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ECLAC

ECLAC SUBREGIONAL HEADQUARTERS FOR THE CARIBBEAN

# FOCUS

Magazine of the Caribbean Development and Cooperation Committee (CDCC)

## A BLUE PATH FOR THE CARIBBEAN: OCEAN SUSTAINABILITY FOR PROSPERITY AND RESILIENCE

## ABOUT ECLAC/CDCC

The Economic Commission for Latin America and the Caribbean (ECLAC) is one of five regional commissions of the United Nations Economic and Social Council (ECOSOC). It was established in 1948 to support Latin American governments in the economic and social development of that region. Subsequently, in 1966, the Commission (ECLA, at that time) established the subregional headquarters for the Caribbean in Port of Spain to serve all countries of the insular Caribbean, as well as Belize, Guyana and Suriname, making it the largest United Nations body in the subregion.

At its sixteenth session in 1975, the Commission agreed to create the Caribbean Development and Cooperation Committee (CDCC) as a permanent subsidiary body, which would function within the ECLA structure to promote development cooperation among Caribbean countries. Secretariat services to the CDCC would be provided by the subregional headquarters for the Caribbean. Nine years later, the Commission's widened role was officially acknowledged when the Economic Commission for Latin America (ECLA) modified its title to the Economic Commission for Latin America and the Caribbean (ECLAC).

### Key Areas of Activity

The ECLAC subregional headquarters for the Caribbean (ECLAC/CDCC secretariat) functions as a subregional think-tank and facilitates increased contact and cooperation among its membership. Complementing the ECLAC/CDCC work programme framework, are the broader directives issued by the United Nations General Assembly when in session, which constitute the Organisation's mandate. At present, the overarching articulation of this mandate is the Millennium Declaration, which outlines the Sustainable Development Goals.

Towards meeting these objectives, the Secretariat conducts research; provides technical advice to governments, upon request; organizes intergovernmental and expert group meetings; helps to formulate and articulate a regional perspective within global forums; and introduces global concerns at the regional and subregional levels.

Areas of specialization include trade, statistics, social development, science and technology, and sustainable development, while actual operational activities extend to economic and development planning, demography, economic surveys, assessment of the socio-economic impacts of natural disasters, climate change, data collection and analysis, training, and assistance with the management of national economies.

The ECLAC subregional headquarters for the Caribbean also functions as the Secretariat for coordinating the implementation of the Programme of Action for the Sustainable Development of Small Island Developing States. The scope of ECLAC/CDCC activities is documented in the wide range of publications produced by the subregional headquarters in Port of Spain.

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## DIRECTOR'S DESK: THE CENTRAL ROLE OF OCEANS

This issue of FOCUS explores the Caribbean Sea, a vital and unique asset of the wider Caribbean. It represents a significant proportion of the subregion's ecosystems, as well as its natural and economic resources. The Caribbean Sea, coastal zones and bordering oceans define the historical, cultural, geo-political, economic, social and environmental identities of the subregion. Oceans and seas define the culture and history of Caribbean people, and are also essential for the sustainable development of the subregion's economies.

**T**his issue of the FOCUS magazine will explore the many facets of this relationship. The Caribbean Development and Cooperation Committee (CDCC) recognizes the importance of the marine environment to the countries of the subregion and emphasizes the requirements for an integrated management approach for the Caribbean Sea. This integrated approach is necessary to manage and reverse anthropogenic impacts such as overfishing, pollution, climate change, invasive species, and poorly planned land and coastal developments.

Our first article highlights the importance of the Wider Caribbean Region (WCR),<sup>1</sup> and its management structures in the subregion through a multiplicity of multilateral agreements, mediated by regional and global organizations often with overlapping mandates. The article provides an overview of these structures at national and regional levels and of what more can be done to sustain, support and maintain a healthy, productive and resilient WCR.

The second article analyzes the economic importance of oceans and discuss how natural disasters cause severe disruptions to sectors that are highly dependent on natural ocean resources such as tourism, fishery and maritime transportation, utilising the case study of Hurricane Dorian in the Bahamas.

The article also examines the impact of the hurricane on the Bahamas' marine ecosystems, including coastal areas, while demonstrating the importance of economic valuation of these ecosystems as tools for risk assessment.

The relevance of marine and coastal resources is reiterated in the article "Sargassum in the Caribbean", which emphasizes the serious economic, social and environmental impacts and disturbances caused by the large-scale onslaught of Sargassum in the Caribbean since 2011. Although the extent of the economic impact of sargassum influx has not been fully assessed, different sectors have been significantly affected. Managing sargassum continues to be a major challenge for the subregion, and an effective response will require both coordination among stakeholders and dedicated financial resources.

The oceans are also inexorably linked to Caribbean identity, culture and history. The Caribbean States possess some of the world's richest submerged heritage, ranging from pre-Colombian sites, shipwrecks from colonial times to sunken cities. The final article explores the concept of Underwater Cultural Heritage (UCH) with its great economic potential, and discusses the preservation and protection of this heritage. The article includes examination of the international instruments that advocate

for the conservation and smart use of these resources.

The United Nations has proclaimed a Decade of Ocean Science for Sustainable Development (2021-2030), not only to protect the ocean and its resources, but also to "strengthen the international cooperation needed to develop the scientific research and innovative technologies that can connect ocean science with the needs of society".<sup>2</sup> ECLAC supports the Caribbean in this 10-year road map for sustainable ocean governance. Through this issue of FOCUS, it is my hope that all stake holders can be persuaded to manage our ocean spaces sustainably and collaboratively. The sustainable development of the Caribbean is anchored on having healthy and productive coastal, marine and ocean resources.

Yours in Focus

A handwritten signature in black ink, appearing to read "Diane Quarless".

Diane Quarless

<sup>1</sup> The Wider Caribbean Region (WCR), comprised the insular and coastal States and Territories with coasts on the Caribbean Sea and the Gulf of Mexico as well as waters of the Atlantic Ocean adjacent to these States and Territories, The Caribbean SIDS are located in the Caribbean Sea area. Addressing the management of the Caribbean Sea in the broader context of the WCR is also in keeping with the WCR geographical area covered under both the Caribbean Sea Commission and the Convention for the Protection and Development of the Marine Environment on the Wider Caribbean Region, 1983 (Cartagena Convention) available at: <https://www.unenvironment.org>, cited May 2, 2020.

<sup>2</sup> United Nations Decade of Ocean Science for Sustainable Development: <https://www.oceandecade.org/>



# INTEGRATED APPROACHES FOR SUSTAINABLE OCEAN MANAGEMENT IN THE CARIBBEAN REGION

Artie Dubrie\*

“Many SIDS are custodians of some of the world’s richest biodiversity and marine resources, but they continue to face the major challenge of insufficient human and institutional capacity in ocean management, research, and data collection.”

- Peter Thomson, United Nations Special Envoy for the Ocean (2017)<sup>1</sup>

Ocean-based renewable,<sup>2</sup> non-renewable resources<sup>3</sup> and ecosystems services<sup>4</sup> are essential pillars for the sustainable development of the economies of Caribbean countries. The sustainable management of ocean-based resources and services falls under the purview of national, international and regional instruments, and is translated through policies, legislation and regulations. The Small Island Developing States (SIDS) sustainable development agenda<sup>5</sup> and the 2030 Sustainable Development Agenda (Agenda 2030) emphasise the nexus between healthy, productive and resilient marine ecosystems, economic development and essential ecosystem services. In keeping with the importance of coastal and ocean resources to Caribbean SIDS, this article addresses the impacts of major anthropogenic activities in the Wider Caribbean Region (WCR), and the need for an integrated and institutionalised approach to ocean resources management at national and regional levels. It will also offer recommendations for sustainable ocean resources management in the Caribbean region.

## THE WIDER CARIBBEAN REGION (WCR)

The United Nations has recognised the importance of promoting an integrated approach to the management

of the Caribbean Sea in the context of sustainable development.<sup>6</sup>

The WCR covers an area of at 4.4 million km<sup>2</sup> comprising insular and coastal States and Territories with coasts on the Caribbean Sea, the Gulf of Mexico and the Atlantic Ocean. An estimated 41 million people live within 10 km of the WCR- member countries coastlines (UNEP, 2018).<sup>7</sup> Twenty-eight Caribbean SIDS are located in the WCR (Debels et al., 2017).<sup>8</sup> It is within this geo-politically complex space that the sovereign and shared coastal and ocean resources of the WCR are managed. The Map of the

WCR is illustrated in Figure 1.

## OCEAN GOVERNANCE AGREEMENTS IN THE WCR

The economic, social and environmental requirements for the sustainable management of ocean resources are inter-dependent. The overexploitation of living resources, land and marine-based pollution, and direct physical degradation from inappropriate development activities all negatively impact the productive capacities of coastal and marine resources and ecosystem services in the WCR. (ECLAC 2017).<sup>10</sup>



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<sup>1</sup> Small Islands and Sustainable Development Goals 14, Q&A with Peter Thomson, available at <http://sidsworkshop.be/docs/SIDS-PGA.pdf>, cited February 9, 2020

<sup>2</sup> Renewable resources can be defined when their supply replenishes naturally or can be sustained, for example Fisheries

<sup>3</sup> Non-renewable resources can be defined when the resource is finite and cannot be replenished, for example Petroleum

<sup>4</sup> Ecosystem services are the direct and indirect contributions of ecosystems to human well-being, examples are carbon sequestration, recreation and culture

<sup>5</sup> The SIDS Sustainable development agenda includes: the Barbados Programme of Action (BPOA, 1994) for the sustainable development of SIDS, the Mauritius Strategy of Implementation of the BPOA (MSI, 2005) and the SAMOA Pathway (2014). The mid-term review of the SIDS Accelerated Modalities of Action (SAMOA Pathway) maintained the importance of oceans, seas and marine resources as priority areas and to be addressed in the ensuing years.

<sup>6</sup> A/RES/54/225: Promoting an integrated management approach to the Caribbean Sea area in the context of sustainable development: resolution / adopted by the General Assembly

<sup>7</sup> United Nations Environmental Programme (UNEP), Caribbean Environment Programme (2018), available at: <https://www.unenvironment.org/explore-topics/oceans-seas/what-we-do/working-regional-seas/regional-seas-programmes/wider>

<sup>8</sup> Debels P., et al. 2017. The CLME+ Strategic Action Programme: An ecosystems approach for assessing and managing the Caribbean Sea and North Brazil Shelf Large Marine Ecosystems. Environmental Development, 22: 191–205.

<sup>9</sup> Association of Caribbean States, <http://www.acs-aec.org/index.php?q=csc>, cited February 10, 2020.

<sup>10</sup> ECLAC FOCUS Issue 1Jan-Mar2019 (pp 13), [repositorio.cepal.org](http://repositorio.cepal.org).

In addressing the requirements for the sustainable management of coastal and ocean resources, countries have been working to better integrate coastal and marine policies and legislation, with the involvement of government institutions, the private sector and civil society.

Barbados, for example, has established its Coastal Zone Management Unit as a Government agency<sup>11</sup> under the authority of the Minister of Maritime Affairs and The Blue Economy of Barbados.<sup>12</sup> Trinidad and Tobago, in 2018, established an Integrated Coastal Zone Management (ICZM)-Inter-Ministerial Committee.<sup>13</sup> These examples of integrated and structured national bodies for coastal and ocean resources management are necessary for multi-sectoral planning, identification of managerial gaps,<sup>14</sup> streamlining of legislative and institutional overlays, and assessment and assignment of human, financial and budgetary resources. These structures will also facilitate wider multi-sectoral preparedness when entering into negotiations on bi-lateral, regional and international agreements for coastal and ocean resources management.

## OCEAN RELATED MULTI-LATERAL AGREEMENTS

Sustainable Development Goal (SDG) 14 recognises that all life on earth depends on healthy and productive oceans. Particularly for the SIDS, the sustainable management of ocean resources is cross-cutting in most, if not all of the 17- SDGs of Agenda 2030.<sup>15,16</sup>

In addition to being part of the 2030

Agenda and the SIDS-Sustainable Development Agenda, Caribbean SIDS have entered into several regional and international agreements on coastal, ocean resources and eco-systems management. Many of these agreements have transboundary implications, including those on maritime matters, migratory fishing stocks, invasive species, climate change impacts, pollution and over-fishing, among others. In this regard, the implementation modalities of these agreements will require regional and other multi-lateral arrangements. Select examples of these international and Caribbean regional agreements are provided in Table 1 (*see page 15*).

## REGIONAL ORGANISATIONS IN OCEAN RESOURCES MANAGEMENT

Regional organisations have an important role to play in supporting member countries, development partners and other stakeholders in the management of the resources of the WCR.

Within the WRC, over 26 registered regional organizations have been identified as having coastal and marine related activities.<sup>17</sup> These regional bodies have varying legal and operational portfolios; include intergovernmental bodies,<sup>18</sup> United Nations agencies, Secretariats to multi-lateral agreements, developmental partners, private sector and civil society groups. Responsibilities and mandates of these range from supporting member countries in addressing national ocean priorities; the financing and implementing projects; to strengthening development cooperation.<sup>19</sup>

This wide array of inter-regional bodies calls for an over-arching, inter-governmental regional body tasked with harmonizing and coordinating management systems of the WRC. This approach is being negotiated under the Caribbean Large Marine Ecosystem Project- Strategic Action Programme (CLME+SAP).<sup>20</sup> It is envisaged as a long-term iterative process engaging WCR countries, regional, sub-regional and international development partners, civil societies, academia and the private sectors.

## CONCLUSIONS

Negotiated arrangements are necessary for the sustainable management of sovereign, shared resources and ecosystem services.

For Caribbean SIDS and within the WCR, multi-sectoral institutionally integrated approaches at both national and regional levels are necessary for coastal and ocean resources management. The management mechanisms of such approaches will require national and regional political support, adequate and sustained financing, regulations and interdisciplinary institutions with appropriate technologies, ocean literacies<sup>21</sup> and capacities.<sup>22</sup> The designated national and regional management structures will have to be driven by long-term plans with cross-sectoral networking platforms integrating the social, environmental and economic elements of sustainable ocean resources management. ■

<sup>11</sup> Barbados Coastal Zones Management Unit is available at: <http://www.coastal.gov.bb/>

<sup>12</sup> Barbados Ministry of Maritime Affairs and the Blue Economy: See web site at: <https://www.gov.bb/Ministries/maritime-affairs-blue-economy>

<sup>13</sup> Integrated Coastal Zone Management (ICZM) Inter-Ministerial Committee of Trinidad and Tobago was established in 2018. The ICZM Policy Framework seeks to facilitate an integrated approach to coastal zone management aimed at maintaining and where necessary, enhancing the functional integrity of the systems while enabling sustainable, economic development through rational, inclusive decision-making and planning. Further details can be found at <http://www.iczm.gov.tt/>

<sup>14</sup> This will also include for capacity and skills requirements

<sup>15</sup> United Nations, available at <https://unstats.un.org/sdgs/report/2019/goal-14/>, cited February 9, 2020.

<sup>16</sup> The SAMOA Pathway (paragraph 58) provides a priority list for sustainable ocean and sea management. The SDG #14 of the 2030 Agenda, is dedicated to “conserve and sustainably use the oceans, seas and marine resources for sustainable development”. The UN high-level meeting to review the progress made in addressing the SAMOA Pathway (UNGA 74) calls for strengthening of national and regional statistical systems and capacity to effectively monitor and evaluate the implementation of the SAMOA Pathway and the 2030 Agendas. available at: <https://sustainabledevelopment.un.org/sids2014/samoapathway>

<sup>17</sup> Fanning, L., Mahon R., Implementing the Ocean SDG in the Wider Caribbean: state of play and possible ways forward, IASS, IDDRI, TMG, 2017 pp 24

<sup>18</sup> For example Caribbean Community (CARICOM), Organisation of Eastern Caribbean States (OECS), Association of Caribbean States (ACS) and the Central America Integration System (SICA)

<sup>19</sup> These can include for example SIDS-SIDS, North-south, South-south and public-private partnerships

<sup>20</sup> CLME+SAP, As of February 2019, the CLME+ SAP has been politically endorsed by: Antigua & Barbuda, Bahamas, Barbados, Belize, Brazil, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, France (with its 5 overseas territories of Guadeloupe, Martinique, Saint-Barthélemy, Saint Martin and French Guiana in the CLME+ region), Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Montserrat (UK overseas territory), Nicaragua, Panama, St. Kitts & Nevis, Saint Lucia, St. Vincent & the Grenadines, Suriname, Trinidad and Tobago, the United States of America. 8 UNDP/GEF CLME+ Project: , available at: <https://clmeplus.org/>

<sup>21</sup> Ocean literacy is about increasing the awareness of all stakeholders, users, citizens to be responsible and have informed behaviour towards the ocean and its resources see site at: <https://oceanliteracy.unesco.org/>

<sup>22</sup> This will also facilitate participatory involvement of indigenous, vulnerable and marginalized communities. and gainful employment across wider career fields



# OCEANS AND DISASTERS - THE CASE OF HURRICANE DORIAN IN THE BAHAMAS

Luciana Fontes de Meira \*

The Caribbean Sea's ecosystems and natural resources are essential assets for the subregion's countries and territories. Although the area represents just 1 per cent of the global ocean, it is estimated to have generated revenues of US \$407 billion in the last official measurement in 2012.<sup>1</sup>

In this article we will use the example of the Commonwealth of The Bahamas to demonstrate how the impacts of hurricanes may put this valuable resource at risk. For this, we will analyze the impacts and effects of Hurricane Dorian on sectors highly dependent on natural ocean resources: tourism, fisheries and maritime transportation. Finally, we will analyze the effects of this hurricane on marine ecosystems and present selected recommendations on how The Bahamas can build more resilient coastlines.

The economic, social and cultural identities of The Bahamas are closely related to ocean resources. With its more than 762 islands and cays and a territory of 13,943 km<sup>2</sup>, roughly 80 per cent of the country's landmass is within 5 ft (1.5 m) of mean sea level and its coastal areas hold the majority of the population and economic activity.<sup>2</sup> The archipelago is also particularly vulnerable to climate change<sup>3</sup> and the yearly wrath of Atlantic hurricanes and tropical storms. In the last decades, since 1990, the Bahamas has suffered the impact of 34 hurricanes and tropical storms,<sup>4</sup> which represents more than one annual occurrence on average. Over the past 5 years, ECLAC completed

damage and losses assessments in The Bahamas following Hurricanes Joaquin, Matthew, Irma and Maria. The results presented in this article are based on the findings from its latest assessment of Hurricane Dorian.

## HURRICANE DORIAN AND ITS IMPACTS ON NATURAL OCEAN RESOURCES

Hurricane Dorian made landfall on the Abaco islands in the Bahamas on 1 September 2019, with winds of 185 mph (280 km/h) and a storm surge of 20 to 25 ft (6.1 to 7.6 meters). On 2 September, the eye of Dorian moved across the eastern side of Grand Bahama and stalled over the island causing extensive damage due to high winds and storm surges.

The assessed total costs of the event was US \$3.4 billion, or the equivalent of the US losing the combined economic outputs of California, Texas and Florida.<sup>5</sup> The human losses were also significant with 67 confirmed deaths and 282 persons reported missing as of 18 October 2019. In total, an estimate of 29,472 persons were affected by the hurricane through damages to their homes and assets.

Analyzing the selected economic effects of hurricanes on ocean resources in Small Island Developing states (SIDS), such as The Bahamas, offers a unique perspective of the severe long-term impacts that the destruction of those resources might have. Regarding tourism, for example, the proximity to the sea is the key attraction for hotels, resorts and other providers of tourist services. However, it also makes their equipment and infrastructure particularly vulnerable to the impacts of waves, storm surges and saltwater corrosion. In the case of Hurricane Dorian, the hotel establishments located on the coastline suffered the greatest structural damages. For them, the greatest impacts occurred during the high season, as the reduction of room capacity and damage to recreational infrastructure caused a decline in the tourist flows and severe losses to employment and the local economy. The resulting losses were aggravated by the fact that many businessmen in the sector, especially small entrepreneurs, were not insured or were underinsured, which led to further obstacles to recovery and longer reconstruction periods. The total damage in the tourist sector was estimated at US \$530 million, while losses due to

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<sup>1</sup> Patil, P.G., Virdin, J., Diez, S.M., Roberts, J., Singh, A. (2016). *Toward A Blue Economy: A Promise for Sustainable Growth in the Caribbean; An Overview*. The World Bank, Washington D.C.

<sup>2</sup> Bello, O. Camarinhas, C. Fontes de Meira, L (2019). In (ECLAC), *Planning for sustainable territorial development in Latin America and the Caribbean (LC/CRP.17/3)*, Santiago, 2019.

<sup>3</sup> See IPCC Special Report on the Ocean and Cryosphere in a Changing Climate, available at: <https://www.ipcc.ch/srocc/>

<sup>4</sup> The following list contains the years and names of hurricanes that have affected the Bahamas: 1990 (Hurricane Klaus), 1991 (Tropical Storm Fabian), 1992 (Hurricane Andrew), 1995 (Hurricane Erin), 1996 (Hurricane Bertha and Lili), 1998 (Hurricanes Georges and Inez), 1999 (Hurricanes Dennis and Floyd, and tropical storms Harvey and Irene), 2001 (Hurricane Michelle), 2004 (Hurricanes Frances and Jeanne), 2005 (Hurricanes Katrina, Rita and Wilma), 2007 (Hurricane Noel), 2008 (Hurricane Hanna and Ike, and Tropical Storm Fay), 2011 (Hurricane Irene), 2012 (Hurricane Sandy), 2014 (Hurricane Arthur), 2015 (Hurricanes Joaquin and Kate), 2016 (Tropical Storm Bonnie, Hurricanes Hermine and Matthew), 2017 (Hurricanes Irma, Maria and Jose), 2019 (Dorian).

<sup>5</sup> IDB (2019). *Damages and other impacts on Bahamas by Hurricane Dorian estimated at \$3.4 billion: report*. IDB News. Available at: <https://www.iadb.org/en/damages-and-other-impacts-bahamas-hurricane-dorian-estimated-34-billion-report>

disruption of tourist flows in two major Bahamian destinations, amounted to US \$325 million. The additional costs were estimated to surpass US \$15 million considering demolition costs, debris removal and salvaging sunken boats.<sup>6</sup>

In island economies the fisheries sector represents a significant portion of food production. Small-scale fisheries account for more than 95 per cent of fisheries in CARICOM,<sup>7</sup> and are vital for food security and employment globally, particularly in rural and remote areas where alternative employment is lacking.<sup>8</sup> Dorian, like other hurricanes, caused widespread damage that directly and indirectly affected this activity. Furthermore, fishing is an important source of employment, and one of the major resources for exports, as well as a fundamental source of food for both the local population and the tourists. The impact of Hurricane Dorian on the fisheries sector of Abaco and Grand Bahama was significant and generalized. Every fishing processing facility was affected, either by wind damage or storm surge. The total damage to fisheries was US \$11 million, while the estimated losses amounted to US \$7 million.

Another aspect worth mentioning is the effect that hurricanes have on maritime transport infrastructure and port facilities, which are central to supply and transport chains in the Caribbean. These structures tend to be particularly vulnerable to tidal waves due to their coastal location. Unsuitable construction design, poor maintenance and use of inadequate building materials across the subregion exacerbate their weaknesses. Private marinas, important for tourism and recreational activities, also face similar problems as they are often designed with fragile and inadequate building materials. In The Bahamas, ports are essential for tourism, and the supply of

food, beverages, construction materials and merchandise, to the islands of the archipelago and to many other countries. They are also important for post-disaster emergency operations when flying conditions are not ideal. Hurricane Dorian severely damaged Marsh Harbour Government Port and caused minor complications to Freetown Port. Marsh Harbour port remained inoperative for nearly two months after the hurricane and will require major investment to be rebuilt. The estimated damage to ports was US \$2.2 million. Securing fast operability of these structures, considering resilience measures, will be essential to guarantee the normalization of tourist and commercial activities in The Bahamas.

Hurricane impacts to coastal and marine ecosystems are expected not only to cause changes in biodiversity, disappearance of habitats, and displacement of species, but also to affect Bahamians who depend on healthy ecosystems to maintain their livelihoods. Environmental effects are hard to measure economically, but baseline studies offer an indication of the enormous value of potentially impacted natural resources. Ecosystems within the existing marine protected areas (MPA) network in The Bahamas are valued at more than US \$23.5 million annually as nursery habitats for spiny lobster. Mangroves and seagrass within the MPA network also store 400 million tons of carbon, worth US \$5 billion in avoided emissions globally. Coral reefs dissipate wave and storm surge, help to filter water and assimilate CO<sub>2</sub>, and are also one of the main local attractions. In addition, ecosystems in the network reduce the risk of coastal hazards to nearly 40,000 people living along the coastline throughout the country, saving US \$806 million in annual income by reducing damage from storm events.<sup>9</sup>

Moreover, Hurricane Dorian caused serious mangrove and seagrass damage on both Abaco and Grand Bahama. Over 28,000 hectares covered by dense and sparse mangroves experienced hurricane force winds. Submerged aquatic vegetation (SAV) can also be damaged by intense wave energy, and by significant sediment deposits after hurricanes. Based on satellite imagery and the hurricane path, the area of seagrass impacted by hurricane force wind was estimated to be over 452,000 hectares. Typically, damage to SAV will result in reduced catch of lobster and conch in the upcoming years, since larvae of these species depend on SAV for a nursery habitat. Preliminary reports also suggested moderate to extensive damage to coral reef and coral nurseries.

The full effects of Hurricane Dorian on these ecosystems will require further and more detailed analysis over time, but it is important to attempt to estimate costs due to the significant contribution of ecosystem services to the Bahamian economy and to further pursue the development of a baseline that quantifies the economic importance of such resources. Moreover, the recovery of ecosystems is a fundamental component of protection against future hazards and dissipation of disaster effects.

► (continued on page 11)

<sup>6</sup> ECLAC & IDB (2019). Assessment of the Effects and Impacts of Hurricane Dorian in the Bahamas.

<sup>7</sup> CRFM (Caribbean Regional Fisheries Mechanism) (2016). CRFM Statistics and Information Report – 2016: [http://www.crfm.int/images/CRFM\\_Statistics\\_Information\\_Report\\_2016\\_Final.pdf](http://www.crfm.int/images/CRFM_Statistics_Information_Report_2016_Final.pdf)

<sup>8</sup> FAO. 2018. The State of World Fisheries and Aquaculture 2018 - Meeting the sustainable development goals. Rome.

<sup>9</sup> Arkema, K., D. Fisher, K. Wyatt. 2017. Economic valuation of ecosystem services in Bahamian marine protected areas. Prepared for BREEF by The Natural Capital Project, Stanford University.



## SARGASSUM IN THE CARIBBEAN – NEW CHALLENGES AND OPPORTUNITIES

Willard Phillips\*

Although sargassum seaweed (*Sargassum* species) is not new to the Caribbean, since 2011, there has been a significant and dramatic increase of this algae in the Caribbean Sea and Gulf of Mexico. This alga manifests itself as large blooms which have been washing up on coastal areas of the region in increasing quantities. It has been seen in coastal areas from as far as Texas in the western Gulf Coast of the United States, through the Caribbean coastal regions of Central and South America and throughout the chain of Caribbean islands, as far south as Trinidad and Tobago.

The problem assumed overwhelming proportions in 2018, when according to Wang et al. (2018),<sup>1</sup> more than 20 million tonnes of wet biomass of sargassum was estimated to have been formed in the greater Atlantic by June of that year. But unusually large algal blooms were also recorded for 2014 and 2016. This article discusses some of the potential challenges and opportunities which have become apparent with the recent emergence of this phenomenon in the Caribbean.

Among the main causes suggested for this sudden change in sargassum are the increased concentration of municipal and toxic wastes in the greater Atlantic Ocean, increased sea water surface temperatures, and related intensification of the Atlantic basin ocean current circulation due to climate change. These factors are believed to be the main drivers of both the intensity and distribution of

coasts has resulted in significant disruptions of economic and social life in the affected areas, and has had serious impacts on the ecological equilibrium of coastal regions. These include the despoiling of beaches due to large volumes of unsightly and foul-smelling decaying algae, with related effects on tourists and locals; public health impacts on coastal communities due to the production of noxious gases from decaying seaweed which in turn affects ambient air quality; physical damage to housing and household appliances from corrosive gasses; increased operational inconveniences for fishers and divers; and, in some cases, the overwhelming of sea-turtle nesting sites, whose reproduction is thus considerably affected.

Further possible effects such as the bioaccumulation by sargassum of heavy metals and other organic and inorganic substances have also been noted. These make the alga a potentially significant source of toxic materials which can enter into the food chain and may be deposited into terrestrial eco-systems. Given the ecological and ocean dynamics which have so far driven the movement of sargassum in the Caribbean, beaching of the alga has occurred mainly on the eastern and southern coasts of the countries (Figure 2).

In order to obtain a better understanding of the nature of the sargassum phenomenon in the Caribbean, ECLAC recently completed a scoping

Figure 1: Great Atlantic Sargassum Belt stretching from West Africa to the Gulf of Mexico



预览已结束，完整报告链接和二维码如下：

[https://www.yunbaogao.cn/report/index/云报告?reportId=5\\_381](https://www.yunbaogao.cn/report/index/云报告?reportId=5_381)

