



*Eight countries, connected by one ecosystem,
working together to secure its future.*



Report of the
**Technical Workshop
on Developing an Action Plan
on Pollution and Water Quality**

6 -7 June, 2012 • Phuket, Thailand

Bay of Bengal Large Marine Ecosystem Project



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1. BACKGROUND

A Strategic Action Programme (SAP) that addresses and remediates the major transboundary environmental concerns and issues in the Bay of Bengal is one of the two major outputs of the BOBLME Project. The concerns and issues addressed in the SAP have been identified and prioritized in the BOBLME Transboundary Diagnostic Analysis (TDA) that included an extensive consultative process involving all of the BOBLME countries. The concerns were grouped under three themes – (i) Overexploitation of marine living resources, (ii) Degradation of critical habitats, and (iii) Pollution and water quality and 14 issues related to these themes identified.

On the 15-17 February 2012, the BOBLME National Coordinators and SAP experts met in Phuket to draft a SAP framework that incorporated an outline of an action plan and also developed a work plan for SAP completion. The meeting also developed Ecological Quality Objectives (EcoQOs) for each theme to guide the formulation of the action plan through subsequent regional technical workshops and developed example objectives, targets, indicators, information needs and actions within the three priority themes.

A regional technical workshop was held in Phuket, Thailand, from 6-7 June 2012, to further develop the action plan for the theme "Pollution and water quality". Its objective was to derive objectives, targets, indicators (including information needs) and actions to address the seven issues under this particular theme:

1. Sewage-borne pathogens and organic load
2. Solid waste/marine litter
3. Increasing nutrient inputs
4. Oil pollution
5. Persistent organic pollutants (POPs) and Persistent toxic substances (PTSs)
6. Sedimentation
7. Heavy metals

Widespread pollution and poor water quality and its transboundary dimensions have been identified as a priority for the BOBLME. A number of proximate causes that have resulted in the current poor state of the environment have included:

- The widespread discharges of untreated or inadequately treated domestic, industrial, and agricultural wastewater;
- Inadequate solid waste management, including widespread discharges of solid waste into rivers and coastal waters and the open burning of solid waste, which generates dioxins and furans;
- Increasing emissions of nutrients from fertilizer use in agriculture, expanding aquaculture, and atmospheric emissions from industry and fossil fuel burning; and
- Routine operational discharges of oil from shipping, and dumping of waste oil by vessels and vehicles on land.

These in turn are a result of:

- Increasing coastal population density and urbanization;
- Increasing per capita consumption;
- Migration of industry into BOBLME countries, and a proliferation of small industries;
- Low per-capita GDP;
- Inadequate investment in water management and wastewater treatment;
- Lack of reception facilities for used oil and oily wastes;
- Lack of enforcement of environmental regulations;
- Lack of awareness of policy makers, legal system, and civil society.

In formulating objectives, targets, indicators (and information needs for these) and actions, these proximate and root causes were addressed.

The outputs of this workshop will form the basis for national consultations, the results of which will be included in the National Action Programmes (NAPs), as well as in the SAP.

The workshop was facilitated by the BOBLME Project's Chief Technical Advisor (CTA), Dr Rudolf Hermes, and the Dr Anjan Datta, Officer-in-Charge of the UNEP/GPA Coordination Office.

The agenda for the meeting is given as Appendix I.

The list of participants is given as Appendix II.

2. INTRODUCTION TO THE STRATEGIC ACTION PROGRAMME AND TRANSBOUNDARY WATERS ASSESSMENT PROGRAMME

Following the opening of the workshop and welcome, Dr Hermes gave a presentation introducing the SAP, including its content, process and timetable for completion.

Dr S. Heileman (consultant) gave a presentation on Indicators and the GEF Transboundary Waters Assessment Programme (TWAP). During the first phase of TWAP, an indicators based methodology was developed by an international group of experts for the assessment of LMEs. The BOBLME has decided to adapt this methodology (some of the indicators) for inclusion in the SAP.

3. WORKING GROUP TASKS AND OUTPUTS

Dr Hermes gave a presentation providing guidance to participants on the tasks to be undertaken during the workshop. Two break-out groups were formed, with each consisting of a mix of experts from all the countries represented at the workshop (Appendix IV).

On Day 1, the groups were assigned the task to develop objectives targets, indicators, and information needs for each of the three issues under this theme, using Part A of the template provided to the groups. Dr Hermes was assisted by two resource persons, Dr Anjan Datta (UNEP GPA) and Dr S. Heileman. Each group gave a presentation on its respective outputs during plenary.

On Day 2, the same two groups re-convened to identify actions needed to address each of the three issues, using Part B of the template. As in Day 1, the groups presented their respective outputs, and compared them with a view to consolidating the two sets of outputs from both days into a single table for each issue.

On the final day of the workshop, the plenary compared the results of the two working groups and suggested ways that they could be consolidated. The consolidated and completed templates for each issue are given in Appendix III.

4. CLOSING REMARKS

Dr Hermes thanked participants and emphasized the importance of their involvement in the national SAP/NAP consultations in their respective countries. Dr Datta in his closing remarks underlined the strength of the collaboration between UNEP-GPA and BOBLME.

APPENDIX I AGENDA

1. Welcome and workshop purpose
2. Introduction to the SAP – content, process and timetable for completion
3. Setting objectives/targets/information needs based on TDA issues
 - Introduction and working group tasks
 - Working groups
 - Report back from working groups
4. Agreeing on actions for the SAP
 - Introduction and working group tasks
 - Working groups
 - Report back from working groups
5. Final document for the SAP
6. Closing

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APPENDIX III CONSOLIDATED LIST OF ACTIONS

THEME: Pollution and Water Quality	
EcoQO: Coastal and marine pollution and water quality are controlled to meet agreed standards for human and ecosystem health	
ISSUE 1: Sewage-borne pathogens and organic load	
PART A	
Objective, targets, indicators and information needs	
Objective <i>What are you trying to achieve to address this issue?</i>	Reduce or minimize the discharge of untreated sewage and waste water to river, coastal and marine waters.
Target <i>What is the target and by when?</i>	Short term (Next 5 years) <ul style="list-style-type: none"> • At least additional 5% of the urban and peri-urban settlements (coastal towns) connected to (municipal sewage network; • For the rest other appropriate technological interventions (e.g. septic tanks) adopted; • All sewage collected should filter through proper treatment to achieve the water quality standards (Adequate treatment of XX% sewage collected in order to meet residual water quality standards) • Reduce E. coli and total coliform load to existing National Standards and regulations; • Reduce untreated sewage discharge by xx% (The targets are as per the national priority); • Minimize contaminated seafood incident; • Minimize discharge from ships. Long term (Next 20 years) <ul style="list-style-type: none"> • An additional 25% sewerage connection coverage.

<p>Indicator <i>What measure would you use to judge performance</i></p>	<ul style="list-style-type: none"> • Percentage of household and industrial areas /hotels covered under sewage/waste water management network and septic systems; • Compliance with water quality standard <ul style="list-style-type: none"> ○ Faecal coliform bacteria in coastal marine waters (MPN/100 ml); ○ BOD (mg/l) levels according to national standards; ○ Dissolved organic loads; • Percentage of untreated sewerage discharge; • Contaminate seafood incidences.
<p>Information needs <i>What information is required to check the indicator against the target?</i></p>	<ul style="list-style-type: none"> • Established baseline on coverage of sewage network and water quality for target area (e.g. 20 designated water sampling stations in Thailand); • Water quality measurements/indices; • Eutrophication index; • Water quality monitoring data; • Water borne diseases (e.g. Otitis externa, Hepatitis A, Vibrio illness etc.).

<p>PART B</p>	
<p>Actions</p>	
<p>Institutional arrangements <i>What new institutional arrangements will be needed and what actions are needed to make the institutions function efficiently?</i></p>	<ul style="list-style-type: none"> • Better co-ordination among the existing institutions to discharge their shared responsibilities properly; • Independent regulatory authority; • Strengthen existing monitoring, regulatory and enforcement system; • Strengthen linkages between local-district-state-central; • Powers should be de-centralised; • Privatisation of sewage treatment –impose charges accordingly (e.g. INDAH Water Treatment in Malaysia).
<p>Legal and policy reforms <i>What policy reforms will be needed in the</i></p>	<ul style="list-style-type: none"> • Review of the existing policies and legislations; • Introduce and impose specific targets to reduce discharge of untreated sewage to rivers and seas;

<p><i>future and what legal support is required?</i></p>	<ul style="list-style-type: none"> • Identify gaps and initiate processes to fill the gaps; • Avoid creating project based institutions (focus should to strengthen the existing institutions at all levels); • Mandate an institution to lead, facilitate and co-ordinate (nodal point of information); • Introduce devolution and decentralization; • Enact / amend necessary policies and legislations; • Empower local authorities to impose/collect levies/fees and use them for sustainable management of sewage; • Legislation for <i>Public Interest Litigation</i>; • Legislation to ensure <i>Right to Information</i>; • Multi-lateral agreement on reduction of untreated sewage into Bay of Bengal; • Based on the existing national policies, prepare a common policy brief; • Request UN organization for legal support and for facilitation.
<p>Management measures</p>	
<p>- Current <i>What management actions are currently used?</i></p>	<ul style="list-style-type: none"> • Lack of regulations in some instances; • Limited political commitments; • Discrete and fragmentary policies; • Lack of clarity and conflicting mandates among various agencies and institutions; • Limited capacity and resources; • Management actions are insufficient and there is non-compliance; •
<p>- Future <i>What needs to be in place in the future?</i></p>	<ul style="list-style-type: none"> • Mobilize opinion and action to build consensus and secure political/public commitments; • Revise and harmonize policies and regulations; • Clarify / re-define mandates among various agencies and institutions; • Mobilization of public support; • Establishment of national level multi-stakeholder platform for sustainable management of sewage/waste water; • Provision for necessary capacity and resources; • Promote PPP (Public Private Partnership) and CSR (Corporate Social Responsibility); • For larger housing complex and industrial areas CETPs has to be set up;

	<ul style="list-style-type: none"> • Formulation of water quality standards/criteria; • Total volume of waste collected must filter through at least primary treatments; • Integrated approach among the Government institutions; • National policy leading to regulation in place dealing with the sewerage issues with clear timelines; <ul style="list-style-type: none"> - Higher allocation of resources (both financial and human) to address this issue; - All hotels in tourist hotspots must have sewage treatment facilities/connected to one; • Lobby for formulation of National Wastewater Act (BOBLME?); • Privatisation of sewage treatment- with possible subsidization by government.
Enforcement and compliance	
<p>- Current</p> <p><i>What arrangements are currently used to ensure compliance with rules and regulations?</i></p>	<ul style="list-style-type: none"> • Absence of necessary policies and legislations; • Lack of necessary qualified human resources and supporting infrastructure; • Arrangements for compliance are inadequate.
<p>- Future</p> <p><i>What extra enforcement and compliance arrangements will need to be introduced?</i></p>	<ul style="list-style-type: none"> • Create necessary policies and legislations to empower relevant agencies/institutions; • Provision to train people and supporting infrastructure; • Formulate National water quality standards; • Impose fines for non-compliance at discharge points to district councils; • Incentives for treating water as per National Standards; • Continuous Monitoring Program and the data should be used for compliance as followed in some countries of this region; • Zoning of areas for safe aquaculture and collection of shellfish for consumption; • Stringent screening of chilled seafood for export.
<p>Awareness and communication</p> <p><i>Who will be the main target(s) for improved communications and awareness building?</i></p>	<ul style="list-style-type: none"> • Policy makers, enforcement authorities and local authorities/communities; • All stakeholders (e.g. State Government; public; private sector; NGOs; Industries); • The general public must be made aware of what sewage is doing to the environment; tourism, drinking water etc. - more graphic publicity.

<p>Information strengthening <i>What actions are needed to strengthen information needed for the indicators?</i></p>	<ul style="list-style-type: none"> • Spatial information system on coverage of sewage network; • Water quality including flora and fauna for target area; • Periodic update of water quality data (and improve testing facilities) and ecosystem health (time series data); • Deployment of trained people at various levels with supporting infrastructure / equipment and consumables; • Enhancing the capacity to carry out ecosystem analysis and modelling; • Increase sampling stations to cover the geographical area.
<p>Human capacity development <i>What capacity building is required and who will be the main target audience?</i></p>	<ul style="list-style-type: none"> • Societal awareness raising on cost of non-action; • Capacity building for local authorities to plan, implement and sustainably manage sewerage systems; • Training on waste management (3Rs- Reduce, Reuse and Recycle); • Training on wastewater management; • State Government; public; private sector; NGOs; Industries; • Introduce the concept at schools/colleges as a module.
<p>Responsible agency <i>Nominate what agency is responsible for monitoring and reporting on the issue?</i></p>	<ul style="list-style-type: none"> • Local and national specified authorities; • State Pollution Control Board; Central Pollution Control Board; • Municipal/local authorities/council.
<p>Other</p>	<p>Participation in (sub) regional and global fora concerning sustainable management of waste water, such as proposed Global Partnership on Waste Water Management as decided by the Governments during GPA inter-governmental review in Jan. 2012.</p>

ISSUE 2: Solid waste/marine litter	
PART A	
Objective, targets, indicators and information needs	
<p>Objective <i>What are you trying to achieve to address issue?</i></p>	<p>Reduce and minimize solid waste and marine litter (3R approach - Reduce, Reuse and Recycle)</p>
<p>Target <i>What is the target and by when?</i></p>	<p>Short term target</p> <ul style="list-style-type: none"> • Disposal of solid waste: reduction by XX % in the next 5 years; • Reduction in plastics, e-waste: reduction by XX % in the next 5 years; • Establishment of solid waste management system at coastal regions; • Extended Producers Responsibility (ETR) established for recyclable solid wastes; • Programs especially for tourists areas; • Bins for waste collection; • xx% increase in municipal waste collection. <p>Long term target</p> <ul style="list-style-type: none"> • Reception facility for ports and harbours; • "Clean beaches".
<p>Indicator <i>What measure would you use to judge performance?</i></p>	<ul style="list-style-type: none"> • Quantity of marine litter (per length of coastline); • Number of collection centers/ facilities; • Proportion of waste recycled resulting in decreased proportion of solid waste for disposal by landfill or incineration; • Reduction in annual marine mammal/birds death due to marine litter; • Number and effectiveness of awareness campaigns; • Perception of aesthetic / clean beach; • Water quality parameters related to cleanliness.

<p>Information needs <i>What information is required to check the indicators against the target?</i></p>	<ul style="list-style-type: none"> • Coastal and beach surveys / monitoring, including marine litter data; • Survey of solid wastes per kilometres and their types in different time scale. • Information of tourists, fishing community and other communities contribute for the generation of solid wastes; • Solid waste collection and disposal statistics (tonnage, % municipalities with solid waste collection service); • Assessment of plastics reduction in retailers; • Import / export / production data statistics (e.g. of plastic bags); • Profits from recycling programs. <p>Note: specific indicators needed for each of the targets</p>
<p>PART B</p>	
<p>Actions</p>	
<p>Institutional arrangements <i>What new institutional arrangements will be needed?</i></p>	<ul style="list-style-type: none"> • Local authorities, regional authorities and relevant central government agencies and NGOs need to act in coordination/consultation; • Industry engagement and environmental groups in the national/local level decision making needs to be facilitated and strengthened; • Mandate an institution to lead, facilitate and co-ordinate; • Independent regulatory authority; • Strengthen existing monitoring, regulatory and enforcement system; • Linkages between local-district-state-central should be strengthened and the powers should be de-centralised; • Establish a damage control fund in each country.
<p>Legal and policy reforms <i>What policy reforms will be needed in the future and what legal support is required?</i></p>	<ul style="list-style-type: none"> • Review of the existing policies and legislations, identify gaps and initiate processes to fill the gaps; • Plastic policy should come in force to regulate production, use and disposal; • Provision for penalty and damage assessment; • Harmonize policies; • Empower local authorities to impose / collect levies / fees and use them for sustainable

	<p>management of solid wastes;</p> <ul style="list-style-type: none"> • Enact legislation to regulate packaging and ship-breaking industries; • Legislation for solid waste management; • Legislation for Public Interest Litigation; • Review of existing policies; • Integrated approach among the Government institutions; • National policy leading to regulation in place dealing with the solid waste with clear timelines; • Formulation of National solid waste policy / regulation; • Multi-lateral agreement on reduction of marine litter and solid waste in Bay of Bengal; • Based on the existing national policies, a common policy brief needs to be prepared; • Request UN organization for legal support and for facilitation. • Incentives by local government for retailers/consumers to recycle and reduce plastic/metals.
<p>Management measures</p>	
<p>- Current <i>What management actions are currently used?</i></p>	<ul style="list-style-type: none"> • Limited political commitments; • Casual ad-hoc sporadic response for clean beach; • Limited capacity and resources; • Insufficient management actions and non-compliance.
<p>- Future <i>What needs to be in place in the future?</i></p>	<ul style="list-style-type: none"> • Measures needs revision and harmonization; • Regular beach cleaning; • Improve collection mechanism; • Waste segregation (recycling) at household level; • Establishment of proper disposal system; • Incentive for production and promotion of biodegradable products; • Comprehensive solid waste management plan; • Mobilize opinion and action to build consensus building and secure political/public commitments; • Clarify / re-define mandates among various agencies and institutions; • Mobilization of public support; • Higher allocation of resources (both financial and human) to address this issue

	<ul style="list-style-type: none"> • Establishment of national level multi-stakeholder platform for sustainable management of solid waste and marine litters; • Create incentive mechanisms for solid waste management systems with cleaner or green production concept; • Create provision for necessary capacity and resources; • Promote PPP (Public Private Partnership) and CSR (Corporate Social Responsibility); • Waste reception facility at ports and harbours;
Enforcement and compliance	
<p>- Current</p> <p><i>What arrangements are currently used to ensure compliance with rules and regulations?</i></p>	<ul style="list-style-type: none"> • Weak/sporadic enforcement drives; • Lack of necessary qualified human resources and supporting infrastructure; • Data collection on the quantity and generation and disposal is inadequate; • Unregulated management system in place in many countries
<p>- Future</p> <p><i>What extra enforcement and compliance arrangements will need to be introduced?</i></p>	<ul style="list-style-type: none"> • Create necessary policies and legislations to empower relevant agencies/institutions; • Train people and provide supporting infrastructure; • Identify and designate solid waste disposal sites; • Segregation of waste mandatory; • Adopt cleaner technology for waste management; • Strengthen regulations and enforcement powers vested from laws • Cleaning beaches; • Develop eco-tourism.
<p>Awareness and communication</p> <p><i>Who will be the main target(s) for improved communications and awareness building?</i></p>	<ul style="list-style-type: none"> • Policy makers, enforcement authorities and local authorities/communities/industries/tourists/local vendors / students; households • Officials, vendors, managers and all concerns responsible for handling of wastes at ports / harbours, tourists and fishing harbours; • All the stakeholders (e.g. State Government; public; private sector; NGOs; Industries).

<p>Information strengthening <i>What actions are needed to strengthen information needed for the indicators?</i></p>	<ul style="list-style-type: none"> • Map of dump yards; • Waste composition and segregation and their disposal system; • Periodical dissemination of information on waste generation, their disposal system and associated impacts; • Improve data collection on the quantity and generation and disposal; • EIA on landfills/incineration.
<p>Human capacity development <i>What capacity building is required and who will be the main target audience?</i></p>	<ul style="list-style-type: none"> • Societal awareness raising on cost of non-action; • Capacity building for local authorities to plan, implement and sustainably manage solid wastes; • Training on solid waste management (3Rs); • State Government; public; private sector; NGOs; Industries; • Introduce the concept at schools/colleges as a module.
<p>Responsible agency <i>Nominate what agency is responsible for monitoring and reporting on the issue?</i></p>	<ul style="list-style-type: none"> • Local and national specified authorities; • State Pollution Control Board; Central Pollution Control Board; • Municipal/local authorities/council; • Tourism Board; • Waste management cooperation mechanism
<p>Other</p>	<p>Participation in (sub) regional and global fora concerning sustainable management of solid waste, such as proposed Global Partnership on Waste Management as decided by the Governments during GPA inter-governmental review in Jan. 2012</p>

ISSUE 3: Increasing nutrient inputs	
PART A	
Objective, targets, indicators and information needs	
<p>Objective <i>What are you trying to achieve to address this issue?</i></p>	<p>Reduce and control nutrient loading into the coastal waters.</p>
<p>Target <i>What is the target and by when?</i></p>	<ul style="list-style-type: none"> • Improve nutrient use efficiency (by xx % in next 5 years) mostly in agriculture, aquaculture and other nutrient disposing industries; • Recovery of nutrient from waste waters; • Reduction of red tide phenomena (HABs); • Reduce eutrophication; • Hypoxic / anoxic area reduced.
<p>Indicator <i>What measure would you use to judge performance?</i></p>	<ul style="list-style-type: none"> • Water quality relating to nitrogen components (NO₃, NO₂, NH₃) and phosphorous vs standards; • Fertilizer use (perhaps a proxy, e.g. nitrogenous fertilizer imports, sales, application/unit area, etc) ; • N:P ratio; • Occurrence of Red tides, HAB (Frequency and area cover); • Degree and coverage of eutrophication, including hypoxia and anoxia; • Chlorophyll level; • Frequency and magnitude of fish kills and other mass mortalities; • ORP and pH level (at different stages of eutrophication); • Water transparency; • Nitrification/denitrification; • COD/BOD.

<p>Information needs <i>What information is required to check the indicators against the target?</i></p>	<ul style="list-style-type: none"> • N:P ratio; • Data on point and non-point sources (ground water seepage); • Information from archive data, remote sensing and modelling efforts; • Water quality data; • Nutrient input data; • Agriculture and aquaculture land use and land cover; • Fertilizer production / import / export and usage.
<p>PART B</p>	
<p>Actions</p>	
<p>Institutional arrangements <i>What new institutional arrangements will be needed?</i></p>	<ul style="list-style-type: none"> • Better co-ordination among the existing institutions to carry out their shared responsibilities properly; • Facilitate establishment of national level nutrient management forum; • Strengthen existing regulatory and enforcement system; • Linkages between local-district-state-central should be strengthened; • Improved coordination between various ministries/agencies.
<p>Legal and policy reforms <i>What policy reforms will be needed in the future and what legal support is required?</i></p>	<ul style="list-style-type: none"> • Review the existing policies and legislations, identify gaps and initiate processes to fill the gaps; • Rules and regulation for development of nutrient management plan; • Mandate an institution to lead, facilitate and co-ordinate; • Introduce devolution and decentralization; • Enact / amend necessary policies and legislations to promote nutrient use efficiency; • Empower local authorities to impose fines / collect levies / fees; • Legislation for Public Interest Litigation; • Legislation to ensure Right to Information; • Multi-lateral agreement on reduction of nutrient discharge into Bay of Bengal; • Based on the existing national policies, prepare a common policy and regulation; • Request UN organization for legal support and for facilitation; • Reduction and control of the use of fertilizers; • Promote organic farming, process livestock waste into fertilizer.

Management measures	
<p>- Current <i>What management actions are currently used?</i></p>	<ul style="list-style-type: none"> • Limited political commitments; • Discrete and fragmentary policies are existing; • Management actions are insufficient and there is non-compliance; • Little or absent coordination between agencies (e.g. Agriculture, Environment, Fisheries)
<p>- Future <i>What needs to be in place in the future?</i></p>	<ul style="list-style-type: none"> • Mobilize opinion and action to build consensus and secure political / public commitments to tackle nutrient over-enrichment of the coastal waters; • Harmonise policies (subsidy on fertilizer vs. environmental protection); • Clarify / re-define mandates among various agencies and institutions; • Ensure private sector and industries engagement; • Mobilization of public support for nutrient reduction; • Establishment of national and regional level multi-stakeholder platform for sustainable management of nutrients; • Build necessary capacity and provide resources; • Promote PPP (Public Private Partnership) and CSR (Corporate Social Responsibility); • Formulate or adopt water quality standards/criteria; • Establish common protocol/ guideline for analysis/determination of nutrient levels; • Deployment of trained people at various level with supporting infrastructure/ equipment and consumables • Promote an integrated approach among the Government institutions; • National policy leading to regulation be in place dealing with the nutrient enrichment issues with clear timelines; • Higher allocation of resources (both financial and human) to address this issue; • Improve sustainable agricultural/aquaculture practices; • Promote eco-friendly products (e.g. detergents) and organic farming; • Improve irrigation efficiency (to reduce nutrient run-off).

Enforcement and compliance	
<p>- Current</p> <p><i>What arrangements are currently used to ensure compliance with rules and regulations?</i></p>	<ul style="list-style-type: none"> • Absence/ lack of necessary policies and legislations; • Lack of necessary qualified human resources and supporting infrastructure; • No regulation on use of fertilizers and waste discharge.
<p>- Future</p> <p><i>What extra enforcement and compliance arrangements will need to be introduced?</i></p>	<ul style="list-style-type: none"> • Create necessary policies and legislations to empower relevant agencies/institutions; • Train people and provide supporting infrastructure; • A common protocol/ guideline for analysis/determination of nutrient levels; • Improve regular monitoring and the database on the coastal water nutrient concentration; • Introduce nutrient modelling for future scenarios; • Introduce regulation on fertilizer use (Ministry: Agriculture / Environment / EPA); • Continuous monitoring program and the data should be used for compliance.
<p>Awareness and communication</p> <p><i>Who will be the main target(s) for improved communications and awareness building?</i></p>	<ul style="list-style-type: none"> • Policy makers, enforcement authorities and local authorities/communities and enforcement; • All stakeholders (e.g. State Government; farmers; public; private sector; NGOs; Industries).
<p>Information strengthening</p> <p><i>What actions are needed to strengthen information needed for the indicators?</i></p>	<ul style="list-style-type: none"> • Spatial information system on coverage of land area under agriculture, aquaculture and animal husbandry; • N:P ratio; • Data on point and non-point sources (ground water seepage); • Information from archive data and modelling efforts on changes in the land use pattern; • Periodic update of water quality data and ecosystem health; • Enhancing the capacity to carry out ecosystem analysis and modelling; • Understanding of biogeochemical processes; • Improve nutrient testing facilities and more periodic monitoring (time series/fate/transport data); • Increase sampling stations to cover the geographical area; • Measurement from River-Coast-Ocean continuum.

<p>Human capacity development <i>What capacity building is required and who will be the main target audience?</i></p>	<ul style="list-style-type: none"> • Societal awareness raising on cost of non-action; • Capacity building for farm/ aquaculture farms owners and local authorities to plan, implement and sustainably manage nutrients; • Training on nutrient management; • State Government; public; private sector; NGOs; industries; • Introduce the concept at schools/colleges as a module.
<p>Responsible agency <i>Nominate what agency is responsible for monitoring and reporting on the issue?</i></p>	<ul style="list-style-type: none"> • Local and national specified authorities; • Ministry of Agriculture, Environment, finance and industry; • Fertilizer industry; • Sellers and distributor of fertilizer; • Certified national laboratories; • State Pollution Control Board; Central Pollution Control Board; • Agriculture/Fisheries/Environment Ministries; • Municipal/local authorities/council.
<p>Other</p>	<p>Participation in Global Partnership on Nutrient Management (GPNM) and its associated regional and national platforms as decided by the Governments during GPA inter-governmental review in Jan. 2012</p>

ISSUE 4: Oil Pollution	
PART A	
Objective, targets, indicators and information needs	
<p>Objective <i>What are you trying to achieve to address this issue?</i></p>	<p>Prevent, reduce and control oil spills and operational / accidental oil discharges.</p>
<p>Target <i>What is the target and by when?</i></p>	<ul style="list-style-type: none"> • Operational oil spill contingency plans within a defined time frame at national and regional level (short term); • Reduction of routine operational discharge of oil by XX % in the next 5 years; • Reduction in operational (on a daily basis) oil spills and discharges by XX % in the next 5 years; • Reduction in the number of tar balls by xx % in the next 5 years. <p>Note: need a target related to routine operational discharge of oil</p>
<p>Indicator <i>What measure would you use to judge performance?</i></p>	<ul style="list-style-type: none"> • Number and effectiveness of oil spill contingency plans; • Concentration of total hydrocarbon contents in contents of marine and coastal water; • Concentration of PAH (polyaromatic hydrocarbons) in coastal waters; • Incidences of mass mortality of fish and other marine organisms (due to oil contamination); • Oil slick along the coastline; • Number of tar balls on beach; • Number and magnitude of oil spill accidents; • Oil and grease in coastal sediment concentration data.
<p>Information needs <i>What information is required to check the indicator against the target?</i></p>	<ul style="list-style-type: none"> • Navigational routes mapping; • Archived information of accidents; • Data of petroleum hydrocarbon , tar balls, survey of point sources, oil spill accident information • Concentration of hydrocarbon in the water. • Crude oil volumes being transported in tankers along major shipping routes.

PART B	
Actions	
<p>Institutional arrangements <i>What new institutional arrangements will be needed?</i></p>	<ul style="list-style-type: none"> • Better co-ordination among the existing institutions to discharge their shared responsibilities properly (Ministry of Environment, Coast Guard, disaster management, transport and shipping); • Strengthen existing regulatory and enforcement system; • Improve coordination with SACEP/IMO organisations; • Generate compliance with MARPOL shipping regulation; • Integrated approach among the Government institutions/regional cooperation
<p>Legal and policy reforms <i>What policy reforms will be needed in the future and what legal support is required?</i></p>	<ul style="list-style-type: none"> • Review of the existing policies and legislations, identify gaps and initiate processes to fill the gaps; • Avoid creating project based institutions (strengthen the existing institutions at all levels); • Mandate an institution to lead, facilitate and co-ordinate (Nodal point of information); • Enact / amend necessary policies and legislations; • IMO and country specific shipping and transport ministries regulation for legal support and for facilitation; • Regulation of discharge of oil/ballast water from shipyard / workshops / port and harbours; • EIA immediately after any major event/accident; • Harmonize policies; • Monitoring of oil/grease discharges from SMEs and cooking oil from food outlets.
Management measures	
<p>- Current <i>What management actions are currently used?</i></p>	<ul style="list-style-type: none"> • Discrete and fragmentary policies are existing; • Limited capacity and resources; • Management actions are insufficient; • Limited support facilities for oil spill contingency plan • Needs revision and harmonization.
<p>- Future</p>	<ul style="list-style-type: none"> • Track shipping routes of oil tankers; • Build necessary capacity and provide resources;

<p><i>What needs to be in place in the future?</i></p>	<ul style="list-style-type: none"> • Facilitate information generation and dissemination through participation of fishing communities; • Formulate oil spill contingency plans/emergency action plans; • Collaboration among countries in case of oil spills emergency; • Effective response mechanism to combat oil spill; • Define navigational routes based on ESI (Environmental Sensitivity Index) maps; • Identify ecologically/ economically sensitive areas for protection • Appropriate reception facility at all ports and harbours. • Controlling the fishing trawlers and motor boats regarding disposal of their waste oil; • Deployment of trained people at various level with supporting infrastructure/ equipment and consumables; • Phase out of 2-stroke engines; • Recycling and proper disposal/incineration of waste oil.
<p>Enforcement and compliance</p>	
<p>- Current <i>What arrangements are currently used to ensure compliance with rules and regulations?</i></p>	<ul style="list-style-type: none"> • Absence of necessary policies and legislations; • Lack of necessary qualified human resources and supporting infrastructure; • Arrangements for compliance are inadequate. • The issue does not get sufficient attention until there is a major spill; • Daily discharges which contribute significantly to oil in water are not addressed.
<p>- Future <i>What extra enforcement and compliance arrangements will need to be introduced?</i></p>	<ul style="list-style-type: none"> • Create necessary policies and legislations to empower relevant agencies/institutions; • Train people and provide supporting infrastructure; • Continuous Monitoring Program of oil and grease data should be used for compliance as followed in some countries of this region; • Measurement and data gathering of TPH (Total Petroleum Hydrocarbons) in surface waters • Sharing of surveillance information and system between countries. • Introduce Polluter Pays principle; • Monitoring of toxic components of oil such as PAHs in biota, sediments and water (they pose a risk to fishery resources).
<p>Awareness and communication</p>	<ul style="list-style-type: none"> • Policy makers, enforcement authorities and local authorities/fishing communities/shipping and

<p><i>Who will be the main target(s) for improved communications and awareness building?</i></p>	<ul style="list-style-type: none"> · petrochemical industry; · All stakeholders (e.g. State Government; Coast Guard; Navy; public; private sector; NGOs; industries); · Societal awareness raising on cost of non-action; · Tourism stakeholders.
<p>Information strengthening <i>What actions are needed to strengthen information needed for the indicators?</i></p>	<ul style="list-style-type: none"> · Periodic update of ESI maps; · Appropriate model to forecast the spilling; · Improve TPH testing facilities and more periodic monitoring (time series data); · Increase sampling stations to cover the geographical area; · Modelling oil spill trajectory; · Satellite image processing to track oil slick; · Archive information on oil spills.
<p>Human capacity development <i>What capacity building is required and who will be the main target audience?</i></p>	<ul style="list-style-type: none"> · Capacity building for all concern agencies including the private sector; · Training on oil spill emergency response · Training on environmental impact assessment · State Government; coast guard; Navy; private sector; NGOs; Industries; Energy sectors · Build capacity to manage emergency accidents;
<p>Responsible agency <i>Nominate what agency is responsible for monitoring and reporting on the issue?</i></p>	<ul style="list-style-type: none"> · Local and national specified authorities and industries; · Maritime Board; Ministry of Shipping and Transportation; Coast Guard; Pollution Control Board or Departments.
<p>Other</p>	<ul style="list-style-type: none"> · Habitats such as coral reefs, seagrasses and mangroves have been negatively impacted by oil discharges/spills. Such areas should be marked and avoided by shipping routes. · Policy on oil dispersants use during spill combat.

ISSUE 5: Persistent Organic Pollutants (POPs) and Persistent toxic substances (PTsS)	
PART A	
Objective, targets, indicators and information needs	
<p>Objective <i>What are you trying to achieve to address this issue?</i></p>	<p>Reduction and safe disposal of POPs and PTsS.</p>
<p>Target <i>What is the target and by when?</i></p>	<ul style="list-style-type: none"> • Control and eliminate POPs and PTsS in agriculture (e.g. DDTs and Pesticides); • Phasing out and elimination of PCBs; • Preventing the unintentional production of PTsS by disposal of plastics by burning.
<p>Indicator <i>What measure would you use to judge performance?</i></p>	<ul style="list-style-type: none"> • Quantity of POPs and PTsS used in agriculture; • Quantity of PTsS produced by disposal of plastics by burning; • Use of PCB; • Quantity of POPS (pesticides) in stock piles of POPs (Pesticides) as per the implementation plan (NIP) mandated by Stockholm Convention; • Level of POPs in fish tissues, poultry products and human bloods; • Level of POPs in coastal sediments especially in harbours and at disposal sites; • Bio-magnification and bioaccumulation of POPs and PTS in fishery products.
<p>Information needs <i>What information is required to check the indicator against the target?</i></p>	<ul style="list-style-type: none"> • Content of POPs content in food chain including human blood; • National and regional plans on POPs and PCBs concentration; • Information on cross-border studies in concern with POPs and PCBs; • Information on the stock piles; • Check list of approved pesticides in use- (quantities and mixtures).

PART B	
Actions	
<p>Institutional arrangements <i>What new institutional arrangements will be needed?</i></p>	<ul style="list-style-type: none"> • Better co-ordination among the existing institutions at national, regional and local to carry out their shared responsibilities properly (e.g. Ministry of Agriculture, Industry, Transport, Trade, Environment and Fisheries); • Common protocol to measure/determine of POPs and PTSs; • Establish Pesticides Board which monitors import and usage of regulated pesticides.
<p>Legal and policy reforms <i>What policy reforms will be needed in the future and what legal support is required?</i></p>	<ul style="list-style-type: none"> • Review of the existing policies and legislations, identify gaps and initiate processes to fill the gaps; • Mandate an institution to lead, facilitate and co-ordinate (in case this has not yet been acted upon as per Stockholm Convention); • Enact / amend necessary policies, legislations and regulations; • Legislation for Public Interest Litigation; • Legislation to ensure Right to Information.
Management measures	
<p>- Current <i>What management actions are currently used?</i></p>	<ul style="list-style-type: none"> • Limited political commitments; • Stockholm Convention; • Discrete and fragmentary policies are existing; • Lack of clarity and conflicting mandates among various agencies and institutions; • Limited capacity and resources.
<p>- Future <i>What needs to be in place in the future?</i></p>	<ul style="list-style-type: none"> • Elimination of stock pile of POPs (Pesticides) as per the implementation plan (NIP) mandated by Stockholm Convention; • Mobilize opinion and action to build consensus and secure political / public commitments; • Provide technical and financial support to dispose current stocks; • Develop and expedite national implementation plan (NIP); • Control transboundary movement of POPs and PTSs; • Promote BAT (Best Available Techniques) and BMP (Best Management Practice) to control POPs

	<ul style="list-style-type: none"> and PTSs; • Promote PPP (Public Private Partnership) and CSR (Corporate Social Responsibility); • Formulate of water quality standards/criteria; • Provide PCB detection kits; • Safely collect and dispose hazardous wastes like batteries, electronic components; • Promote new technology for replacement of PCBs.
Enforcement and compliance	
<p>- Current</p> <p><i>What arrangements are currently used to ensure compliance with rules and regulations?</i></p>	<ul style="list-style-type: none"> • Inadequate policies and legislations; • Lack of necessary qualified human resources and supporting infrastructure.
<p>- Future</p> <p><i>What extra enforcement and compliance arrangements will need to be introduced?</i></p>	<ul style="list-style-type: none"> • Create necessary policies and legislations to empower relevant agencies/institutions to monitor and enforce proper implementations; • Train people and provide supporting infrastructure.
<p>Awareness and communication</p> <p><i>Who will be the main target(s) for improved communications and awareness building?</i></p>	<ul style="list-style-type: none"> • Policy makers, law makers to enforcement authorities and local authorities/communities; • Enhancing the public awareness and enforcement on flux dispersion of POPs and PTSs; • Awareness for farmers, users and consumers (food safety issues); • -Producers and exporters of sea food; • Societal awareness raising on cost of non-action.
<p>Information strengthening</p> <p><i>What actions are needed to strengthen information needed for the indicators?</i></p>	<ul style="list-style-type: none"> • Periodic update of water quality data and ecosystem health; • Bio accumulation factors in food chain; • Information on alternatives for POPs and PTSs; • Relevant import and export trade information; • Improve access of information to public; • Sharing of information across the regions/trans boundaries.

<p>Human capacity development <i>What capacity building is required and who will be the main target audience?</i></p>	<ul style="list-style-type: none"> • Capacity building for development and implementation of POPs-NIP.
<p>Responsible agency <i>Nominate what agency is responsible for monitoring and reporting on the issue?</i></p>	<p>See institutions above.</p>
<p>Other</p>	

ISSUE 6: Sedimentation	
PART A	
Objective, targets, indicators and information needs	
<p>Objective <i>What are you trying to achieve to address this issue?</i></p>	<p>To control / reduce sediment flow into the coastal ecosystems with special reference to critical habitat areas (mangrove, coral reef and sea grass).</p>
<p>Target <i>What is the target and by when?</i></p>	<ul style="list-style-type: none"> • Reduced sediment stress on critical habitats and delta; • Catchments area treatment with proper soil and agriculture area management; • A comprehensive shoreline management plan (ICM); • Reduce deforestation and increase forest cover; • Reduced river inputs with improved land use practices upstream.
<p>Indicator <i>What measure would you use to judge performance?</i></p>	<ul style="list-style-type: none"> • Sedimentation rates at selected critical habitats; • Sedimentation input from various sources, including rivers; • Number and effectiveness of management plans; • Water quality parameters (turbidity); • Area of forest; • Status of beach processes like erosion and accretions along the coastline;
<p>Information needs <i>What information is required to check the indicator against the target?</i></p>	<ul style="list-style-type: none"> • Quantitative data on sediment loads from different sources; • Measurement of sedimentation using sediment traps; • TSS concentration over different time and space; • Erosion data; • Deforestation data; • Coastal infrastructure data; • Sediment budgets; • Data on subsidence.

PART B	
Actions	
Institutional arrangements <i>What new institutional arrangements will be needed?</i>	<ul style="list-style-type: none"> • Better co-ordination among the existing institutions to carry out their shared responsibilities properly (Ministry of Land Water Resources, Agriculture, Environment, Maritime Transport, Shipping etc.).
Legal and policy reforms <i>What policy reforms will be needed in the future and what legal support is required?</i>	<ul style="list-style-type: none"> • Review of the existing policies and legislations, identify gaps and initiate processes to fill the gaps; • Mandate an institution to lead, facilitate and co-ordinate (Nodal point of information); • Enact / amend necessary policies and legislations (e.g. sand mining, damming, sediment traps, dredging etc.).
Management measures	
- Current <i>What management actions are currently used?</i>	<ul style="list-style-type: none"> • Limited political commitments; • Discrete and fragmentary policies are existing; • Lack of clarity and conflicting mandates among various agencies and institutions; • Limited capacity and resources.
- Future <i>What needs to be in place in the future?</i>	<ul style="list-style-type: none"> • Mobilize opinion and action to build consensus and secure political/public commitments; • Build necessary capacity and provide resources; • Formulate / adopt water quality standards/criteria (suspended solids concentration and organic loads); • Promote land use practices that enhance soil conservations; • Regulate dredging and reclamation; • Control and reduce deforestation process; • Conserve coastal habitats such as mangroves.

Enforcement and compliance	
<p>- Current</p> <p><i>What arrangements are currently used to ensure compliance with rules and regulations?</i></p>	<ul style="list-style-type: none"> • Absence of necessary policies and legislations; • Lack of necessary qualified human resources and supporting infrastructure.
<p>- Future</p> <p><i>What extra enforcement and compliance arrangements will need to be introduced?</i></p>	<ul style="list-style-type: none"> • Create necessary policies and legislations to empower relevant agencies/institutions; • Train people and provide supporting infrastructure; • Create legal provision for penalty on inappropriate land use, clearing of forest land, mangroves for residential or other purposes.
<p>Awareness and communication</p> <p><i>Who will be the main target(s) for improved communications and awareness building?</i></p>	<ul style="list-style-type: none"> • Societal awareness raising on cost of non-action; • Policy makers, enforcement authorities and local authorities/communities.
<p>Information strengthening</p> <p><i>What actions are needed to strengthen information needed for the indicators?</i></p>	<ul style="list-style-type: none"> • Sediment atlas; • Periodic update of water quality data and sediment budgets; • Deployment of trained people at various levels with supporting infrastructure / equipment and consumables.
<p>Human capacity development</p> <p><i>What capacity building is required and who will be the main target audience?</i></p>	<ul style="list-style-type: none"> • Capacity building for authorities to plan, implement and sustainably manage systems; • Capacity building for appropriate land use techniques.
<p>Responsible agency</p> <p><i>Nominate what agency is responsible for monitoring and reporting on the issue?</i></p>	<ul style="list-style-type: none"> • Local and national specified authorities.
<p>Other</p>	<p>Global Soil Forum and Global Soil Partnership. GPNM.</p>

ISSUE 7: Heavy Metals	
PART A	
Objective, targets, indicators and information needs	
<p>Objective <i>What are you trying to achieve to address this issue?</i></p>	<p>Protect the coastal marine ecosystem from the negative impact of heavy metals.</p>
<p>Target <i>What is the target and by when?</i></p>	<p>[Major heavy metals (Hg, Pb, As, Zn, Cr, Cd and Cu)]</p> <ul style="list-style-type: none"> • Proper disposal of heavy metals at the primary level; • Reduce and control of anthropogenic heavy metal sources into the coastal system by xx% by 2025; • Reduce or eliminate heavy metal contents in paints.
<p>Indicator <i>What measure would you use to judge performance?</i></p>	<ul style="list-style-type: none"> • Water quality parameters (heavy metal concentrations); • Concentration of heavy metals in biota (indicator organisms such as shellfish- "musselwatch" program); • Quantity of heavy metal content (TBT/ Cu) in paints used as anti-fouling.
<p>Information needs <i>What information is required to check the indicator against the target?</i></p>	<ul style="list-style-type: none"> • List of industries producing heavy metal and sources; • List of import and export of materials which contain heavy metals; • Disposal data of heavy metals; • Recovery of mercury from tube lights and other electronic equipment; • Concentration of heavy metals in water, biota (fishery products) and sediments; • Point source discharge monitoring data from industries.

PART B	
Actions	
<p>Institutional arrangements <i>What new institutional arrangements will be needed?</i></p>	<ul style="list-style-type: none"> • Better co-ordination among the existing institutions at national, regional and local to carry out their shared responsibilities properly (e.g. Ministry of Agriculture, Industry, Transport, Environment and Fisheries).
<p>Legal and policy reforms <i>What policy reforms will be needed in the future and what legal support is required?</i></p>	<ul style="list-style-type: none"> • Review of the existing policies and legislations, identify gaps and initiate processes to fill the gaps; • Mandate an institution to lead and facilitate to co-ordinate (in case this has not yet been acted upon as per Stockholm Convention); • Clarify/re-define mandates among various agencies and institutions. • Enact / amend necessary policies, legislations and regulations; • Legislation for Public Interest Litigation; • Harmonize policies; • Legislation to ensure Right to Information.
Management measures	
<p>- Current <i>What management actions are currently used?</i></p>	<ul style="list-style-type: none"> • Limited political commitments; • Discrete and fragmentary policies are existing; • Lack of clarity and conflicting mandates among various agencies and institutions; • Limited capacity and resources.
<p>- Future <i>What needs to be in place in the future?</i></p>	<ul style="list-style-type: none"> • Mobilize opinion and action to build consensus and secure political/public commitments; • Mobilization of public support; • Introduce cleaner production concept to industries (small, medium and large) • Build necessary capacity and provide resource; • Promote PPP (Public Private Partnership) and CSR (Corporate Social Responsibility); • Formulation of water quality standards/criteria; • Recovery of heavy metals such as chromium (Cr) and other heavy metals which are technically feasible;

	<ul style="list-style-type: none"> • Promote cleaner production technology support /SMEs; • Promote 3Rs; • Establish strong monitoring system for heavy metals; • Proper measurement of heavy metals (GMOS: Global Mercury Observation System); • Treatment / removal of metals of production effluent waters by industries prior to discharge into waterways.
Enforcement and compliance	
<p>- Current</p> <p><i>What arrangements are currently used to ensure compliance with rules and regulations?</i></p>	<ul style="list-style-type: none"> • Inadequate policies and legislations; • Lack of necessary qualified human resources and supporting infrastructure.
<p>- Future</p> <p><i>What extra enforcement and compliance arrangements will need to be introduced?</i></p>	<ul style="list-style-type: none"> • Create necessary policies and legislations to empower relevant agencies/institutions; • Train people and provide supporting infrastructure; • Creation of environmental police as is practice in many countries; • Provision for penalty mechanism for heavy metal discharge and enforcement; • Self regulation by industries; • "Enlightened vested interest".
<p>Awareness and communication</p> <p><i>Who will be the main target(s) for improved communications and awareness building?</i></p>	<ul style="list-style-type: none"> • Policy makers and law makers, enforcement authorities, industries and local authorities/communities and other stake holders; • Societal awareness raising on cost of non-action; • Producers and exporters of sea food.
<p>Information strengthening</p> <p><i>What actions are needed to strengthen information needed for the indicators?</i></p>	<ul style="list-style-type: none"> • Periodic update of water quality data; • Periodic update of sediment quality data near discharge points / harbours.

<p>Human capacity development <i>What capacity building is required and who will be the main target audience?</i></p>	<ul style="list-style-type: none"> • Capacity building for local, regional and national authorities to enact policies, legislation and regulations; • Deployment of trained people at various level with supporting infrastructure/ equipment and consumables; • Special education of measurement and controlling of heavy metal related sources.
<p>Responsible agency <i>Nominate what agency is responsible for monitoring and reporting on the issue?</i></p>	<ul style="list-style-type: none"> • Local and national specified authorities. • Environmental authority, fishery authority; Regional "Musselwatch" Program.
<p>Other</p>	



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.

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For more information, please visit www.boblme.org



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