

17

**Sustainable
Management
Of Marine and
Coastal Protected
Areas: Taking
An Inclusive
Approach**

Neeraj Khara*#

Deutsche Gesellschaft für Internationale
Zusammenarbeit (GIZ) GmbH,
A-2/18, Safdarjung Enclave,
New Delhi 110029, India

*Email: neerajkhara@gmail.com

The views and ideas expressed in this publication are
those of the author and do not necessarily represent the
views of GIZ

Summary

Ecosystem services arising out of protected marine and coastal ecosystems are the foundation for the livelihood security of coastal communities as well as business establishments and coastal megacities. The positive impact that the marine and coastal protected areas have for climate change management and disaster risk reduction strategies further accentuates their role in safeguarding human habitations, livelihoods and overall well-being. However, there is a trade-off in the use of ecosystem services by different activities of various sectors, and this trade-off exists within the 'green sector' as well. For sustaining the life-supporting ecosystem services, it is extremely relevant to be able to identify such synergies and trade-offs at the right time. A conceptual framework is presented in this paper for identifying these synergies and trade-offs, as the first step towards inclusive planning of these protected areas. It is proposed that an inclusive approach to marine and coastal protected areas be taken to tackle the current challenges. It spans awareness strategies, economic incentives, joint planning with other sectors, avoiding trade-offs with activities aiming at climate change adaptation and disaster risk reduction, facilitating a legal environment that enables participation of local communities, and supporting capacity development solutions for key stakeholders and sectors.

Keywords: *Climate change adaptation; disaster risk reduction, marine and coastal protected areas, ecosystem services.*

Introduction

Protection and maintenance of marine and coastal biodiversity is the most urgent and important task for maintaining the marine and coastal ecosystem services that form the foundation of livelihood security as well as for managing climate change and natural disasters. The marine and coastal biodiversity is the source of provisioning services such as food (UNEP 2009), water, genetic resources, biochemicals and medicines; regulating services such as climate regulation (CBD 2009; Turner et al 2009; World Bank 2009; Pramova et al 2012), facilitating water flows and protection from natural hazards and shoreline erosion (Dahdouh-Guebas et al 2005; Kathiresan & Rajendran 2005); cultural services such as recreation and ecotourism, protection of cultural heritage and social relations and the customs and traditions of fishing communities (Mengerink et al 2009); and supporting services such as photosynthesis, provision of oxygen, maintenance of nutrient cycles and serving as the foundation of the food chain (MEA 2005).

Ecosystems and biodiversity underpin the global economy and human well-being and need to be valued and protected. The ocean and coastal ecosystems may provide as much as two-thirds of the ecosystem services that make up the planet's natural capital (TEEB 2012). In the coastal areas, a major determinant of the well-being and livelihood security is the availability of marine and coastal biodiversity resources and access to these resources. The consequences of the biodiversity loss and resulting loss of ecosystem services, therefore, have far reaching impacts on livelihoods and the overall well-being of human communities. One of the most effective means of protecting marine and coastal biodiversity is through the establishment and management of marine and coastal protected areas (MPAs or MCPAs).



Fig 1 : Fishermen

Neeraj Khera



MPAs provide a win-win solution for both conservation of biodiversity and sustaining the livelihoods of local communities, which should make coastal communities the biggest supporter of MPAs. However, in practice the MPAs have not been very successful in securing the participation and acceptance of local communities. Rather, some existing and proposed MPAs have been criticized by local communities as impinging on land usage rights and consequently leading to a loss of livelihood opportunities (Christie & White 2007). This criticism is stronger in poor and developing countries, and India is not an exception.

The available information shows that the major threats to the sustainability of marine and coastal protected areas include land-based pollution and eutrophication, overfishing, destructive fishing (and illegal, unreported and unregulated (IUU) fishing), alteration of physical habitats, invasions of exotic species, global climate change and natural disasters. A good understanding of the mechanisms (scientific, socio-political, economic and legal) under which different factors operate and affect marine and coastal biodiversity will be the key to developing approaches for sustainable management of MPAs. This paper intends to explore the inter-linkages that exist between different factors that influence the sustainability of marine and coastal protected areas and discusses a possible inclusive approach that can be adopted to ensure success in managing marine and coastal protected areas.

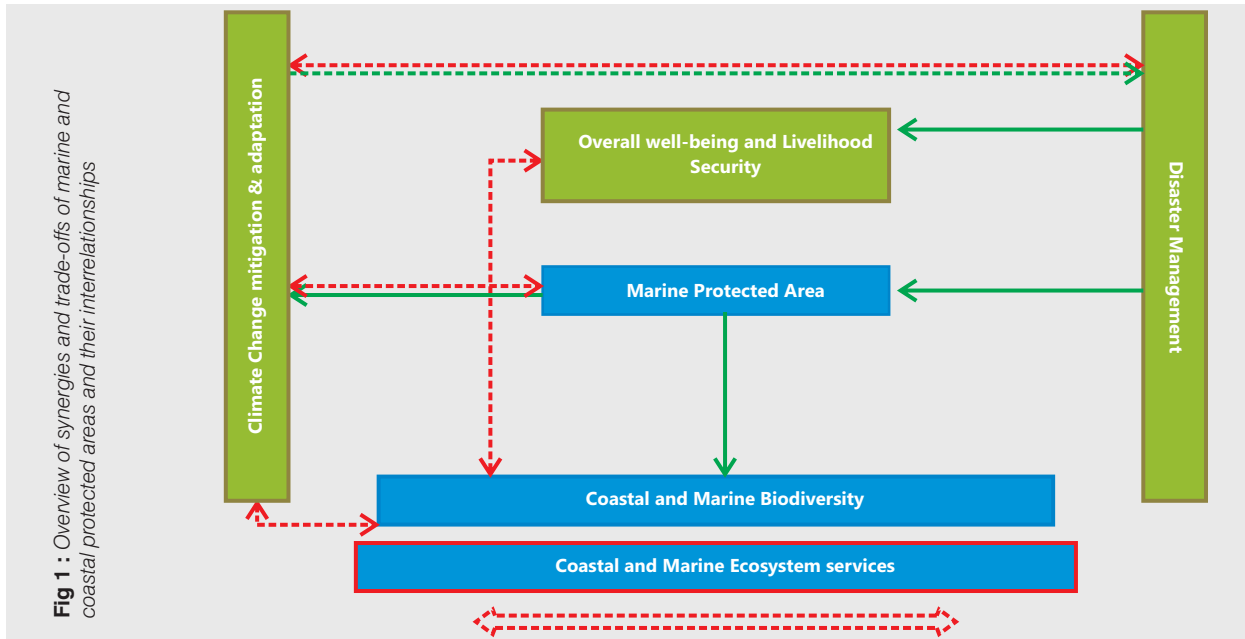
Methods

The paper builds upon the existing information about the aforementioned factors and their relationship with marine and coastal biodiversity. The available literature and documents specifically addressing the relationship between marine and coastal biodiversity and any of the important factors (coastal livelihoods, disaster risk reduction (DRR), climate change adaptation & mitigation) were reviewed, followed by conceptual analysis leading to construction of a framework.

The fundamental assumption, on which further discussions in this paper are based, is that sustainable management of MPAs can be realized only with an inclusive approach towards managing marine and coastal biodiversity.

Discussion and Analysis

The following paragraphs provide an indicative overview of the interrelationship (synergies and trade-offs) that marine and coastal protected areas have with livelihood security, climate change adaptation (CCA) and DRR. These relationships are delineated in the form of a conceptual framework (Figure 1), which helps take forward the discussion about these interrelationships.



Trade-offs between different ecosystem services

Stable and bio-diverse ecosystems provide multiple services, which interact in multiple ways. This makes the ecosystem services related to each other either negatively or positively. Some ecosystem services co-vary positively (an increase in one service means another also increases) and others co-vary negatively (an increase in one service means another decreases). Focusing on one ecosystem service in isolation from the possible impacts on other critical ecosystems services provided by the same ecosystem leads to a situation of conflict and management failure (Elmqvist et al 2011).

Marine and coastal ecosystems around the world are experiencing an increasing demand for their diverse ecosystem services, required for different sectors such as fisheries, tourism, biodiversity conservation, CCA, DRR and so on. The viability of many activities of these sectors is dependent on the services provided by the same ecosystem. In such situations, progress toward one objective such as increasing fish production has often been at the cost of other objectives such as conserving biological diversity or improving water quality (MEA 2005), and this is known as a 'trade-off'. These trade-offs exist even within the 'green sector'.





Synergies and trade-offs with disaster risk reduction and climate change adaptation

A number of studies indicate that sustainable strategies for DRR help improve livelihoods (Pomeroy et al 2006). DRR strategies involve enhancement of the adaptive capacity of the coastal population, which also increases the livelihood options through better communication and awareness (Pomeroy et al 2006; IPCC 2012). The coastal population, with enhanced adaptive capacities, is also less vulnerable to the negative impacts of climate change.

While most of the DRR activities are synergistic with the objectives of marine and coastal protected areas and the livelihoods of coastal communities, there are certain activities with trade-offs, such as shelterbelt plantation on the shoreline with *Casuarina equisetifolia* for cyclone protection (NDMA 2008), which reportedly has adverse effects on the nesting of sea turtles by causing beaches to shrink (Balu 2008). Ironically, it has also not been possible so far to establish the effectiveness of thin shelterbelt plantations as bio-shields (Forbes & Broadhead 2007). This example supports the need to build scenarios of ecosystem services trade-offs, which will help prioritize activities based on their impacts on ecosystem services.

Threats to marine and coastal biodiversity are further enhanced in light of the observed and predicted impacts of climate change. Climate change will have heightened negative impacts on the coastal ecosystems by increasing the risk of natural disasters such as coastal flooding and other extreme events (IPCC 2012). CCA is an important management strategy for reducing the vulnerability of people and infrastructure to the negative impacts of climate change. CCA interventions reduce the threats to habitats and tourism infrastructure and therefore enhance tourism opportunities (Parry et al 2007). However, trade-offs can be seen with the adaptation options such as modification of land use for agricultural practices and aquaculture, which may lead to habitat loss and degradation, spread of invasive alien species and coastal pollution-changes that may result in loss of fisheries, affecting local livelihoods and ultimately leaving the coastal communities even more vulnerable to the negative impacts of climate change and natural disasters than before.

.Similarly, protective hard infrastructure raised as CCA option (such as seawalls, floodgates and tidal barriers and saltwater-intrusion barriers) have been reported to be ineffective in extending protection, rather enhancing the risk of natural disasters and contributing to habitat loss due to coastal squeeze (Knogge et al 2004; Rochelle-Newall et al 2005). Such CCA strategies, termed as mal-adaptation (Burton 1996), may compromise biodiversity and ecosystem stability in the long term and not only increases disaster risk but also diminish livelihood opportunities of the population and make them more vulnerable to climate change.

Marine and coastal protected areas and livelihood security

Coastal communities, especially those in the developing countries, depend largely on fisheries for their livelihoods (Pérez 2010; Koziell 2001). With the increasing population, the need for fish catch is also increasing. Marine and coastal protected areas play a crucial role in maintaining the fish population in the sea and help meet the increasing demand for fish and support coastal livelihoods. These protected areas, if partially or entirely closed to fishing, have proved to be very effective in association with conventional fisheries management in rebuilding damaged fish stocks and in giving all stocks some stability. In several regions, fish stocks have increased rapidly following the establishment of MPAs. Far from hurting the fishing industry, the MPAs have led to enhanced catches, hence providing a direct economic benefit. The larger stocks inside the reserves export their offspring to fishing grounds through ocean currents. Juveniles and adults may also emigrate from the reserves, so boosting fisheries nearby (Kelleher 1999).

Certain livelihood activities negatively affect marine and coastal habitats and species and thus hinder the sustainability of MPAs. The use of two ecosystem services-capture fisheries and freshwater-is now well beyond levels that can be sustained even at current demands, much less future ones (MEA 2005). The role of the shipping industry in spreading invasive alien species is known to threaten several ecosystems (IOC/UNESCO, IMO, FAO and UNDP 2011). Tourism is emerging as another important livelihood activity among the coastal communities. The values of tourism increase when the areas receive some degree of protection. Marine and coastal protected areas, therefore, are instrumental in bringing income to the coastal communities in the form of tourism. Coastal tourism is a double-edged activity: on one hand it has the potential to contribute to socio-economic achievements and, on the other hand, its fast and uncontrolled growth can be the major cause of degradation of the coastal environment and loss of local identity and traditional cultures (SCBD 2004).

A very important issue, when discussing trade-offs, is the perceived loss of livelihood opportunity of the coastal populations due to restricted resource use in a marine protected area. The designation and expansion of protected areas apparently have also brought associated social and ecological costs and can threaten the long-term viability of the protected areas themselves (Pimbert & Jules 1997). This lack of livelihood security and loss of trust ultimately undermine conservation objectives as the rates of extraction intensify in areas surrounding the marine and coastal protected areas.



Fig 3: Fishermen in an estuary

Neeraj Khera

Way Forward

Many marine and coastal ecosystems no longer deliver the full suite of ecosystem services upon which humans have come to rely (Mengerink et al 2009) due to the existence of trade-offs between the activities of different sectors. Trade-offs can be minimized if the primary goal of all the activities in the marine and coastal ecosystems is maintaining a sustainable flow of ecosystem services (Rosenberg 2005; MEA 2005). An inclusive approach to marine and coastal protected area management, comprising the following pathways could possibly lead to sustainable management of marine and coastal protected areas in general and enhancing support from the coastal communities in particular.

- **Awareness strategies and actors.** The role played by the ecosystem services-in all the four dimensions i.e. productive, regulatory, cultural and support-can serve as a very useful starting point to bring about the levels of awareness needed. Also, bringing in all the other major factors affecting people in their day-to-day actions, such as climate change and natural disasters, will help people understand the significance of marine and coastal protection in a more holistic and positive way. The conceptual framework (Figure 1) can serve as the basis for drawing linkages. In a country like India, with the youth being dominant in the population and with a strong presence of the media in even the remotest of villages, innovative approaches toward communication and awareness can work well. The print, electronic and new media can play a very important role in enhancing awareness about the issues related to marine and coastal protected areas in the country.
- **Economic incentives.** However, an awareness of the benefits of protecting marine and coastal ecosystems alone will not be sufficient to bring in a change in unsustainable livelihood practices. It is crucial to put in place economic incentives for those who participate in conservation efforts (TEEB 2012). Incentives to support the participating communities and stakeholders by compensating them for their short-term losses may be included in long-term conservation strategies. An increased awareness coupled with economic incentives may enable the coastal communities to make informed decisions with regard to short-term financial gains (unsustainable livelihood practices) and long-term sustainable economic gains (sustainable livelihood practices).
- **Inclusion of other sectors in planning and implementation.** The relationship between biodiversity and livelihoods in marine and coastal ecosystems may not take a positive turn even after the best of investments and efforts unless and until other prevailing factors in the same ecosystem are also included in planning. The existence of commercial interests, in the form of commercial fisheries (deep sea fishing, trawling etc), has been reported to be one of the main reasons behind small traditional fish workers not only adopting unsustainable fishing practices but also being diverted to other practices such as aquaculture when the fisheries no longer support their livelihood needs. So when commercial fisheries practices are going on in an area, it is almost impossible (and may be unreasonable) to direct sustainable utilization efforts at traditional or small fish workers along the coast.
- Apart from commercial fishing activities, other factors that must be included in planning are the sprawling tourism facilities and associated infrastructure, industrial establishments on the coast and urban megacities. These



development activities undoubtedly bring better facilities to the area and support local livelihoods; however, the negative impacts of their processes on the marine and coastal ecosystems are high and result in irreplaceable loss of ecosystem services. There is a need to facilitate dialogue and joint planning and management between different sectors, especially the forest and fisheries departments, possibly at the state level. Impact assessment is potentially an effective tool for aligning biodiversity and development priorities (Trewick et al 2005; Rajvanshi et al 2010, 2011). This has been used in protected areas in India (Rajvanshi 2005) and may help identify potential trade-offs and synergies among different sectors.

- As discussed in the previous section, strategies and activities of the 'green sector' can also be a matter of concern, sometimes, for the sustainability of marine and coastal protected areas. An inclusive approach to enhancing synergies and minimizing trade-offs can be adopted by considering CCA planning, DRR strategies and livelihood strategies in the overall management planning for marine and coastal protected areas. Disaster management and fisheries being state subjects, the most effective level of this joint planning may be at the level of the state government. Conservation of marine and coastal biodiversity and ecosystems provide multiple benefits in the long run and will automatically minimize the trade-offs between actions of various sectors. Adopting 'no regrets' measures can go a long way toward reducing vulnerability (Bettencourt 2006), in this case that of the coastal communities and biodiversity.
- At the global level, a joint liaison group has been established between the three Rio conventions-CBD, UNFCCC and UNCCD, for biodiversity, disaster risk and climate change, respectively. The Multilateral Environment Agreement Information and Knowledge Management (MEA IKM) initiative seeks to develop a harmonized information system in support of knowledge management activities among MEAs for the benefit of Parties and the environment community at large. To enhance cooperation and coordination among the Basel, Rotterdam and Stockholm conventions, their respective COPs have taken up the synergies processes. A number of studies and technical reports on the interlinkages between biodiversity and climate change (CBD 2009) and between climate change and disaster risk (IPCC 2012; UNISDR/UNDP 2012a) reveal the seriousness with which the global community is addressing the issues of trade-offs and synergies between these three elements. The Indian National Biodiversity Action Plan (NBAP) also emphasizes the need to mainstream biodiversity in other sectors and cross-sectoral cooperation.
- There is, therefore, a need to develop institutional framework, at the state level, to facilitate joint planning for marine protected area management and CCA strategies and actions, as well as DRR strategies. National and state-level policy dialogues can help bring about a cross-sectoral approach and undertaking strategic planning. Marine spatial management-also called marine spatial planning, area-based management and ocean zoning-is a management approach that delineates permissible uses in specific geographic areas of ocean waters. Done correctly, marine spatial management provides a proactive way of addressing trade-offs among competing and conflicting uses (White et al 2012). At the activity level, local bodies such as panchayats and municipalities may be facilitated to carefully assess the long term impacts of development activities on ecosystem services.
- **Enabling legal environment.** The major obstacles to minimizing trade-offs, apart from a lack of evidence-based scientific research relating to this issue, include insufficient legal mechanisms to safeguard the loss and degradation of marine and coastal ecosystem services. After similar experiences in many parts of the world, some of the ideas behind protected area management are being changed, and now protected area categories that allow sustainable use of resources are recognized and included in internationally accepted criteria for defining protected areas (Kelleher 1999). This is a major paradigm shift in managing marine and coastal protected areas, and an enhanced scope of participation of local communities is expected to enhance the acceptability of marine protected areas among the coastal communities and therefore bring down resistance, which subsequently contributes to the sustainability of the marine protected area itself. An overview of the laws and policies related to marine and coastal ecosystems and biodiversity has been provided by Rajagopalan (2008) and Lakshmi et al (2012). New territories in the legal and policy framework need to be explored to ensure cross-sector and multi-stakeholder participation in marine and coastal protected area management. One such provision is provided under Section 37 of the Biological Diversity Act, 2002 and Rules, 2004 of India, for protecting areas of biological, ecological and cultural significance as Biodiversity Heritage Sites (BHS) (NBA 2013).

Cross-cutting measures

Two areas emerge clearly from the foregoing discussion, where intensive efforts and possibly a fresh approach are needed: an inclusive approach towards research and studies in marine and coastal ecosystems, and capacity development.

Research and studies

- There is a need to include a diversity of marine and coastal habitats under research planning by institutes and government departments and to identify vulnerable habitats that need immediate attention. Similarly, while it is important to intensify research on endangered species and vulnerable habitats for extending conservation to marine and coastal protected areas, more inclusive and broad-based research is also needed to constantly update our understanding of common marine and coastal species and their significant contributions to ecosystem services.
- The challenges in the domain of marine and coastal protected area management clearly reflect the need to bring in state-of-the-art technology to conduct multi-disciplinary research for assessing and monitoring biodiversity over space and time.
- Incorporating marine ecosystem services into fiscal, planning and regulatory regimes requires more and better information about the ways in which ecosystems contribute to people's well-being (TEEB 2012), assessing the flow of ecosystem services provided by different ecosystems and their values and building scenarios of synergies and trade-offs between different ecosystem services. Intensified scientific cooperation between coastal states and with other countries is needed to update the available information and technology.

Supporting Capacity Development

- Capacity development is the process of developing the capacities of individuals and shaping joint learning processes such that these individuals are enabled to achieve sustainable results within their own system of reference. The UN-Jakarta Mandate (1995), outlining the programme of actions for marine and coastal biodiversity within the CBD, stressed the importance of capacity building to ensure effective management of these areas. The IUCN marine guidelines emphasize that marine protected areas only work if all the users of the marine environment have a stake in their success. Similarly, a capacity building strategy toward sustainable management of marine and coastal protected areas can meet success only by taking an inclusive approach. An inclusive approach is needed in stakeholder selection (UNISDR/UNDP 2012b) as well as in implementing capacity building measures.
- Stakeholders may include the users/beneficiaries (fish workers, tourism agencies, traders, urban dwellers, etc), governance institutions (national/state/local governments and boards, protected area managers, traditional governance systems, boards), influencers (trade unions, the media, local leaders, youth groups) and providers (research institutions, consultants, etc). Though the intensity of capacity development efforts may vary between different stakeholders, depending on the situation, all the stakeholders must be included in the capacity development process to avoid any weak link in the chain. Capacity development must be able to bring change among stakeholders, in three dimensions: knowledge, skills and values/attitudes. A combination of traditional and innovative capacity development measures is required to achieve the objective.
- The most important factor is to use capacity development measures in a format that ensures sustainability and in which the individuals who take part in these measures are able to use their knowledge, skills and values for the intended purpose. This can be achieved by strengthening the existing or facilitating new knowledge-sharing networks. The challenging times ahead will require us to look beyond political boundaries and establish knowledge networks across states and nations.

Management of marine and coastal protected areas in these challenging times call for an inclusive approach by bringing in different stakeholders and sectors for planning and managing marine and coastal protected areas and exploring new forms of legal and policy support for establishing and managing these areas. This will require an in-depth understanding of ecosystem services, their synergies and trade-offs, management effectiveness in different categories of marine protected areas, as well as developing new and improved skills to not only study marine and coastal ecosystems but also to enhance the capabilities of the stakeholders. Most important is to bring in the shared values among different stakeholders vis-à-vis management of marine and coastal ecosystems. Placing ecosystem services at the centre of all the strategic development planning in marine and coastal ecosystems may support decision makers in framing policies, plans and programmes with 'biodiversity in mind'.

Fig 4 : Sundarbans

Neeraj Khara



References

- BALU, A. 2008. The World Bank funded coastal shelterbelt project threatens sea turtle nesting habitats in Tamil Nadu, India. *Indian Ocean Turtle Newsletter* 7: 23-25
- BETTENCOURT, S. 2006. *Not if, but When: Adapting to Natural Hazards in the Pacific Islands Region: A Policy Note*. Pacific Islands Country Management Unit, East Asia and Pacific Region, World Bank
- BURTON, I. 1996. The growth of adaptation capacity: Practice and policy. In: Smith, J.B., Bhatti, N., Menzhulin, G., Benioff, R., Budyko, M., Campos, M., Jallow B. & Rijsberman, F. (Eds.) *Adapting to Climate Change*. New York: Springer. Pp. 55-67.
- CONVENTION ON BIOLOGICAL DIVERSITY (CBD). 2009. Connecting Biodiversity and Climate Change Mitigation and Adaptation: Report of the Second Ad Hoc Technical Expert Group on Biodiversity and Climate Change. Technical Series No. 41. Montreal, Canada: Secretariat of the Convention on Biological Diversity (CBD). 126 pp.
- CHRISTIE, P. & WHITE, A.T. 2007. Best practices in governance and enforcement of marine protected areas: An overview. In: *FAO Expert Workshop on Marine Protected Areas and Fisheries Management: Review of Issues and Considerations*. Rome: FAO. Pp. 183-220.
- DAHDOUH-GUEBAS, F., JAYATISSA, L.P., DI NITTO, D., BOSIRE, J.O., LO SEEN, D., & KOEDAM, N. 2005. How effective were mangroves as a defence against the recent tsunami? *Current Biology* 15(12): 443-447.
- ELMQVIST, T., TUVENDAL, M., KRISHNASWAMY, J. & HYLANDER, K. 2011. Managing Trade-offs in Ecosystems Services. Division of Environmental Policy Implementation Working Paper 4. UNDP.
- FORBES, K. & BROADHEAD, J. 2007. *The Role of Coastal Forests in the Mitigation of Tsunami Impacts*. FAO.
- IOC/UNESCO, IMO, FAO, UNDP. 2011. *A Blueprint for Ocean and Coastal Sustainability*. Paris: IOC/UNESCO
- IPCC. 2012. Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. In: Field, C.B., Barros, V., Stocker, T.F., Qin, D., Dokken, D.J., Ebi, K.L., Mastrandrea, M.D., Mach, K.J., Plattner, G.-K., Allen, S.K., Tignor, M. & Midgley, P.M. (Eds.) *A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change*. Cambridge, UK/New York, USA: Cambridge University Press. 582 pp.
- KATHIRESAN, K. & RAJENDRAN, N. 2005. Coastal mangrove forests mitigated tsunamis. *Estuarine, Coastal and Shelf Science* 65: 601-606.
- KELLEHER, G. 1999. *Guidelines for Marine Protected Areas*. Gland: IUCN.
- KNOGGE, T., SCHIRMER, M. & SCHUCHARDT, B. 2004. Landscape-scale socio-economics of sea-level rise. *Ibis* 146: 11-17.
- KOZIELL, I. 2001. *Diversity not Adversity: Sustaining Livelihoods with Biodiversity*. IIED.
- LAKSHMI, A., SCHIAVINA, A., BANERJEE, P., REDDY, A., MANDEEN, S., RODRIGUEZ, S. & APTE, D. 2012. The Challenged Coast of India. A Report Prepared by Pondy CAN in Collaboration with BNHS and TISS. 233 pp.
- MENGERINK, K., SCHEMPP, A. & AUSTIN, J. 2009. *Ocean and Coastal Ecosystem-Based Management: Implementation Handbook*. Washington, DC: Environmental Law Institute. Retrieved on 15 June 2013. http://www.eli.org/sites/default/files/eli-pubs/d19_03.pdf

- MILLENNIUM ECOSYSTEM ASSESSMENT (MEA). 2005. *Ecosystems and Human Well Being: Synthesis*. Washington, DC: Island Press.
- NBA. 2013. Guidelines for selection and management of the Biodiversity Heritage Sites. Available from <http://nbaindia.org/uploaded/ut/Final%20BHS%20guidelines%20Approved%20in%20the%2019th%20Authority.pdf>
- NDMA. 2008. Management of Cyclones. National Disaster Management Authority, Government of India. 190 pp.
- PARRY, M.L., CANZIANI, O.F., PALUTIKOF, J.P., VAN DER LINDEN, P.J. & HANSON, C.E. (Eds.) 2007. *Climate Change 2007: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK: Cambridge University Press. 1000 pp. Also available at www.ipcc.ch.
- PÉREZ, A.A., FERNÁNDEZ, B.H. & GATTI, R.C. (Eds.) (2010). *Building Resilience to Climate Change: Ecosystem-Based Adaptation and Lessons from the Field* (No. 9). IUCN.
- PIMBERT, M.P. & JULES, N.P. 1997. Parks, people and professionals: Putting 'participation' into protected area management. Pp. 297-330 In: GHIMIRE, K.B. & PIMBERT, M.P. (Eds.) *Social Change and Conservation: Environmental Politics and Impacts of National Parks and Protected Areas*. London: Earthscan.
- POMEROY, R.S., RATNER, B.D., HALL, S.J., PIMOLJINDA, J. & VIVEKANANDAN, V. 2006. Coping with disaster: Rehabilitating coastal livelihoods and communities. *Marine Policy* 30(6): 786-793.
- PRAMOVA, E., LOCATELLI, B., BROCKHAUS, M. & FOHLMEISTER, S. 2012. Ecosystem services in the National Adaptation Programmes of Action. *Climate Policy* 12(4): 393-409.
- RAJAGOPALAN, R. 2008. *The Samudra Monograph: Marine Protected Areas in India*. Chennai, India: International Collective in Support of Fishworkers.
- RAJVANSHI, A. 2005. Strengthening biodiversity conservation through community oriented development projects: Environmental review of the India Eco-Development Project. *Journal of Environmental Assessment Policy and Management* 7(2): 299-325.
- RAJVANSHI, A., MATHUR, V.B. & SLOOTWEG, R. 2010. Biodiversity in environmental impact assessment In: Sloomweg R., Rajvanshi A., Mathur VB., Kolhoff A., (Ed.) *Biodiversity in environmental assessment: Enhancing Ecosystem Services for Human Well-Being*. New York: Cambridge University Press. p. 154-204
- RAJVANSHI, A., BROWNIE, S., SLOOTWEG, R. & ARORA, R. 2011. Maximizing benefits for biodiversity: The potential of enhancement strategies in impact assessment. *Impact Assessment and Project Appraisal* 29(3): 181-193
- ROCHELLE-NEWALL, E., KLEIN, R.J.T., NICHOLLS, R.J., BARRETT, K., BEHRENDT, H., BRESSER, T.N.H., CIESLAK, A., DE BRUIN, E.F.L.M., EDWARDS, T., HERMAN, P.M.J., LAANE, R.P.W.M., LEDOUX, L., LINDEBOOM, H., LISE, W., MONCHEVA, S., MOSCHELLA, P.S., STIVE, M.J.F. & VERMAAT, J.E. 2005. Global change and the European coast: Climate change and economic development. In: Vermaat, J.E., Ledoux, L., Turner, K. & Salomons, W. (Eds.) *Managing European Coasts: Past, Present and Future Environmental Science Monograph Series*. New York: Springer. Pp. 239-254.
- ROSENBERG, A.A. 2005. Regional governance and ecosystem-based management of ocean and coastal resources: Can we get there from here. *Duke Environmental Law & Policy* 16: 79.
- SECRETARIAT OF THE CONVENTION ON BIOLOGICAL DIVERSITY (SCBD). 2004. *Guidelines on Biodiversity and Tourism Development: International Guidelines for Activities Related to Sustainable Tourism Development in Vulnerable Terrestrial, Marine and Coastal Ecosystems and Habitats of Major Importance for Biological Diversity and Protected Areas, Including Fragile Riparian and Mountain Ecosystems (CBD Guidelines)*. Montreal: Secretariat of the Convention on Biological Diversity. 29 pp.
- TEEB. 2012. *Why value the oceans: A discussion paper*. Edited by Yannick Beaudoin and Linwood Pendleton. Available from <http://www.teebweb.org/wp-content/uploads/2013/04/2013-TEEB-for-Oceans-Discussion-Paper.pdf>
- TREWEEK, J., THERIVEL, R., THOMPSON, S. & SLATER, M. 2005. Principles for the use of SEA as a tool for promoting the conservation and sustainable use of biodiversity. *Journal of Environmental Assessment and Policy* 7(2): 173-199.
- TURNER, W.R., OPPENHEIMER, M. & WILCOVE, D.S. 2009. A force to fight global warming. *Nature* 428: 278-279.
- UNEP. 2009. *Fisheries and aquaculture in our changing climate*. UNEP.
- UNISDR/UNDP. 2012a. *Disaster Risk Reduction and Climate Change Adaptation in the Pacific: An Institutional and Policy Analysis*. Suva, Fiji: UNISDR, UNDP. 76 pp.
- UNISDR/UNDP. 2012b. *A Toolkit for Integrating Disaster Risk Reduction and Climate Change Adaptation into Ecosystem Management of Coastal and Marine Areas in South Asia*. Outcome of the South Asian Consultative Workshop on "Integration of Disaster Risk Reduction and Climate Change Adaptation into Biodiversity and Ecosystem Management of Coastal and Marine Areas in South Asia", held in New Delhi on 6 and 7 March 2012. New Delhi: UNDP. 173 pp.
- WORLD BANK. 2009. *Convenient Solutions to an Inconvenient Truth: Ecosystem-Based Approaches to Climate Change*. Washington, DC: The World Bank.
- WHITE, C., HALPERN, B.S. & KAPPEL, C.V. 2012. Ecosystem service trade off analysis reveals the value of marine spatial planning for multiple ocean uses. *Proceedings of the National Academy of Sciences* 109(12): 4696-4701.