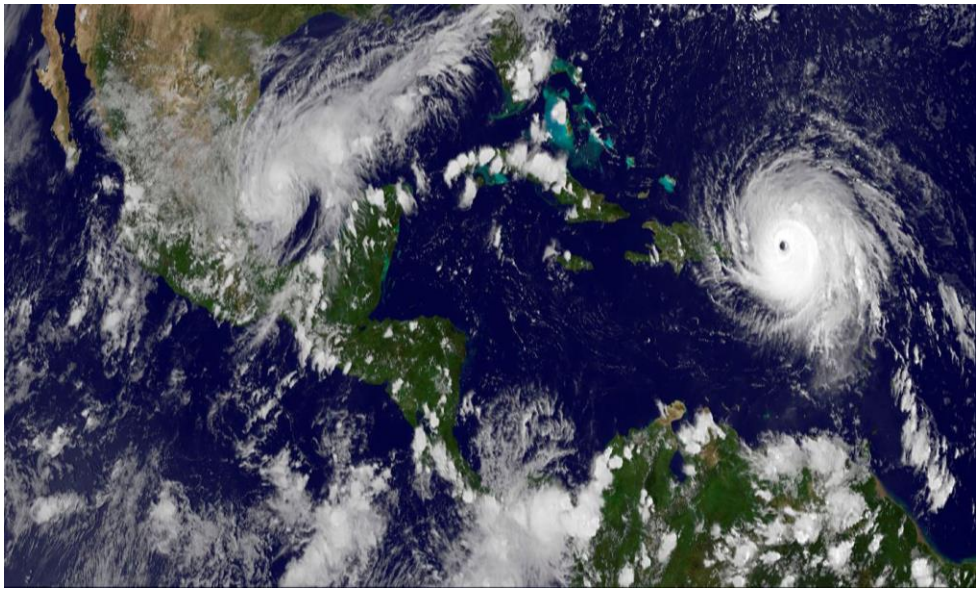
CLME+ 'Business as Usual' Scenario
Draft Report – Version 3



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Acronyms

BaU	Business as Usual
BBNJ	Biodiversity Beyond National Jurisdiction
CARICOM	Caribbean Community
CarSea	Caribbean Sea
CBD	Convention on Biological Diversity
CEP	Caribbean Environment Programme
CSC	Caribbean Sea Commission
CRFM	Caribbean Regional Fisheries Mechanism
CLME	Caribbean Large Marine Ecosystem
CLME+	Caribbean and North Brazil Shelf LMEs
EBM	Ecosystem-Based Management
EcoQOs	Ecosystem Quality Objectives
FAO	Food and Agriculture Organisation (United Nations)
ICM	Interim Coordinating Mechanism
IGO	Inter-Governmental Organisation
LAC	Latin America and the Caribbean
LMR	Living Marine Resources
OECS	Organisation of Eastern Caribbean States
OSPESCA	Organización del Sector Pesquero y Acuícola del Istmo CentroAmericano
PPCM	Permanent Policy Coordinating Mechanism
RGF	Regional Governance Framework
SAP	Strategic Action Programme
SBOs	Societal Benefits Objectives
SD	Strategic Direction
SDG	Sustainable development Goal
SICA	Sistema de la Integración CentroAmericana
SIDS	Small Island Developing States
sLMRs	Shared Living Marine Resources
TDA	Transboundary Diagnostic Analysis
TEU	Twenty-foot Equivalent Units
UNEP	United Nations Environment Programme
WECAFC	Western Central Atlantic Fisheries Commission

Summary

This report provides a 2015-2050 Business-as-Usual (BaU) Scenario in the CLME+ region that is a plausible description of how the future may evolve and affect the goal and objectives of the CLME+ Strategic Action Programme (SAP), if there is no Permanent Policy Coordination Mechanism (PPCM). The scenario examines the current trends related to the priority transboundary issues identified in the CLME Transboundary Diagnostic Analysis (TDA): unsustainable fisheries, ecosystem degradation, and marine pollution. It discusses how these issues may develop based on a coherent and internally consistent set of assumptions about the likely trajectory of the key drivers of environmental change in the CLME+ region and where relevant, globally.

This report is not scenario planning where a number of scenarios are developed to indicate the likely outcomes of selecting various policy options. The BaU scenario discussed in this report was developed as the most plausible scenario using the best available social and economic information and trends of the region underpinned by the following assumptions:

- The focus is on the absence of a PPCM and its role in regional ocean governance and the attainment of ecosystem-based management (EBM), not on the entire suite of regional governance arrangements that form the Regional Governance Framework (RGF).
- The focus is on the three key transboundary issues for the CLME+ region, namely unsustainable fishing, marine pollution and ecosystem degradation.
- The scenario is developed out to 2050, with a starting year of 2015.
- GEF funding that supports interim coordinating mechanisms (ICM) for both fisheries and EBM more broadly will cease at the end of the current phase of the CLME+ Project (2020)
- After 2020 there is no mechanism to oversee SAP implementation
- After 2025 there is no SAP for the CLME+ region.

Focusing on the period 2015-2050, this BaU summary provides the key conclusions regarding: (1) Social, economic and political trends; (2) How these trends relate to key transboundary issues within the CLME+ region; and (3) Consequences of pursuing the 'Business as Usual' scenario in terms of meeting the CLME+ SAP goals and objectives and the UN Sustainable Development Goals, particularly Goal 14 (Life below the water) and Goal 13 (Climate change and its impacts). It is important to note that due to the paucity of economic valuation data for ecosystem services in the region (and elsewhere), the assessment of a plausible future under the BaU scenario from 2015 to 2050 draws on qualitative and limited quantitative data. ***For a detailed discussion on the justification and context supporting the conclusions presented in this summary, readers are urged to refer to the full BaU report.***

(1) Social, Economic and Political Trends

The key drivers with the potential to influence environmental change in the BaU scenario over the period 2015-2050 have been identified following an extensive review of literature, including those by key organisations in the region. These drivers are: demographic change; economic growth (including consumption and production patterns; and trade and globalization); socio-political conditions; institutional setting; environmental governance; and technology. Global climate change impacts (particularly rising sea surface temperature, acidification, and sea level rise) and its effects on the regional shared living marine resources—are also considered a key driver in the scenario. These drivers are consistent with the root causes of the three priority issues identified by the CLME+ TDA causal chain analyses (CLME, 2011). Trends anticipated over the scenario period are summarized in Table S1.

Table S1. Summary of key trends underpinning the BaU scenario

Key Drivers	BaU Scenario Trends: 2015 - 2050	Explanatory Comments
Demographic Changes *Population numbers* *Population distribution* – Rural to Urban	• Small increase to an average of 3% growth, taking into account births, deaths and migration • Significant shift of movement from rural to urban areas • Increase in per cent of population having access to safe water and sewage	Significant diversity among countries in term of population growth. All countries show trend of rural to urban migration but greater movement to urban centres in SIDs.
Economic growth	• Little change in economic structure of the region, priority sectors remain the same with tourism the key driver for most Caribbean countries. • Increase in contribution from remittances to the region to as much as 10% of GDP for CARICOM countries.	Asymmetric growth among countries Factors external to the region dominate potential for growth
Social-Political Conditions	• Externally, no change in US policies towards the region • No change in high vulnerability to threats arising from shifts in global events • Internally growing corruption, institutional weakness and lack of financial resources continue if not slightly increase • Continued perception as a "low" terrorism region • Increase in level of protected areas due to rising concern with climate change and international pressure to comply with CBD commitments.	Social injustices and rising tensions as disparity between the 'haves' and 'have nots' increase in countries across the region
Regional institutional setting	• No change in sectoral basis of organisations responsible for addressing key transboundary issues. • Continued lack of meaningful regional economic and/or ecosystem-based approaches to integration across the region • Funding to support regional IGOs decreases due to increasing disparities and decreased priority given to regional collaboration	Countries in the region continue to view each other as competitors rather than partners although effort is made in Central American countries to foster a coherent approach among member countries and to a lesser extent, in the member states of the OECS.
Regional governance of sLMRs	• No measurable progress in regional level governance to address sLMRs. • Efforts initiated in 2015 remain only on paper with no ability to implement an integrated approach to managing key transboundary issues • No improvement in involvement of private sector in regional governance	Private sector benefiting from ecosystem goods and services continue to be 'free riders' and profit from environmental degradation. Initially fish catches increase in the BaU period, in response to demand from a growing tourism sector and population increase but catches decreased back to 2010 levels, as ecosystem health continued to degrade.
Technological advances	• Decrease in ability to generate 'home grown' research and innovation within the region as access to foreign technology increased • Some improvement in addressing pollution and declining fisheries using foreign technologies • Ongoing heavy dependence on oil and gas as an energy source with slight improvement in use of alternative energy sources	Multinationals, primarily from outside the region, continue to benefit from the resources within the region. Inclusion of genetic resources and traditional knowledge as commodities provide for a new level of multinational exploitation.
Climate Change	• Limited ability of SIDs and lowlying countries to respond to climate change impacts • Region as whole susceptible to increasing storm intensity, flooding, ocean acidification, loss of coral cover and other types of coastal habitat • Increase percent coverage of marine protected areas • Increase in invasive species and diseases affecting both humans and LMRs	Moderate decrease in social vulnerability on average across the region but wealthy countries and individuals better able to handle effects of climate change

(2). How these trends relate to key transboundary issues in the CLME+ Region

Given the trends anticipated under the BaU scenario, it is clear that despite some improvement on average in the region, overall environmental degradation has continued throughout the period of the scenario, as have the challenges associated with addressing the key transboundary issues identified in the CLME Transboundary Diagnostic Analysis (CLME, 2011).

Unsustainable fishing

Over the period 2015-2030, a growing tourism sector and the rise in population increased the pressure to fish unsustainably. Given the social political conditions of the period, sectoral institutional setting and lack of a regional governance mechanism for ensuring coordination and collaboration across the region, these trends were accompanied by ongoing environmental degradation. As a consequence, in the latter half of the BaU scenario period (2030-2050), the tourism sector declined due to a reduction in the environmental quality of the touristic product offered by the region, leading to a reduction in fishing pressure. However, given negative impacts on the fisheries due to climate change, declines in fish posed a threat to food security for many coastal communities in the region.

By 2050, the linkages and connections among the key drivers associated with the BaU scenario synergistically undermine efforts to restore critically important fish stocks. Additionally, the lack of resources to support coordinated efforts between regional fisheries organizations and the failure to establish an RFMO with a meaningful regional mandate (i.e. one that addressed fisheries both on the high seas and within EEZs of countries), exacerbated the consequences arising from the heavy social dependence of fishing to coastal communities within the CLME+ region. These factors put at risk the contribution fisheries was making at the beginning of the scenario period where the sector provided employment for approximately 116,000 persons and contributed between 0.3% and 2.3% of value added to GDP of CARICOM countries. At least 64,000 people were directly employed in small-scale fisheries and aquaculture at that time. Furthermore, if other industries such as boat construction, net repair and fish processing are added, the number of people employed in the CARICOM Region in the broad-based fisheries sector was estimated around 180,000 (CDB, 2018).

As a key overarching driver, rising temperatures and ocean acidification due to climate change led to shifts in fish species composition and community structure that negatively affect fisheries as an economic and socially-dependent activity across the region. With warming temperatures, new viral and other debilitating diseases have at times impacted commercially important species such as lobster, reef fishes and their coral habitat. Likewise, by 2050, growing ocean acidification has affected the quality and quantity of lobster and other species dependent on a carbonate structure.

Marine Pollution

Under the BaU scenario, the most significant chronic contribution to marine pollution remains land-based sources, which mostly impact the nearshore environment. This has increased primarily from a growing urban population and inadequate sewerage to meet the rising demand in substantial parts of urban centres around the region. However, increasing economic growth from tourism during the first two decades of the BaU scenario has driven improvements in sewage treatment and has somewhat slowed the rate of deterioration of marine water quality from this land-based source. Continued use of fertilizers, herbicides and pesticides by the agricultural and tourism sectors, along with land clearing and efforts to diversify national economies, still contribute to declining marine water.

During the expansion of tourism phase (2015-2030), sources of marine-based pollution continued to be mainly from cruise ships. To support the growing demand from tourists due to the low terrorism threat in the region, an increase in the size and number of vessels occurred. Despite efforts to develop and implement a regional port reception facilities plan, the port state reception facilities in many of the countries, particularly the SIDs, have been inadequate to handle the growing amount of waste generated by these vessels.

In addition to cruise ships, the expansion of the Panama Canal at the start of BaU scenario resulted in increased vessel traffic transiting the Caribbean Sea, making the area one of the most heavily used for trans-shipment of cargo and by cruise vessels. The global demand for trade and advances in technology have led to even larger ships by 2050. This has led to an increase in the threat of marine pollution from these sources, particularly from ballast water discharges and the potential for catastrophic accidents at sea resulting in the spillage of hydrocarbons and other noxious substances.

By 2050, there are still significant gaps in the data needed for a comprehensive understanding of the state of marine water quality in the CLME+ region, despite continuing efforts to address these gaps in the State of Convention Area Reports (SOCAR) by UNEP/CEP.

Ecosytem Degradation
Supporting the need for economic growth from tourism, providing shelter for a growing regional population and migration to urban centres all have led to a decrease in the availability of coastal habitat throughout the region under the BaU scenario. Commitments to multilateral environmental agreements have increased marine protected area coverage in the region. However, ongoing effects of climate change and a lack of an integrated regional approach to ecosystem-based management make the region increasingly susceptible to ecosystem degradation, leading to a decrease in overall ecosystem health.

By 2050, countries in the region dependent on 'sun, sand and sea' tourism are particularly impacted by coral cover decrease with an estimated decline in healthy reefs by some 50% (UNEP, 2016). Loss of mangroves and other natural systems from coastal development pressures (Blankenspoor 2017), invasive species introductions from both marine and land-based sources, along with increasing incidents of disease to LMRs have all contributed to a loss in both marine and terrestrial biodiversity, many of the former being important commercial species.

(3) Consequences of the 'Business as Usual' Scenario
In this BaU scenario, an integrated regional policy coordination mechanism to foster marine ecosystem-based management is lacking. The CLME+ region has continued to give priority to improving economic growth while trading off social and environmental objectives over the 2015 – 2050 period. Policies have been mostly reactive with each country deciding how best to meet its national priorities despite consequences to neighbouring states and the region as a whole. Consequently, economic instability has increased over time as has the inability to mitigate and respond in a coordinated manner to unforeseen, externally driven global events, internally driven social political conditions and the consequences of more frequent catastrophic natural disasters. Major risks and benefits for the region in the period covered by the BaU scenario are highlighted in Table S2.

With funding provided by the GEF to help the region initiate these changes, progress was made between 2015 and 2020 towards improved regional governance. However, when GEF funding ended in 2020, these initial gains were reversed and after 2025 there was no mechanism for revision of the SAP, which subsequently ceased to exist. Regional IGOs continued to focus on their mandated programmes and

there was a return to fragmented ocean governance in the CLME+ region. This led to the trends and conditions described in this scenario out to 2050.

Table S2. Potential Risks and Benefits of 'Business as Usual' Scenario – 2015-2050

Risks arising from BaU Scenario	BaU Scenario Benefits
• Inability to meet SAP goals and objectives • Initial increase in tourism (2015-2030) followed by significant decline in the sector (2030-2050) as environmental quality degrades • Erosion of local/regional biodiversity; decline in coral reefs by 50% • Decline in fisheries to 2010 levels by 2050 • Vulnerable to global economic collapse • Lower paying jobs result in human capital being under-developed and under-used • Local crime limits interest of tourists to the region, significantly affecting the tourism sector • Low capacity to respond to increases in natural disasters significantly affect the tourism sector in the region • Pressure on nearshore fisheries leading to increasing conflicts • Greater dependency on world markets for food production, especially among SIDs • Tendency to lower environmental standards where they conflict with investment opportunities, as countries pursue efforts to diversify their economic base • Growing inequities/polarisation leading to increased social unrest • Increasing dependence on foreign technology • Growing inability among member countries, particularly SIDs to meet financial commitments to regional IGOs, leading to erosion in ability of IGOs to meet stated mandates • Less regional cooperation leading to increase in negative transboundary impacts and increased tension among countries • Overall loss in adaptive capacity and resilience	• Creation of employment, albeit lower paying jobs, due to initial growth in tourism sector (2015-2030) • Outside investment stimulates improvement in sewage treatment, potable water quality, roads, etc. • Interest to visit the region from outsiders stimulates policies to address local crime • Improved quality standards • Improved protection of a number of ecological resources and habitats through Marine Protected Areas.

(Source: Adapted from CarSea, 2007 and UNEP, 2016).

This scenario sees the region continuing its demand for ecosystem goods and services to support an initial growing tourism sector while at the same time, minimising environmental sustainability in favour of foreign economic investment in an effort to diversify their economies. With a lack of a long-term sustainable financing mechanism and little to no long-term commitment to regional collaboration to address key transboundary issues, coastal and marine ecosystems continued to decline leading to missed opportunities for achieving the CLME+ goals and objectives. Likewise, in the period used for the BaU scenario (2015-2050), the countries in the CLME+ region have made little real progress towards achieving the Sustainable Development Goals they committed to in 2015, with the exception of meeting and exceeding the target for marine protected areas. Given the differing financial, human and technical capacities of the countries within the region, there is growing disparity among the countries as national governments focus less on regional solutions and give priority to national goals. By 2050, this perspective ultimately resulted in ongoing, negative transboundary impacts and associated political tensions for the region.

Under the BaU scenario, in the absence of a regional coordinating mechanism, there is limited opportunity to achieve the goals and objectives of the CLME+ SAP. Marine ecosystems and living marine resources are increasingly threatened, degraded or destroyed by human activities, reducing/eliminating their ability to provide ecosystem goods and services so essential to the well-being of people in the region. There is failure to address the key transboundary issues of overfishing, marine pollution and ecosystem degradation. The ability to respond to unpredictable changes in these issues and to be resilient is compromised. This scenario has been driven by trends in demographic changes, economic growth, social political conditions, institutional setting, regional governance, technology and climate change.

1. Introduction

This report provides a storyline that describes the 'Business-as-Usual' (BaU) Scenario in the CLME+ region. It is a plausible description of how the future may evolve in terms of achieving the goal and objectives outlined in the CLME Strategic Action Programme (SAP) (CLME, 2013) without the establishment of a Permanent Policy Coordination Mechanism (PPCM) for the shared living marine resources (sLMRs) of the CLME+ region. The focus is on the absence of a PPCM and its role in regional ocean governance and the attainment of ecosystem-based management (EBM), not on the entire suite of regional governance arrangements that form the Regional Governance Framework (RGF).

This report is not scenario planning where a number of scenarios are developed to indicate the likely outcomes of selecting various policy options. The BaU scenario discussed in this report was developed as the most plausible scenario using the best available social and economic information and trends of the region and clearly stated assumptions.

CLME+ Strategic Action Programme

The 2013 Strategic Action Programme for the Caribbean and North Brazil Shelf Large Marine Ecosystems region (the CLME+ SAP), provides a 10-year roadmap for countries and stakeholders, sub-regional and regional organisations, multi-lateral and bilateral donors and development partners to achieving the long-term vision of: "a healthy marine environment in the CLME+ provides benefits and livelihoods for the well-being of the people of the region" (CLME, 2013; Debels *et al.*, 2017). The CLME+ SAP specifies overall and subecosystem-specific long-term Ecosystem Quality Objectives (EcoQOs) and the Societal Benefits Objectives (SBOs) to be derived from achieving the EcoQOs (Table 1). Additionally, mainstreaming adaptation to climate change across all actions that contribute to achieving these objectives is an important overarching consideration for the SAP.

The CLME+ SAP proposed to accomplish strengthening and expanding the regional, sub-regional and national-level collaboration in sLMRs governance through the development of a network of consolidated, inter-linked and complementary organisations, referred to as the Regional Governance Framework (RGF), coordinated through a PPCM (CLME, 2013; Fanning *et al.,* 2007; Mahon *et al.,* 2011).

Table 1. CLME+ SAP Ecosystem Quality Objectives (EcoQOs) and Societal Benefits (SBOs) to be derived from

achieving the EcoQOs.

Overall Long-Term
EcoQO
Healthy Reef, Continental Shelf and Pelagic Ecosystems
SBO
The provision of goods and services by the marine ecosystems of the CLME+ is such that it optimizes the systems' contributions to societal well-being and to the region's development needs (including the preservation of aesthetic, cultural, traditional, health and scientific values of the ecosystems)
Sub-ecosystem-Specific
Pelagic ecosystem EcoQO
Conservation, protection, and/or restoration of the fish stocks and biodiversity of the pelagic ecosystem.
EcoQOs common to continental shelf and reef and associated ecosystems
Restoration and maintenance of the fish stocks at a sustainable level and adoption of responsible fishing operations and fisheries management practices. *Safeguarding the habitats and community structure of the ecosystems from harmful impacts (including those caused by fisheries and pollution) that would diminish the contributions of these systems for enhancing livelihoods and human wellbeing.*
SBO for all three subecosystems
Contributions to human well-being, socio-economic development, food security and enhanced livelihoods from goods and services provided by the ecosystems are optimized.

(Source: Debels et al., 2017)

Business as Usual Scenario Parameters

This document focuses on a 'Business as Usual' scenario for the CLME+ region and builds on scenarios developed in regional assessments such as the Caribbean Sea Ecosystem Assessment (CARSEA, 2007) and the UN Environment Programme Global Environment Outlook (GEO-6) for Latin America and the Caribbean (UNEP, 2016). This report is not scenario planning where a number of scenarios are developed to indicate the likely outcomes of selecting various policy options. The BaU scenario discussed in this report was developed as the most plausible scenario using the best available social and economic information and trends of the region and clearly stated assumptions. It also draws on the substantial data and information base that exists on the region's marine environment, marine living resources, and socio-economic drivers as well as on previous key studies on LME governance in the CLME+ region, underpinned by the following overarching assumptions:

- The focus is on the absence of a PPCM and its role in regional ocean governance and the attainment of ecosystem-based management (EBM), not on the entire suite of regional governance arrangements that form the Regional Governance Framework (RGF).

- The focus is on the three key transboundary issues for the CLME+ region, namely unsustainable fishing, marine pollution and ecosystem degradation.
- The scenario is developed out to 2050, with a starting year of 2015.
- GEF funding that supports interim coordinating mechanisms (ICM) for both fisheries and EBM more broadly will cease at the end of the current phase of the CLME+ Project (2020).

Based on key assumptions about the trajectory of the various drivers and their impacts, the likely consequences of the BaU scenario for attainment of the long-term vision and Ecosystem Quality Objectives of the CLME+ SAP as well as for progress towards relevant global and regional commitments and targets are discussed. The future that unfolds in the BaU scenario is written as a retrospective, looking back from the year 2050.

Status of Economic Valuation of Ecosystem Services in the WCR

It is important to note at the outset of this assessment that economic valuation data to quantitatively assess the dollar value of the loss of marine ecosystem services is lacking in the Caribbean region (Schuhmann and Mahon, 2015), apart from some localized studies focusing mainly on reef ecosystems. In fact, following their assessment of the state of valuation studies in the region, Schuhmann and Mahon (2015) called for the countries of the WCR to "adopt an ecosystem services approach to economic valuation that is expanded in scope and method relative to the current piecemeal approach" (p.63). They provided a framework by which measurable benefits (e.g. changes in fisheries output, incidence of health effects, likelihood of storm damage, effect on tourism visits and probability of pharmaceutical discovery) could be determined and used to influence policy decisions affecting the maintenance of marine and coastal ecosystem services. They recommended that the framework be streamlined into regional policy processes such as the CLME+ SAP and promoted by regional sectoral organizations. It is worth noting that Patil et al. (2016) also commented on the lack of economic data to assess the ocean economy of the region as well as the contribution from ecosystem services and echoed these calls in their report entitled "Toward a Blue Economy: A promise of sustainable growth for the Caribbean" by recommending the following strategies and associated actions:

> *Strategy 1: Measure both the region's ocean economy and natural capital*; Action 1.1: Improve the statistical and methodological base for measuring the scale and performance of the ocean economy; Action 1.2: Establish natural capital accounts for the Caribbean Sea at the national and regional level; *Strategy 2: Manage the Caribbean ocean space in a more integrated manner; Action 2.1: Create/ expand integrated approaches to ocean governance; Action 2.2: Apply marine spatial planning at the scale of EEZs; Action 2.3: Invest in restoration and maintenance of marine ecosystem function and integrity, with a focus on protecting critical ecosystems and ecosystem processes; Action 2.4: Build and strengthen the institutional and human capacity to act*.

The lack of economic valuation data to assess ecosystem goods and services is not unique to the WCR. While a global review of studies conducted for the Great Barrier Reef (GBR) found valuation studies of forests in Mexico (Adger et al., 1995), wetlands in Sri Lanka (Wattage and

Mardle, 2008), small-scale fisheries in Madagascar (Barnes-Mauthe, Oleson, and Zafindrasilivonona, 2013), mangroves in India (Badola and Hussain, 2005) and terrestrial and marine biodiversity (Turpie et al., 2003), the benefits that made up the total economic value were found to be lacking (DeLoitte, 2017). A similar study to that of Schuhmann and Mahon (2015) by Stoeckle et al. (2011) for the GBR found significant gaps, particularly in the valuation of regulating and support ecosystem services. The 2017 DeLoitte study noted that they were aware of only one study (Oxford Economics, 2009) that had attempted to value the consumer and producer benefits lost under a severe GBR coral bleaching scenario.

While quantitative economic valuation data of ecosystem services may be lacking in the WCR, there are still numerous examples where qualitative and partial quantitative analysis have been used to influence policy making towards protecting marine and coastal ecosystem services. Waite et al. (2015) identified a number of examples focusing primarily on use and non-use benefits derived from coral reefs, mangroves, wetlands and storm protection that influenced policy level decisions in Bahamas, Belize, Bonaire, Cuba, Dominican Republic, Honduras, Mexico, St. Maarten and the USA. Policy changes influenced by these studies included banning bottom trawling, creation of protected areas, increased fines for damaging critical habitat, banning offshore oil and gas activities, increase in user fees, beach 'buy back' and beach renourishment. The Bahamas study below provides an example of valuing use and non-use benefits of coral reefs, beaches, wetlands and mangroves of Andros Island and calls for a 0.6% percent of net economic benefits to be invested in sustainable management efforts (Hargreaves-Allen, 2010). For the Caribbean Region, and focusing only on a fraction of the benefits derived from ecosystem services such as 2012 fisheries catch data (US $4.99B), coastal tourism data for island nations and territories (US$ 47.1B), estimates of carbon sequestration (US$ 0.09B) and economic benefits of Caribbean coral reefs (US$ 1.47B), Patil et al. (2016) estimated a dollar value benefit of US$53.65 billion. Using a similar 0.6% estimate as was called for in the Bahamas example, this would translate to some US $322 million that the region should consider allocating to support the sustainable management and ongoing provision of ecosystem services.

An Economic Valuation of the Natural Resources of Andros Islands, Bahamas.
By Venetia Hargreaves-Allen (PhD) of the Conservation Strategy Fund for The Nature Conservancy, August 2010.

Key messages from the Economic Valuation of the Natural Resources of Andros Islands, Bahamas

- The ecosystems, species and landscapes of Andros represent a huge ecological and economic endowment for the people of Andros, The Bahamas and the wider Caribbean region.
- The habitats on Andros provide an estimated mean of $46,000 per km^2 per year in ecosystem services, such as carbon storage, water supply and recreation.
- Overall, habitats on Andros are thought to generate $260 million a year in net economic benefits, which if sustained, will be worth $4.6 billion over the next 25 years.
- The net benefit of fresh water on Andros is $3.5 million each year.
- Nature provides income and employment for 80% of Andros; 1,645 full time jobs and 8,000 part time jobs.
- Commercial fisheries in Andros (including crabbing and sponging) generate $70 million in revenues each year, which provides food and income for many people and households.
- Nature based tourism activities (including accommodation, bonefishing and diving) constitute $43.6 million in revenues each year in Andros.
- Overall, the extractive and non-extractive use of Androsian natural resources generates $142 million in direct gross economic activity and an additional $35 million in associated spending, which is at least 60% of all economic activity on Andros. Over the next 25 years, this could add up to $3 billion in revenues.
- Environmental degradation in the Caribbean means that natural resources on Andros are likely to become more valuable, if they are properly protected. Conversely, the potential losses in values and the loss in income, jobs and welfare could be enormous, if effective conservation actions are not implemented.
- In order to establish a basic level of sustainable management of these habitats, initial funding of $1.62 million is needed, which is equivalent to 0.6% of the economic benefits and 1% of the gross revenues this island's ecosystems produce each year.
- Promising sources of funding include bonefishing fees, fines for environmental damage, grants from international organizations, a "friends of Andros" fundraising program, cruise ship fees and voluntary hotel surcharges.

2. Social, economic and political trends

Key drivers underpinning the BaU scenario in the CLME+ region to 2050 include: demographic changes; overall growth in economies across the region; socio-political conditions both within the region and external influences; the institutional setting for addressing shared living marine resources; governance mechanisms for addressing these at the regional level; advances in technology and the overarching driver of climate change and its impacts on the region. Table 2 provides a summary of the trends expected for each of these key drivers, followed by explanatory text.

Table 2. Summary of key trends underpinning the BaU scenario

Key Drivers	BaU Scenario Trends: 2015 - 2050	Explanatory Comments
Demographic Changes *Population numbers* *Population distribution* – Rural to Urban	• Small increase to an average of 3% growth, taking into account births, deaths and migration • Significant shift of movement from rural to urban areas • Increase in per cent of population having access to safe water and sewage	Significant diversity among countries in term of population growth. All countries show trend of rural to urban migration but greater movement in urban centres in SIDs.
Economic growth	• Little change in economic structure of the region, priority sectors remain the same with tourism the key driver for most Caribbean countries. • Increase in contribution from remittances to the region to as much as 10% of GDP for CARICOM countries.	Asymmetric growth among countries Factors external to the region dominate potential for growth
Social-Political Conditions	• Externally, no change in US policies towards the region • No change in high vulnerability to threats arising from shifts in global events • Internally growing corruption, institutional weakness and lack of financial resources continue if not slightly increase • Continued perception as a "low" terrorism region • Increase in level of protected areas due to rising concern with climate change and international pressure to comply with CBD commitments.	Social injustices and rising tensions as disparity between the 'haves' and 'have nots' increase in countries across the region
Regional institutional setting	• No change in sectoral bias of organisations responsible for addressing key transboundary issues. • Continued lack of meaningful regional economic and/or ecosystem-based approaches to integration across the region • Funding to support regional IGOs decreases due to increasing disparities and decreased priority given to regional collaboration	Countries in the region continue to view each other as competitors rather than partners although some effort is made in Central American countries to foster a coherent approach among member countries and to a lesser extent, in the member states of the OECS.
Regional governance of sLMRs	• No measurable progress in regional level governance to address sLMRs. • Efforts initiated in 2015 remain only on paper with no ability to implement an integrated approach to managing key transboundary issues • No improvement in involvement of private sector in regional governance	Private sector benefiting from ecosystem goods and services continue to be 'free riders' and profit from environmental degradation. Initially fish catches increase in the BaU period, in response to demand from a growing tourism sector and population increase but catches decreased back to 2010 levels, as ecosystem health continued to degrade.
Technological advances	• Decrease in ability to generate 'home grown' research and innovation within the region as access to foreign technology increased • Improvement in addressing pollution and declining fisheries using foreign technologies • Ongoing heavy dependence on oil and gas as an energy source with slight improvement in use of alternative energy sources	Multinationals, primarily from outside the region, continue to benefit from the resources within the region. Inclusion of genetic resources and traditional knowledge as commodities provide for a new level of multinational exploitation.
Climate Change	• Limited ability of SIDs and low lying countries to respond to climate change impacts • Region as whole susceptible to increasing storm intensity, flooding, ocean acidification, loss of coral cover and other coastal habitat • Increase percent coverage of marine protected areas • Increase in invasive species and diseases affecting both humans and LMRs	Moderate decrease in social vulnerability on average across the region but wealthy countries and individuals better able to handle effects of climate change

By 2050 there is considerable diversity among the countries regarding the changes in number and distribution of the population. Among English-speaking Caribbean countries some almost doubled their population while others lost approximately half resulting in an overall net growth of only about three per cent (CDB, 2017). Key factors contributing to this were outmigration in some countries, an aging population, especially in the English-speaking countries, and high birth rates in some countries. While population growth for the entire Latin America and Caribbean region (which includes all of South America) in 2050 is close to seven per cent (UNEP, 2016), growth in the CLME+ region between 2015 and 2050 is more in line with the CDB (2017) estimate.

Of greater significance than population in the BaU scenario is the growing rural to urban migration across the countries in the CLME+ region. By 2025, as much as 75% of the population in the Caribbean SIDS moved into urban centres, with only marginally less movement in the continental countries (UNEP, 2016). In 2050, close to 80% of the overall population within the CLME+ region is in urban centres. One benefit of this is a 10% increase in the number of people with access to modern sanitation from 2015.

In terms of economic growth as a key driver of the BaU scenario, the economic structure of the region showed little change over the period 2015-2050 (UNEP, 2016). It continues to give priority to primary and resource-intensive industries in the continental countries, small assembly manufacturing on the isthmus and sand-and-sea all-inclusive type resorts in the Caribbean. The region continues to contribute approximately seven per cent to the world's Gross Domestic Product (GDP) in 2050. However, disparity between and among the CDB Member countries and the rest of the region is evident, with economic growth estimated to range between 0.7 to 7% (average two percent), while the rest of the region enjoys greater growth (CDB 2017).

Helping to offset the consequences of slow economic growth is the contribution of nationals from the region who are overseas. According to the Pew Research Center, remittances at the start of the scenario period accounted for approximately eight per cent of the total GDP of countries in Latin America and Caribbean (Budiman and Connor, 2018). As a share of total economic output (measured in gross domestic product), remittances were equivalent to 29.4% of Haiti's 2016 GDP, while for the Caribbean as a whole, remittances were equal to 8% of GDP – a far higher share than for Central and South America (3.6% and 0.5% respectively). By the latter part of the scenario period (2030-2050), remittances to the region as a whole increased to over 10%, in part due to increasing emigration arising from nationals seeking better economic opportunities outside the region, particularly given losses in the tourism and fisheries sectors due to environmental degradation. Another likely contribution to economic growth in the region during the scenario period is the proceeds of illegal activities (e.g. the drug trade and money laundering). However, with the unpredictability of these activities and the increasing trend towards legalisation of some illegal substances, the economic implications of illegal activity are not explicitly addressed in this report.

For all CLME+ countries, the drivers of economic growth in the BaU scenario are primarily those external factors influencing global economic growth. Ironically, increased GDP for some CLME+ countries arose from infrastructure rebuilding following climate related natural disasters. However, by 2050, this has contributed to an increase in borrowing by countries in the region and growth in public debt to as much as 65% of GDP (with some countries exceeding 100% of GDP), counteracting the productive expenditure needed to stimulate growth (UNEP, 2016). Growth initially was also a result of a significant rise in tourism related businesses up to 2030 (CDB, 2017).

Over the period 2015-2030, marine-based tourism was a major contributor to the economy in many Caribbean countries. The World Travel and Tourism Council showed total contribution of travel and tourism for the region in 2016 to be 14.9% of GDP, with many of the island states being much more dependent than the regional average. For example, 30.3% of GDP for Jamaica, 39.9% for Barbados, 44.8% for The Bahamas, 60.4% for Antigua & Barbuda and for Aruba, a staggering 88.4% (WTTC, 2017). By 2024, economic benefits derived from coastal tourism among island states and territories in the region reached some US $70B, an increase of close to 50% compared to the 2012 (Patil et al., 2016). In addition to the importance of seafood to the industry, healthy marine ecosystems continued to be the major driver supporting this sector's growth during the 2015-2030 period (Barker 2002; Christie et al. 2015; Gopal et al. 2015). As noted by Barker, writing more than a decade before the start of the scenario period (2002):

> "The hallmarks of Caribbean tourism – living coral reefs, brightly-colored fish, clear water and clean sandy beaches – are components of healthy marine ecosystems that are easily damaged or destroyed by the 'tourism development' activities that depend on them. These marine ecosystems extend to and include seagrass beds, muddy estuaries and mangrove forests, which often experience 'collateral damage' from tourist-oriented residential and commercial development along prime beaches as they are cleared for use or polluted by untreated municipal wastes".

However, this growth in tourism was offset by increasing import costs and by 2030, the sector declined to 2015 levels. This was due to changes in demand for the region's touristic products due to declining ecosystem health as warned by Barker (2002). This led to significant economic hardship for tourism dependent countries.

The socio-political factors influencing the period of the BaU scenario were external as well as internal to the CLME+ region. Externally, US policies towards Caribbean countries have not changed. However, impacts of volatile global financial markets and fluctuations in energy prices remains high in 2050. On the positive side, the region continues as a "low" terrorism area, initially supporting increased visitorship to the region from across the world. Notably, growth in disposable income in Asia and China contributed to the increase in the region's tourism sector between 2015 and 2030. Additionally, with growing global awareness of the need to address climate change impacts and the existing commitments to the Convention on Biological Diversity, CLME+ countries increased the percentage of protected areas over the 2015 level.

Likewise, given the voluntary commitments made in 2015 to achieve the SDGs, countries have been under growing pressure to demonstrate how they are meeting the SDGs, particularly SDG 14, but progress has been minimal, other than the increase in marine protected areas.

Internal to the region, income inequality (GINI coefficient) remains about the same across the region under the BaU scenario to 2050 (CARSEA, 2007). However, within some countries, inequality has increased. This has led to increasing social tension and a demonstrated lack of basic human rights at individual and country levels (UNEP, 2016). Despite growth in some lower paying touristic jobs, there is double digit unemployment across countries in the CLME+ region, with youth and women being most affected. More significantly, growing corruption, institutional weakness and lack of financial resources continued to negatively impact capacity of governments to implement policies that would alleviate these internally-driven conditions. Overall, these social-political conditions have resulted in increasing risk to countries in the CLME+ region, exacerbated by ongoing macroeconomic instability, lack of competitiveness and limited human capital.

Institutional arrangements for management of shared living marine resources of the CLME+ region has not changed over the period of the BaU scenario. The key issues relating to fisheries, marine pollution and ecosystem degradation in the region's two LMEs continued to be addressed by the regional intergovernmental organisations (IGOs) that managed them in 2015; with limited *ad hoc* attempts at integration across their respective mandates. These IGOs (e.g. UNEP-CEP, FAO/WECAFC, CARICOM/CRFM, OECS, SICA/OSPESCA) continue to depend on their member countries to implement policies and enforce legislation aimed at addressing the key transboundary issues, but due to drivers discussed above, uptake by countries remains limited in 2050. Additionally, some countries, particularly SIDs have been increasingly unable to support IGOs that depend on them.[1] This scenario is also underpinned by a continued lack of meaningful regional economic integration and political will to deal with the key transboundary issues at a regional institutional level, despite earlier efforts on paper such as the Caribbean Sea Initiative. While there has been some progress at the subregional level such as the Eastern Caribbean Regional Ocean Policy (ECROP) of the Organisation of Eastern Caribbean States (OECS) and within the Central American Integration System (SICA), countries continue to view each other as competitors rather than partners within the CLME+ region.

Under the BaU scenario, regional level governance affecting the shared living marine resources within the CLME+ area has not evolved since 2015. The Interim Coordinating Mechanism (ICM) comprising eight regional IGOs that the CLME+ project supported in 2015 remains unresourced and exists largely in name with minimal *ad hoc* collaborative activity. Similarly, the ICM focused on fisheries and comprising FAO/WECAFC, CRFM and OSPESCA remains only on paper. Earlier efforts during 2015-2020 to create an RFMO resulted in limiting its area of competence to high seas fisheries not already covered by other arrangements, due to a lack of support from member countries. In 2050, the regional IGOs continue to operate as they did in 2015, with limited resources for their programmes and even less for integration.

[1] See the Sustainable Financing Mechanism report for additional details.

Limited involvement of the private sector in regional governance continues, despite its dependence on a healthy marine and coastal environment. 'Free ridership' in reaping the benefits that led to a degrading natural system continues and the resulting burden is transferred to those least able to afford it. Regional environmental degradation and pressure on natural resources continued to grow due to unsustainable forms of production and consumption (UNEP, 2016). For example, fish landings in the WECAFC area initially increased in response to growth in population and the tourism sector then, by 2050, they leveled off to about 2010 levels (UNEP, 2016). This decrease parallels the continuous decline in ecosystem health as measured by the fisheries depletion index (UNEP, 2016).

Over the period covered by the BaU scenario, advances in technology, primarily from outside of the CLME+ region, were applied slowly but steadily to address pollution and unsustainable fisheries (UNEP, 2016). However, by 2050, increasing access to and growing penetration of foreign technology has led to a decrease in ability to generate home-grown research and innovation within the region. Although the Convention on Biodiversity Beyond National Jurisdiction (BBNJ) came into force in 2025, intellectual property associated with genetic resources and traditional knowledge held by countries within the CLME+ region became part of the market economy, favouring multinationals (UNEP, 2016). In terms of energy, the countries are still depend heavily on oil and gas while there is a small but noticeable increase in alternative energy (wind and solar) by 2050.

Lastly, climate change impacts strongly influence the BaU scenario out to 2050. Low-lying countries in Central America and SIDS still have very limited response capacity to climate change impacts. There is continued exposure to flooding, sea level rise, intensified storms, ocean acidification and increases in sea temperatures. Coral coverage has declined in the Caribbean, from approximately 16% in 2011 to only 8% in 2050, negatively impacting marine biodiversity, tourism and fisheries. Additionally, natural barriers to storm surge and the provision of fish nursery areas that mangroves and other coastal ecosystems once provided have become virtually non-existent by 2050 (Blankespoor et al., 2017). Where these have been replaced by hard structures such as seawalls, revetments and other forms of technologically driven advancements, in many instances, they do nothing to compensate for the loss in habitat protection for juvenile fish, critical to the fisheries and themselves lead to further coastal erosion. Despite these negative impacts, the region experiences some improvements in the ability to address climate change impacts as well as increasing the coverage by marine protected areas. As a result, overall social vulnerability in the region is moderately improved.

3. How these trends relate to key transboundary issues in the CLME+ Region

Under the BaU scenario presented in this document, it is clear that despite some improvement on average in the region, overall environmental degradation has continued as have the challenges associated with addressing the key transboundary issues identified in the CLME Transboundary Diagnostic Analysis (CLME, 2011). This was foreshadowed in the CLME+ Project Document on *Catalysing Implementation of the Strategic Action Programme for the Sustainable*

Management of Shared Living Marine Resources in the Caribbean and North Brazil Shelf Large Marine Ecosystems (CLME 2013) which warned that:

- *critical fish stocks -economically and socially very important to the region- will not become sufficiently restored, and that Maximum Sustainable Yield (MSY) across relevant geographic ranges will not be achieved;*
- *the specific areas and/or total extension of key habitats and ecosystems that become protected, restored and well-managed under such a BaU scenario, will be insufficient to optimize the delivery of goods and services from sLMR in a sustainable and climate-resilient way.*

Following we elaborate on these initial observations by outlining how the expected trends have affected efforts to address the key CLME+ issues under this BaU scenario through 2050.

3.1 Unsustainable fishing

By 2050, the linkages and connections among the key drivers associated with the BaU scenario synergistically undermine efforts to restore critically important fish stocks. Additionally, the lack of resources to support coordinated efforts between regional fisheries organizations and the failure to establish an RFMO with a meaningful regional mandate (i.e. one that addressed fisheries both on the high seas and within EEZs of countries), exacerbated the consequences arising from the heavy social dependence of fishing to coastal communities within the CLME+ region. These factors put at risk the contribution fisheries was making at the beginning of the scenario period where the sector provided employment for approximately 116,000 persons and contributes between 0.32% and 2.3% of value added to GDP of CARICOM countries. At least 64,000 people were directly employed in small-scale fisheries and aquaculture at that time. Furthermore, if other industries such as boat construction, net repair and fish processing are added, the number of people employed in the CARICOM Region in the broad-based fisheries sector was estimated around 180,000 (CDB, 2018).

As a key overarching driver, climate change impacts on fish stocks due to rising temperatures and ocean acidification have led to shifts in species composition and community structure that negatively affect fisheries as an economic and socially-dependent activity across the region. With warming temperatures, new viral and other debilitating disease have at times impacted commercially important species such as lobster, reef fishes and their coral habitat. Likewise, by 2050, growing ocean acidification has affected the quality and quantity of lobster and other species dependent on a carbonate structure. Declines of the spiny lobster from almost 36,000 tonnes in 1999 down to 31,000 tonnes in 2015 (FAO 2017) continued throughout the scenario period impacting the economic and social contribution of this fishery to the 27 countries harvesting it. In the south-eastern Caribbean, the increasing incidence of sargassum has worsened and reduced catches of pelagic fishes especially flyingfish (Ramlogan *et al*., 2017). While no full valuation of the economic benefits of fisheries to the region has been undertaken, the added value of the flyingfish fishery to Barbados has been estimated to be 7.6 times the landed value (Mahon et al. 2007). As such, declines in landings have had significant social and economic consequences.

Over the period 2015-2030, the growing tourism sector and the rise in population increased the pressure to fish unsustainably. Given the social political conditions of the period, sectoral institutional setting and lack of a regional governance mechanism for ensuring coordination and collaboration across the region, these trends were accompanied by ongoing environmental degradation and a concomitant impact on fisheries.

In the latter half of the BaU scenario period, fishing pressure reduced as the tourism sector declined due to a reduction in the environmental quality of the touristic product offered by the region. With a harvest of 1.4 million tonnes in 2050 that is similar to what was landed in 2010 (UNEP, 2016), the number of fishers benefitting from the resource have decreased and levels of poverty among fishers have increased. This has led to increasing social justice issues, loss of livelihoods and increasing lack of food security for many coastal communities and urban centres within the region.

3.2 Marine Pollution

Under the BaU scenario, the most significant chronic contribution to marine pollution remains land-based sources, which mostly impact the nearshore environment. This has increased primarily from a growing urban population and inadequate sewerage to meet the rising demand in substantial parts of urban centres around the region. However, increasing economic growth from tourism during the first two decades of the BaU scenario has driven improvements in sewage treatment and has somewhat slowed the rate of deterioration of marine water quality from this land-based source. Continued use of fertilizers, herbicides and pesticides by the agricultural and tourism sectors, along with land clearing and efforts to diversity national economies, still contribute to declining marine water.

During the expansion of tourism phase (2015-2030), sources of marine-based pollution continued to be mainly from cruise ships. To support the growing demand from tourists due to the low terrorism threat in the region, an increase in the size and number of vessels occurred. Despite efforts to develop and implement a regional port reception facilities plan, the port state reception facilities in many of the countries, particularly the SIDs, have been inadequate to handle the growing amount of waste generated by these vessels. This has led to an increase in both legal and illegal disposal at sea. Challenges identified in 2018 remained unaddressed and include lack of information on volumes of ship-generated waste (SGW) that is actually received at port facilities. The absence of this data is due in part to: a lack of MARPOL implementation legislation throughout the region; the non-use of IMO or other advance notice documentation for the reception of SGW by maritime or port authorities; the absence of requirements for service providers/waste haulers to track their wastes from reception to final disposal; and, inadequate enforcement of any requirements that are in place pertaining to the management of SGWs (RAC/REMPEITC, 2018). In addition to cruise ships, the expansion of the Panama Canal at the start of BaU scenario resulted in an increased capacity for vessels transiting the Caribbean Sea from 5,000 twenty-foot equivalent units (TEUs) to 13,000 TEUs (UNEP, 2016), making the area one of the most heavily used for trans-shipment of cargo and by cruise vessels.

The global demand for trade and advances in technology have led to ships having even greater capacity by 2050, leading to an increase in the threat of marine pollution from these sources within the CLME+ region, particularly from ballast water discharges.

The most significant acute threats to marine pollution in certain parts of the region remain the potential for a blowout at an offshore hydrocarbon production facility and an accident at sea from ships carrying noxious substances, especially during hurricane season and given the strong currents and narrow passages between islands.

Both chronic and acute contamination and the potential for significant accidents remain major sources of concern for the marine ecosystems of the region given the amount of oil and gas exploration, extraction and transportation along the north coast of South America (initially from Venezuela as the third largest producer of oil and gas in the western hemisphere, and Trinidad &Tobago) and in the Gulf of Mexico where Mexico and the US rank as the fourth and second largest oil and gas producer in the western hemisphere (CIA, 2017). With increasing discoveries within the EEZ of some countries in the Caribbean and North Brazil Shelf LMEs coupled with the need for these countries to benefit economically from this resource, minimizing environmental requirements to attract investment have resulted in an increase in threats to the marine environment.

By 2050, there are still significant gaps in the data needed for a comprehensive understanding of the state of marine water quality in the CLME+ region, despite continuing efforts to address these gaps in the State of Convention Area Reports (SOCAR) by UNEP/CEP. The Ocean Health Index for the EEZs of countries in the region continues to decrease from the estimates provided by Halpern et al., (2012) at the beginning of the BaU scenario period. At that time, out of a possible score of 100, the “Clean Waters” scores ranged from around 55 (Caribbean countries) to 64 (Central American countries) (UNEP, 2016).

3.3 Ecosystem Degradation

Supporting the need for economic growth from tourism, providing shelter for a growing regional population and migration to urban centres all have led to a decrease in the availability of coastal habitat throughout the region under the BaU scenario. Commitments to multilateral environmental agreements have increased marine protected area coverage in the region. However, ongoing effects of climate change and a lack of an integrated regional approach to ecosystem-based management make the region increasingly susceptible to ecosystem degradation, leading to a decrease in overall ecosystem health.

By 2050, countries in the region dependent on ‘sun, sand and sea’ tourism are particularly impacted by coral cover decrease, with an estimated decline in healthy reefs by some 50% (UNEP, 2016). Loss of mangroves and other natural systems from coastal development pressures (Blankenspoor 2017), invasive species introductions from both marine and land-based sources, along with increasing incidents of disease to LMRs have all contributed to a loss

in both marine and terrestrial biodiversity, many of the former being important commercial species.

4. Consequences of the 'Business as Usual' Scenario

In this BaU scenario, an integrated regional policy coordination mechanism to foster marine ecosystem-based management is lacking. The CLME+ region has continued to give priority to improving economic growth while trading off social and environmental objectives over the 2015 – 2050 period. Policies have been mostly reactive with each country deciding how best to meet its national priorities despite consequences to neighbouring states and the region as a whole. Consequently, economic growth instability has increased over time as has the inability to respond to unforeseen, externally driven global events, internally driven social political conditions and the consequences of more frequent catastrophic natural disasters. Major risks and benefits for the region in the period covered by the BaU scenario are highlighted in Table 3.

Table 3. Potential Risks and Benefits of 'Business as Usual' Scenario – 2015-2050

Risks arising from BaU Scenario	BaU Scenario Benefits
• Inability to meet SAP goals and objectives • Initial increase in tourism (2015-2030) followed by significant decline in the sector (2030-2050) as environmental quality degrades • Erosion of local/regional biodiversity; decline in coral reefs by 50% • Decline in fisheries to 2010 levels by 2050 • Vulnerable to global economic collapse • Lower paying jobs result in human capital being under-developed and under-used • Local crime limits interest of tourists to the region, significantly affecting the tourism sector • Low capacity to respond to increases in natural disasters significantly affect the tourism sector in the region • Pressure on nearshore fisheries leading to increasing conflicts • Greater dependency on world markets for food production, especially among SIDs • Tendency to lower environmental standards where they conflict with investment opportunities, as countries pursue efforts to diversify their economic base • Growing inequities/polarisation leading to increased social unrest • Increasing dependence on foreign technology • Growing inability among member countries, particularly SIDs to meet financial commitments to regional IGOs, leading to erosion in ability of IGOs to meet stated mandates • Less regional cooperation leading to increase in negative transboundary impacts and increased tension among countries • Overall loss in adaptive capacity and resilience	• Creation of employment, albeit lower paying jobs, due to initial growth in tourism sector (2015-2030) • Outside investment stimulates improvement in sewage treatment, potable water quality, roads, etc. • Interest to visit the region from outsiders stimulates policies to address local crime • Improved quality standards • Improved protection of a number of ecological resources and habitats through Marine Protected Areas.

(Source: Adapted from CarSea, 2007 and UNEP, 2016).

4.1 Challenges in meeting CLME+ SAP Goals and Objectives

Achieving the CLME+ SAP Goals and Objectives under the BaU scenario have presented substantial challenges. The long-term goal of "*healthy reef, pelagic and continental shelf ecosystems contributing to human well-being, socio-economic development, food security and enhanced livelihoods from goods and services provided by the ecosystems*" (Debels *et a*l., 2017), was to be achieved through a number of strategies and sub-strategies. Each of these had associated targets and actions that focused on the need to change the approach being followed in 2015, if the root causes of the key transboundary issues of unsustainable fishing, marine pollution and ecosystem degradation were to be meaningfully addressed (CLME, 2013). Table 4 highlights the three key strategies critical to improving the weak governance regime that existed within the region in 2015.

With funding provided by the GEF to help the region initiate these changes, progress was made between 2015 and 2020 towards improved regional governance. However, when GEF funding ended in 2020, these initial gains were reversed and after 2025 there was no mechanism for revision of the SAP, which subsequently ceased to exist. Regional IGOs continued to focus on their mandated programmes and there was a return to fragmented ocean governance in the CLME+ region. This led to the trends and conditions described in this scenario out to 2050.

Table 4. The three regional-level strategies (S) to be pursued to give effect to the EcoQOs, SBOs and strategic directions for sLMR Governance in the CLME+

Regional Level Strategy	Approach
S1: Enhance the regional governance arrangements for the protection of the marine environment	The focus of the 11 priority actions is institutional strengthening to ensure that: all CLME+ countries are involved; the mandates of organisations adequately cover this issue; they have the capacity to engage civil society and can actively address compliance and enforcement.
S2: Enhance the regional governance arrangements for sustainable fisheries	These 14 actions will be pursued in a phased approach starting with establishing an interim arrangement for sustainable fisheries, developing close cooperation and interaction for harmonized management measures among the fisheries bodies in the region and examining the feasibility of an RFMO. Small scale fisheries will receive special attention with an emphasis on poverty reduction and alternative livelihoods.
S3: Establish and operationalise a regional policy coordination mechanism for governance of the marine environment, with initial focus on shared living marine resources	The 7 actions represent a phased approach that begins with Regional Fisheries Bodies and Regional Environmental Bodies establishing an Interim Coordination Mechanism in the short-term. Subsequently, focus will be on evaluating options for a long-term coordinating mechanism, including sustainable financing, and ultimately operationalizing the preferred option. Supporting actions include a regional policy for data and information sharing, and a regional monitoring and reporting mechanism for marine resources.

(Source: Adapted from Debels *et al.,* 2017)

This scenario sees the region continuing its demand for ecosystem goods and services to support an initial growing tourism sector while at the same time, minimising environmental sustainability in favour of foreign economic investment in an effort to diversify their economies.

With a lack of a long-term sustainable financing mechanism and little to no long-term commitment to regional collaboration to address key transboundary issues, coastal and marine ecosystems continued to decline leading to missed opportunities for achieving the CLME+ goals and objectives. Given the differing financial, human and technical capacities of the countries within the region, there is growing disparity among the countries as national governments focus less on regional solutions and give priority to national goals. By 2050, this perspective ultimately resulted in ongoing, negative transboundary impacts and associated political tensions for the region.

4.2 Challenges in achieving Sustainable Development Goals 14 and 13

In the BaU scenario, the countries in the CLME+ region have made little real progress towards achieving the Sustainable Development Goals they had committed to in 2015 (UN, 2015). Given the complexity of the region, progress on a country basis has been variable. However, the region has fallen short of the targets set for Goal 14 (focusing on the ocean) and Goal 13 (focusing on climate change). This is attributed to the lack of an integrated approach to regional ocean governance as well as the other consequences resulting from the connected nature of the key drivers underpinning the BaU scenario.

Specifically with respect to Goal 14: *Conserve and sustainably use the oceans, seas and marine resources for sustainable development,* key targets aimed at the conservation and sustainable management of marine and coastal ecosystems (Target 14.2), and increasing economic benefits to SIDs from sustainable use of marine resources, including though sustainable management of tourism (Target 14.7), fall short even by 2050. While the region can take pride in conserving more than 10% of coastal and marine areas, consistent with national and international law (Target 14.5), the level of protection is demonstrably inadequate to overcome the exacerbating and synergistic effects of other key drivers. This has led to increasing social tension as some segments of the population lose access to once lucrative fishing areas while other segments benefit from other forms of economic activity. Key among these is the expansion of coastal and near-shore development, despite its detrimental impacts on natural ecosystems and contribution to increasing levels of marine pollution.

Regarding SDG 13: T*ake urgent action to combat climate change and its impacts,* the limited capacity of countries in the region, particularly SIDs, have made it difficult to achieve this goal. This is influenced by the high financial cost and dependence on foreign technologies associated with taking action, low levels of indigenous investment, innovation and research and development, as well as little attention being paid to some critical aspects of climate change such as ocean acidification (Fanning and Mahon, 2018). Additionally, there is a sense within the region that, despite an increase in energy emissions to support economic growth, overall the region still has the lowest carbon output of any region through 2050 (UNEP, 2016) and as such, could do little to mitigate climate change. However, with growing international pressure to stabilize emissions (suggested at 2 tonnes per capita), the region has struggled with the cost of

tens of billions of dollars needed to meet globally agreed abatement requirements by 2050 (UNEP, 2016).

5. Conclusion

This scenario sees the region continuing its demand for ecosystem goods and services to support an initial growing tourism sector while at the same time, minimising environmental sustainability in favour of foreign economic investment in an effort to diversify their economies. With a lack of a long-term sustainable financing mechanism and little to no long-term commitment to regional collaboration to address key transboundary issues, coastal and marine ecosystems continued to decline leading to missed opportunities for achieving the CLME+ goals and objectives. Likewise, in the period used for the BaU scenario (2015-2050), the countries in the CLME+ region have made little real progress towards achieving the Sustainable Development Goals they committed to in 2015, with the exception of meeting and exceeding the target for marine protected areas. Given the differing financial, human and technical capacities of the countries within the region, there is growing disparity among the countries as national governments focus less on regional solutions and give priority to national goals. By 2050, this perspective ultimately resulted in ongoing, negative transboundary impacts and associated political tensions for the region.

Under the BaU scenario, in the absence of a regional coordinating mechanism, there is limited opportunity to achieve the goals and objectives of the CLME+ SAP. As discussed above, marine ecosystems and living marine resources are increasingly threatened, degraded or destroyed by human activities, reducing/eliminating their ability to provide ecosystem goods and services so essential to the well-being of people in the region. There is failure to address the key transboundary issues of overfishing, marine pollution and ecosystem degradation. The ability to respond to unpredictable changes in these issues and to be resilient is compromised. This scenario has been driven by trends in demographic changes, economic growth, social political conditions, institutional setting, regional governance, technology and climate change.

References

Adger, W. N., Brown, K., Cervigni, R., and Moran, D. (1995). Total economic value of forests in Mexico. Ambio, 286-296

Badola, R., and Hussain, S. A. (2005). Valuing ecosystem functions: an empirical study on the storm protection function of Bhitarkanika mangrove ecosystem, India. Environmental Conservation, 32(01), 85-92

Barker, D. R. (2002). Biodiversity Conservation in the Wider Caribbean Region. Review of European, Comparative & International Environmental Law, 11:74-83.

Barnes-Mauthe, M., Oleson, K. L., and Zafindrasilivonona, B. (2013). The total economic value of small-scale fisheries with a characterization of post-landing trends: An application in Madagascar with global relevance. Fisheries Research, 147, 175-185

Blankespoor, B., S. Dasgupta, and Lange, G-M. (2017). Mangroves as a protection from storm surges in a changing climate. Ambio 46: 478–491, DOI 10.1007/s13280-016-0838-x

Budiman, A., and Connor, P. (2018). Migrants from Latin America and the Caribbean sent a record amount of money to their home countries in 2016. PEW Research Center, Washington, DC. Available at http://pewrsr.ch/2rxZnEY

Caribbean Development Bank (CDB). (2017). 2017 Caribbean Economic Review and 2018 Outlook. Available at http://www.caribank.org/publications/featured-publications/2017-caribbean-economic-review-2018-outlook

Caribbean Development Bank (CDB). (2018). Financing the Blue Economy: A Caribbean Development Opportunity. Available at http://issuu.com/caribank/docs/financing_the_blue_economy-_a_carib?e=21431045/61831833

CARSEA. (2007). Caribbean Sea Ecosystem Assessment (CARSEA). A sub-global component of the Millennium Ecosystem Assessment (MA), J. Agard, A. Cropper, K. Garcia, eds., Caribbean Marine Studies, Special Edition, 2007. Available at http://www.cep.unep.org/publications-and-resources/databases/document-database/other/caribbean-sea-assessment-report-2007.pdf/view

Christie, M., K. Remoundou, E. Siwicka and Wainwright, W. (2015). Valuing marine and coastal ecosystem service benefits: case study of St Vincent and the Grenadines' proposed marine protected areas. Ecosystem Services, 11, 115-127.

CLME Project. (2011). Caribbean Large Marine Ecosystem regional transboundary diagnostic analysis. The UNDP/GEF Caribbean Large Marine Ecosystem and Adjacent Areas (CLME) Project, Cartagena, Colombia, 138 p.

CLME Project. (2013). CLME+ Catalysing Implementation of the Strategic Action Programme for the Sustainable Management of shared Living Marine Resources in the Caribbean and

North Brazil Shelf Large Marine Ecosystems The UNDP/GEF Caribbean Large Marine Ecosystem and Adjacent Areas (CLME) Project, Cartagena, Colombia, 123 p.

Debels, P., Fanning, L., Mahon, R., McConney, P., Walker, L., Bahri, T., Haughton, M., McDonald, K., Perez, M., Singh-Renton, S. and Toro, C. (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.

Fanning, L., and Mahon R. (2017). Implementing the Ocean SDG in the Wider Caribbean: state of play and possible ways forward. IASS, IDDRI, TMG.

Fanning, L., Mahon, R., McConney, P., Angulo, J., Burrows, F., Chakalall, B., Gil, D., Haughton, M., Heileman, S., Martinez, S., Ostine, L., Oviedo, A., Parsons, S., Phillips, T., Santizo Arroya, C., Simmons, B., and Toro C. (2007). A large marine ecosystem governance framework. Marine Policy 31: 434–443.

Gopal, S., L. Kaufman, V. Pasquarella, M. Ribera, C. Holden, B. Shank and Joshua, P. (2015). Modeling Coastal and Marine Environmental Risks in Belize: the Marine Integrated Decision Analysis System (MIDAS). Coastal Management, 43(3): 217-237.

Halpern, B.S., Longo, C., Hardy, D., McLeod, K.L., Samhouri, J.F., Katona, S.K., Kleisner, K., Lester, S.E., O'Leary, J., Ranelletti, M. and Rosenberg, A.A. (2012). An index to assess the health and benefits of the global ocean. Nature, 488(7413): 615-620.

Hargreaves-Allen, V. (2010). The Economic Valuation of the Natural Resources of Andros. *Conservation Strategy Fund*.

Mahon, R., Fanning, L., and McConney, P. (2011). CLME TDA update for fisheries ecosystems: governance issues. The UNDP/GEF Caribbean Large Marine Ecosystem and Adjacent Areas (CLME) Project, Cartagena, Colombia, 113 p.

Mahon, R., Parker, C., Sinckler, T., Willoughby, S., and Johnson J. (2007). The value of Barbados' fisheries: a preliminary assessment. Gulf and Caribbean Fisheries Institute 58: 88-92.

O'Mahoney, J., Simes, R., Redhill, D., Heaton, K., Atkinson, C., Hayward, E., and Nguyen, M. (2017). At what price? The economic, social and icon value of the Great Barrier Reef. DeLoitte Access Economics.

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.

Ramlogan, N.R., P. McConney and Oxenford, H.A. (2017). Socio-economic impacts of Sargassum influx events on the fishery sector of Barbados. Centre for Resource Management and Environmental Studies, the University of the West Indies, Cave Hill Campus, Barbados. CERMES Technical Report No. 81: 86pp.

Regional Activity Centre/ Regional Marine Pollution Emergency Information and Training Centre – Wider Caribbean (RAC/REMPEITC). (2018). Draft Feasibility study on the Development

of a Regional Reception Facilities Plan for the Small Island Developing States (SIDS) of the Wider Caribbean Region (WCR).

Schuhmann, P. W., and Mahon, R. (2015). The valuation of marine ecosystem goods and services in the Caribbean: A literature review and framework for future valuation efforts. Ecosystem Services, 11, 56-66.

Stoeckl, N., Hicks, C. C., Mills, M., Fabricius, K., Esparon, M., Kroon, F., and Costanza, R. (2011). The economic value of ecosystem services in the GBR: our state of knowledge. Annals of the New York Academy of Sciences, 1219(1), 113-133.

Turpie, J. K., Heydenrych, B. J., and Lamberth, S. J. (2003). Economic value of terrestrial and marine biodiversity in the Cape Floristic Region: implications for defining effective and socially optimal conservation strategies. Biological Conservation, 112(1-2), 233-251.

United Nations. (2015). Sustainable development Goals. Available at https://www.un.org/sustainabledevelopment/sustainable-development-goals/

UNEP. (2016). GEO-6 Regional Assessment for Latin America and the Caribbean. United Nations Environment Programme, Nairobi, Kenya. Available at http://web.unep.org/geo/assessments/regional-assessments/regional-assessment-latin-america-and-caribbean

Waite, R., Kushner, B., Jungwiwattanaporn, M., Gray, E., and Burke, L. (2015). Use of coastal economic valuation in decision making in the Caribbean: enabling conditions and lessons learned. Ecosystem Services, 11, 45-55.

Wattage, P., and Mardle, S. (2008). Total economic value of wetland conservation in Sri Lanka identifying use and non-use values. Wetlands Ecology and Management, 16(5), 359-369.

WECAFC. (2017). Review of the State of Fisheries in FAO Area 31. Eight Session of the Scientific Advisory Group. WECAFC/SAG/VIII/2017/3

World Travel and Tourism Council (WTTC). (2017). Travel and Tourism Economic Impact Caribbean. Available at https://www.wttc.org/-/media/files/reports/economic-impact-research/regions-2017/caribbean2017.pdf