Regional Cooperation on Coastal and Marine Risk Mitigation Plan for South Asia

Road Map

SAARC Workshop on
Coastal and Marine Risk Mitigation Plan

March 27-28, 2008
Goa, India

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Introduction

1.1 Surrounded by Bay of Bengal and Arabian Sea, the South Asia is endowed with a long coastline of 12, 000 Km with extremely high population density along the coast. The coastlines of South Asia that forms a part of Bangladesh, India, Maldives, Pakistan and Sri Lanka, are highly prone to oceanogenic, hydro-meteorological, seismic as well as manmade disasters. Along these coastlines, there are major commercial capitals of the region. Besides, these coastal areas are also homes to the large number of poor & vulnerable population. Coastal protection and risk reduction are therefore amongst the core issues facing the region.

1.2 SAARC has placed considerable focus on addressing the coastal and marine issues. SAARC has two specialized regional organizations viz., SAARC Coastal Zone Management Centre (SCZMC), Male and SAARC Disaster Management Centre (SDMC), New Delhi working in synergy on addressing coastal protection as well as coastal and marine risk reduction issues. With the recommendations of Expert Group Meeting on the SAARC Coastal Zone Management Action Plan and subsequently the decisions taken by Governing Boards of SCZMC and SDMC, SDMC organized a workshop pooling the domain experts from all the coastal countries in collaboration with National Institute of Oceanography (NIO), Goa, India on March 27-28, 2008.

1.3 The Workshop was planned to discuss the outstanding operational issues to suggest the methodology for the development of a template, in two parts, for the preparation of a Coastal and Marine Hazard Mitigation Plan for the South Asia;

i. Part-1 - Coastal and Marine Risk Mitigation Plan for each Coastal country.

ii. Part-II - Coastal and Marine Risk Mitigation Plan for the region.

The template in Part-I was to lay emphasis on the issues that each coastal country has to address within the country for the development of detailed mitigation plan according to its own needs, priorities and resources.

The template in Part-II was to facilitate the development of a detailed regional Coastal and Marine Risk Mitigation Plan, which could focus mainly on the issues of regional cooperation. It was also envisaged that the regional plan shall be implemented by the SDMC to the extent it would be within its mandate.

Marine and Coastal Risk in South Asia: Key Issues and Challenges

2.1 The coastal regions of South Asia have been facing atmospheric depressions resulting in cyclones, storm surges, tsunami, erosion and coastal flood. Seawater rise has threatened many coastal and deltaic regions from submergence. There is also man -made disasters like oil spills, coastal pollution and ballast water exchange, creating newer grounds for coastal and marine vulnerability in the region. The United Nations has ranked South Asia region among the lowest in the world in terms of declared marine and coastal protected areas. All these factors contribute to the increasingly high coastal and marine risks in South Asia.

The major disaster risks facing the coastal and marine areas of South Asia are summarized below:

2.2 The Bay of Bengal and Arabian Ocean Basins, of which a large portion of the South Asia coast is a part, generate lesser numbers of the world's cyclone; yet their coastal impacts are comparatively very high and devastating especially, when they strike coasts bordering the North Bay of Bengal. Higher sea temperatures are likely to lead to more intense tropical and extra-tropical cyclones. During the past

three decades the number of tropical cyclones of Category 4 and above has increased sharply from 8% to 25% in North Indian Ocean and 18% to 34% in South Indian Ocean basins – the largest among the ocean basins of the world. This is going to directly increase hazard exposure in existing cyclone hotspots especially when combined with an increase in the concentration of population and economic activities in South Asian coastal regions. At the same time, higher sea temperatures may also alter cyclone tracks, meaning that hazard exposure to tropical storms could increase in regions that historically have not suffered cyclones, creating newer hotspots.

2.3 Storm surge is the catastrophic feature of cyclones. The degree of disaster potential depends on the storm surge amplitude associated with the cyclone at the time of landfall, characteristics of coast, phases of tides and the vulnerability of the area and community. The impacts of storm surges have been devastating on the coastal areas bordering the North Bay of Bengal. The tropical cyclones of specified intensity in the Bay of Bengal striking the east coast of India and Bangladesh coasts usually produce higher storm surge compared to elsewhere in the world because of the special nature of the coastline, shallow coastal ocean bottom topography and characteristics of tide. Their coastal impact is very large in the region because of low and flat coastal terrain, high density of population, low awareness of community, inadequate response and preparedness and absence of hedging mechanism.

2.4 Tsunamis are an ever-present threat to lives and property along the coasts of most of the world's oceans. In the vicinity of SAARC countries, there are two tsunamigenic zones, Andaman-Sumatra trench and the Makran coast. The 2004 Indian Ocean tsunami was one of the most devastating disasters in modern history. The earthquake, which triggered the waves, was the second largest earthquake ever recorded on a seismograph. The hardest hit countries were Indonesia, Sri Lanka, India, Thailand and the Maldives. Many coastal settlements of South Asia continue to live with the high risk from tsunami.

2.5 The IPCC (2007) report gives alarming scenarios on the potential sea level rise; it is expected to rise by at least 40 cm by 2100, inundating vast areas on the Asian coastline. In terms of direct impacts, this is very likely to lead to a rapid increase in hazard exposure due to increased coastal flooding, wave and storm surges and erosion, particularly if population and economic activities continue to be concentrated in coastal areas. The rise in sea level impacts coastal community by many ways directly and indirectly. It will force coastal community to move inland, increase coastal erosion, salt-water intrusion, and render agricultural land infertile. Bangladesh, India, Maldives and Sri Lanka, with extensive low-lying areas just above the sea level, are likely to be hard hit. In addition to sea level rise, increase in sea temperature will intensify the coral bleaching. It may also cause migration of species towards polar region and increase in algal blooming.

2.6 Coastal erosion is a universal problem and it has been estimated that 70% of all the beaches in the world are eroding. Most of the existing and potential coastal erosion hazard problems arise because of coastal development having been undertaken too close to the sea. Coastal erosion is primarily associated with dynamic natural shoreline fluctuations and changes. At many places development has been undertaken without adequate measures to accommodate these natural shoreline movements. In South Asia, the continental shelf along the east coast is narrow, whereas along the west coast, the width of the shelf varies from about 340 km in the north to less than about 60 km in the south.

2.7 Damage to coastal habitats and wildlife is increasingly becoming more severe in South Asia due to population growth and increased economic and development activities. Oil spills, pipeline leaks, accidents, sub-marine earthquakes, mudslides and volcanic eruptions contribute further to the costal and marine pollution. The most affected coastal systems include wetlands, mangroves and coral reefs, which do provide natural cover to alleviate the impact of coastal disasters. Concentration of heavy metals such as mercury, lead and cadmium in coastal water has become a cause of great concern.

2.8 Significant amounts of oil and oil by-products are released into the environment, mainly due to oil production, transportation and use affecting adversely marine and coastal environment. Although major oil spills constitute an estimated two-percent of the total marine pollution, they cause severe damage to coastal environmental and serious degradation of the aesthetic of shoreline.

Global & Regional Efforts on Coastal and Marine Risk Reduction

3.1 At global level, primarily Intergovernmental Oceanographic Commission (IOC) under UNESCO and WMO have been dealing with coastal and marine risk reduction issues. The efforts have helped considerably setting up as well as improving the quality of Early Warning Systems (EWS) and thus enhanced the risk reduction capacities worldwide.

3.2 The common ocean basins of Bay of Bengal and Arabian Sea bring in several common elements of coastal and ocean science, technologies, policies, planning, experiences and lessons learnt to share with and work together in the framework of regional cooperation for coastal and marine risk reduction. At regional level, the mitigation needs vary according to the types of disasters. The mitigation needs for tsunami, for example would include the assessment of relative vulnerability/risk across the region and sub-region, networking of seismic stations/Tide Gauges/Deep Ocean Assessment and Reporting of Tsunami (DART) etc. With regards to cyclone, it starts from hazard detection (often having trans-boundary origins) to monitoring, tracking & prediction of intensity and landfall.

National Efforts

4.1 The coastal countries of South Asia have adopted in varying degrees some mitigation measures to reduce the risks of coastal and marine disasters. Some of the common mitigation measures that have been adapted to safeguard the coastal communities are listed below.

Structural mitigation measures:

a) Construction of cyclone shelters to safeguard the lives of the communities living along the disaster prone stretches of the coasts.
b) Construction of sea walls to absorb the impact of the force being exerted by the sea waves, and to check coastal erosion.
c) Protection of sand dunes in the back beach area with their vegetation cover. These dunes form a natural barrier to high storm surges and waves, protecting the back beach environment from the hazards of these storms.
d) Development and regeneration of bio shields for the protection of coastal environment

Non-structural mitigation measures:

a) Prediction of coastal hazards in time and space using the advances in enabling technologies – including ICT, space, modeling and better scientific understanding of the coastal processes.
b) Micro-zonation and risk mapping to target all kinds of technological, physical, financial and policy related interventions.
c) Regulatory measures to impose restrictions on land use pattern as a part of coastal zone management can be adopted.
d) Community education programmes to serve as both mitigation as well as preparedness measures to build resilience in vulnerable coastal communities.

4.2 Some of the national efforts viz., Cyclone Preparedness Programme of Bangladesh, Coastal Zone Management of Sri Lanka, 'Safe Island' programme of Maldives and development of National Tsunami and Strom Surge Warning System in India have been among the good practices.

Regional Workshop on Coastal and Marine Risk: Outcomes and Key Recommendations

5.1 The SAARC Disaster Management Centre (SDMC) organized the SAARC Workshop on Coastal and Marine Risk Mitigation Plan in collaboration with National Institute of Oceanography (NIO) Goa on

March 27-28, 2008. The deliberations highlighted that coastal and marine risks are seen often having trans-boundary regional character of their causes as well as effects. Mitigation plans for marine hazards and risks therefore need national action as well as regional cooperation.

5.3 The workshop also brought out certain issues for national action and regional cooperation such as:

- Aggregation of mitigation plan for marine hazards and risks at regional level;
- Integrated coastal zone management based on the broad parameters of Indian Ocean basin as a whole;
- Enhancing the scope and effectiveness of Early Warning Systems for coastal hazards such as Cyclone, Storm Surge and Tsunami;
- Development of Oil Spill Contingency Plans at national as well as regional levels;
- Capacity building needs in R&D, training and networking of knowledge institutions in areas of coastal and marine risk;
- Institutionalization of Regional Cooperation through SAARC Disaster Management Centre (SDMC) especially in the areas of coastal and marine risks.

5.4 Following specific recommendations were made:

I. Areas for Regional Cooperation

- The coastal countries of South Asia share the common Indian Ocean basins of Bay of Bengal and Arabian Sea and *it is necessary that a common protocol should be developed at regional level addressing the coastal and marine risks*;
- Integrated Coastal Zone Management does provide a common ground for several issues viz., sustainable development of the coasts, climate change mitigation and adaptation, and also coastal & marine risk reduction. It is therefore *necessary to promote integrated coastal zone management strategies with regional perspectives*;
- Establish *a compatible and interoperable national and regional integrated coastal zone management system along the Indian Ocean coast*;

- Internalize strategically coastal and marine risk reduction strategies in the coastal zone management plans;
- Develop the Regional Oil Spill Contingency Plan engaging the stakeholders and enhance national capacities for preparation of National Oil Spill Contingency Plan;
- Engage stakeholders and secure the commitment and political support from the respective governments on regional cooperation towards addressing coastal and marine risks;
- Develop, pass and enforce national legislation to provide an institutional and legal basis for coastal management with the regional perspectives;
- Establish a network of SAARC knowledge institutions involved in coastal and marine hazards for sharing of data, expertise and knowledge;
- Regional agreements on sharing the data along the coasts, scaling up the scope of India's National Tsunami and Storm Surge Warning System; similarly for the cyclone and storm surge warning systems along the coast.

II. Enhancing the Capacities as well as Effectiveness of Early Warning Systems of Coastal Disasters

- Put in place the mechanisms for regional cooperation to enhance the quality of the forecast of storms, tsunami, coastal floods and storm surge in line with the best practices forecast capacities in the region and the rest of the world.
- Regional efforts on mapping coastal risks in areas, provinces, districts and critical zones for proactive prevention, disaster risk assessment and policy formulation. Preference is given to most vulnerable coastal areas.

III. Mitigation

[A] Structural and non-structural measures (shelters, Coastal Resource Management etc)

- Sustainable and integrated land use planning to minimize exposure to risks
- Identifying evacuation zones and protecting evacuation routes to identified safe areas
- Identifying buildings for approved vertical evacuation
- Reduce exposure of critical infrastructure to risk including possible relocation

- Sitting, design and construction of building and infrastructure considers risks from coastal hazards and protects sensitive coastal habitats
- Management of sensitive coastal resources and natural protective features to reduce risk (eg. Mangroves, coral reefs, etc…)
- Redevelopment policies and systems in place to guide post reconstruction away from high risk areas

[B] Enforcement of construction guidelines and building codes

- Commitment to promote best practice guidelines and adoption of model building codes
- Land use planning and building codes

IV. Information sharing regionally

- Establish structure and mechanisms for information sharing on coastal and marine risk reduction,
- Development and testing of tools to exchange information e.g. internet links, knowledge portals etc,
- Promote and encourage – (i) scientist to scientist interactions & information sharing; (ii) institution to institution partnerships, and (iii) government to government cooperation both on bilateral as well as regional level facilitating R&D, better operational strategies, more effective S&T products and services in support of reducing marine and coastal risks along the coast of Indian ocean;
- Organize the working groups on risk assessment, inundation modeling and interoperable warning system issues through regional cooperation.

V. Knowledge and awareness

- Develop knowledge and awareness outreach materials
- Establish system for knowledge management and advocacy programmes
- Incorporate awareness and education about coastal hazards into school curricula from primary to tertiary levels, formal and non-formal (local, religious, social)
- Identify target groups and partners
- Collect and share best practice examples
- Establish regional coastal hazard education programmes
- Promote research to support improved Mitigation, Preparation and Response addressing the coastal and marine risks

- Documentation and harnessing the untapped indigenous knowledge available in coastal regions of South Asia

5.3 The deliberations led to the content creation for the template in Part-I focusing on the issues that each coastal country has to address within the country, while the contents in template in Part-II are arrived at to take up for development of a detailed regional Coastal and Marine Risk Mitigation Plan, focusing mainly on the issues of regional cooperation.

Development of Template for Coastal and Marine Risk Mitigation Plan for South Asia

6.1 The key recommendations on development of a template for coastal and marine risk mitigation plan for South Asia evolved through the discussions and exchange of information and knowledge on both the parts:

i. **Part-I** - Coastal and Marine Risk Mitigation Plan for each Coastal country on the basis of which each country shall develop its own Plan, and

ii. **Part-II** - Coastal and Marine Risk Mitigation Plan for the region.

6.2 Essentially, the outlines for Part I & II are designed in a way that facilitates and leads to the following outcomes:

a) To enable the coastal countries of the region to develop its own Mitigation Plan with the regional perspectives;
b) To bring in synergy and convergence among the SAARC countries on their Mitigation Planning efforts – in terms of common, uniform and inter-operable parameters/indicators with regards to the coastal and marine risks;
c) To harmonize with on-going international protocols and conventions with regards to coastal protection;
d) To aggregate the Nationwide Mitigation Plans and efforts enabling more effective and inclusive strategies at regional level; and

e) Coupling the Coastal Zone Management strategies with risk reduction at regional level.

TEMPLATE CONTENT OF
[A] National Coastal and Marine Mitigation Plan

i. Country with per cent of coastal population (gender wise/age wise classifications), their density and coastline

   a. The information is required for profiling the overall coastal vulnerability at national level;
   b. Economic and social status of the population is defined in terms of income and literacy levels to assess layers of vulnerability;
   c. The population within 5 km from the coast will bring uniformity in terms of classifying the coastal population.

ii. Major Coastal Disasters in terms of frequency, per cent of affected population, geographical areas, perceived vulnerability to the climate change impact especially – sea level rise, adaptation issues provide vulnerability levels. This information is essentially for vulnerability indexing.

iii. Status of pre-disaster preparedness is to highlight the institutional, policy and networking issues (at various levels – International, national, state, district and further down the line community level) that illustrates the overall framework a country has to address the coastal hazards.

iv. Status of Early Detection and Warning Systems – (i) cyclone, (ii) storm surge, (iii) tsunami, (iv) coastal flooding, & (v) Coastal erosion will illustrate the status of preparedness.

v. Whether a country is the part of international enabling mechanisms of Early Warning Systems like IOC, WMO will also indicate the levels of preparedness and linkages to the global/regional Early Warning Systems.

vi. Status of monitoring mechanisms for each disaster explains the existing gaps in the existing systems.

vii. Status of response mechanisms includes specialized agencies like coastal guards, trained search and rescue teams etc in the event of emergencies/coastal disasters.

viii. Hazard Zonation/Vulnerability Mapping in terms of availability of maps, if yes then what is scale of the mapping or whether they are in digital or analog forms. This information will explain the needs as well as the gaps with regards to vulnerability mapping, which is also crucial for positioning Early Warning Systems.

ix. Institutional framework for coastal and marine risk assessment that includes status of S&T agencies/establishments, operational set-up including training and education networks will bring out the knowledge infrastructure in the respective country. For example, India and Pakistan have specialized National Institute of Oceanography (NIO) dedicated for specialized R&D and also training. It is important to list out such agencies for networking at various levels.

x. Legal and legislative framework in terms of having a coastal zone management plan, structural/non-structural measures etc indicates the level of preparedness.

xi. Critical needs based on the assessment of existing national programmes in terms of having the optimal level of densification of Early Warning Systems, Hazard Zonation/Risk Assessment, Mitigation Plans, Policy/institutional and training needs are required for regional cooperation.

xii. Elements of National Mitigation Plans taking into account national priorities towards conservation, development, coastal zone management as well as conceived structural/non-structural measures and scale of vulnerability mapping bring out the specific need matrix, which could be addressed by various means including regional cooperation.

xiii. Assessment of synergy between the Coastal Zone Management Plan and Coastal Hazard Mitigation strategy is to bring out the

convergence between the two. It is essentially to address the cross-sectoral issue.

xiv. Major issues for regional cooperation for a particular country could be felt in terms of the priority matrix involving networking, Early Warning, Capacity Building and by having joint projects at regional level. It is important to spell out such issues to initiate dialogues and follow-up actions at various levels.

xv. For the preparation of National Mitigation Plan what could be the expectations from SAARC Disaster Management Centre. For example, whether they could be:

i. to assess the capacity building needs of different national agencies through consultation,
ii. to design user oriented need based capacity building programmes, and
iii. to facilitate in executing capacity building programmes.

xvi. Any Specific Issues of Priorities – like National Oil Spill Contingency Plan is the issue of high priority for Maldives

TEMPLATE CONTENT OF
[B] Regional Coastal and Marine Mitigation Plan

I. Specific Areas (or problems/ issues) for Regional Cooperation – It is important to spell out those areas [for example coastal vulnerability to the cyclone along the Bay of Bengal coastline beyond the political boundaries etc] so that suitable strategies could be formulated.

II. Outline the strategies/ solutions addressing the critical areas in National Mitigation Plans through Regional Cooperation

It's in way suggesting a strategy based on the country's perspectives.

III. Elements of Regional Coastal and Marine Risk Mitigation Plan

What could be the elements, for example, the levels of information about vulnerability, terrain, ecological features etc.

IV. Scale of Mapping for Regional Mitigation Plans

- (1:>1 Million, 1: 250K or better)
- Sources of data/info for aggregation at regional level
- Whether it will be seamless to National Mitigation Plans;
- What could be the possible layers for vulnerability assessment
  - geo-physical, climatic, socio-economic & ecological?
- Name the best practices suiting to the approach of the regional mitigation plans.

V. Approach to encourage participatory efforts on preparing Regional Mitigation Plan

VI. Suggested Work Plan for SDMC in Preparation of Regional Mitigation Plan for Reducing Coastal and Marine Risks

Road Map

Following action points were emerged for which the roadmaps to be followed during 2009-2011 were suggested below:

I. Development of Template for Harmonization of Coastal and Marine Risk Management Plans in South Asia

Taking into account the above recommendations and the broad contents for development of template for inter-operable coastal and marine risk management plans, SDMC shall develop a detailed template to harmonize the coastal and marine risk management plans being followed among the coastal South Asian countries.

The draft template shall be circulated among the member countries for their comments and a template will be finalized incorporating the concerns/views of all stakeholders. The template, besides harmonizing the coastal and marine risk management plans, shall take into the typical ocean basin characteristics of Bay of Bengal and Arabian Sea to bring in synergy among the on-going and future initiatives.

II. **Development of Detailed Coastal and Marine Risk Management Plans**

With the backdrop of above findings and recommendations, SDMC shall develop, a regional level – ocean basin wise, detailed coastal and marine risk management plans. The risk management plan shall draw lessons, experiences and perspectives from the existing coastal zone management activities in the region.

III. **Development of Regional Protocols for Sharing of Tsunami and Cyclone Early Warning**

SDMC shall examine all the existing arrangements [UNESCO Inter-governmental Oceanographic Commission (IOC) framework, Pacific Tsunami Warning System protocols for sharing Tsunami Warning, etc] which enable real time access to tsunami warning to develop the framework for regional cooperation to share real time Tsunami warning data.

SDMC shall study the operational feasibility towards synergy among the existing/planned cyclone warning systems along the coasts of Bay of Bengal and Arabian Sea and develop the regional protocols for sharing Tsunami and Cyclone Early Warning.

A draft regional protocol for sharing real time Tsunami warning and bringing in synergy and convergence among cyclone warning systems along the coasts of Bay of Bengal and Arabian Sea shall be prepared and also initiate dialogues involving all the stakeholders and enabling mechanisms towards operationalizing the protocols.

IV. **Enabling Knowledge Sharing for Coastal and Marine Risk Reduction**

SDMC shall attach high priority for knowledge creation, sharing and dissemination by making more focused provisions

while operationalizing South Asian Disaster Knowledge Network (SADKN).