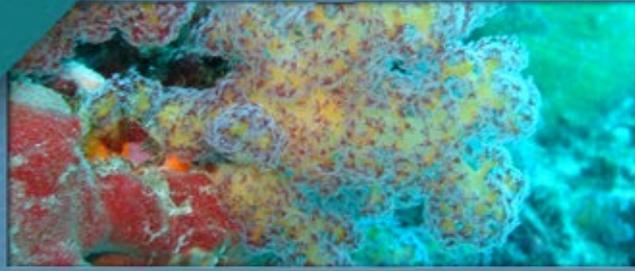




Bay of Bengal Large Marine Ecosystem Project



Report of the Indicators Working Group

19-22 October 2010 • Putrajaya Malaysia

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Indicators Working Group Meeting

October 19th – 22nd 2010

Marriott Hotel, Putrajaya, Kuala Lumpur, Malaysia



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1 BACKGROUND

The objective of the BOBLME Project Component 4 (Maintenance of Ecosystem Health and Management of Pollution) is to support activities leading to an agreed set of environmental indicators to measure the health of the BOBLME, and the development of a regional collaborative approach to identifying important coastal water pollution issues and to develop remedial strategies. The indicators, water quality criteria, including hotspots identified, and other key information that will result from this component will feed directly into the SAP (Strategic Action Programme) processes.

Subcomponent 4.1 aims to establish an effective Ecosystem Indicator Framework to measure progress toward sustaining the BOBLME ecosystem health. The approach the BOBLME Project is taking to achieve its objectives on this topic is to align itself with the existing competent bodies, initiatives and programmes in the region. To this end, BOBLME Project is collaborating in the First International Conference on Managing Ecosystem Health of Tropical Seas, ECOSEAS 2010.

The BOBLME Project supported Working Group participants from all project partner countries to attend this conference (19-21 October). BOBLME held a short Working Group Meeting at the completion of the Conference activities. The main Working Group Meeting took place on 22 October (0900h-1200h) to review practices on existing ecosystem health and quality indicators and standards and their application in the BOBLME. Participants were expected to consult and consolidate materials available in their respective countries with regard to the identification and application of Ecosystem Health (or Quality) Indicators, and be prepared to provide a short presentation (5-10 Powerpoint slides or 5-10 minute statement / lecture) on the topic (Agenda is at Annex 1).

Participants included one representative from each BOBLME country (except Myanmar), BOBLME Chief Technical Advisor, BOBLME Secretary and a Workshop facilitator. Participant list is at Annex 2.

2 PURPOSE OF BOBLME INDICATORS

It was agreed that BOBLME indicators were to assist in assessing the BOBLME's Project's progress in meeting its objective- *to improve the lives of the coastal populations through improved regional management of the Bay of Bengal environment and its fisheries*. As recognized in the Transboundary Diagnostic Analysis (TDA) the main areas of concern are (i) overexploitation of marine living resources, (ii) degradation of critical habitats, and (iii) pollution, especially land-based pollution, both over the life of the project (5 years) and in the implementation of a Strategic Action Programme (SAP) after the Project.

It was also agreed that the indicator set should be compatible with the indicator set being developed by the Global Environment Facility (GEF) Transboundary Water Assessment Programme (TWAP) that will be used as a common method to assess and compare the world's LMEs.

3 SCOPE OF THE INDICATORS

Throughout the course of the project, indicators will need to be developed for all five LME modules (i) productivity, (ii) fish and fisheries, (iii) pollution and ecosystem health, (iv) socio-economic and (v) governance. However, the Working Group agreed that it should start with modules (i) to (iii) and expand into modules (iv) and (v) at a later stage. The workshop also recalled the GEF usage of monitoring and evaluation indicators, distinguishing between process, stress reduction, and environmental status indicators.

4 INDICATOR FRAMEWORK

The indicator set will be based on the framework developed by the GEF Transboundary Waters Assessment Programme (TWAP)¹ as shown in Figure 1.

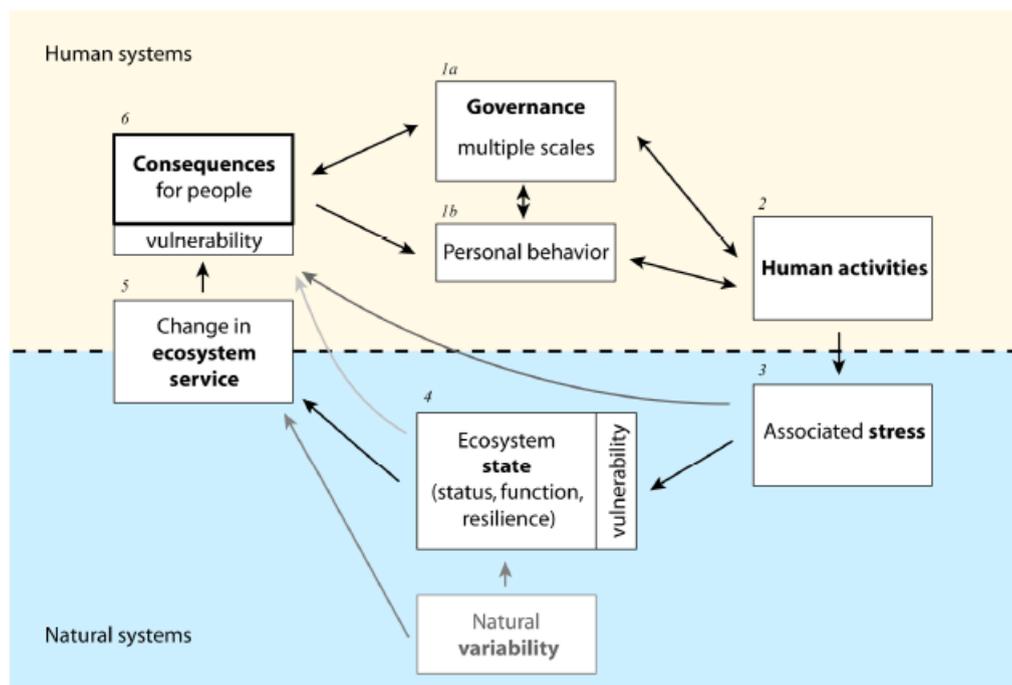


Figure 1 : Conceptual framework for indicators. Source: UNEP TWAP methodology

¹ UNEP (2010). Development of the Methodology and Arrangements for the Global Environmental Facility Transboundary Waters Assessment Programme (TWAP). 12th Global Meeting of the Regional Seas Conventions and Action Plans. Bergen, Norway, 20th-22nd September 2010.

The indicator set should be used in assessing changes in the state of the environment, the human activities and their associated stress the change in ecosystem goods and services and the governance covering the management arrangements.

5 COUNTRY PAPERS

Each country made a short presentation about indicators in their respective countries.

5.1 Bangladesh

Bangladesh described the data availability for each of the indicators chosen by the BOBLME IWG.

For the Productivity Module : Impact indicators

- Primary productivity (no data on coastal water, except may be global satellite data)
- Chlorophyll a (as above)
- Surface and water column temperature (no current data except global data)
- Nitrogen (no data all over the coast, except global data if any from that area)
- Zooplankton biomass/biodiversity (as above)

For the Fish and Fisheries Module : Impact indicators

- Demersal & Pelagic fish species surveys (Only old survey data)
- Reported landings (Fishery statistics but may be incomplete)
- Invertebrate surveys (clams, scallops, shrimp, lobster, squid & other fishery resources) (only old survey data)
- Catch –Stock Status and Trends (little information)
- Catch Potential (predicted at global level)

For the Ecosystem and pollution Module : Impact indicators

- Water Clarity (no inventory /data for the whole coastal water of BD.)
- Dissolved Oxygen (as above)
- Coastal Wetland Loss(Mangrove forest, Coral reefs) (Mangrove forest data available but current data for coral reefs)
- Eutrophic Condition (N, P, Si con.) (no coastal water data)
- Water & Sediment Contamination (Heavy metals, oils, POPs, health Indicator bacteria etc.) (no study or data on coastal water, scattered data)
- Benthic Index (no data, except fragmentary data on intertidal zone)
- Fish Tissue Contaminants (heavy metals, POPs, PAHs etc)(few data from individual studies, but no national data)
- Invasive /alien Species (no data known)
- Multiple Marine Ecological Disturbances (?)
- Sea level rise/acidification (?)

Bangladesh also presented BOB indicator data for (i) chlorophyll and primary productivity, (ii) SST and (iii) fronts.

5.2 India

India explained that, to date, no indicator work had been done so far. However, they have developed vulnerability index for fish stocks using 13 parameters and have developed trophic models for the Gulf of Mannar outputs, of which some have ecosystem indicators.

For the Productivity Module the following are available:

- SST available from global databases ICODS/ INCOIS
- Temperature and Salinity up to 2000 m depth from ARGO floats – INCOIS
- Chlorophyll a values from IRS P4 satellite
- Fronts information used for generating PFZ advisories to fishers – INCOIS
- Zooplankton – ship based sampling - limited coverage

Maps of (i) SST, (ii) depth of the 20° isotherm, (iii) mixed layer depth, and (iii) sea surface currents for the BOBLME produced by the ARGO National Data Centre were presented and zooplankton diversity data discussed. The fisheries of India were then described and trends in catch and effort presented. India has also calculated several TWAP indicators including (i) mean trophic index (MTI) and (ii) fishing in balance (FIB), and carries out routine stock assessments for all key stocks. Data are also available for mangrove and seagrass extent. The Indian State of the Environment report covers several of the pollution indicators, including sediments, industrial effluents, sewerage, garbage and other solids, fertilizer residue, pesticide residues, tar ball residues, mining reject, dredge spoils and sand extractions.

5.3 Indonesia

Indonesia started its presentation by describing how they calculate a sensitivity mapping index based on:

- Level of sensitivity to disturbances (SD): how strong is the ecosystem stands to the disturbances
- Conservation value (CV): how important the ecosystem in term of conservation.
- Social Value (SV): the level of usefulness of the ecosystem to the human beings nearby.

Although no details could be given, Indonesia has data on mangroves, seagrass and coral reefs and pollutants.

5.4 Malaysia

Malaysia presented data on

- water quality,
- habitats (mangroves, seagrass, coral reefs and tidal flats),
- fish and fisheries
- Fish stock status
- Vulnerable and endangered species

The pressures on coastal ecosystems were then discussed.

The report of the coastal pollution workshop was also presented in brief. This report described the current status of the ecosystem health of the Straits of Malacca. It first described the sources of pollution, followed by existing targets, the coastal monitoring and prediction system and estimates of pollutant loads.

The role of the different Departments that would be involved in the indicator work was also presented:

- Department of Environment
 - Administrated the Environmental Quality Act, 1974.
 - implemented strategy based on pollution control and prevention
- Department of Fisheries
 - Responsible in advancing, restoring and protecting fishing sources by distributing the licenses, rational resource management, constructing the artificial reefs and creating of marine parks
- Department of Irrigation and Drainage
 - monitors and maintains river conditions and hydraulic regimes with respect to river bank protection, river reserves, sedimentation, sand mining activity, solid waste and flood warning system
- Department of Forestry
 - responsible for the management, planning, protection and development of the Permanent Reversed Forests (PRF) – water catchment forest and flood control forest
- Malaysian Maritime Enforcement Agency (MMEA)
 - maritime search and rescue, controlling and preventing maritime pollution
- National Oceanography Directorate

5.5 Sri Lanka

Sri Lanka explained that there was no formalized ecosystem health assessments carried out. However through NARA, there are data on (i) primary productivity and zooplankton, (ii) fish landing , (iii) fish stocks and status, including potential yield estimates and species composition change.

5.6 Thailand

1. Ministry of Agriculture and Co-operatives

Department of Fisheries: DOF (also PSC member and National Coordinator for BOBLME)

- Fish landings – yearly statistics report
- Fishery status

2. Ministry of Natural Resources and Environment

Department of Marine and Coastal Resources: DMCR (PSC member for BOBLME)

- Phuket Marine Biological Centre: PMBC
 - Coastal monitoring of water quality, phytoplankton and benthos
 - Ecological studies; habitat, marine resources from plankton to mammals
 - Public and local community participation
- Department of Pollution Control : PCD (chemical oceanography)

3. Universities

- Chulalongkorn University : CU (chemical oceanography)
- Kasetsart University : KU (Plankton)

4. SEAFDEC : Oceanography / Fisheries

- Andaman Sea, BIMSTEC

Thailand also presented a table that showed the sources of data that could be used in indicator work. The working group agreed to use this template in all countries.

6 WORK PLAN FOR BOBLME INDICATOR WORKING GROUPS (IWG) – 2010/11

What	When	Who	How
1. Complete Indicator Templates or at least core indicators	December 20, 2010	IWG subgroups*	Subgroups to complete INDICATOR TEMPLATE for their indicators.
2. Complete National templates for source of data	December 20, 2010	IWG national representatives	Each national representative to complete DATA SOURCE TEMPLATE for their country
3. Conduct National Workshop	January/February 2011	IWG national representatives	Conduct workshop to 1. Introduce partners to BOBLME indicators 2. Verify data sources 3. Make arrangements, where necessary, to obtain data
4. Participate in 2 nd BOBLME IWG workshop	April/May 2010	IWG national representatives & BOBLME	Participate in workshop to 1. Agree on final set of indicators and data sources 2. Identify gaps and BOBLME intervention with regard to measuring, obtaining, analyzing and reporting data 3. Consider socio-economic and governance indicators 4. Agree on process to provide indicators to BOBLME (and TWAP)

*Productivity sub group = Indonesia/Thailand

Fish & fisheries sub group = India/Derek Staples

Habitat sub group = Maldives/Sri Lanka

Pollution sub group = Malaysia/Bangladesh

Note: All templates to be sent to the IWG Chair [Dr. Shahunthala Devi Ramachandran, Malaysia] shadev01@ yahoo.com before the deadline.

7 CLOSE

The workshop closed with Rudolf Hemes, CTA BOBLME, thanking all the participants for their input and expressing his hope that the Working Group would work well in the future. The Workshop closed at 12.30am.

Appendix I Working Group Workshop agenda

BOBLME Indicator Working Group

Workshop

22 October, 2010

Marriott Hotel, Kuala Lumpur

Agenda

1. Agreement on purpose and scope of indicators
2. National experience with indicators (*7 minutes per country*)
3. What indicators should BOBLME use?
4. Working Group mode of operation
5. Working Group Work Plan
 - National activities
 - Regional activities
6. Close

Appendix II Working Group participants

Country	Name	Title	Organisation	Email address
Bangladesh	Dr Maruf Hossain	Professor	University of Chittagong	marufctgu@yahoo.com
India	Dr K. Sunil Mohamwd	Head, Molluscan Fisheries Division	Central Marine Fisheries Research Institute (CMFRI)	kasmohamed@vsnl.com ; kasmohamed@gmail.com
Indonesia	Dr Kus Prisetiahadi		Ministry of Environment, Directorate for Marine and Coastal Degradation Control	cussthea@gmail.com
Malaysia	Dr Shahunthala Devi	Senior Research Officer	The Fisheries Research Institute	shadev01@yahoo.com
Maldives	Mr Hussain Zahir	Senior Reef Biologist	Ministry of Fisheries and Agriculture	hzahir@mrc.gov.mv ; huseinbe@gmail.com
Sri Lanka	Mr Anuruddha Tennakoon	Environment Management Officer	Ministry of Environment	anuruddha_mails@yahoo.com
Thailand	Dr Suree Satapoomin	Chief of Marine and Coastal Resources Assessment and Productivity	Phuket Marine Biological Center	suree_ss@yahoo.com ; suree.ss@gmail.com
BOBLME Project	Dr Derek Staples	FAO/Consultant		derekstap@gmail.com
BOBLME Project	Dr Rudolf Hermes	Chief Technical Advisor	FAO	rudolf.hermes@boblme.org

Appendix III Preliminary List of BOBLME indicators

BOBLME indicators (October 2010). Core indicators in bold

LME MODULE	STRESS INDICATORS	STATUS / IMPACT INDICATORS
PRODUCTIVITY	<ul style="list-style-type: none"> • SST (25 year trend and projections) • Ocean Fronts (upwelling, downwelling^{*2}) • Currents (?) • Monsoon Onset, (strength, no. of typhoons) 	<ul style="list-style-type: none"> • Primary productivity (gC/m2/yr) • Chlorophyll a • Zooplankton (??)
INFISH & FISHERIES	<ul style="list-style-type: none"> • Primary Production Required (?) (Ecological Footprint) • Fishing effort • Bycatch/discards 	<ul style="list-style-type: none"> • Reported Landings • Marine Trophic Index • Species composition change (biodiversity) • Fishing In Balance Index • Catch-Stock Status & Trends • Catch potential (predicted) • Immature fish in catch (?)
POLLUTION & ECOSYSTEM HEALTH	<p>HABITATS/ECOSYSTEM</p> <ul style="list-style-type: none"> • Invasive species <p>POLLUTION</p> <ul style="list-style-type: none"> • Nutrient inputs: DIN, P, Si (t/yr) to delta and LME (current & and projections) • Fertilizer application (t/km²/yr) • Freshwater Discharge • Sediment Flux • Acidification (CO2 Sequestration) • Mercury, other contaminants (oil, heavy metals, POPs, coliform, etc) 	<p>HABITATS/ECOSYSTEM</p> <ul style="list-style-type: none"> • Critical Habitat Extent (% change): Mangrove, coral reefs, salt marshes, seagrass beds, turtle nesting grounds – include quality & other attributes ? • Habitats at Risk Index: Reefs, Deltas, Seamounts • Coral bleaching/diseases Multiple Marine Ecological Disturbances (cyclones?) • Species listed (IUCN Red List) <p>POLLUTION</p> <ul style="list-style-type: none"> • N, P, Si concentration (t/km³/yr) • HABs • Mercury in water (?) and animal tissue • “Mussel watch” • Marine litter

² – Coastal Upwelling Strength, CODAS)

Appendix IV Indicator template

Module:

1. Indicator	
Indicator Name	
Category	<i>e.g. state and/or stress</i>
Definition of indicator / Descriptor	<i>Simple description of the indicator</i>
Units of measurements	
2. Relevance	
Rationale for Inclusion	<i>Indicator of what</i>
Benchmark	<i>What indicator will be compared with e.g. target, baseline, trend</i>
Linkage with other indicators	<i>How it links with other indicators both in his module and in other modules</i>
3. Methodology	
Description of measurement methods and calculation of the indicator	<i>How is indicator calculated?</i>
Geographical scale	<i>What is the scale covered by the indicator -National, LME?</i>
Temporal scale	<i>Average over time span</i>
Limitations	
4. Assessment of Data	
Data sources, availability and quality (<i>Existing datasets</i>)	<i>Include both national and global data bases</i>
Variations among data sources and alternative methods	
Data linkages	<i>Is local/national data included in any global data bases</i>
5. Partners	
Partners/agencies involved in the development of the indicator	
6. References	

Pollution & ecosystem health	Stress									
	Habitats									
	Invasive species									
	Pollution									
	Nutrient inputs DIN, P, Si to delta and LME (current & and projections)									
	Fertilizer application									
	Freshwater discharge									
	Sediment Flux									
	Acidification (CO2 Sequestration)									
	Mercury, other contaminants (oil, heavy metals, POPs, coliform, etc)									
	Status/impact									
	Habitats									
	Critical habitat extent (mangrove, coral reefs, seagrass, turtle nesting grounds)									
	Habitats at Risk Index (deltas, reefs, seamounts)									
	Coral bleaching/disease									
	Pollution									
	N, P, Si concentration									
	HABs									
	Mercury in water (?) and animal tissue									
	Multiple Marine Ecological Disturbances (cyclones?)									
	Species listed (IUCN Red List)									
	"Mussel watch"									
	Marine litter									



Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand are working together through the Bay of Bengal Large Marine Ecosystem (BOBLME) Project and to lay the foundations for a coordinated programme of action designed to improve the lives of the coastal populations through improved regional management of the Bay of Bengal environment and its fisheries.

The Food and Agriculture Organization (FAO) is the implementing agency for the BOBLME Project.

The Project is funded principally by the Global Environment Facility (GEF), Norway, the Swedish International Development Cooperation Agency, the FAO, and the National Oceanic and Atmospheric Administration of the USA.

For more information, please visit www.boblme.org



Sida



Norad

