UNITED NATIONS

EP

Distr. LIMITED

UNEP(DEPI)/CAR WG.38/5 Rev.1

21 February 2017

Original: ENGLISH

Ninth Meeting of the Contracting Parties (COP) to the Protocol Concerning Specially Protected Areas and Wildlife (SPAW) in the Wider Caribbean Region

Cayenne, French Guiana, 13 March 2017

GCRMN-CARIBBEAN GUIDELINES FOR INTEGRATED CORAL REEF MONITORING

For reasons of economy and the environment, Delegates are kindly requested to bring their copies of the Working and Information documents to the Meeting, and not to request additional copies.

*This document has been reproduced without formal editing.

GCRMN-CARIBBEAN GUIDELINES FOR INTEGRATED CORAL REEF MONITORING

INTRODUCTION:

1. The Global Coral Reef Monitoring Network (GCRMN) was established to support the International Coral Reef Initiative (ICRI)'s Call to Action and Framework for Action in 1994. The GCRMN worked through regional networks, comprising a variety of institutions, with the aim of strengthening the provision of the best available scientific information and communication on the status and trends of coral reef ecosystems, for their conservation and management. Since its inception the Wider Caribbean has been participating in GCRMN through the regional network and sub-regional nodes, coordinated through UNEP's Caribbean Environment Programme (CEP), which also serves as the regional focal point for ICRI.

2. The current reactivated GCRMN-Caribbean is an open network of coral reef scientists, managers and government expert representatives involved with coral reef monitoring in the region, led by a Steering Committee with the support of UNEP-CEP and the SPAW-RAC[1] as regional coordinator. Former participants of the sub-regional nodes also participate in the current network. Following the publication of the "Status and Trends of Caribbean Coral Reefs: 1970-2012"[2] report, UNEP-CEP has taken the initiative in 2014[3] to revitalize and strengthen coral reef monitoring, to ensure the collection of useful and accessible data that can effectively reveal the status and trends of the coral reefs in the region.

3. To achieve this objective, it is of prime importance to both increase and harmonize the monitoring efforts conducted across the region, starting from the field and the data collection. The GCRMN-Caribbean also recognizes the importance of using an integrated approach to coral reef monitoring and seeks to promote the systematic implementation of a monitoring of social science indicators in conjunction with biophysical monitoring, in order to enhance the ability to make connections and inferences between observed changes in the coral reef ecosystem quality and human and social parameters.

4. To serve this purposes, the GCRMN-Caribbean has agreed on regional technical coral reef biophysical monitoring guidelines[4] and integrated coral reef monitoring guidelines, presented hereby, to guide and support coral reef practitioners and relevant programmes. Those guidelines provides a multi-level framework for existing and developing monitoring programmes to contribute data that support a regional understanding of status and trends of Caribbean coral reefs.

---

1 Regional Activity Centre aimed at implementing the protocol concerning specially protected areas and wildlife in the Caribbean region (SPAW)

2 Jackson, J. B. C., M. K. Donovan, et al. (2014). Status and Trends of Caribbean Coral Reefs: 1970-2012. Gland, Switzerland, Global Coral Reef Monitoring Network, IUCN.

3 http://www.car-spaw-rac.org/?Caribbean-Coral-reef-monitoring,566

4 GCRMN-Caribbean Guidelines for coral reef biophysical monitoring, 12 October 2016, UNEP(DEPI)/CAR WG3.8/INF.17

5. Of particular importance, the GCRMN-Caribbean seeks to help reinforce existing national coral reef monitoring programmes and to support the development of new ones where needed. Caribbean Governments are invited to take part in this regional effort, by encouraging their relevant Departments and partners to use both GCRMN-Caribbean coral reef biophysical monitoring guidelines and integrated coral reef monitoring guidelines, as well as to request assistance and support from this expert network at their convenience.

6. The GCRMN-Caribbean contributes to, and coordinates with the global GCRMN and ICRI efforts, as well as UNEP's coral reefs global partnership and programme (UNEP(DEPI)/CAR WG.36/INF.10). The ICRI General Meeting was held in Paris, 2 - 4 November 2016 where UNEP-CEP represented through the SPAW-RAC, presented on the GCRMN-Caribbean efforts. The action plan of ICRI Secretariat (2016-2018) was adopted and includes the theme « *monitor the state of reefs in order to better manage them* ». The resolution on the global GCRMN was also adopted and « *encourages ICRI members to strengthen monitoring and reportg efforts at national and regional level, including by participation in and contributing data and information ot region GCRMN initiatives* ».

7. The development of the *Socio-economic Manual for Coral Reef Management*[5] (Bunce et al 2000) was intended to improve the understanding of the social and economic conditions, contexts and motivations associated with the use of coral reef ecosystems. In addition to this manual, regional guidelines were developed including one for the Caribbean titled; *Socio-economic Monitoring Guidelines for Coastal Managers in the Caribbean*[6] (SocMon Caribbean). These two publications should serve as key resource documents when implementing the recommended monitoring of the socioeconomic indicators discussed below. These publications were intended to parallel the biophysical manual (English et al 1997) and therefore this renewed commitment by the Caribbean GCRMN participants aims to foster integrated coral reef monitoring, both the biophysical and human impacts to coral reefs.

Recommended Socioeconomic Indicators for Monitoring

8. The GCRMN-Caribbean recommends that the socio-economic parameters described below to be collected in the first instance for each site willing to be part of the network, as "Tier 1" or basic Socio-economic Monitoring. This level of monitoring is required. In addition to the required (Tier 1) monitoring, the GCRMN-Caribbean highy recommends the implementation of more indepth socio-economic assessments/monitoring exercises once funding and capacity are available. This may include community level surveys, facilitated stakeholder discussions, other key informant interviews, group interactive methods and visualization techniques as part of the data collection process. Where possible, data collection should be linked to management goals and objectives and to decision-making questions of the respective agencies and stakeholders. This would represent what is called "Tier 2" or Advanced Socio-economic Monitoring.

Integrated Coral Reef Monitoring – Social Drivers of Ecological Change

9. For integrated monitoring , the express goal is to make explicit linkages between social science and biophysical coral reef monitoring parameters. This document introduces some categories that can be potentially linked to observed ecological changes. These categories can be considered drivers of coral reef ecosystem change and can be linked to major industries such as; Tourism, Fisheries, Agriculture, Other Industries, as well as Land Use and Demographic characteristics. Those parameters represent key drivers of coral reef ecosystem impacts. In addition, there are recommendations on conducting an analysis of governance indicators that can also have an impact on coral reef health and fisheries.

5 http://www.socmon.org/download.ashx?docid=58170
6 http://www.socmon.org/download.ashx?docid=58172

10. The industrial drivers of ecological change outlined in the following tables along with their relevant socio-economic variables or indicators. Methodological approaches for monitoring these indicators and using the data are described in more detail in the Caribbean Regional Guideline as well as the Socioeconomic Monitoring Manual described above. The rationale for organizing the drivers below is to help coral reef managers to help make the connections between observed changes in ecological parameters and some of the major sources of pressure on Caribbean reefs. It should be noted that these drivers may originate far away from the reefs themselves and as a result, primary (in person surveys) and secondary data collection methods may be required to collect information from persons who may live further inland from coral reefs and coastal areas. Secondary data collection (see page 17 Caribbean SocMon Guidelines) should be primarily collected from information that exists or has already been collected, analysed and published in various forms through various sources such as government agencies and institutions, national and local government offices, NGOs, Universities, websites etc. This information can be accessed from public records and industry profiles. In some cases, this information may have to be obtained through direct contact with key informants. In other cases, GIS representation of the data is the most appropriate way to display the information. Where possible, spatial representation of the key drivers mentioned below should be attempted. In the Caribbean, CERMES investigated the development of a practical method for integrating of SocMon and participatory GIS – “SocMon Spatial”. One of the main aims of SocMon Spatial is to offer alternative visualization of socio-economic data that may be more useful for decision-making (Wood 2013).

11. The tables below are organized by the major human drivers that can impact nearshore coastal resources.

Ecological Drivers of Change

Driver/Industry	**Tourism**
Indicator	Tourism Arrivals
Rationale	Coral reef locations/countries are often highly dependent on coastal tourism for their economies. The collection of annual statistics on visitor arrivals and other variables can provide an indication of volume of tourists per given period. This gross number of persons who can be identified to be engaged in coastal tourism can also be used as a proxy for pressure on coastal ecosystems including coral reefs. Examining annual trends of tourist arrivals can also be linked to the rate of tourism related infrastructure development occurring in specific locations thus leading to additional environmental pressure.
Data Collection Methods/Sources (Page 18 Caribbean SocMon Guideline)	1) National tourism statistics, government and tourism agencies. Caribbean Tourism Organisation (CTO) country profiles can be obtained from CTO and World Tourism Organisation (WTO) web resources. Where possible find data that disaggregates or highlights tourists who indicated the primary purpose of the vacation is beach/coastal 2) Annual hotel occupancy statistics and cruise ship arrival statistics *when possible, obtain these statistics for tourism entities that may be located close to the GCRMN sites/location. For example – number of hotel rooms in a 5 mile radius of the biophysical monitoring site OR in the upper watershed
Reporting Format/Units	1) Visitor Arrivals (stop over and cruise passengers) 2) Number of ship arrivals and capacity of vessels (or estimated annual volume of passengers) + number of hotel clients?
Periodicity	If possible, obtain annual statistics for national arrival numbers Collect every 4 years or timed to coincide with GCRMN Report preparation

Driver/Industry	**Tourism**
Indicator	Tourism Recreation
Rationale	The collection of information on various types of recreational activities that may occur on or near a particular reef location will give more specific information on reef related pressure. This can provide answers to questions on who is doing what, where and with what frequency. The activities/entities that would fall under this category include dive shops snorkel tours, kayaking, glass bottom boats and other watersports reef-related activities dependent on healthy coral reefs (for example a stable back reef environment).
Data Collection Methods/Sources (Page 18 SocMon Caribbean Guideline: Key Informant and Secondary Data)	1) Tourism Board, published lists of registered companies, chambers of commerce, web searches, tourism brochures. 2) In person visual census and field data collection. For the purpose of enumerating the number of relevant establishments/operators. If possible in person data collection can include information requests from these establishments. Suggested questionnaire formats could be provided. Information on annual/seasonal numbers of visitors, number of trips per week/month and locations most frequently accessed would be useful to collect. 3) Develop a sampling protocol for observing and counting the number of reef related activities occurring in a given location (randomize, stratify if necessary – eg 8 random visits over the course of one year)
Reporting Format/Units	1 Type of entity – e.g. Number of “Dive shops” 2 Quantity of operators – Number of Snorkeler Boats/Dive Boats 3 Where the activity occurs – General areas, GPS coordinates and maps (GIS) 4 Frequency, Number of trips/tours per day (will require proper sampling protocol for visual census)
Periodicity	Every 2 years

Driver/Industry	**Tourism**
Indicator	Tourism Infrastructure
Rationale	Coral reef locations/countries are often highly dependent on coastal tourism for their economies. The collection of statistics on the number, size and location of tourism establishments (hotels and coastal attractions) can provide an indication of potential impacts to the coast from coastal development. These types of infrastructure can be linked to water and energy demand, coastal pollution and general indicators of carrying capacity. The information can therefore be used as a proxy for pressure on coastal ecosystems including coral reefs. This information can also be used to track impacts from infrastructure development occurring in specific for example increased sedimentation from damage from hotel construction, seagrass removal for swimming area and beach creation as well as dredging for port maintenance – cruise and cargo shipping.
Data Collection Methods/Sources (Secondary Data)	1) Tourism Board, published lists of registered companies, chambers of commerce, web searches, planning agencies – maps and GIS information 2) Port Authority, cruise ship schedules (number per year, capacity), web sites of major cruise lines
Reporting Format/Units	1 Number and size of hotels per unit area (room numbers) 2 Number and types of large coastal attractions (water parks, aquaria, dolphinaria etc) 3 Number and size of cruise shipping piers 4 Number of cruise ship calls per annum
Periodicity	Every 4 years (or timed for the production of the GCRMN report). Baseline information should be collected initially

Driver/Industry	**Fishing**
Indicator	Fishing Infrastructure
Rationale	This information is useful for making a link to the level of fishing activity from specific landing sites (fishing beaches). Fishing pressure is directly linked to (in water) abundance and biomass. Information on the location of fishing beaches, other features such as sanitation, storage facilities, waste management etc. is also useful.
Data Collection Methods/Sources (Page 18 Caribbean Guidelines: Key Informant, Secondary & Primary Data Collection)	1 National fishing statistics, fisheries agencies, MPAs/NGOs that interact directly with fishers at/near the GCRMN site. 2 National export statistics (if any), Ministry of Fisheries/Trade etc – for example Lobster and Conch are typically key species for export. 3 In person visual census (at landing sites that may have an impact on the GCRMN site of interest). Field sampling to count and enumerate number of landing sites, number of vessels, estimates of fishers etc.
Reporting Format/Units	Number of beaches/landing sites Number of fishing vessels – type and size of boats and type of gear Number of fish markets or cold storage facilities
Periodicity	Every 4 years – completed in time for GCRMN Report (collect initial data in the first year – baseline)

Driver/Industry	**Fishing**
Indicator	Fishing Pressure
Rationale	This information is useful for making the link to the level of fishing activity by fishers who operate from specific landing sites (fishing beaches). Fishing pressure is directly linked to (biophysical parameters) abundance and biomass. Information on the amount and type of catch that is targeted can be correlated with the abundance and biomass data collected at the GCRMN site of relevance. Thus confirming presence/absence of key biological indicator species.
Data Collection Methods/Sources (Secondary, Key Informant and Primary Data)	1 National statistics from fisheries agencies, number of registered fishers, reports of creel surveys (if conducted by an agency), MPA/NGOs who interact with fishers at the location of interest (at/near GCRMN site) 2 Information on large exporters (conch, lobster, reef fish) – national statistics may not be directly related to GCRMN site but provides a picture of overall (national) demand for key reef species. 3 Field data collection, in-person visual census or interviews (creel survey approaches) – *Direct link to biophysical data*
Reporting Format/Units	Number of Fishers who operate from a particular site Estimated catch – kgs/lbs of fish caught (per trip/month) Annual export figures if available (tonnes/$)
Periodicity	Every 4 years – completed in time for GCRMN Report (do in first year – baseline

Driver/Industry	**Agriculture (Large Scale)**
Indicator	Logging/Coffee/Sugar Cane/Livestock/Other Agriculture* [Templates can be made for each of these industries where applicable]
Rationale	Watershed degradation leads increased coastal pollutions. This variable seeks to identify some large industries that may have point (and non-point) source coastal pollution impacts (sediment, nutrients, coliforms). These in-turn can affect coral health. Information on the scale location and level of activity can provide data that links coastal water quality characteristics with upstream activities. This data is only relevant for GCRMN sites if it can be reasonably shown that the particular industry/activity may have an impact on the site of interest.
Data Collection Methods/Sources (Secondary, Key Informant and Primary Data)	1 Land management agencies, local planning bodies, GIS imagery and maps. This category should rely heavily on spatial imagery/mapping tools and databases. More than one industry could be represented spatially to show diversity of possible pollution inputs and to major receiving water bodies. 2 Industry information, production figures and annual reports from each major sector. Web site, ministries responsible for industry (eg Agriculture, Forestry) 3 In person field visit to conduct rapid watershed/coastline assessments and ground truthing exercises. Provides a profile of the various point source pollution sources that may impact GCRMN biological site. Recommend collecting photographic information.
Reporting Format/Units	Some form of spatial representation – km^2, hectares – A map with areas of interest identified, perhaps in relation to (distance from) GRCMN biological site. List of potential types locations of waste streams e.g. dunder (sugar/rum), manure, coffee pulp, offal and animal waste (abattoirs) Gross Production figures –tonnes coffee/sugar per annum, lumber (m^3 per annum) – T*hese numbers could be analysed with WQ data for receiving water bodies (correlation)*
Periodicity	Every 5 years (timed with the production of GCRMN report), should be done initially to provide baseline information

Driver/Industry	Other Point Sources Pollution Activities
Indicator	Quarry/Mine/Oil/Other Minerals/Power Plant/Transshipment Port/Dry Dock/Sewage Treatment Plant/Other* [Templates can be made for each of these industries where applicable]
Rationale	Like agriculture this category highlights other major industrial activities. Particularly those that may be operating in the coast and in proximity to the GCRMN Biological monitoring site. This will assist in the identification of large industries that may have point (and non-point) source coastal pollution impacts (sediment, nutrients, water temperature, hydrocarbon and other chemical pollutants) that in turn affect coral health. Information on the scale location and level of activity can provide data that links coastal water quality characteristics with upstream activities. This data is only relevant for GCRMN sites if it can be reasonably shown that the particular industry/activity may have an impact on the site of interest.
Data Collection Methods/Sources (Secondary, Key Informant and Primary Data)	1 Secondary (pre-existing) sources of information, Land management agencies,). Government ministries with the relevant portfolios (eg mining, petroleum, energy), industry websites and other public records. (GIS, Satellite Imagery) 2 Primary data collection, in person field census, rapid enumeration of the types and numbers of activities in the areas close to the GCRMN site of interest. (photographic records recommended)
Reporting Format/Units	GIS spatial representation most appropriate, perhaps embedded with meta data on other characteristics such as gross annual production figures, annual output. If possible waste streams should be identified (photos) - not necessarily quantified (Maps).
Periodicity	Every 4 years (timed with the production of GCRMN report), should be done initially to provide baseline information

Driver/Industry	Land Use and Demographics (Watershed)
Indicator	Population
Rationale	Number of residents in coastal area (enumeration district, watershed) Urban pressure on receiving water bodies and coastal areas. Presence of municipal sources of waste such as sewage treatment facilities and landfills/garbage dumps should be noted. This information should be collected by other agencies. Please note: it is not intended that the GRCMN participant will initiate field collection of this type of information. If the data does not exist then its absence should be noted. (governance gap)
Data Collection Methods/Sources (Secondary, Key Informant)	Land use and planning agencies, web based searches
Reporting Format/Units	GIS and spatial representation, enumeration districts, counties, municipalities. Location of sewage treatment facilities, major drainage ditches/gullies
Periodicity	Every 4 years (timed with the production of GCRMN report), should be done initially to provide baseline information

Other Governance Indicators

Instructions for collecting governance indicators are provided in the Caribbean SocMon Manual (pages 18 and 45). The collection of data from examples of industries presented above will provide opportunities for collection of some of this information. For example, if there is the presence or absence of appropriate management bodies, the level of enforcement of the rules and regulations (resource management/pollution control). Collection of this type of information will require a combination of secondary (desktop analysis) and key informant interviews.

Key features of interest for collecting information is the presence, absence and level of effectiveness of the following categories as applied to relevant agencies and institutions that impact on coral reef ecosystems and their associated resources. These include; Management Body, Management Plan, Legislation, Management resources, Enforcement, Public Education; Legal/Judicial processes

References

Bunce, L., Townsely, P., Pomeroy, R. and Pollnac, R. (2000). Socioeconomic Manual for Coral Reef Management. Australian Institute of Marine Science and IUCN, Townsville, Australia

Bunce, L. and Pomeroy R., (2003). Socioeconomic Monitoring Guidelines for Coastal Managers in the Caribbean. World Commission of Protected Areas & Australian Institute of Marine Science.

English, S., Wilkinson, C., and Baker, V. (1997). Survey Manual for Tropical Marine Resources. Townsville, Australia. Australian Institute of Marine Science.

Jackson J, Donovan M, Cramer K and Lam V. 2014 *Status and Trends of Caribbean Coral Reefs: 1970-2012*. Global Coral Reef Monitoring Network & IUCN, Washington DC, USA

Wood J, M. Pena (2014) Spatial Application of SocMon monitoring data: SocMon Spatial. UWI CERMES, Barbados