

UNITED
NATIONS

EP

UNEP/EARS/WG.1/2



**United Nations
Environment**

Distr.: General

11 June 2014



Programme

Original: English

Technical Workshop on Selecting Indicators for
the State of Regional Seas, Geneva, Switzerland,
30 June - 2 July 2014

**Review of ecosystem-based indicators and indices on the state of the Regional
Seas**

Review of ecosystem-based indicators and indices on the state of the Regional Seas

FINAL REPORT

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29 November 2013

Executive Summary

Indicators can provide information to guide sustainable management. Ecosystem-based indicators can apply both to the state of the marine environment and to considerations of performance against environmental targets and/or limits in a defined geographical area. In order to guide management, indicators should be set within a reference framework and hierarchies of indicators can provide coordinated support. In time current ecosystem-based indicators are likely to embrace ecosystem service indicators and synergies should be considered when considering any relevant strategic development.

The Ecosystem Approach is widely accepted in international and national policy as a valuable framework to guide the sustainable development of marine and coastal ecosystems. In addition to factoring in human activities and social choices more emphasis is placed on integrity of the ecosystem than previous site-based and/or target species approaches to conservation. Application of the Ecosystem Approach to marine regions relies on establishing a coordinated system of ecological and operational objectives, informed by indicators, limits and targets. Such applications have been implemented in the marine context with varying success by the United Nations Environment Programme (UNEP) Regional Seas Programme (RSP), Global Environment Facility-Large Marine Ecosystem Projects (GEF-LMEs) and a number of global initiatives with regional dimensions. A better understanding of which indicators are being used, and their utility in demonstrating application of the Ecosystem Approach at the regional scale, would help make more explicit the value of regional entities and strengthen arguments to support their work. Furthermore it makes sense to avoid duplication. Regional indices should ideally nest within and feed global initiatives established to measure environmental condition or change (these range between using 4 - 260 indicators) with the intention of reporting on sustainable development progress and/or state of the environment. Lessons can be learned from the on-going development of indicators and a reporting mechanism for monitoring and evaluation of implementation of the United Nations Forest Instrument (UNFI).

This study considers the relevance of a 'coordinated set' of indicators capable of comparing common regional marine ecosystem issues. The report collates information on ecosystem-based indicators and indices currently being measure by regional entities and seeks to identify common elements. From this analysis the report postulates whether a limited generic set of indicators can be derived. A series of case studies are used to exemplify the diversity of ways indicators have been applied. For State of the Environment reporting, ecosystem-based indicator systems have developed in an *ad hoc* way, influenced by regional pressures and priorities. Indicator systems linked to targets and objectives have been more coordinated (e.g. Transboundary Waters Assessment Programme) and the European Environment Agency (EEA) approach to indicators is an example of pan-regional coordination associated with regulatory requirements. Indicator information is most usually collected on an annual basis but this is not always the case with the possibility of some near real time data collection. Most indicator systems in place are being adapted and refined based upon evaluations of their usefulness and practicality. However, all regional entities regard them as costly and technically challenging. There is something of a mismatch between expectations of policy and ability to achieve reporting needs and an opportunity to consider which global data and information streams can best serve to support the needs of the RSP.

The current use of marine ecosystem-based indicators and indices by regional entities is both overwhelming in terms of numbers being used and disparate in terms of the different indicators, systems and terminology employed. The analysis of indicators currently being used highlights different levels of specificity, wide variation in terms of the numbers of indicators, different rationales for indicator selection, different levels of sophistication and, for some parameters, the use of qualitative indicator statements. When trying to compare regions, rather than clarifying, this complexity clouds and confuses any underlying messages that may emerge. Indicators in themselves are not

sufficient to describe or understand progress against a baseline. To contribute to governance efforts indicators should inform ecological and operational objectives. The RSP should and can input to regular global quality status and any such reports could interface and complement the World Ocean Assessment as well as contributing (and if appropriate adapting to) an ocean-related Sustainable Development Goal.

This report puts forward a draft set of coordinated indicators reflecting approaches already underway within the RSP. In doing so it provides a draft framework that does not impose extra work for Regional Seas Conventions and Action Plans but rather proposes the use of existing indicators that fulfill multiple reporting requirements and combines with existing RSP obligations using the Regional Seas Marine Biodiversity and Outlook Series as a point of departure. At the same time it is acknowledged that too many indicators blur any policy message. What is wanted is a process to underpin a communication tool. In other words an achievable limited set of ecosystem-based indicators agreed by the RSP and endorsed by UNEP. Choosing appropriate metrics that can be agreed collectively requires further work and the opportunity for a more substantive collective technical discussion. Such a discussion should feed into agreed global assessment processes (such as Aichi Targets) and should anticipate an interface with Sustainable Development Goals. An illustrative approach towards defining a collective 'coordinated set' is proposed.

We conclude that a 'coordinated set' of indicators should be purpose dependent relating explicitly to 'healthy oceans'. It should harmonize effort rather than adding to reporting burdens and provide an opportunity to bring together the work of the RSP and GEF-LMEs. To achieve this we recommend further consideration of work underway by UNFF and EEA, together with the application of lessons learned from the Biodiversity Indicators Partnership, and the need for a technical workshop to consolidate indicator selection and agree common data / information sources.

Glossary of terms

ASC	Agulhas and Somali Current
ASCLME	Agulhas and Somali Current Large Marine Ecosystems Project
ATS	Arafura and Timor Seas
ATSEA	Arafura and Timor Seas Action Plan
BCLME	Benguela Current Large Marine Ecosystem
BD	Biodiversity
BOBLME	Bay of Bengal Large Marine Ecosystem Project
BOD	Biological/Biochemical Oxygen Demand
BSAP	Baltic Sea Action Plan
BSC	Black Sea Commission
BSIMAP	Black Sea Integrated Monitoring and Assessment Program
BSIS	Black Sea Information System
BSSAP	Strategic Action Plan for the Environmental Protection and Rehabilitation of the Black Sea
CAFF	Conservation of Arctic Fauna and Flora
CBD	Convention on Biological Diversity
CCA	Causal Chain Analysis
CCAMLR	Commission for the Conservation of Antarctic Living Resources
CEMP	CCAMLR Ecosystem Monitoring Program
CEP	Caribbean Environment Programme
CFC	Chlorofluorocarbon
Chl/ Chl a	Chlorophyll/ Chlorophyll a
CI	Conservation International
CIMAB	Center of Engineering and Environmental Management of Coasts and Bays
CLME	Caribbean Large Marine Ecosystem Project
CO ₂	Carbon Dioxide
COD	Chemical Oxygen Demand
COP	Conference of the Parties
CPPS	Comisión Permanente del Pacifico Sur
CPUE	Catch Per Unit Effort
CSD	(UN) Commission on Sustainable Development
CSI	Core Set Indicator
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DPSIR	Drivers-Pressures-State-Impacts-Response
EAS	East Asia Seas
EC-DG	European Commission / Directorate-General
EcoQO	Ecosystem Quality Objective
EEA	European Environment Agency
EEZ	Exclusive Economic Zone
EO	UNEP/MAP Ecological Objective
EQO	Ecological Quality Objective
EU	European Union
EVI	Environmental Vulnerability Index
FAO	Food and Agriculture Organization
FIB	Fishing in Balance Index
FRA	Forest Resources Assessment
GCLME Guinea	Current Marge Marine Ecosystem Project
GCRMN	Global Coral Reef Monitoring Network
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEF-LME	Global Environment Facility-Large Marine Ecosystem Projects
GEO	(UNEP) Global Environment Outlook
GES	Good Environmental Status
GHG	Green House Gas
GIWA	Global International Waters Assessment
GLOC	Global Conference on Land-Oceans Connection
GLOSS	Global Sea Level Observing System

GOBI	Global Ocean Biodiversity Initiative
GOMLME	Gulf of Mexico Large Marine Ecosystem
GOOS	Global Ocean Observing System
GPA	Global Programme of Action for the Protection of the Marine Environment from Land-based sources
GRID	(UNEP) Global Resource and Information Database
HAB	Harmful Algal Blooms
HCLME	Humboldt Current Large Marine Ecosystem
HDI	Human Development Index
HELCOM	Helsinki Commission
HOD	Heads of Delegation
IAS	Invasive Alien Species
ICES	International Council for the Exploration of the Sea
ICM	Integrated Coastal Management
ICZM	Integrated Coastal Zone Management
IOC	Intergovernmental Oceanographic Commission
IOGOOS	Indian Ocean Global Ocean Observing System
IPBES	Intergovernmental Platform on Biodiversity and Ecosystem Services
ISR	Integrated Study Regions
ITTO	International Tropical Timber Organization
IUCN	International Union for Conservation of Nature
IUU	Illegal, unreported and unregulated
IW	International Waters
JAMP	Joint Assessment and Monitoring Programme
LBS	Land-based sources
LME	Large Marine Ecosystems
MAP	Mediterranean Action Plan
MDG	Millennium Development Goals
MEA	Millennium Ecosystem Assessment
MEOW	Marine Ecoregions of the World
MONAS	HELCOM Monitoring and Assessment Strategy
MPA	Marine Protected Area
MSFD	Marine Strategy Framework Directive
MSSD	Mediterranean Strategy for Sustainable Development
MSY	Maximum Sustainable Yield
MTI	Marine Trophic Index
MYPOW	Multi-Year Programme of Work
N	Nitrogen
NAP	National Action Plan
NGO	Non-Governmental Organization
NH ₃	Ammonia
NIP	National Implementation Plan
NIS	Non-Indigenous Species
NOAA	National Oceanic and Atmospheric Administration
NOWPAP	Northwest Pacific Action Plan
NO _x	Nitrogen oxides
OBIS	Ocean Biogeographic Information System
ODS	Ocean Data Standards Pilot Project
OECD	Organisation for Economic Co-operation and Development
OHI	Ocean Health Index
ORP	Oxidation-Reduction Potential
OSPAR	OSPAR Commission: Convention for the Protection of the Environment of the North-East Atlantic
OSY	Optimum Sustainable Yield
PAH	Polyaromatic hydrocarbon
PAME	Protection of the Arctic Marine Environment
PCB	Polychlorinated biphenyl
PEMSEA	Partnerships in Environmental Management for the Seas of East Asia
PERSGA	The Regional Organization for the Conservation of the Environment of the Red Sea & Gulf of Aden

PICES	North Pacific Marine Science Organization
PMA	Pollution Monitoring and Assessment
POC	Particulate Organic Carbon
POP	Persistent Organic Pollutant
PSR	Pressure-State-Response
PTB	Persistence, Bioaccumulation, Toxicity
PTS	Persistent Toxic Substance
QSR	Quality Status Report
RAC	Regional Activity Center
RAM	Rapid Assessment Method
REMPEITC	Regional Marine Pollution Emergency Information and Training Centre
RFB	Regional Fishing Body
RIIS	ROPME Integrated Information System
ROPME	Regional Organization for the Protection of the Marine Environment
RSCAP	Regional Seas Convention and Action Plan
RSP	Regional Seas Programme
S/W	Specific surface of macrophyte species
SACEP	South Asian Co-operative Environment Programme
SAP	Strategic Action Programme; Strategic Action Plan
SAS	South Asian Seas
SASP	South Asian Seas Programme
SAUP	Sea Around Us Project
SCS	South China Sea Project
SDG	Sustainable Development Goals
SDS-SEA	Sustainable Development Strategy for the Seas of East Asia
SEEA	(UN) System of Environmental-Economic Accounting
SIDS	Small Island Developing States
SOC	State of the Coasts
SOCR	State of Convention Area Report
SOx	Sulphur oxides
SPAW	Specially Protected Areas and Wildlife
SPREP	Secretariat of the Pacific Regional Environment Programme
SSM	Standard Survey Method
SST	Sea Surface Temperature
TBT	Tributyltin
TDA	Transboundary Diagnostic Analyses
TEEB	The Economics of Ecosystems and Biodiversity initiative
TWAP	Transboundary Waters Assessment Programme
UBC-SAUP	University of British Columbia - Sea Around Us Project
UkrSCES	Ukrainian Scientific Centre for Ecology of the Sea
UN	United Nations
UNCSD	United Nations Conference on Sustainable Development
UNEP	United Nations Environment Programme
UNFF	United Nations Forum on Forests
UNFI	United Nations Forest Instrument
UNGA	United Nations General Assembly
USD	United States Dollar
USEPA	United States Environmental Protection Agency
VME	Vulnerable Marine Ecosystem
WACAF	Abidjan Convention
WCMC	(UNEP) World Conservation Monitoring Centre
WDPA	World Database on Protected Areas
WFD	Water Framework Directive
WG-EMM	CCAMLR Working Group on Ecosystem Monitoring and Management
WHO	World Health Organization
WIO	Western Indian Ocean
WOA	World Ocean Assessment
WOD	World Ocean Database
WRI	World Resources Institute
YSLME	Yellow Sea Large Marine Ecosystem

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