Implementing the Strategic Action Programme for the South China Sea and Gulf of Thailand
(SCS SAP Project)

First Meeting of the Regional Working Group on Land-Based Pollution

Teleconference, 13 December 2022

REVIEW OF THE SCS PROJECT OUTPUTS AND SAP TARGETS FOR LAND-BASED POLLUTION

Outputs of the South China Sea Project and the SAP targets on Land-based Pollution

1. Activities and outputs of the SCS project

Regional networking

The Regional Working Group for Land-based Pollution (RWG-LbP) established in the first meeting held in Bangkok, Thailand, 3 - 5 April 2002, was comprised of seven Focal Points from the participating countries, two Regional Experts, and one member from the Project Co-ordinating Unit (PCU). The government designated Focal Points were contracted to provide 25 percent of their time to the project under the Memoranda of Understanding signed between UNEP and the Specialised Executing Agency within which the focal point worked. The RWG-LbP links to other regional working groups and two regional task forces one for Economic evaluation and one for Legal Matters.

At the national level, the national coordinators or focal points were responsible for convening regular meetings of a national land-based pollution committee or working group. National working groups for land-based pollution were developed in all participating countries, and were Chaired by the National Focal Points. A total of 126 individuals representing 66 separate national institutions were members of these committees which ranged in size from eight to twenty-six members. A total of 12 institutions or agencies with expertise in various aspects of land-based pollution were sub-contracted at the national level to assist in the completion of tasks in the MoU signed with UNEP.

Development of a regional information base for management

A problem identified during the development phase of the South China Sea Project was that, while many valuable data sets on land-based pollution were available within the region, the sharing of this information was restricted by weak data management systems in most countries. Limited cross-sectorial integration between government ministries and departments involved in marine environment and natural resource management was also identified as a key constraint in improving the information base for the management of land-based pollution of the South China Sea. In response to this, national and regional meta-databases were compiled to enable the sharing of data about existing pollution data sets (i.e., metadata). During the period from 2003-2007, a total of 226 meta-data entries on land-based pollution data sets have been contributed to the regional online meta-database for the South China Sea (http://metadata.unepscs.org) by Cambodia (12), China (27), Indonesia (13), Thailand (28), and Viet Nam (146).

The Regional Working Group on Land-Based Pollution also worked during the preparatory and operational phases of the South China Sea Project to collate data for inclusion in a regional GIS database on: the coastal impacts of pollution (ambient water quality/sediment quality); the impacts of pollution on human health; pollution loading from key rivers draining into the South China Sea basin; and land-based activities in coastal catchments of the South China Sea. However, despite the large number of water quality (539), sediment quality (99), and biota monitoring stations (21) in the South China Sea and Gulf of Thailand, very little information relating to data collected at monitoring stations was contributed to the regional GIS database by the countries (61 data sets in total). A total of 35 datasets relating to the impacts of pollution on human health, and 68 data sets relating to pollution loading from river catchments, were compiled at the regional level and used in development of SAP targets for land-based pollution management.

Hotspot characterization and priority ranking

The target identified for land-based pollution management was based on setting and maintaining region-wide water quality standards and water quality objectives which will assist in maintaining the health of coastal ecosystems. In order to achieve this goal, the SCS project adopted the marine water quality criteria adopted by the Association of South East Asian Nations (ASEAN) and the biological and sediment quality standards used in the People's Republic of China for use in characterising potential regional "pollution hot spots", the term which has been proposed and agreed within the context of SAP implementation as:

> *"A limited and definable area in which there are prevailing environmental conditions attributable to anthropogenic activities that adversely affect, or threaten to affect, human health, threaten ecosystem functioning, reduce biodiversity and/or compromise resources and amenities of economic importance in a manner that would appear to warrant priority management attention".*

The procedures employed in characterising pollution hot spots in this project partially benefited from work conducted within the preparative (PDF-B) phase of a UNEP/GEF project on the Russian Arctic. However, the refinement and augmentation of these procedures within the South China Sea project have substantially enhanced their potential replicability. The criteria for ranking hot spots were agreed by consensus and a total of 17 hotspots were characterised using the ranking system agreed by the RWG-LbP. In categorising the magnitude of the problems, the "impact on the marine environment" was evaluated in terms of impacts on: water quality; sediment quality; biological samples; changes in living marine organisms; and affected marine communities. Ambient water quality was itself defined in terms of: nutrients; faecal coliform bacteria; heavy metals and dissolved oxygen concentration.

Ranking of the impacts resulting from contaminants in the South China Sea marine basin suggests that the reduction in water quality is apparently the major concern, followed by biological impacts which are less well demonstrated and thirdly contamination of sediments. In terms of the contaminants themselves the most widespread and severe problems resulted from enhanced nutrient inputs whilst heavy metals were found to be a significant problem in biological samples, and sediments of certain hotspots. The results form a sound basis for selection of pilot activities addressing regionally significant impacts of specific contaminants in hot spots of the region and capacity building.

Pilot activity

In evaluating potential pilot activities, it was recognised that the resources available to the project were insufficient to rectify all pollution problems at even one pollution hotspot. The focus was to identify potential pilot activities that would serve as replication models addressing particular types of land-based pollution rather than to attempt the cleanup of individual sources or an entire "hotspot". As part of this evaluation a "causal chain analysis" was conducted. A causal chain analysis is a recommended GEF tool used in the identification of the causes of change in environmental state, the level or scale of threats at a particular site, and the alternative points of intervention, along the chain of cause and effect. Optimally, all causes are identified and quantified and the potential benefits of intervention at any one point along the chain are evaluated, where possible through some form of cost benefit analysis. The causal chain therefore is used to provide an objective basis for deciding between different types of intervention at a particular site.

In this context, the environment of Batam Island in Indonesia had and continues to be degraded as a consequence of increased population and demands on marine resources by residents to achieve higher living standards. This has led to overexploitation of resources, increases in domestic and industrial wastes and physical destruction of coastal habitats. With the support of the land-based pollution pilot project, a multi-sectoral management board was established and maintained beyond the life of the project at this site. This body not only coordinated the pilot activity but also integrated the work of related entities in the planning and implementation of activities for the sustainable development of the entire city.

This management board selected the peri-urban village of Tanjung Riau on Batam Island to trial communal septic and solid waste management systems. To manage solid wastes, the project organised waste collections and storage and treatment in the village. Two hundred plastic rubbish bins were provided for the collection of solid wastes separated into organic wet materials and non-organic dry wastes. The organic wastes were gathered in a temporary waste management site and used to produce compost. Around 300-400 kg of compost was produced per month from organic waste. The product was used as fertiliser and provides an additional source of income for villagers and the local women's group. Non-organic waste was transported for disposal at the Batam city solid waste dump.

The project worked closely with local communities in Tanjung Riau village in order to address environment problems caused by domestic waste. Ten systems of communal septic tanks were installed, each providing for the needs of 8-10 families. The local community offered its own land for the placement of these tanks. One third of householders in the village were connected to such systems and plans were developed to replicate this system elsewhere. The process of installing septic tanks included the participation of the local communities starting from planning, design, construction and maintenance. The system has not only improved sanitary conditions in the village but also proved helpful in enhancing awareness and generating support from the local community for environmental management. The project's management board encouraged the scaling-up of the practices of domestic waste management in Tanjung Riau village to the whole island level through its inclusion as a priority action area of Batam City's environmental policy.

The pilot activities further promoted the adoption of the Indonesian SUPER[1] and PROPER[2] programmes that were introduced in 2002 to reduce heavy metal discharges from industry. Through activities executed by the pilot project, awareness of industrial sector enterprises was significantly improved as was compliance with standards for the heavy metal content of wastewater. The project was successful in working with government and industry in clearly delineating responsibilities in the management of heavy metal discharges. Local government undertook control and evaluation of environmental management in industries (e.g., documentation and sea water quality) and the organisation of training seminars for industrial sector representatives and associated stakeholders. The industrial sector was responsible for reporting on environmental management of industrial activities, ensuring compliance with national and local government regulations and monitoring sea water quality.

A database on environmental status and management in Batam City was developed to include all data obtained through surveys and monitoring made by the environmental sector and data collected through the monitoring of industrial centres during recent years. This database was a useful tool for environmental management in the city, for assessing changes in environment status and evaluating the effectiveness of the SUPER and PROPER programmes in terms of reductions in the heavy metal content of wastewater discharged from industrial enterprises in the city.

In terms of land-based pollution management, the potential for replicating activities to promote the SUPER and PROPER programmes within the industrial sector is high. Involvement of industrial enterprises in environment management in Batam serves as a good example for wider dissemination. Pilot-scale improvements to domestic waste management systems in Tanjung Riau village on Batam Island have been scaled up by the Batam City Government. A key experience at Tanjung Riau is that solid wastes can be used to generate income for the community, if managed properly. This provides a positive example for use in encouraging other villages to establish similar systems.

Valuing the impacts of land-based pollution

The Regional Task Force on Economic Valuation has developed a framework for the valuation of land-based pollution impacts on coastal habitats that includes: a checklist of the impacts of land-based pollution on coastal

[1] National environment management system for the sustainable development of industry.
[2] Government system for rating the compliance of industry with environment standards.

habitats, specifying types of pollutants and their specific impacts on the four major habitats [mangroves, coral reefs, seagrass, and wetlands]; a framework for valuing the impacts of land-based pollution on the four habitat types, categorising the various specific impacts in the checklist into three categories, i.e. productivity, amenity, and human welfare; and procedures to undertake valuation of impacts of land-based pollution on the four habitat types, in which valuation techniques, indicator of measurement, data needed, and notes and assumptions were described for each specific impact identified in the checklist and framework.

The impact checklist, the framework, and the procedures for valuing the impact on the coastal habitats have been reviewed and checked by the members of all Regional Working Groups and guided adoption of SAP targets. It was identified that impacts resulting from land-based pollution either cause reductions in production of specific resources which can be measured in terms of losses in market value; in loss of ecosystem services resulting from ecosystem level impacts; and economic losses resulting from illness of individuals eating contaminated seafood. Detailed procedures for the economic evaluation of these impacts in terms of applicable valuation techniques for: productivity, amenity value, and human welfare are provided in the guidelines for economic valuation adopted by the SCS project and which underpin the cost-benefits analysis of action versus non-action presented in the SAP (the adopted guidelines on economic valuation were published as UNEP, 2007h).

Modelling the carrying capacity of the SCS marine basin with respect to nutrients

As part of the overall work of the project on the impacts of land-based pollution a model was developed to evaluate the sensitivity of coastal ecosystems to changes in nutrient flux from land via rivers. The model is based on the relationship between chlorophyll and nutrient concentration and was developed by SEA START RC using river runoff data and remote sensing information of monthly chlorophyll concentration in the surface waters of the South China Sea (UNEP, 2007a). Marine water along the Philippine coast from Luzon to the Palawan Islands were found to have the highest assimilative capacity and this part of the South China Sea is never likely to become eutrophic. However, this does not apply to the potential eutrophication of bays and estuaries that were not the focus of this model. The Gulf of Thailand was also found to have a high assimilative capacity while areas with low assimilative capacity include for example the southern coast of China, central Viet Nam, Peninsular Malaysia and the Straits of Malacca (UNEP, 2007a).

The work of the SCS project in this area resulted in a tool and trained people in each country to undertake modelling of different scenarios of nutrient inputs to coastal waters. The model can be run to estimate the monthly 'effective' loading of total nutrient from any catchment, as point or non-point loading. The model output in chlorophyll equivalent units can be converted to nutrient elements, such as N, using a Chlorophyll to nutrient ratio. The model can be used to simulate the monthly responses of the chlorophyll biomass in any area of the South China Sea (at a resolution 0.1^{o} x 0.1^{o}) to different loading scenarios and to estimate the maximum monthly load of nutrient from any selected catchment that would ensure the chlorophyll-defined biomass remains under a pre-defined limit. It is reiterated that the results of this modeling demonstrating that, while nutrient pollution of the South China Sea is important from a local perspective, it is not significant from the transboundary perspective of basin-wide assimilative capacity.

2. Status and challenges on land-based pollution in the South China Sea

Countries bordering the South China Sea are experiencing problems with pollutants such as nutrients and organic wastes in their coastal waters. These contaminants are derived mainly from sewage and agricultural discharge and if left unmanaged could lead to eutrophication, decline in living resources, and impacts on human health. Current land-based pollution management practices differ between countries. Most countries have environmental laws which require the establishment of standards and enforcement to ensure compliance. In order to meet standards and regulations stipulated under the law, structural facilities like waste water treatment plants are required, yet often the

financial resources to invest in such infrastructure are lacking. The scale of action required to address issues of national pollution are being supporting through the linked GEF financed PEMSEA.

All countries in the region require an Environmental Assessment (EIA) prior to initiating a major development project and all have programmes to increase environmental awareness, and educate the public regarding environmental issues. In addition, monitoring of pollution discharge points and water quality monitoring is also currently undertaken by all countries. Although these management practices are in place some countries lack the capacity to enforce the Environmental Acts due to limited budgets and manpower. Private sector waste producers generally do not have treatment facilities resulting in a low level of compliance with standards stipulated under the law.

Monitoring programmes for some countries involve extensive numbers of sites, but the data collected are not used appropriately, being used merely for the publication and dissemination of annual and environment quality reports. In order to address the key challenges and weakness in land-based pollution management, the SAP promotes the adoption of targets for land-based pollution including the setting and maintaining of region-wide water quality standards and water quality objectives which will assist in maintaining coastal ecosystem health. Modelling of carrying capacity of the marine basin with respect to heavy metals is among the regional priorities

The following regional challenges were identified from the available National Action Plans and discussions of the Regional Working Group:

- High population pressure and industrialization causing increased contaminant load;
- Lack of treatment facilities;
- Lack of cooperation and coordination among related sectors at the national level and weak linkage between central and lower levels of the governments;
- Lack of appropriate legislation and weak law enforcement;
- Low public awareness and lack of (responsible) committed of citizens;
- Lack of government commitment in balancing economic growth and environmental protection and low priority given to environment protection;
- Lack of research and monitoring resources (man power, facilities);
- Lack of regionally comparable monitoring and analytical methodology; and
- Lack of criteria for sediment quality.

3. Targets on Land-based Pollution in the Strategic Action Programme

The main goal of the land-based pollution component is to foster regional co-operation in the identification of sensitive ecosystems, land-based contamination problems, evaluation of their significance and development of standards for national level adoption within a regional context in order to develop an appropriate precautionary approach to discharges to the South China Sea marine basin. The targets for the land-based pollution component are to set and maintain region-wide water quality standards and water quality objectives which will assist in maintaining health of the coastal ecosystems. The specific targets for Land-based Pollution management are:

1. By the year 2012, estimate total contaminant loading to the South China Sea.
2. By the year 2012, agree and adopt regional criteria for contaminants in sediment and biota.
3. By the year 2012, characterise and prioritise all hot spots surrounding the South China Sea.
4. By the year 2012, review and amend national legislation in support of all Land-based Pollution targets of the SAP.

5. By the year 2017, to meet ASEAN seawater quality (14 parameters) criteria (except pollutants from scientifically identified natural sources, if any) for:

   - 90% of monitoring stations in the 17 hot spots characterised by the RWG-LbP between 2002 – 2004;
   - 80% of other monitoring stations (more than 400 at present) in coastal waters of the South China Sea.

The present monitoring stations and pollution hot spots in the participating countries, and potential targets to be included in the SAP are presented in Table 1.

Table 1. Monitoring Stations and Pollution Hot Spots in the Participating Countries, and Potential Targets to be Included in the SAP.

	Cambodia	China	Indonesia	Malaysia	Philippines	Thailand	Viet Nam
Monitoring stations	**2008**						
Water	8	102	100	128	9 (Manila Bay)	170	22
Sediment	3	>9	n/a	n/a	15 (Manila Bay)	50	22
Biota	3	No routine	n/a	n/a	3	15 (fish/shellfish)	22
Hot Spots	3	3	3	n/a	3	2	3
	TARGETS 2012						
Total contaminant loads to SCS be estimated	All countries						
Criteria for contaminants in sediment and biota be adopted in the region	All countries						
All hot spots in SCS Sea be characterised and prioritised	All countries						
National legislation in support of targets be reviewed and amended	All countries						
	TARGETS 2017						
90% of hot spots meet water quality criteria	3	3	3	n/a	3	2	3
80% of water monitoring stns meet water quality criteria	6	80	80	104	7	136	17