Strengthening Regional Security in South Asia

Cooperative Monitoring in Coastal Regions

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The cessation of hostilities between India and Pakistan is an immediate need and of global concern, as these countries have tested nuclear devices, and have the capability to deploy nuclear weapons and long-range ballistic missiles. Cooperative monitoring projects among neighboring countries in South Asia could build regional confidence, and, gradually improve relations. This paper discusses cooperative monitoring in the Indian and Pakistani shared coastal areas. Through such a project, India and Pakistan could initiate greater cooperation, and engender movement towards the resolution of the Sir Creek territorial dispute in their coastal region. The proposed project falls within a regional framework of cooperation agreed to by several South Asian countries. This framework has been codified in the South Asian Seas Action Plan, developed by Bangladesh, India, Maldives, Pakistan and Sri Lanka. The framework provides a

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useful starting point for Indian and Pakistani cooperative monitoring in their trans-border coastal area.

Introduction

A collaborative study by an Indian and a Pakistani scholar has concluded, "Non-military confidence building measures could create conditions for an incremental reduction in tensions between India and Pakistan."[1] This study also identified technological collaboration in critical infrastructure areas as a key step forward towards achieving peace in South Asia. Such Confidence and Security Building Measures (CSBMs) are usually the precursors to more significant weapons non-proliferation and weapons reduction agreements.[2] In the case of India and Pakistan, a lack of trust and confidence makes the development of CSBMs problematic. To initiate a process of incremental progress towards greater trust and confidence and improved relations, this paper suggests cooperative environmental monitoring projects by India and Pakistan in their trans-border coastal zone.[3]

A "hot peace" exists between India and Pakistan, characterized by cross-border shelling and exchange of fire almost as a daily occurrence. Therefore, proposing steps for increased cooperation could easily seem futile. However, the Indian and Pakistani relationship is complex and works at many levels. The complexity of the Indian and Pakistani relationship provides glimmers of hope that progress can occur in some areas of interaction even while there are major setbacks in others.

Apart from Kashmir, the Indian and Pakistani trans-border coastal zone is the only other area where the border between the two countries is not agreed on. The shooting down by Indian jet

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1 S. Ahmed and S. Das, *Movements of People, Ideas, Trade and Technology: Toward a Peaceful Coexistence of India and Pakistan*, Occasional Paper, Albuquerque, New Mexico: Cooperative Monitoring Center, Sandia National Laboratories, USA, 1998.

2 A detailed discussion of CSBMs in South Asia is provided in S. Ganguly and T. Greenwood, eds., *Mending Fences: Confidence and Security-Building in South Asia*, Colorado: Westview Press, 1996.

3 The ideas presented here are based on research conducted by the author while at the Cooperative Monitoring Center, Sandia National Laboratories, Albuquerque, New Mexico, USA. This research also resulted in an Occasional Paper.

fighters of a Pakistani maritime surveillance aircraft in this region in August 1999[4] heightens the need for CSBMs in the disputed coastal regions. In the case of Kashmir, the two countries are involved in low-intensity warfare. The trans-border coastal zone is, comparatively, far more tranquil. The resolution of territorial disputes in this region could, therefore, occur far easier than in Kashmir. The Indian and Pakistani trans-border coastal area is, therefore, well suited as an area for proposing cooperative environmental monitoring studies that could form a part of a process for improved relations.

In October 1998, India and Pakistan - after direct talks between their respective Prime Ministers - revived a process of dialogue characterized by Joint Working Groups. However, the Joint Working Group dialogue has been stalled, with the two countries having fought a limited border war in May-July 1999, and a military-led regime under Pervez Musharraf having come to power in Pakistan with whom the Indian Government has had limited dialogue thus far. A failed summit at Agra in India in 2001 further exacerbated tense relations. A military standoff over terrorist attacks in India on December 13, 2001, on the Indian Parliament led the two countries to the brink of war. However, considerable international diplomatic efforts were undertaken to prevent war and re-initiate an India-Pakistan dialogue. Both countries have during May 2003 agreed to the restoration of diplomatic relations and stated that they would prefer dialogue to war. Therefore, there is every expectation that at a date in the near future, India and Pakistan will revive their dialogue to settle outstanding contentious issues. When the talks commence again, they are likely to follow the previously agreed format of the Joint Working Groups. Even if the format differs, the issues needing resolution will remain the same. In the previous dialogue process, there were eight working groups set up dealing with the following subjects: Kashmir, Peace and Security, the Siachen glacier, the

[4] The Indian Air Force (IAF) on August 10, 1999, shot down a Pakistani French-built *Atlantique* aircraft as it intruded 10 km into Indian airspace over the Western Indian State of Gujarat. India said that the wreckage had fallen two kms inside its territory while in Karachi, Pakistani Navy claimed that it had been located within their area near Badin, around 300 km north-east of Karachi, and all 16 on board had been killed. See "IAF shoots down Pakistan spy plane over Gujarat", *Daily Excelsior*, Jammu, August 10, 1999.

Wullar Barrage, Sir Creek, Terrorism and Drug-Trafficking, Economic and Commercial Cooperation, and Promotion of Friendly Exchanges in Various Fields. The Sir Creek working group deals with the demarcation of the border in their shared coastal regions and related maritime issues.

Among the contentious issues being dealt with by the working groups, the Sir Creek issue seems one amenable to an early settlement. The Sir Creek issue is a disagreement over an approximately 100 km. stretch of the Indian and Pakistani border, along a creek that runs from the Arabian Sea up to a location after which the border is agreed on. The disagreement is not severe: India believes that the boundary lies along the middle of the creek, while Pakistan's position is that the border lies along the eastern bank of the creek. The issue is somewhat complicated by the fact that the creek has migrated over time. A further complication is that the demarcation of the boundary on the coast relates to the definition of the maritime border and the demarcation of the Exclusive Economic Zones (EEZ) of the two countries in the ocean.[5] A difference of moving the border one mile along the coastline, therefore, could translate into a loss of a few hundreds of square miles of the EEZ, an area suspected to be rich in oil and gas deposits. Despite these complicating factors, the issue is one in which the two countries' positions are not far apart. For example, to create movement forward on this issue, it is possible to conceive that the two countries could set boundary disputes temporarily aside and jointly undertake studies in monitoring the environment in this region.

The idea of putting aside territorial disputes while undertaking joint studies for shared benefits has been successfully applied by 39 countries in the Treaty of Antarctica.[6] For ending the armed conflict on the Siachen Glacier between India and

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5 A. G. Noorani, "CBMs for the Siachen Glacier, Sir Creek, and Wullar Barrage" in *Crisis Prevention, Confidence Building, and Reconciliation in South Asia*, Michael Krepon and Amit Sevak, eds., New York: St. Martin's Press, 1993.

6 The Antarctic Treaty, signed on December 1, 1959, concerns the use of Antarctica for peaceful purposes, and scientific investigation through international cooperation. The following specific issues are addressed: military activity; freedom of scientific investigation, international cooperation and disclosure of data collected; nuclear explosions, radioactive waste; enforcement through observation.

Pakistan, a similar concept in the form of a Siachen Science Center has also been proposed.[7] Another example is a series of workshops convened by Indonesia to resolve the dispute over the Spratly Islands in the South China Sea. The workshops "have initiated steps towards cooperative marine scientific research and geological surveys, temporarily setting aside the fundamental problems of sovereignty and maritime boundaries. These workshops and associated activities have proceeded on the assumption that resolution of territorial and jurisdictional disputes in the region is not possible without first addressing cooperation on other levels such as navigation and the environment."[8]

Many subject areas could form the basis of maritime non-military CSBMs[9] between India and Pakistan. This paper focuses specifically on coastal cooperative monitoring projects.

Cooperative Monitoring for the Verification of Agreements

Cooperative monitoring can be defined as the process of obtaining and sharing verifiable information among parties. Monitoring involves interactions with moving objects, and is based on hypotheses that are falsifiable - the hypothetico-deductive model of the physical sciences. Verification, on the other hand, involves communication between interacting subjects, and is based on interpretation - the hermeneutics model of the social and life sciences. Cooperative monitoring is a synthesis of these two forms of human knowledge, involving inter-subjective communication and interactions with physical objects. The underlying precepts of cooperative monitoring projects have been discussed in detail in papers prepared by researchers of the

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7 K. L. Biringer, *Siachen Science Center: A Concept for Cooperation at the Top of the World*, Occasional Paper, Cooperative Monitoring Center, Sandia National Laboratories, USA, 1998.

8 S. Bateman, "Asia-Pacific Maritime Confidence Building" in *Maritime Confidence Building in Regions of Tension*, Jill R. Junnola, Report No. 21, Washington DC: Henry L. Stimson Center, 1996.

9 Rear Admiral K.R. Menon, retired from the Indian Navy, has made an excellent case for maritime CSBMs (both military and non-military) between India and Pakistan. See K. R. Menon, "Maritime Confidence Building in South Asia", in *Maritime Confidence Building in Regions of Tension*, Junnola, Henry L. Stimson Center.

Cooperative Monitoring Center (CMC) of the Sandia National Laboratories.[10] As described in the CMC papers, technically based cooperative monitoring strengthens agreements between two or more states and allows continued progress. By cooperatively monitoring the terms of an agreement, states can ensure the stability and permanence of the agreement. Cooperative monitoring also documents compliance and prevents the deterioration of relations through unverifiable claims of non-compliance.

Cooperative monitoring technologies include unattended data acquisition sensor systems, aerial overflight systems, commercial satellite systems, data authentication, tamper indication and access control technologies. Existing international environmental conventions and treaties could provide the framework within which to develop joint Indian and Pakistani coastal environmental monitoring projects in the selected area of study.

Environmental Conventions and Monitoring Agreements

Numerous studies have predicted a link between environmental scarcity and violent conflict.[11] Environmental security issues (such as the control of pollution, greenhouse gas emissions reductions and effective management of water resources) require cooperative solutions. No state can hope to solve these global and regional problems in isolation. Over the years, various international conventions have emerged that allow states to work together on solving environmental problems.

Several multilateral and regional efforts are underway currently to create a community of littoral and island states in the Indian Ocean. Countries such as Australia, India, and South

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[10] For example, a paper by A. Pregenzer, M. Vannoni and K.L. Biringer, *Cooperative Monitoring of Regional Security Agreements*, Cooperative Monitoring Center, Sandia National Laboratories, USA, 1996. The CMC also provides a virtual tour on its web site that highlights successful cooperative monitoring projects worldwide (available at www.cmc.sandia.gov).

[11] A review of this literature is available in a paper by N.P. Gleditsch, "Armed Conflict and the Environment: A Critique of the Literature", *Journal of Peace Research*, London: Sage Publications, vol. 35, no. 3, 1998, pp. 381-400.

Africa are leading these efforts. The Indian Ocean is an extremely strategic region, providing transit routes (1) for the movement of petroleum products from the Arabian Gulf to Europe and North and South America and (2) for all maritime traffic between Asia and Africa. Large reserves of hydrocarbons exist in the offshore areas of Saudi Arabia, Iran, India, and Western Australia, and an estimated 40 per cent of the world's offshore oil production comes from the Indian Ocean.[12] Many countries actively exploit beach sands and offshore deposits rich in heavy minerals. The fishing fleets of several nations ply these waters. Given the strategic importance of the Indian Ocean region, coupled with the economic value of its minerals and marine life, issues of maritime security and maritime CSBMs in this region are increasing in significance. Strengthening existing international maritime conventions and treaties in this region is, therefore, becoming increasingly important.

India and Pakistan are signatories to or have ratified several international conventions on protecting the environment. Some of these conventions require the creation of regional mechanisms of cooperation with related plans for the monitoring of environmental indicators. One of these conventions, the United Nations Convention on the Law of the Sea (UNCLOS)[13] provides a good basis for an Indian and Pakistani coastal environmental monitoring project. The UNCLOS is unique in the South Asian context in that, under its aegis, a sub-regional mechanism of cooperation has been established. A South Asian Seas Action Plan[14] has been developed through a collaborative process.

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12 CIA World Fact Book, 1992 edition, www.anbg.gov.au/world/indian-ocean.html.

13 UNCLOS was signed at Montego Bay, Jamaica, on December 10, 1982. The UNCLOS combines many pre-existing conventions and agreements. It deals with a wide variety of subjects—ocean resources (such as fish, oil, and gas) and the Exclusive Economic Zones of states, rights of passage and navigation, enforcement, marine research—and has emerged through many years of negotiations. From the perspective of this study, Part 12 of the UNCLOS is the most relevant. Part 12 deals with the protection and preservation of the marine environment. Section 2 of this part deals with global and regional cooperation, and Section 4 deals with monitoring and environmental assessment. For details, see www.unclos.com.

14 The formal title of the South Asian Seas Action Plan is the Action Plan for the Protection and Management of the Marine and Coastal Environment of the South Asian Seas Region.

Adopted in March 1995, the governments of India and Pakistan have agreed to this regional plan along with the governments of Bangladesh, Maldives and Sri Lanka.

The United Nations also operates several global environmental monitoring programmes, including the Global Environment Measurement System (GEMS) and the Global Resource Information Database. Data generated for such programmes could form the basis of an effort to collect and disseminate existing data on the Indian and Pakistani coasts. The International Coral Reef Initiative (ICRI) is a similar multinational initiative involving a monitoring network. These existing international environmental monitoring networks could serve to initiate environmental data sharing between India and Pakistan. A cooperative monitoring project would begin by sharing the data generated through ongoing Indian and Pakistani coastal monitoring programmes.

Scope of Cooperation between Indian and Pakistani Coastal Monitoring Programmes in the Trans-border Coastal Regions

There is ample scope for the coastal monitoring programmes of India and Pakistan to cooperate in monitoring their trans-border coastal regions. Cross-flow connections exist between the Indian and Pakistani trans-border coastal regions. The main ocean currents in the region turn clockwise and counter-clockwise with the monsoon seasons. Tidal flows also create fluctuating cross-border flows.

The silt and fresh waters carried by the Indus are the food and life-blood of the trans-border region, regulating the stability and primary productivity of the mudflats and the salinity of the creeks. The Indus Delta sustains the largest area of arid climate mangroves in the world. The mangroves of the Indus Delta are under threat from reduced freshwater flows of the Indus and rapid declines in the available quantities of silt and nutrients.

Most rivers of South Asia carry huge quantities of sediment, created primarily by tectonic uplift and the geologically young mountains of the northern borders of this region. Human deforestation activities augment this sediment load. The turbidity

created in the coastal waters has prevented the formation of coral reefs in most of South Asia's delta regions. Corals require clear waters that allow the penetration of sunlight. The Gulf of Kutch is unique in supporting coral reefs, despite its proximity to the Indus Delta. Understanding the long-term threats to the coral reefs of the Gulf of Kutch will require simultaneous study of the Indus Delta.

Impact of the Indus Waters on Coastal Ecosystems

The Indus Waters Treaty[15] of 1960 between India and Pakistan resolved water-sharing disputes between the two countries. This led to a substantial increase in barrages, dams, and link canals that have reduced the freshwater outflow of the Indus to the sea to less than 25 per cent of that available – from 180 billion m^3/year to less than 43 billion m^3/year.[16] A portion of the current annual outflow is permitted for use but not currently utilized by India. Within Pakistan, current development proposals indicate that the outflow into the sea may be reduced to 12 billion m^3/year. One of the current development proposals is the Kalabagh Dam on the Indus in the North-West Frontier Province proposed by the Government of Pakistan. Kalabagh Dam was conceived in 1953 as a multi-purpose project to store water in order to keep the water supply going in the lean months.[17] The State Government of Sindh opposes this dam. From the Sindhi

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15 The Indus Waters Treaty which assigns the Jhelum River waters to Pakistan divided between the two countries the six great rivers of Punjab: the eastern rivers, including the Beas, Ravi and Sutlej, are for the unrestricted use of India. Pakistan received for unrestricted use all the waters of the three western rivers, and India is under treaty obligation to let them flow into Pakistan without any "interference." See Niranjan D. Gulhati, *Indus Water Treaty*, Delhi: Allied Publishers, 1973.

16 "Possible Effects of the Indus Water Accord on the Indus Delta Ecosystem", IUCN-Pakistan, Karachi, World Conservation Union (formerly the International Union for the Conservation of Nature), 1991.

17 Kalabagh Dam is proposed to be built on the Indus 15 miles north of Kalabagh in Punjab with a height of 260 feet and a length of 11,000 feet with a storage capacity of 6.1 MAF. It will also generate 11,750-kilowatt hours of cheap electricity and irrigate 2.4 million additional acres. All the preparatory works for the Dam are complete while the feasibilities of the two alternative dams, Basha and Skardu, have not yet been finalised. The cost of the Kalabagh Dam today is estimated at 10 billion dollars. See "Fighting over the Indus waters in Pakistan", *The Friday Times*, Lahore, June 6-12, 2003.

perspective, the dam primarily benefits Punjab and is likely to deprive the desert regions of Sindh of water.[18] Punjabis dominate the present Government of Pakistan and this exacerbates the situation, adding the fires of regional animosities into an already explosive mix. If State Governments in India increase utilization of their allocation of Indus waters (an action extremely likely in the next five to ten years), the Government of India could become embroiled in the situation of reduced flows of freshwater into the Indus Delta. The reduced flow of the Indus into the sea has reduced the annual quantity of silt delivered into the delta. If the Pakistani Government implements further development proposals and reduces the Indus' outflow to 12 billion m^3/year, the annual quantity of silt delivered could become dangerously low and affect the long-term sustainability of the Indus Delta.

Reduced freshwater flows in the Indus will increase the salinity of the tidal creeks in the delta system and could stunt mangrove growth. A single species of mangrove dominates the Indus Delta (over 95 per cent of the trees). Increasing salinity levels in some regions of the mangrove forests have already created observable declines in the growth of new trees. The loss of silt is even more dangerous given the sea-level rise of 1.1 mm/year known to occur near Karachi.[19] Mangroves can survive sea-level increases as high as 2.5 mm/year if there is a sufficient discharge of sediment-bearing waters into the mangrove forests. Without any delivery of silt, mangroves cannot sustain themselves for rates of sea-level rise of 1.2 mm/year. With increases in sea level rise expected as a result of global warming, the mangroves of the Indus Delta could suffer a severe long-term threat. In the short term, increased tidal areas will probably provide expanded opportunities for mangrove propagation.

Tidal currents in the Gulf of Kutch set up a hydraulic barrier that prevents sediment discharged by the Indus from entering the

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[18] On the pros and cons of the dispute over the Kalabagh Dam, see Kaiser Bengali, *The Politics of Managing Water*, Islamabad: Sustainable Development Policy Institute-Oxford University Press, 2003.

[19] These figures are based on studies done by the IUCN, 1991, "Sea-level Rise – Possible Impacts on the Indus Delta", IUCN-Pakistan, Karachi, World Conservation Union (formerly the International Union for the Conservation of Nature).

Gulf.[20] Turbidity is still fairly high from cyclones, wind-blown sediment, discharge from minor rivers along the southern shore, and numerous human activities (such as salt mining and agriculture). The strong currents within the Gulf are the features that have allowed coral reefs to develop in these turbid waters. Living corals in the Gulf are usually found on the northern and western sides of islands within the Gulf and in patches between islands in areas exposed to the strongest tidal currents. On the landward side of the corals, mangroves are always present on the islands. Mangroves and coral reefs are symbiotically joined. Mangroves filter sediment and allow corals to grow in waters that might otherwise be excessively turbid. Coral reefs, the rainforests of the ocean, support the marine life that nurses and breeds among the roots of mangroves, cleansing the forest litter and maintaining the health of the mangroves.

Current threats to the Gulf of Kutch stem primarily from human industrial activities. Dredging sand for the cement industry has caused reef damage and increased turbidity sufficiently to destroy almost 50 per cent of the coral. By the year 2007, almost 50 per cent of India's crude oil import (approximately 80 million tons) will be handled by ports in the area. This could create severe pollution problems from oil spills. In 1997, approximately 12 million tons of crude oil was discharged at a floating oil terminal near the Gulf. Minor oil spills have damaged mangroves and marine life. Oil and heavy metals pollution that stems from a ship-breaking yard along the coast north of the Gulf has also damaged marine life and the Gulf's ecosystems. Residues from salt mining on the southern shores of the Gulf are other contributors to pollution in the Gulf. Finally, the loss of mangroves in the area has allowed the fury of cyclones to reach far inland and extensive damage has often been caused to life in the area from typhoons and cyclones.

Apart from its sediment load, the Indus River affects the delta region through its influx of freshwater and the concomitant impact on salinity levels. At this time, the impact of this freshwater on the salinity levels across the border is unknown. If

[20] R.R. Nair, "The Indus Paradox", *New Scientist*, London, vol. 1397, 1984, pp. 41-42.

the salinity levels increase sufficiently within the inter-tidal creeks that make up the trans-border areas and there is a significant impact on mangroves, coastal erosion could increase rapidly. This could alter turbidity levels within the Gulf of Kutch. A thorough understanding of issues such as these will require cooperation between India and Pakistan.

Initiating Indian and Pakistani Coastal Environmental Monitoring Projects: First Steps

Despite the lack of overt conflict in their coastal regions, the development of Indian and Pakistani environmentally related CSBMs in coastal areas is not likely to be easy. Decades of hostility and the political sensitivities involved pose significant barriers to progress. Therefore, an Indian and Pakistani CSBM project needs to be composed of a series of mini-CSBMs that will lead up to the larger CSBM, which itself is a part of a greater trust and confidence building movement. From this perspective, a series of steps are first proposed that could serve as the building blocks of a larger cooperative environmental monitoring project in the Indian and Pakistani coastal trans-border region.

The following steps are proposed for developing collaborative Indian and Pakistani coastal projects:

Create a draft document that will govern coastal environmental projects between the two countries. Signing off on the document, akin to a Code of Conduct, need not be a precondition of progress on data gathering and data sharing. Such activities could proceed on the basis of existing regional cooperative frameworks or through non-governmental channels. Preparing and discussing a working draft of a document on governing principles for cooperation would allow both sides to present and better understand each other's views. The document could be designed as a statement of existing practices and principles. It would avoid contentious issues and be written for easy acceptance. The existing high-level dialogue through Joint Working Groups could be a suitable forum for discussion of such a document, especially in the Working Group discussing the Sir Creek issue.

Compile existing environmental data from the coastal regions into a joint baseline document. The process of conducting cooperative environmental projects needs to begin by sharing available data and creating a baseline document. A reference baseline provides a foundation for monitoring trends and identifying critical issues. The sharing of available baseline data could be institutionalized through a series of workshops culminating in a bi-national conference and then continued through an Internet-based dissemination system. Sharing existing data that is already in the public domain would be relatively easier than generating new data jointly. The political benefits of a joint document would, however, be considerable and establish a sense of progress early in the effort. This baseline document could also include satellite maps of the Indian and Pakistani coastal regions. Space-based photographs of both countries' border areas will illustrate the shared nature of ecosystems. A satellite atlas would be very useful in school educational curricula. Possessing its own satellite imagery, India could offer some of this imagery to Pakistan as a goodwill gesture.

Harmonize existing measurements of environmental parameters through transparency in the sampling methodologies and reporting procedures. The major initial focus of an effort to create a reference baseline document and then initiate a programme to monitor changes has to be the identification of suitable indicators that reflect environmental changes. The measurement procedures for these indicators need to be intercomparable.

The three steps described here for initiating environmental monitoring projects are common to efforts that promote cooperation between states. Specific projects in the Indian and Pakistani coastal areas will need to incorporate elements of these steps.

A Framework for Cooperation

A framework under which limited environmental monitoring data could be shared between Indian and Pakistani agencies is provided by the South Asian Seas Action Plan (SASAP) to which India and Pakistan are signatories. One of the key elements of the

SASAP is to encourage collaboration among regional scientists and technicians and their institutions through the "establishment of a coordinated regional marine pollution monitoring program, based on intercomparable methods, for the study of the various processes occurring in the coastal areas and open ocean of the region and the assessment of the sources and levels of pollutants and their effects on marine life and human health."[21] The UNCLOS has specific provisions relating to the prevention, reduction, and control of marine pollution from land-based activities. In keeping with these provisions, Annex IV of the SASAP includes a "Regional Program of Action for the Protection of the Marine Environment of the South Asian Seas from Land-based Activities." The proposed activities include the "Development of a Regional Program for Monitoring of Marine Pollution in the Coastal Waters of the South Asian Seas and the Regular Exchange of Relevant Data and Information." As an existing regional framework for the sharing of coastal environmental monitoring data, the SASAP provides a framework for promoting Indian and Pakistani sharing of coastal environmental data.

Concluding Remarks

In South Asia, oceanography projects with foreign collaboration are often viewed with suspicion because of their bearing on national security. For example, *The Indian Express* published a story on March 4, 1998, that described concerns of the Indian Ministry of Defence regarding a mission of the *Sagar Kanya* (Daughter of the Ocean), a ship owned by the Indian Department of Ocean Development. The Ministry was concerned at the presence of eight American scientists on board. The mission (which was held despite these concerns) was to gather atmospheric radiation and aerosol data to improve general circulation weather models. The Ministry of Defence was concerned that permission for the cruise had not been granted by a Ministry committee, and data being gathered such as

[21] P. Dias, personal communication, South Asia Cooperative Environmental Program, Kandy, Sri Lanka, 1998.

bathymetry, ocean salinity, and temperature profiles could be "crucial for underwater warfare and submarine navigation." These concerns were raised despite the mission being organized by the Indian Department of Space and the Department of Ocean Development, and the mission being cleared by naval intelligence and with a naval scientist on board.

The story illustrates not only the political tussles between various Indian bureaucracies, but also the sensitivities associated with marine scientific projects. Collaborative projects with Pakistan will be viewed with even graver concerns. Similar concerns will probably influence Pakistani thought as well. Therefore, any projects that are proposed will have to follow an internal confidence-building process that progresses from relatively easily implemented tasks to more complex and sensitive activities. A series of such steps has been described in this paper.

Using this approach, a cooperative monitoring project between India and Pakistan would begin with identifying a subset of selected parameters that are already a part of national programmes. Next, the two countries could collaborate on the harmonization of sampling methodologies and the sharing of existing measurements. The phased approach would lead to a technologically sophisticated cooperative monitoring experiment.

Advanced technologies could help reduce tensions between India and Pakistan through the strengthening of monitoring, verification, and communication means. As stated by Jasjit Singh, a former Director of the Delhi-based Institute of Defence Studies and Analyses (IDSA), "Given the high level of mutual mistrust, especially between India and Pakistan, any CSBM agreement would still raise the problem of verification. CSBMs could rapidly become counterproductive if violations start taking place and cannot be arrested in time. But both India and Pakistan have very limited technical means of verification, and it is highly unlikely that third-party assistance in this field would be acceptable to either side. This is why there is a need for countries such as the United States to support the strengthening of national technical means of verification in India and Pakistan."[22]

[22] Jasjit Singh, "Military Postures, Risks, and Security Building" in *Mending Fences:Confidence and Security-Building in South Asia*, Sumit Ganguly and Ted Greenwood, eds., Colorado: Westview Press, 1996, pp. 163-180.

The demonstration of cooperative monitoring technologies for nonmilitary purposes will develop and establish the abilities of India and Pakistan to document the verifiability of agreements. The documentation of the ability to verify compliance is an essential part of building a national consensus in support of the ratification of agreements. Further, cooperative monitoring projects in areas other than military or security-related matters could build an Indian and Pakistani infrastructure for future cooperative monitoring projects that would deal more directly with weapons control agreements. Finally, cooperative environmental monitoring projects will promote Indian and Pakistani security by preventing the degradation of land and natural resources.

Much of South Asia consists of semi-arid regions and the regional economy is predominantly based on rain-fed agriculture. Proper use of the region's water resources is key to the long-term sustainability of the region. Parts of this region of 1.5 billion people are already facing acute scarcities of clean drinking water. Water scarcity is expected to become worse in the future. Ineffective water management leads to annual devastation from floods, followed by periods of severe drought. With increasing use of the Indus River waters, there is a possibility that the Indus Waters Treaty between India and Pakistan could break down. This could seriously exacerbate tensions in the region. For more effective water management based on reliable and current data, there is an urgent need to facilitate a process of water-related data sharing among countries in South Asia. Such projects could begin with sharing data on coastal regions.

The outflows to the sea of the Indus River's waters are not wasted from an economic valuation perspective. These waters sustain export-oriented fisheries. A great diversity of species lives and nurtures in the sea grass beds, coral reefs, and coastal wetlands of the Indus Delta and Gulf of Kutch region. Understanding the interactions between the Indus River, the Delta region, and the adjoining Gulf of Kutch through sharing of data could begin a process of more effective management by India and Pakistan of the natural resources in their coastal areas.

Resolution of territorial disputes stemming from the deposition of sediments, the creation of new land and the

migration of a boundary creek would be easier based on a common understanding of the underlying physical processes. The resolution of these territorial disputes could initiate improved relations between India and Pakistan. To diminish environmental causes of conflict and strengthen their environmental security, India and Pakistan are seeking to establish a regional and cooperative approach (as exemplified in the South Asia Seas Action Plan). The types of projects proposed in this paper could be a part of this emerging structure of regional environmental cooperation.