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REGIONAL NUTRIENTS STRATEGY AND ACTION PLAN CONCEPT PAPER

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Working Draft: Regional Nutrient Reduction Strategy (RNRS) for the Wider Caribbean Region and North Brazil Shelf

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1.0 Global Context

The issue of nutrient pollution in the form of excess nitrogen and phosphorus flows to the marine environment has gradually gained prominence given the growing ecological and socio-economic impacts in coastal and marine ecosystems. An estimated 80% of marine pollution originates from land-based sources that include wastewater, nutrients and sediment loadings. Deoxygenation and hypoxia in coastal waters due to land-based pollution has increased exponentially since the 1960s and is estimated to cover an area of about 245,000 km^2 worldwide (UN DOALOS, 2016)[1] with over 700 eutrophic and hypoxic coastal systems worldwide (Diaz et al., 2010). Of these, at least 169 coastal areas are considered hypoxic, with dead zones especially prevalent in the seas around South East Asia, Europe and eastern North America. According to the Transboundary Assessment Programme (TWAP)[2] of the 63 large marine ecosystems (LMEs) assessed under the Programme, some 16% are in the 'high' or 'highest' risk categories for coastal eutrophication. They are mainly in Western Europe and southern and eastern Asia, and the Gulf of Mexico (IOC-UNESCO and UNEP, 2016).

Excess nutrients, sediments and waste from agriculture and untreated sewage are common in all oceans. These have increased roughly threefold from pre-industrial levels, creating about 500 separate low-oxygen "dead zones" that, by 2010, covered 245,000 square kilometers of ocean (Doney 2010). Some of these zones are within the Wider Caribbean Region (WCR) (Altieri et al. 2017). Solid waste, sedimentation, and toxic by-products from industries, including mining and oil exploration, are also contributing to the deterioration of marine ecosystems, in synergy with warming waters and acidification of oceans due to climate change.

Global trends point to continued deterioration in terms of nutrient pollution, with regions of greatest concern being South East Asia, Europe and eastern North America (UNEP 2012)[3]. Global river nutrient export has increased by approximately 15% since 1970, with South Asia accounting for at least half of the increase (Seitzinger et al. 2010; UNEP 2012). Based on current trends, it is estimated that the risk of coastal eutrophication will increase in just under one-quarter of large marine ecosystems by 2050. Most of the projected increase will be in LMEs in southern and eastern Asia, with some increase also in LMEs in South America and Africa. Only two large marine ecosystems (the Iberian Coastal and Northeast US Continental Shelf) are projected to lower their coastal eutrophication risk by 2050 (IOC-UNESCO and UNEP (2016).

There are noted adverse global environmental outcomes associated with poor management of nutrient and wastewater discharges. Fluvial phosphorus transport from agricultural land, and release of phosphorus-rich animal and human wastewater into the environment, have degraded lakes, rivers, reservoirs and coastal waters with excess phosphorus, causing costly damages. In the case of nitrogen, a substantial amount of nitrogen

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[1] First Global Integrated Marine Assessment - First World Ocean Assessment (UN DOALOS, 2016) http://www.un.org/Depts/los/global_reporting/WOA_RegProcess.htm
[2] IOC-UNESCO and UNEP (2016) GEF- Transboundary Waters Assessment Programme http://www.geftwap.org/
[3] Global Environment Outlook: Environment for the future we want (GEO-5) (UNEP, 2012) http://web.unep.org/geo/sites/unep.org.geo/files/documents/geo5_report_full_en_0.pdf

entering agricultural soils, both by fertilization and biological fixation, is lost through surface run-off, leaching into groundwater and emissions the atmosphere, according to the Our Nutrient World (2013) report[4]. Nitrogen-based fertilizers are also the source of gaseous reactive nitrogen emissions. Globally, synthetic fertilizer and agricultural crops account for 12% of total ammonia emission and FAO predictions indicate that global nitrous oxide (N_2O) emissions from fertilizers will increase to between 35 and 60% by 2030.

The Global Partnership on Nutrient Management (GPNM) was launched in 2009 to address the global challenges faced by the mismanagement of nutrients and nutrient over-enrichment. It is a global partnership of governments, scientists, policy makers, private sector, NGOs and international organizations. It responds to the 'nutrient challenge' – how to reduce the amount of excess nutrients in the global environment consistent with global development. The GPNM reflects a need for strategic, global advocacy to trigger governments and stakeholders in moving towards more efficient and effective nitrogen and phosphorous use and lower losses associated with human activities. It provides a platform for governments, UN agencies, scientists and the private sector to forge a common agenda, mainstreaming best practices and integrated assessments, so that policy and investment responses/options are effectively 'nutrient proofed'.

The GPNM also provides a space where countries and other stakeholders can forge more co-operative work across the variety of international and regional fora and agencies dealing with nutrients, including the importance of impact assessment work. The work of the GPNM is advanced by a Steering Committee, a sub-set of the Partnership members and is supported by the GPA Unit of the Marine and Coastal Ecosystems Branch of the Division of Environmental Policy Implementation of UN Environment, which serves as the Secretariat to the Steering Committee.

2.0 Relationships to the SDGs other relevant frameworks

The nutrients reduction strategy will support global commitments relating to the maintenance of the health of ecosystems. Aichi Target 8 of the UN Convention on the Protection of Biological Diversity states "*By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.*"

With respect to Sustainable Development Goal 6: "*Ensure availability and sustainable management of water and sanitation for all*" and its Target 6.3: "*By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally…*" is relevant in the context of minimizing excessive nutrient leakage to the environment from wastewater and agricultural runoff that can result in adverse environmental conditions and pollution.

Sustainable Development Goal 14: "*Conserve and sustainably use the oceans, seas and marine resources for sustainable development*" and its Target 14.1 "*By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution*" is directly related to addressing nutrient loading into the marine environment from land-based sources that include agricultural runoff (crop and livestock production), discharge of untreated domestic and industrial wastewater.

[4] Our Nutrient World (Sutton el al., 2013) on behalf of Global Partnership on Nutrient Management and the International Nitrogen Initiative http://nutrientchallenge.org/document/our-nutrient-world

The second session of the UN Environment Assembly (UNEA2), adopted Resolution 2/12 in 2016 on sustainable coral reefs management, which encourages governments to formulate, adopt and implement integrated, ecosystem-based and comprehensive approaches for the sustainable management of coral reefs. The resolution calls on countries to undertake the priority actions to achieve Aichi Target 10 in CBD decision XII/23, which includes implementation of watershed management policies encompassing reforestation; erosion control; runoff reduction; sustainable agriculture and mining; reduction of pesticides, herbicides, fertilizer and other agrochemical use; and wastewater management and treatment.

The resolution also called on the Executive Director, UN Environment, within available resources and in cooperation with Governments and stakeholders in a position to do so, to strengthen capacity-building, knowledge transfer and the development of relevant planning tools to avoid, minimize and mitigate the adverse impacts of climate change and human-based threats on coral reefs and related ecosystems, as well as to support the improvement and maintaining of the resilience of coral reefs and related ecosystems.

At the third session of the UN Environment Assembly (UNEA3) the adopted resolution on water pollution to protect and restore water-related ecosystems EA.3/L.27, invites Member States, in collaboration with relevant stakeholders, private sector, industry, academia, civil society, and the Global Programme of Action, including through encouraging platforms for wastewater and management of nutrients, to help prevent and mitigate water pollution and to protect and restore water-related ecosystems in order to minimize adverse impacts on human health and the environment.

The Our Ocean, Our Future: Call for Action[5] which emerged from the United Nations Conference to Support the Implementation of Sustainable Development Goal 14 of the 2030 Agenda, that was held in New York in June 2017, called on stakeholders to take urgent actions to develop and implement effective adaptation and mitigation measures that will enhance resilience of ecosystems including coral reefs to effects of climate change, and accelerate actions to prevent and significantly reduce marine pollution of all kinds, particularly from land-based activities.

3.0 Regional Context

The Caribbean Sea is a natural resource of great importance to the Wider Caribbean Region (WCR). It is home to invaluable coastal and marine biodiversity including a diverse population of endemic and endangered species.

The Caribbean Sea supports tourism, fisheries, maritime transportation, trade, and recreation. It forms the lifeblood of the peoples of the region and the basis for their economic and social development.

In 1981, the United Nations Environment Programme (UN Environment) developed the Caribbean Environment Programme (CEP). UN Environment CEP is now one of the oldest and most successful of the Global "Regional Seas Programmes".

Following the development of CEP, Governments established the region's only legally binding agreement for the protection of the Caribbean Sea. The Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region or Cartagena

[5] Our Ocean, Our Future: Call for Action https://oceanconference.un.org/callforaction

Convention, was adopted in 1983. It became legally binding in 1986 along with the Protocol concerning Co-operation in Combatting Oil Spills (Oil Spills Protocol).

Two additional technical Protocols or Agreements were developed for coastal and marine biodiversity (Specially Protected Areas and Wildlife – SPAW) and pollution (Land Based Sources of Marine Pollution – LBS). These were adopted in 1990 and 1999, and became legally binding/ entered into force in 2000 and 2010 respectively.

3.1 Cartagena Convention

The Cartagena Convention is the only regionally binding legal instrument for managing the use of the coastal and marine resources of the Caribbean Sea. The WCR, the geographic scope of the Convention or Convention Area, comprises the insular and coastal States and Territories with coasts on the Caribbean Sea and Gulf of Mexico, as well as waters of the Atlantic Ocean adjacent to these States and Territories. The Cartagena Convention covers twenty-eight member states and fourteen territories.

The obligations of the Convention reflect the region's environmental priorities including:

- pollution from ships;
- dumping of wastes at sea;
- land-based sources of pollution;
- sea-bed activities;
- airborne pollution;
- protection of rare or fragile ecosystems;
- protection of the habitats of depleted, threatened or endangered species.

The Cartagena Convention also provides a mechanism for the implementation of several Multilateral Environmental Agreements (MEAs) and other Global and Regional commitments such as the Sustainable Development Goals, and in particular Goal 6 on Oceans. This coordination ensures that programmes, projects and activities are implemented in an integrated manner and respond directly to the region's needs and priorities.

3.2 LBS/Pollution Protocol

The goal of the LBS Protocol is to control, prevent and reduce pollution from land-based sources and activities. Projects and activities assist Government to:

- establish effluent and emission limits for domestic wastewater;
- use appropriate pollution prevention technologies and practices;
- exchange scientific and technical information on pollution including cooperation in areas of planning, monitoring and research.

The Secretariat to the Cartagena Convention through its pollution sub-programme also coordinates projects and activities related to the LBS Protocol. This is achieved in partnership with two Regional Activity Centres which provide technical support. These are the Institute of Marine Affairs (IMA), hosted by the Government of Trinidad and Tobago, and the Centre of Engineering and Environmental Management of Coasts and Bays (CIMAB), hosted by the Government of Cuba.

3.3 Large Marine Ecosystems

The Wider Caribbean Region (WCR) covers three LMEs that together span across a vast marine area of 4.4 million km^2 from the Bahamas and the Florida Keys in the North to the Parnaiba River estuary in Brazil in the South and comprises a total of 26 Independent States and 18 Overseas Territories.

Eutrophication—the presence of excess levels of nutrients in water—creates "dead zones" and could pose the biggest single threat to the US$47 billion of revenue that the region's coastal tourism brings in annually. To survive, all living organisms require nutrients such as carbon, hydrogen, oxygen, nitrogen, phosphorus, and calcium. When these are in balance, healthy ecosystems are sustained. However, excess nutrients and sediments discharged into the marine environment through sewage and fertilizers from agriculture, as well as poor land used practices may lead to excessive growth of marine plants, known as an algal bloom. This limits the sunlight available and reduces the amount of oxygen in the water. Their hypoxic conditions may lead to coral bleaching and mortality, as well as shifts in coral abundance and distribution because some coral species are better able to tolerate these conditions (Altieri et al. 2017). This in turn affects fisheries and may be toxic to other marine life and humans. Local economies can feel pain not only from reduced fisheries but a fall-off in tourism caused by degraded reefs, contaminated beaches, and disease (UNEP-CEP).

The nutrient production of the Amazon Basin and the Amazon Continental Shelf and its influence on the WCR is yet poorly understood. Strong evidence of ecological and evolutionary connectivity between the Amazon shelf and the Caribbean Sea has already been published[2,3], but the impacts of the Amazon river plume carrying huge land-based nutrient and sediment loads to the WCR are still largely unknown and need future investigation.

The increase of nutrients and its environmental impacts are known from long term increase of Nitrogen and Phosphorus: plankton and macro-algae blooms, increase of the biological pump, reduction and even depletion of Oxygen leading to dead zones at the sea floor, among others. The *Sargassum* golden tides in recent years all around the WCR, including the Brazilian coast, reached impressive magnitude[5,6], and is an important example of the unpredictable consequences of global coastal eutrophication.

The GPNM launched a Caribbean Platform for nutrient management in May 2013 in Trinidad and Tobago. The purpose of the regional nutrient platform is to extend the reach of UN Environment and the GPNM down to the country level so as to drive policy and encourage implementation of best practices in nutrient management to minimize adverse impacts on the marine environment. The GPNM convened the second meeting of the platform between February 24 and 25, 2016 and was co-hosted by the Institute of Marine Affairs (IMA) of Trinidad and Tobago, and UN Environment's Caribbean Regional Coordinating Unit. The aim of this meeting was to continue to build awareness of nutrient management issues in the Caribbean, consider recommendations made from the first meeting of the platform, present a draft action plan, and seek out an appropriate institutional mechanism to support the work of the Platform within the region

The meeting: (i) agreed on a plan of action for the operationalization of the Caribbean Platform for Nutrient Management, (ii) agreed on mechanisms for mainstreaming and building sustainability for the Platform into existing frameworks, and (iii) identified immediate opportunities from ongoing or planned projects to support nutrient related activities in the region.[6]

The sources of nutrient contamination in the Amazon Shelf and the Caribbean Sea originate from both agro-chemical run -off and the discharge of untreated domestic wastewater. Work under the Global Wastewater Initiative (GW2I) and its Caribbean Platform for Wastewater Management together with the legal framework of the Cartagena Convention and its Protocols as well as the Strategic Action Programme of the UNDP GEF CLME+ project form a basis for cooperation and collaboration on this critical issue.

The development of the regional nutrient reduction strategy will be done in collaboration with a regional habitat restoration strategy to maximize on opportunities for synergies and the development of investment plans and business cases that demonstrate a comprehensive and integrated ecosystem-based management approach.

4.0 Nutrients and the Sargassum Invasion

In 2013, satellite data showed that there was a new area of origin north of the mouth of the Amazon River[7]. For about 18 months prior landing, back traces from the Sargassum sighting location were made using a high resolution numerical ocean current model which pointed to the North Equatorial Recirculation Region (NERR) off Brazil. (Johnson et al. 2013)[8]. Additionally, it is suggested that Sargassum consolidates in the NERR accumulation Regions and blooms there. Reports indicate that when the North Equatorial Counter Current broke down prior to 2011, Sargassum was 'flushed' from the NERR in spring of 2011. Further research suggests that Sargassum cycles are closely linked to a seasonal change of sea surface temperature, which results in the movement of Sargassum into the Eastern Caribbean and Northwest African coastlines.

It should be noted that surface waters of the NERR are warm and relatively rich in nutrient coming from the Congo River, equatorial upwelling, coastal upwelling off West Africa, the Amazon River, and from Northwest Africa's iron-rich dust (Johnson et al. 2013). This nutrient value may enhance the growth of Sargassum.

Maps of the sea surface temperature indicate that the NERR and the Accumulation Regions are the warmest regions in the Atlantic Ocean.

Presently, the exact conditions (chemical, physical, or biological drivers) responsible for the unusual bloom of seaweeds in the region are unclear. However, the probable causes for the proliferation of the massive seaweeds in recent times are suggested as follow:

- Warming and changing of ocean temperature due to global climate change.
- **Increased land-based nutrients, sediments and pollutants (which include nitrogen-heavy fertilizers and sewage waters) washing into the ocean water.**

[6] Global Partnership on Nutrient Management (GPNM) Second Regional Planning Meeting of the Caribbean Platform for Nutrient Management Workshop Proceedings February 24-25, 2016

[7] Gower, J., Young, E. & King, S. (2013): Satellite images suggest a new Sargassum source region in 2011, Remote Sensing Letters, 4:8, 764-773, DOI: 10.1080/2150704X.2013.796433

[8] Johnson, D.R., Franks, J.S., Ko, D.S., Moreno, P., Sanchez-Rubio G (2013): Sargassum Invasion of the Eastern Caribbean and West Africa 2011: Hypothesis. Proceedings of the GFCI 2012 annual meeting.

- **Flow of nutrients and sediments from the Congo River, Amazon River, Northwest Africa iron-rich dust.**
- Maritime traffic as a potential introduction vector.

In January 2018, unusually high amount of Sargassum was caught in satellite imagery in both the Caribbean and the central West Atlantic. Based on these observations and based on the connectivity between the two regions, in early February 2018 South Florida University generated and distributed our first 1-page Sargassum outlook bulletin for the Caribbean Sea, and predicted that 2018 would be a major bloom year for the Caribbean (USF)[9]

5.0 Nutrient Sources

5.1 Domestic Wastewater

Wastewater poses a significant threat to the region's development and the quality of life of its people. On average, about 85 percent of wastewater in the WCR goes untreated into the ocean. In the insular Caribbean, about 52 percent of households lack sewer connections and only 17 percent have acceptable collection and treatment systems. Small islands often have insufficient or no waste water treatment facilities at all. Domestic wastewater treatment rates are low for the entire region—on average, only 37 percent of the wastewater which flows into WCR waters from larger countries (excluding the United States) is treated. For island nations, these percentages are even lower, only 8 percent (mostly with primary treatment). While some countries have succeeded in raising the number of private wastewater treatments plants, supervision by state agencies is often poor and many of the plants are dysfunctional.

The high concentration of nutrients and sediments, primarily from inadequately treated sewage, has far-reaching impacts beyond coral reefs and could pose the biggest single threat to the US$47 billion of revenue that the region's coastal tourism brings in annually. Contamination of the coastal marine environment by sewage can lead to several infectious diseases (diarrhea, cholera, dysentery, typhoid, and hepatitis A) being transmitted to people swimming in marine waters or eating seafood.

Wastewater's main pollution impacts occur in coastal areas and bays close to urban centers that have low levels of wastewater treatment. Pathogens in the water pose significant hazards to the health of local people and visitors. Excess nutrients and sediments discharged into the marine environment through sewage can also cause human exposure to toxins associated with the resulting algae blooms. Moreover, sewage pollution poses serious threats to marine biodiversity, in particular coral reef ecosystems. After overfishing, high concentrations of nutrients, primarily from inadequately treated sewage, are the main cause of the widespread death of coral cover across the region (Jackson et al. 2014).

5.2 Agrochemical Run-off

Run-off from agricultural non-point sources, including fertilizers and pesticides, is a significant concern in the region. Countries in the WCR with large agriculture practices, such as Colombia and Costa Rica, use significantly higher levels of fertilizer per hectare of cultivated land than most countries, and much of this ends up in the Caribbean Sea rivers and watersheds. Most rivers in the WCR discharge significant sediment loads, straining biodiversity and

[9] http://optics.marine.usf.edu/projects/saws.html

shallow coastal waters. Sediment loads from the Meso-American region (Belize, Guatemala, Honduras, and part of Mexico's Yucatan Peninsula) contribute significant amounts of sediment to the WCR—374 million tons per year. Land-based activities including agriculture, forestry, urbanization, and mining contribute further to sedimentation and erosion.

6.0 Pollution/Nutrient Impacts on Ecosystem Goods and Services

Pollution can harm coastal and marine ecosystems in ways that are only now being documented and understood. For example, recent studies have indicated that plastic debris may increase the incidence of coral disease (Lamb et al. 2018), while eutrophication caused by agricultural run-off and sewage outflows has been linked to hypoxic zones in deeper water, resulting in coral bleaching at non-stressful temperatures (Altieri et al. 2017). In addition to nutrients, sewage outflows may contain freshwater, pathogens, endocrine disrupters, heavy metals, and suspended particles (Wear and Vega Thurber 2015). These have all been associated with coral mortality rises, disease, suppressed growth and reproduction, and coral bleaching (Wear and Vega Thurber 2015). Coral reef degradation from overfishing and pollution, meanwhile, increases under the impacts of climate change, such as bleaching, disease, acidification, and damage by stronger storms and hurricanes.

Seagrass beds and mangroves are also critical for the Caribbean's socioeconomic and environmental sustainability. Seagrass beds get little recognition for the contribution they make to key services, including fisheries (directly) and tourism (indirectly). The beds produce sand, protect beaches from wave action, and nurture wildlife, an important part of eco-tourism and fisheries (CARSEA 2007). Threats to seagrass beds in the Caribbean include pollution from nutrients, such as nitrogen, which causes excessive growth of epiphytes (other plants that grow on the grass blades). Nutrient pollution can also overstimulate the growth of the seagrass itself, leading to difficult decisions to clear beds that expand into previously clear sandy areas. High sediment loads have also harmed seagrass ecosystems, including in Cartagena Bay, where seagrass has practically disappeared (Restrepo et al. 2006).

7.0 Goal

Develop **Regional Nutrient Reduction Strategy and Action Plan** for the reduction of impacts from excess nutrient loads on priority marine ecosystems in the WCR.

8.0 Objectives of Regional Strategy and Action Plan

- To expand the baseline developed under the State of Convention Area (Pollution) report and identify most important "regionally relevant" pollution sources in terms of the transboundary nature of both sources and impacts;
- To identify high priority areas for further action based on most affected ecosystem types and most important socio-economic impacts;
- To contribute to leveraging of additional financing for on-ground investments in best practices to reduce the influx of land-based nutrient pollution to the Caribbean Large Marine and North Brazil Shelf Ecosystems;

- To contribute to relevant regional and global commitments including UNEA Resolutions on marine pollution, the Cartagena Convention for the Protection of the Marine Environment of the Wider Caribbean region and SDGs 6 and 14;
- To contribute to the operationalization of the Caribbean Platform for Nutrients Management;
- To facilitate knowledge exchange and transfer on best practices and case studies relating to nutrients and sediments management including South-South cooperation and GEF IW Learn;
- To support institutional, policy and legal reforms relating to nutrients and sediments management including supporting integrated, high-priority interventions to reduce discharge of untreated sewage, nutrients and sediments, and promote resource recovery of waste water;
- To facilitate building in-country capacity to access funding to implement best practices/ interventions for nutrient reduction;
- To assist in defining regional standards and criteria for nutrient discharges including regional indicators for monitoring nutrient discharges to the marine environment;
- To assist in defining new areas of research relating to nutrient pollution in the Wider Caribbean Region; and
- To assist in establishing the pollution baseline and informing the development of national and/or regional projects including those funded by the GEF.

9.0 Methodology

1. The development of the Nutrients Regional Reduction Strategy and Action Plan will be informed by the State of Pollution (SOCAR) and State of Habitat Reports, Research Strategies on Pollution, Fisheries and Habitat;
2. It will identify priorities to inform the preparation of a feasibility assessment report on the needs and opportunities for investments for the reduction of pollution with a focus on nutrients and sediment reduction, will form the basis for development of pre-feasibility assessment and selected investment plans.
3. The Scope of the strategy will be the Wider Caribbean Region including Gulf of Mexico, Caribbean and North Brazil Shelf Ecosystems. It corresponds to the marine environment of the Gulf of Mexico, the Caribbean Sea and the areas of the Atlantic Ocean adjacent thereto, south of 30 degrees north latitude and within 200 nautical miles of the Atlantic coasts of the States referred to in article 25 of the Convention.
4. Hot spots will be defined based on a sub-regional approach as delineated in earlier pollution reports by the Cartagena Convention Secretariat**.**
5. Review linkages with the Cartagena Convention and the LBS and SPAW Protocols, the Convention on Biological Diversity Aichi Biodiversity Targets, the 2030 Agenda for Sustainable Development specific goals and the overall cluster of Chemical and relevant Biodiversity Conventions;
6. LBS Regional Activity Centres (RACs – CIMAB and IMA) and partner organizations that form part of the Regional Activity Network (RAN) will take the lead in coordinating analysis for selected sub-regions.

7. Efforts will be made to maximize sharing of experiences, best practices, use of appropriate and cost-effective technologies within the Wider Caribbean Regional and through external networks such as the GPNM.

10.0 Results Framework for development of the Strategy

Outcome: Regional Nutrient Reduction Strategy (RNRS) included and implemented in mandates of regional multi-lateral environmental agreements related to marine ecosystem-based management (EBM) in the WCR and in agreement with the CLME+ project (Target O2.1)[10]		
Output	**Activity**	**TimeLine (to be completed during meeting)**
Task team established and active.	**Establishment of a technical task team** for the development of the Strategic Action Plan for nutrient reduction in the WCR.	
Baseline of Nutrient impacts in the WCR established and mapping of regionally relevant initiatives and organizations achieved.	**Establishment of the Baseline of Nutrient impacts** in the WCR and mapping of regionally relevant initiatives and organizations already dealing with nutrient issues under LBS Protocol or other agreements.	
Map of the geographical extension and transboundary characteristics of the most affected ecosystems and socio-economic impacts due to excessive nutrient input, available.	**Identification and mapping of the most affected ecosystems** and most important socio-economic impacts which require high-priority action to identify and characterize the transboundary nature of the regionally most relevant pollution sources.	
A map of essential monitoring points and a detailed nutrient monitoring protocol covering the WCR.	**Identification of a set of priority monitoring points** covering the WCR, and implementation of local infrastructure to enable continuous data collection and proposition of analytical standardized protocols (sequence and parameters to be analyzed at each sampling point/campaign). Parameters linked to the SDG14.1 indicator on nutrients.	
Local and national specific reports on the main nutrient sources. Identified types, concentration and temporal variations of nutrients in each country/region.	**Quantitative and qualitative identification and mapping** of land-based and offshore sources of nutrients through multidisciplinary approach (field sampling, fixed monitoring stations, remote sensing).	

[10] http://www.clmeproject.org/sap-overview/

Output	**Activity**	**TimeLine (to be completed during meeting)**
An integrated nutrient Databank available for the WCR countries.	**Creation of an integrated databank and on-line platform** for nutrient issues and related environmental variables - time-series for the WCR countries linked to the Caribbean NEWS model. This should include an assessment and compilaiton of the most appropriate technologies / best practices for addressing nutrient pollution.	
Integrative strategy for nutrient reduction and policies, as well as local and national management plans for nutrient monitoring and reduction (e.g. physic-chemical and biological treatments, recycling of nutrients) is available.	**Development** of a policies oriented **Regional Action Plan** according to the specific nutrient sources, concentrations and environmental risks (e.g. sewage treatment, industrial discharges, control of fertilizers and pesticides use, slash and burn agriculture, ecosystem restoration, aquaculture, recycling of biomass, among others).	
Investment Plan identifying the costs of high-priority actions to reduce nutrient pollution sources which cause substantial impacts on ecosystem goods and services available.	**Establishment of an investment plan** that outlines and costs high-priority actions to reduce nutrient pollution sources which cause substantial impacts on ecosystem goods and services of critical importance for human well-being and sustained socio-economic development Reach out to regional banks (CDB, WB or IDB) should be considered. Establishment of an action plan for knowledge transfer and empowerment of coastal communities, to proper act and be part of the RNRS.	
Feasible timeline for the adoption and implementation of the Regional Action Programme/Action Plan for nutrient monitoring and reduction available.	**Establishment of a feasible timeline** for the adoption and implementation of the regional Programme and Action Plan within the framework of the LBS Protocol and timelines for existing National Plans of Action for the Protection of the Marine Environment from Land-based Activities (NPAs).	

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Appendix 1

Regional Nutrients Reduction Strategy and Action Plan for the Wider Caribbean Region

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Annexes