerable population	20%	3.7	4.0	4.0	2.3	2.3	3.8	2.7	4.0
	Institutional strengthening and local linkages	20%	3.8	2.0	3.5	2.3	2.7	3.8	4.0	3.0
	Builds local economic resiliency	15%	2.3	4.0	3.5	2.3	3.0	2.3	3.0	3.5
	Environmental sustainability	15%	4.0	4.0	4.0	3.7	2.7	4.0	3.3	4.0
	Average Score	100%	3.6	3.2	3.7	2.6	2.7	3.6	3.3	3.5
	Weighted Average Score		3.7	3.0	3.7	2.5	2.7	3.6	3.3	3.4
	Number of Evaluators (n=?)		3	1	2	3	3	4	3	1

	Feasibility Factors	Weight	Barbados C-Combinator	Guyana Drones for Mangroves	Suriname Mangrove Corridor	Barbados Tuna	Bahamas Virtual Tourism	Jamaica C-Combinator	Barbados Research Clearinghouse	Trinidad and Tobago Fisher Fuel Initiative
FEASIBILITY ASSESSMENT	Demand	25%	4.2	3.0	3.0	3.0	2.7	4.1	3.0	2.5
	Competitiveness	25%	3.0	3.0	3.0	3.0	2.0	2.8	2.7	2.5
	Adequacy of institutional factors	20%	2.3	3.0	3.0	2.0	2.0	2.3	2.7	3.0
	Geographic vulnerabilities	10%	2.3	3.0	3.5	2.0	3..0	2.3	2.7	3.0
	Leadership	20%	1.7	4.0	3.5	3.0	1.0	2.3	1.3	3.0
	Average Score	100%	2.7	3.2	3.2	2.6	2.1	2.7	2.5	2.8
	Weighted Average Score		2.8	3.2	3.2	2.7	2.1	2.8	2.5	2.8
	Number of Evaluators (n=?)		3	1	2	3	3	4	3	1

Figure ES2: Scatterplot Generated within Master Scorecard Reflecting Impact vs. Feasibility Scores for Different Initiatives.

FEASIBILITY vs IMPACT
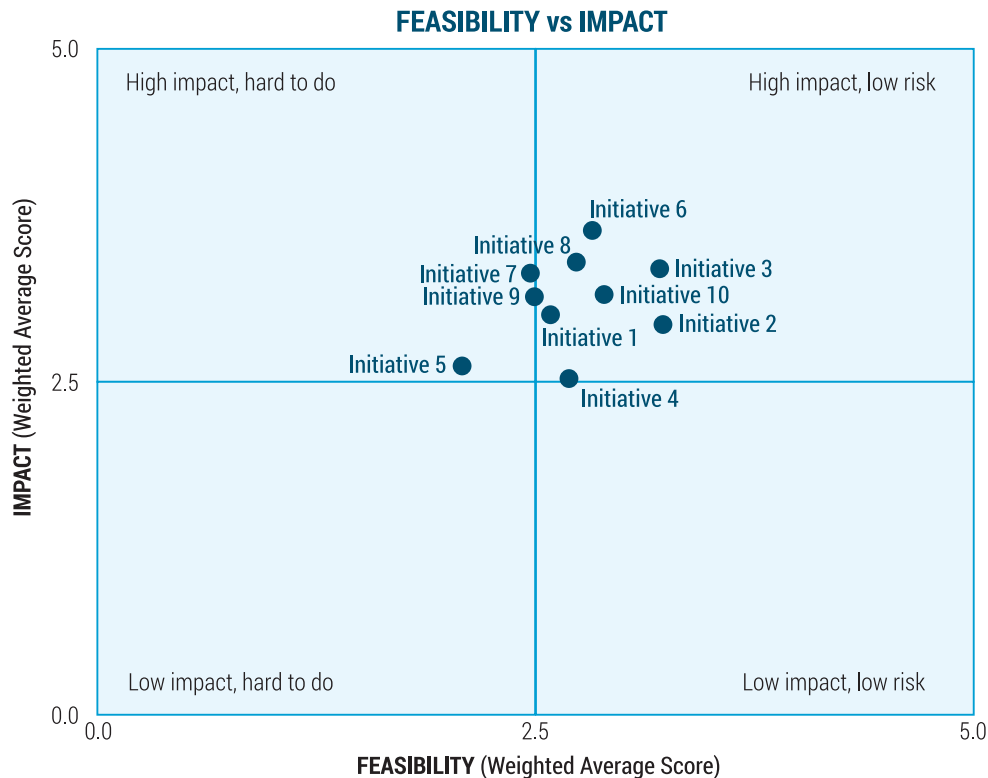
The rankings also reflect specific enabling conditions that need to be met in order for longer-term, larger-scale blue economy development to occur. For example, within "Job creation and skills upgrading," there are explicit ranking distinctions between projects that provide temporary vs. permanent job prospects vs. those that also provide long-term professional growth opportunities. These rankings reflect the all-too-common systemic barrier of "brain drain," where local talent leaves the region to secure more satisfying, often better-paying jobs that have greater room for growth and development.

By considering how projects are potentially meeting (or failing to meet) the specific milestones provided in each rank, users can more explicitly identify where more resources or better design may be needed in order to maximize potential impact of the proposed project. The scorecard is designed to evaluate initiatives where a discrete purpose and model for implementation has been identified. As this report is Phase 1 of a two-part investigation, the projects identified remain preliminary. Evaluation and prioritization of country-level projects using the tool will occur during Phase 2. However, preliminary test runs of the tool are provided in SIDS BLUE ECONOMY RAPID ASSESSMENT TOOL section.

Regional Analysis: Barriers and Conditions for Progress

The Global Scan identified trends in innovation and growth across eleven industry and nine technology sectors. The first analysis identified the general state of maturity of industry sectors;

a second pattern-finding analysis uncovered the forces that are either blocking or accelerating blue economy growth at a global level. The forces that block progress are System Barriers, and they are by definition, movable or changeable aspects of the system. Forces that help to accelerate progress are categorized as Drivers, Enabling Conditions, or Design Principles, defined respectively as the catalytic forces that launch initiatives, the factors that allow an initiative to take root, and the strategies that allow innovations and initiatives to gain traction or progress.

Following the global scan, a regional analysis was conducted to evaluate the current landscape of blue economy conditions in the Caribbean. Not surprisingly, the blue economy industry sector maturity at the global-level compared with the Caribbean shows that while several industry sectors are mature in the Caribbean, many have been slower to progress, or remain nascent or negligible, compared with the global landscape (**Table 5**).

Table ES5: Maturity of Blue Economy Industries Globally vs in the Caribbean.

Blue Economy Industry Status	Blue Economy Global Scan	Blue Economy Caribbean Scan
Mature	Fishing; Tourism (Cruise, Coastal, Marine); Shipping; Oil & Gas	Fishing; Cruise, Coastal, Marine Tourism; Shipping
Growth Stage	Mariculture: coastal & offshore; Maritime Monitoring & Surveillance; Ports; Renewables: offshore wind, solar	Oil & Gas*; Maritime Monitoring & Surveillance; Ports
Emergent	Coastal Development, Protection & Restoration; Marine Products; Deep-sea mining; Renewables: wave, current, thermal	Mariculture: coastal & offshore; Coastal Development, Protection & Restoration; Marine Products
Nascent/ Negligible		Renewables: offshore wind, solar; Deep-sea mining; Renewables: wave, current, thermal

The lag in blue economy development in the Caribbean can be attributed to the strong manifestation of several System Barriers and gaps in Enabling Conditions that are critical for sector growth, as summarized in **Table 6**.

Table ES6: Summary of Key Findings from Phase 1 Research on Global Trends that Support Advancement of Blue Economy Growth in the Caribbean.

Lack of organizational infrastructure to retain and grow talent

"Brain drain" is a significant barrier to accelerating blue economy growth in SIDS. Technical, analytical, and topical expertise and opportunity for professional growth, are all needed. In addition, although the Caribbean's emerging blue economy entrepreneurial ecosystem is growing with institutions such as the Branson Centre and the UNDP's Blue Economy and Sustainable Management of Ocean Degradation Lab, entrepreneurial support structures are still minimal. Incubators that do exist are largely working in silos and face shortage of experienced, talented entrepreneurs and limited deal flow. Further, there are few major institutions or research clusters in the Caribbean that could support blue economy R&D and commercialization processes, and that have a track record of working with good candidate entrepreneurs.

Lack of Marine Spatial Planning, Uncertain regulatory environment and poor legal frameworks

The lack of clear policies, frequent government turnovers, lack of enforcement, and other factors create uncertainty—and risk—around the rules of engagement and long-term projects. Meanwhile, data needed to map and evaluate marine resources, and plan strategic use, is missing. Finally, legal expertise, tools, and instruments—including environmental impact assessment protocols—are needed to ensure that the interests of stakeholders and the environment are clearly articulated and protected.

Lack of access and high cost of energy

Several of the six target countries have some of the highest debt-to-GDP ratios in the world, driven in part by dependence on fossil fuel imports. "Covering the ever-increasing cost of energy places enormous pressure on countries whose national budgets are already heavily indebted."[2]

Limited Insurance Options & Lack of Risk-Tolerant Financing for Local Enterprises:

Limited insurance options in a natural disaster-prone region like the Caribbean further erodes the bankability of potential capital-intensive blue economy activities. Creative approaches to build the patient, risk-tolerant capital are critical and currently missing. Given typical market drivers are absent, innovative insurance models that can share risk broadly through the Caribbean should be considered and local governments will likely need to be a stakeholder and potential investor in insurance access to support activities to get off the ground and reach scale.

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2   https://blogs.iadb.org/caribbean-dev-trends/en/the-caribbean-has-some-of-the-worlds-highest-energy-costs-now-is-the-time-to-transform-the-regions-energy-market/

Table ES6: Summary of Key Findings from Phase 1 Research on Global Trends that Support Advancement of Blue Economy Growth in the Caribbean. (cont.)

Fragmented institutions and lack of strong partnerships

Rather than working together, fledgling businesses compete for limited start-up capital and resources; countries work to position themselves as leaders, rather than as partners. Despite the small size of island nations in the Caribbean, and regional groups such as CARICOM, institutions are highly fragmented—both within their own divisions and across the region. The lack of collaboration and partnership leads to data silos, duplicative effort and wasted resources, and an inability to leverage success to accelerate progress across the region. "The existing ocean governance framework in most, if not all, Caribbean countries emphasises a traditional sector-specific approach to management and planning and thus shows symptoms of the problem facing a large number of countries seeking to implement a blue economy approach — ocean governance remains highly 'balkanized'.[3]
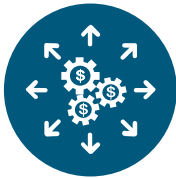
Combined Impact of System Barriers on the Investment Climate and Capital Resources

Historically, the Caribbean region has not been noted for sophisticated capital markets or abundant sources of investment capital. In turn, many potential commercial ventures in the region have been constrained by a variety of scalability issues. In addition, the lack of investment capital makes it difficult to overcome the opportunity costs of adopting new technology.

Any one of the critical barriers highlighted alone could derail the feasibility and viability of a blue economy commercial venture. When these barriers are combined, the enormous challenge of the current investment climate becomes even more apparent. As one interviewee succinctly summarized, "the challenge isn't how to find capital, it's how to find bankable projects." These barriers augment the (already numerous, inherent) risks associated with emerging blue economy activities that do not always have long track records of commercial success. Further, accessing capital that has always been scarce in the Caribbean region has become even more difficult in a post-COVID-19 environment.

Although the challenges are significant, the regional analysis also uncovered significant assets that could be pivotal in supporting both regional and country-specific blue economy policy and strategies. Institutions, including CARICOM and the OECS as well as business and industry bodies all could serve as key partners for advancing blue economy activities. There are also significant resources being provided by multilateral development financial institutions that are investing in the Caribbean.

The analysis also highlights ways that small states can be an asset in supporting the blue economy. The small population size in many island nations means momentum can build quickly as personal relationships can set and drive collaborative efforts. In these settings, convening stakeholders and getting support and cooperation for projects or initiatives can be catalytic.

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[3] Julian Roberts, "The Blue Economy: From Concept to Reality in the Caribbean Region." Discussion Paper for the Caribbean Regional Dialogue with the G20 Development Working Group, 2015

Likewise, there seems to be increasing interest in understanding how best to use ocean resources for long-term prosperity. This is evidenced through various efforts scattered across the Caribbean including: seagrass, coral and mangrove restoration projects; industry-led initiatives to improve marine environments per SDG and better business practices; the abundance of MPAs and mapping efforts undertaken; and even in the recent creation of the Ministry of Maritime Affairs and the Blue Economy in Barbados in 2018, the first of its kind in the Caribbean. These are seeds of potential growth and demonstrate the interest and opportunity for the blue economy in the Caribbean.

Taken together, the barriers and assets within the Caribbean region create an uneven landscape in the level and quality of enabling conditions across key blue economy industries. The relative readiness for blue economy growth is moderately better for existing sectors than for growth sectors, yet conditions must be upgraded across the board (**Table 7**).

Table ES7: Adequacy of Blue Economy Enabling Conditions within the Caribbean Region for Key Industry Sectors.

Blue Economy Enabling Conditions	Blue Economy Sectors					
	Fishing	**Coastal Maritime Tourism**	**Shipping**	**Offshore Oil and Gas**	**Mariculture**	**Renewable Energy**
Local expertise and research capacity	Half	Half	Half	Mostly Low	Mostly Low	Low
Strong partnerships among key stakeholder	Half	Half	Half	Mostly High	Low	Low
Risk-tolerant financing for local enterprises	Half	Half	Half	Mostly High	Low	Low
Visionary Leadership	Half	Half	Mostly High	Low	Low	Low
Legal agreements and structures to protect project interests	Mostly High	Half	Mostly High	Mostly High	Mostly High	Mostly High
Global Standards and Conventions	Half	Half	Mostly High	Mostly High	Mostly High	Mostly High
Market beyond the region	Half	Mostly High	Half	Mostly High	Low	Low

● High   ● Low

Trends in Industry and Technology to Inspire and Inform

Our global scan analysis of eleven industry and nine technology sectors relevant to the blue economy provided more than the framework of System Barriers and critical forces for progress. This scan also helped identify where multiple technologies and sectors were coming together to foster new and exciting innovations. Based on this analysis, we create a Global Blue Economy Hotspot Matrix that contains representation of the types of innovations we found at the crossroads of industry, technology and science (**Table 8**).

Table ES8: Blue Economy Hotspot Matrix. Selection of Innovations occurring at the nexus of science, technology, and industry. Colors show qualitative scale from scaled, "hot" intersections (red) to those that are still nascent but promising (beige).

Technologies	Mariculture	Coastal Development	Deep Sea Mining	Fisheries	Marine Products	Maritime Surveillance and Safety	Oil and Gas	Ports	Renewable Energy	Shipping	Tourism
AI	(1) Swarm intelligence to detect pollution	(10) Tourist safety	(19) Autonomous mapping and species identification	(28) Increase efficiencies at sea	(37) Seaweed Farming Management	(46) Accident prevention at sea	(55) Mass data analysis for site identification	(64) Machine-based arrival and departure predictions	(73) Managing energy input and flow	(82) Mapping analysis for reduced fuel consumption	(91) Chatbots for personalized experiences
AR/VR	(2) Remote teaching and instructions	(11) Imaging coastal adaptation to sea level rise	(20) N/A	(29) N/A	(38) N/A	(47) Virtual training for maritime enforcement	(56) Underwater equipment training	(65) N/A	(74) Renewable energy training	(83) N/A	(92) AR virtual tours to attract tourists
Biotechnology	(3) Increased productivity and quality	(12) Ecologically active concrete	(21) Environmental DNA	(30) Fish leather alternative	(39) Edible and biodegradable plastic alternatives	(48) Marine mammals for defense	(57) Bioremediation	(66) Biometrics security systems	(75) Synthetic biology for biofuel production	(84) Anti-fouling	(93) Bio-safety; Anti-viral coatings
Blockchain	(4) Rapid and secure sales	(13) N/A	(22) N/A	(31) Addressing IUU with traceability	(40) N/A	(49) Real-time digital insurance	(58) Trading simplification	(67) Secure and real-time information transfer	(76) Tracking biofuel creation and delivery	(85) Tracking and verifying fuel compliance	(94) N/A
Drones	(5) Monitoring and maintenance	(14) *See Robotics	(23) *See Robotics	(32) Mapping remote underwater zones	(41) *See AI	(50) Remote patrolling at sea	(59) Remote project monitoring and surveillance	(68) Surveillance and Security	(77) Remote inspection of offshore platforms	(86) Hull cleaning robots to avoid biofouling	(95) *See AR/VR
GIS and spatial mapping	(6) Mapping for improved management	(15) Calculating exposure to coastal erosion	(24) *See Sensors	(33) Satellite tracking to monitor IUU	(42) Mapping sargassum	(51) *See Blockchain	(60) Asset mapping and management	(69) Locational intelligence	(78) Identification of ideal project locations	(87) *See AI	(96) Ecotourism site selection and management
Nanotechnology	(7) Contaminant removal	(16) N/A	(25) N/A	(34) Fish RFID for tracking and monitoring	(43) Extracellular synthesis of metallic nanoparticles	(52) N/A	(61) Nanosensor imaging and mapping	(70) N/A	(79) Enhanced bio-availability of plant nutrients	(88) Nanoparticulate hull coatings to combat erosion	(97) Antimicrobial and antifungal Nanocoatings
Robotics	(8) Automated feeding	(17) Unmanned gliders for hurricane warnings	(26) Nodular collection technology	(35) Quality control	(44) Automated urchin removal from kelp beds	(53) Anti-piracy robots	(62) Teleoperated marine operations	(71) *See Drones	(80) Kelp elevators for biofuel	(89) *See Drones	(98) Customer service
Sensors	(9) Autonomous health management	(18) *See Robotics	(27) 3D modeling of seabed	(36) *See Drones	(45) *See AI	(54) *See Robotic	(63) Inspection and maintenance	(72) *See AI	(81) *See Nanotechnology	(90) *See Drones	(99) Bio sensors

Legend:

Commercial use in multiple regions, multiple companies or suppliers; POC

Commercial application but limited use; start-up companies; pilots

Commercial application, limited application outside R&D

Experimental, limited application outside R&D

The matrix is not a comprehensive evaluation; instead, it is a snapshot based on expert interviews and a high-level scoping analysis to highlight the cutting-edge of tech-based innovations that are being applied to the blue economy space. As such, the matrix offers industry experts guidance regarding up-and-coming technological innovations; it can also offer technologists and entrepreneurs insights into where there may be new growth opportunity areas. A few highlights include:

- Multiple types of technologies are progressing quickly (red) within Marine Products, which could indicate opportunity for accelerated growth in this sector despite it being a more nascent industry for the blue economy;
- Fisheries are undergoing a data technology explosion, with advanced systems for identifying and tracing fish, mapping habitats, and tracking vessels all occurring in both industrial and artisanal fleets;
- Drones and GIS/Spatial Mapping tools are—not surprising—advancing strongly within nearly every industry sector that touches the blue economy;
- Rarely does a technology operate on its own; instead, multiple technologies are often tightly interwoven and need to be embedded in public policy and regulatory frameworks in order transforms themselves in sustainable solutions;
- Do not underestimate nascent technologies; given sufficient starting capital, they can and likely will, evolve to meet demand; and
- Innovations in technology are helping to bring greater access, transparency, and accountability—as well as cost efficiencies—to many of these sectors. These developments can help both the mature and emergent industries meet the full definition of blue economy—to support long term health of the environment along with local economies—if properly applied.

Appendix B houses more detailed descriptions of innovations. In the future, the matrix could easily become a more dynamic tool that continues to incorporate new innovations and visualize the rapidly changing edge of blue economy technology development.

Next Steps

Moving forward, government leaders, civil society organizations, funders, and other blue economy stakeholders will benefit from the regionally-grounded Opportunity Areas to narrow the field of potential blue economy initiatives to those that contribute to larger systems-change and are most likely to succeed given present conditions. The seven distinct opportunity areas specifically incorporate regional assets as important points of leverage; these areas are ripe for development in part because they utilize existing momentum within the region. Within each opportunity area, there are multiple potential commercial ventures and projects that currently exist and new commercial initiatives that could be created.

However, for the blue economy to truly grow at any sort of scale in the Caribbean, it will require governments, private sector, and civil society leaders and international organizations to collaborate and provide the necessary funding, expertise, policy reforms and other resources to tangibly address the region's existing barriers and gaps. Taking these actions would support sufficiently "de-risking" the business environment to an extent that entrepreneurs and investors perceive more certainty and have the confidence that there are solid opportunities to achieve the requisite scale and competitiveness that would make new innovative blue economy business models financially viable and sustainable.

In contrast to historic investment into economic activity in ocean environments, the blue economy opportunities identified in this report explicitly consider economic growth balanced with social benefits, equitability, and environmental sustainability. The next phase of this research will focus on validation and refinement of candidate project initiative ideas to develop action plans that can meet this triple impact criteria for true blue economy development. The aim is to provide models and support scaling of initiatives that can help address immediate pain points while creating the enabling conditions and proof of concepts needed to advance successful blue economy growth in the six target countries, and the region as a whole.

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