CHAPTER 5
COMPARATIVE STUDY OF ENVIRONMENTAL MANAGEMENT OF BUNDALA AND CHILIKA WETLANDS

Wetland has been used, managed and conserved since historical times by human being. However, in the recent decades the emphasis on exploitation and modification for greater economic returns has caused much damage to the wetlands and thus we started to consider management of wetlands. An increasing scientific understanding of wetlands has made goods and services more apparent. They have been described both as “the kidneys of the landscape”, because of the functions they can perform in the hydrological and chemical cycles, and as “biological supermarkets” because of the extensive food webs and rich biodiversity they support (Mitsch and Gosselink 1993). The increasing awareness about its value has raised its management prospective. Since a very small portion of wetland remains in the developed world, its management and conservation has picked up momentum here. There is also a growing awareness about wetland value in developing countries since the survival of people and environmental and genetic services is linked inextricably with wetland functioning.

The management of wetland has become important in view of looming danger it faces to the extent of its disappearance in many parts of the world. Wetlands are one of the most threatened ecosystems in the world as it is facing degradation by both natural factors as well as anthropogenic factors. The ever increasing population has led to overexploitation of its resources. In the last 100 years almost fifty percent of wetlands have been lost. Most of these losses in the first half of twentieth century occurred in Northern hemisphere while in the last 50 years pressure on wetlands in south has increased. One of the most important reasons wetland losses is infilling for human settlement and agricultural activities. In Europe 60 percent of wetland loss is due to conversion to agriculture while Asia faces more threatening position with its 85 percent wetlands of International importance being threatened. Paddy cultivation is one of the major factors causing wetland loss in India, Thailand, Vietnam, and China. Human intervention on wetland functioning affected wetland draining and filling or diversion and damming of rivers can alter the frequency of water flow, thereby harming downstream wetlands,
deltas, and coastal ecosystems. In addition to this draining can cause water tables to fall and increase the potential for salinisation of soils. It is predicted that disruption of hydrological regime can cause severity of water shortages in at least 60 countries and can lead to flood related disasters within 50 years. The importance of wetland is immense as they have highest dollar value per hectare of all of Earth’s ecosystems. They contribute $4.9 trillion of the $33.3 trillion estimated value of the biosphere each year (Wade Roush 2000). The environmental cost of paving over wetlands loss is $21,620 per hectare (Litman Todd 1999). It is thus imperative to conserve and manage remaining wetlands for future generation.

5.1 NEED FOR WETLAND MANAGEMENT

There are diverse needs for wetland management such as environmental protection, recreation and aesthetics, and for diverse renewable resources. The important and extensive production ecotone zone and dependence of a diversity of flora and fauna on this and other zones, make wetland management more of a system management rather than species management. Stearn has identified 12 specific goals of wetland management such as: water quality maintenance, erosion reductions, flood protection, provide a natural system to process airborne pollutants, provide a buffer between urban residential and industrial segments to ameliorate climate and physical impact such as noise, maintain gene pool of aquatic plants and provide examples of complete natural communities, provide aesthetic and psychological support for human beings, produce and support wild life, control insect population, provide habitat for spawning and other organizations, produce food, fiber, and fodder and expedite scientific enquiry (Stearns 1978).

In the third world countries a large number of people derive their sustenance from wetland regimes. So if the system is disrupted, it could result in huge ecological cost. A large number of problems being faced currently have already caused the resource base to decline dramatically. It has been predicted that 40 to 50 percent of remaining wetlands will be lost by 2080 to agriculture, urban sprawl, and the effects of a 1 meter sea level rise.
There have been attempts in various nations to restore or recreate degraded wetlands, however complexity of their functioning has made their restoration difficult. A mixed success has been achieved in reinstating wetland ecosystem services.

5.2 GENERAL PRINCIPLES OF WETLAND MANAGEMENT

There are some basic approaches to wetland management. Limits to Growth is one of such approach, however it fails to incorporate human aspirations for a continually improving quality of life (Robert James 2000). Another approach called Sustainable Development which incorporates environmental responsibility with a concern for the needs of all people, present population as well as future generation (Robert James 2000). A concept linking environment and development is environmentally sustainable development (ESD). A policy based on this concept recognises that long-term economic growth is only possible if the nation sustains its natural environment and adopts an integrated approach to sustainable development. It recognises the interconnectedness of scientific, technological, social, cultural and economic dimensions. For achieving ESD it is essential to maintain a balance between its human resources and its natural heritage. Therefore it is a means to prevent adverse environmental impact. The term sustainable development includes two imperatives namely the right to develop, and the need to sustain the environment. It also implies equity between the rich North and the poor South, so that the needs of all people are taken into account through transfer of resources to developing nations. It is however very difficult as richer North continues to squander natural resources in the name of sustaining their own version of quality of life while poor South continues exploitation of natural resources in the name of hunger and poverty. It is in this backdrop that it is very necessary to link sustainable development with environmental stewardship (Dwivedi 1997).

This chapter aims to cover various aspects of wetland management being carried with special reference to Bundala and Chilika, which are threatened wetland ecosystem in Sri Lanka and India respectively.

1 Limits to Growth was a 1972 book modeling the consequences of a rapidly growing global population, commissioned by the Club of Rome.
It's difficult to manage a wetland by physical protection using a fence or boundary, however to achieve some specific objective of management, there is a need for positive manipulation of environment. There are two major issues in wetland management. Firstly, for maintaining its physical resources or biological resources, an enhancement of resources or its reduction to take care of problems like over-fishing, fuel and forage removal, overgrazing and weed removal. Secondly, for managing specific problem which generally originate from anthropogenic activities such as siltation, pollution etc. Further, wetland may also be managed for non-resource value such as recreational and aesthetic values.

Wetland is one of common property resources which have been exploited in a controlled way in some parts of the earth. In fact, many conditions help in their controlled exploitation so it is needed to have proper management to control any such exploitation. The conditions for successful management of common resources are as follows:

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<tr>
<th><strong>Table 5.1: Attributes of successful common property regime</strong></th>
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<tr>
<td>1. User groups need the right to organize, or at least no interference when they do</td>
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<td>2. The boundaries of the resource must be clear</td>
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<td>3. The criteria for membership of the eligible group of users must be clear</td>
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<td>4. Users must have the right to modify rules over time</td>
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<td>5. Use rules must correspond to what the eco-system can tolerate and should be conservative, to provide a margin for error</td>
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<td>6. Use rules must be clear and easily enforceable</td>
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<td>7. Infractions of use rules must be monitored and punished</td>
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<td>8. Distribution of decision-making rights and use rights to co-owners of the commons need not be egalitarian but must be viewed as ‘fair’</td>
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<td>9. Inexpensive and rapid methods are needed for resolving minor conflicts</td>
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<td>10. Institutions for managing very large system needed to be layered, with considerable devolution of authority to small components to give them flexibility and control over their fate</td>
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Source: McKeen (2000) in Roberts Jane, pg. 55
A general guiding principle of wetland management is that the essential characteristics of the system should not be altered, especially to the detriment of another desirable value. Wetland management requires management of not only wetland proper but also its catchment with which it interacts directly. For example, a littoral wetland cannot be managed without taking into account the lake or reservoir with which it is associated. The anthropogenic activities in catchment areas such as deforestation, overgrazing and development activities are causative factors of the accelerated soil erosion and consequent siltation of wetlands. In view of this several activities for catchment development including afforestation, vegetative contour bunding, construction of water harvesting structures, gully control, check dams etc. should be taken.

All these activities for its successful implementation require people’s involvement. People participation has been an important component of all the wetlands for conservation and management. So, stakeholders should be made part of the management plan and decision making. In fact, World Bank favours the ‘collaboration and partnership’ approach when interest of indigenous peoples is likely to be affected (Lee and George 2000). The types of consultation and public participation are information dissemination, consultation, collaboration and partnerships and empowerment and local control.

5.3 LEGAL PROTECTION OF WETLANDS IN SRI LANKA

Policy making exercise is indeed a tedious task and involves a lot of player. In western liberal democracy policy decision come about as a result of the interaction between elected politicians, bureaucrats working within public authorities, interest groups and public opinion. Albert Weale’s account of pollution politics talks of four idioms: rational choice theory, systems, institutions and policy discourse (Garner 1996). These factors also work in the developing countries such as Sri Lanka and India. History of wetland protection in Sri Lanka is recent. It started only in the late nineteenth century. However, till recently the recognition had not come to ground reality about conservation of

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2 The entire geographical area drained by a river and its tributaries; an area characterized by all runoff being conveyed to the same outlet
wetlands. In 1897, enactment to protect the coastal belt system was promulgated. Major legal provisions since early 20th century are as follows:

(i) Coastal belt protection Ordinance (1897)

(ii) Fauna and Flora protection Ordinance (1937) and (1969)

This was a major step in wetland conservation in Sri Lanka. Department of Wildlife Conservation declared wetlands of importance for birds as sanctuaries and other protected areas. This ordinance provided protection to flora in the immediate limit of any water body. Bundala’s importance led it to be declared as a Wildlife Sanctuary under the Fauna and Flora Protection Ordinance (FFPO) in 1969. It was declared as a Ramsar site (a wetland of international importance) in 1990. Till date only three wetlands in Sri Lanka are listed in the Directory of Wetlands of International Importance. Bundala was upgraded to the status of a National Park in 1992 under the management of the Department of Wildlife Conservation.


Sri Lanka had signed Ramsar convention for protection of wetlands in 1971 but ratified it in 1990. By ratifying this convention, it committed itself to preserve ecological values and functions of countries wetlands. With the ratification of Ramsar Convention Bundala National Park and two other, Anaiwilundawa ancient cascading tank system and the Muduganga estuary and Mangrove ecosystem were declared Ramsar sites.

(iv) Interim Wetland Steering Committee (1989)

It was established by Central Environmental Authority in the pretext that wetlands were falling under the responsibility of numerous agencies and there was a need of coordination (Kotagama). After getting cabinet approval in 1990, the Steering Committee initiated effort to prepare a Wetland Commission, legislation and policy. In Bundala Wetlands the Committee was handled by the District Environmental Committee, under the chairmanship of the DS Hambantota. The Committees performed very well once the action plan and the need for integration of activities were understood. The National
Wetland Conservation Committee was reconstituted in 2003 in order to integrate plans for wetland area and coordinate development and conservation activities.

(v) Wetland Policy

Sri Lankan government has taken a number of measures for successful implementation of management of a wetland. In this direction a National Wetland Policy has been prepared; an institutional mechanism has also been established to coordinate wetland conservation activities. It aims at revival of Wetland Steering Committee. In May 2004 Sri Lankan Government approved the National Wetland Policy. Following this management plans for important wetlands in the country has been prepared (Perera and Lynch 2005). In addition, a wetland management unit has been established under the Central Environmental Authority for policy implementation. A digital database is also being prepared in collaboration with Central Environmental Authority, the World Conservation Union (IUCN) and the International Water Management Institute (IWMI).

The politics of environment is increasingly being fought out at the international level. It is in this respect that Sri Lankan government is also part of several international agreements and International organizations such as Asian Development bank (ADB) and GEF (Global Environment Fund) are involved here in protected area conservation programme. GEF is principal source of development assistance for global environment purposes. Since its inception GEF has been viewed as illegitimate by states of Global South because of lack of transparency, public accountability, and public decision-making power. It’s pilot project in particular have been criticised. However, GEF has been restructured recently to make it more transparent, democratic and universal (Jeong). There are several other government and non-government organisations involved in wetland conservation and management in Sri Lanka. Many researchers in universities and private research institutions are also involved in research on wetlands.

5.4 LEGAL PROTECTION OF WETLANDS IN INDIA

There is constitutional provision as well as legal provision for the protection of wetlands in India. In terms of India’s policies and programmes in the backdrop of above mentioned framework on environmental sustainable development we find that India’s policy aims to
reinforce our traditional ethos and to build up a conservation society living in harmony with nature and making frugal and efficient use of resources guided by the best available scientific knowledge. In terms of institutional changes Government has established several ministries and departments, research organizations for environment protection and conservation plan. However, as the environment is a matter for the individual states the effectiveness of compliance, monitoring and regulation depends much upon the machinery in those states. It has led to bottlenecks and it is here that the real battle for environmentally sustainable development is to be fought. Several environmental laws have also been passed which provides central and state governments with ample authority to control point-of-source pollution and damage to the natural environment. However various institutional impediments and the slow movement of cases through the courts are impending progress in this area. (Dwivedi, 1997)

(i) Constitutional provisions

There are several Articles dealing in environment protections, such as: (1) Article 48 A states the duty of government towards environment, wildlife and forest of India. (2) Article 51 A (G) states every citizen’s duty to protect environment, wildlife and forest and have compassion towards all living creatures. (3) The Constitution’s 73rd Amendment Act on Panchayat (1992) which adds the 11th schedule to the constitution has eight entries which assigns panchayats functions that are linked to environment protection and conservation which includes soil conservation, water and watershed management, management of drinking water, fuel and fodder, non conventional energy sources etc. (4) the constitution’s 74th Amendment Act of 1992 for constitution of local bodies, assigns protection of environment and promotion of ecological effects to these bodies. (5) Article 31 A permits central and State governments, to acquire wetlands for public purpose (Parikh and Datye 2003).

(ii) Legal provisions

1. Penal code sections (9): there are provisions in penal code concerning wetlands such as (1) spreading of any disease dangerous to life (section 269), (2) fouling water of public spring or reservoirs rendering it less fit for the purpose for which ordinarily used (section
2. *Code of Criminal procedure*: The code of criminal procedure (1973) authorizes the district magistrate to control and remove all pollution from natural resources under section 133, 143 and 144 of the code.

3. *National level Acts*: There are several Acts that are directly or indirectly related to wetlands such as

(a) The Indian Fisheries Act, 1857

(b) The Indian Forest Act, 1927

(c) Land Acquisition Act, 1894


(e) Water (prevention and control of pollution) Act, 1974

(f) Water (Prevention of Control of Pollution) Cess Act, 1977

(g) Marine zone of India (Regulation and fishing by foreign vessels) Act, 1980

(h) Environment (Protection) Act, 1986 (Parikh and Datye 2003).

(iii). *International Convention on the Conservation of Wetlands of International Importance (Ramsar - Convention) (1982)*: India ratified Ramsar Convention in 1982. Currently it has 93 internationally important wetland covering 54.7 lac ha. area. Out of these 19 are Ramsar sites covering 6.48 lac ha. area.

(iv). *Wetland Policy*: In India a Wetland Committee, a National Wetland Programme and a Management Action Plan for wetlands has been established and priority areas for conservation also identified. For Lake Management, a National Lake Conservation Plan has been prepared and work on transboundary action plans for Rivers is in progress. It is also proposed to plan a wetland inventory and mapping. Loktak Lake and Chilika Lake case study has been undertaken to formulate guidelines for conservation and wise-use of
wetlands and its resources at the river basin level integrating the ecological, economic and social aspects.

5.5 COMPARATIVE ANALYSIS OF BUNDALA AND CHILIKAA MANAGEMENT

(a) Inventory and monitoring: Wetland monitoring is checking, watching, or tracking of wetlands for the purpose of collecting and interpreting data. It is then used to record the wetland or process affecting the wetland. Wetland monitoring is a component of mitigation efforts which is carried using a variety of technique to measure and assess an array of structural and functional parameters (Kent 2001). The reasons for wetland monitoring sometime includes habitat mapping and trend analysis for identifying wetland resources and to detect changes in these resources over time. Indian coastland monitoring uses it for habitat mapping and trend analysis.

In Sri Lanka during WCP data collection took place in a standardised manner. This helped in comparison purpose to decide which wetlands require immediate attention and which do not. WCP prepared a "wetland atlas" under CEA. Together with this a biodiversity assessment was carried out by IUCN- the World Conservation Union in 2001 and a resource inventory was carried out by GEF project of DWC in August-1999. Research and monitoring are another aspect being emphasized by the ADB assisted plan. In fact, this plan aims at developing a comprehensive research and monitoring programme to assess the status of wetland ecosystem. Among these are the changes in the aquatic vegetation in response to water quality changes, fish population changes, productivity, etc. and impact of cattle dung flowing to the water body as well as changes in habitat utilization of the water birds and other fauna etc. also require monitoring. Undertaking a biological diversity survey and collation of past research documents are also a necessity. Wetland conservation and management training programme development and implementation are another aspect which can become part of the activities of the proposed wetland conservation education centre (Kent 2001).

In India the total number of wetlands and the area covered has not yet been comprehensively assessed. A systematic assessment of their biodiversity has also not
been assessed. World Wide Fund (WWF) for nature-India has been working on wetlands conservation for many years and is involved in activities like waterfowl counts, education and public awareness work. A directory of wetlands in India was published by the Ministry of Environment and Forest in 1990 which gives nationwide information of larger wetlands of more than 100 ha. area.

In 1993, MoEF carried wetland survey and mapping in the country using remote sensing technology. Recently in 1998 by using GIS and Remote Sensing (RS) technology a detailed inventory of wetlands have been prepared. However, these inventories only provide information on biodiversity and ecological characteristics and no information on resource use pattern, socio-economic aspects and traditional uses. It is important to carry out wetland assessment in the country with emphasis on the present wetland area and the changes that have taken place over a period of time with regard to their area, vegetation cover, faunal distribution, siltation, encroachment, zonation and overall drainage pattern (Parikh and Datye 2003). Wetland Research & Training Centre, Chanraput established by CDA carries out research work on several aspects such as: close monitoring of Chilika lagoon, sediment analysis, monitoring of river water quality, biological parameters like phyto diversity survey, biomass study of macrophytes, pigment analysis, collection and estimation of fish landing statistics in Chilika lagoon, shooting net operation at new mouth, Satpada and Magarmukh area, distribution and growth pattern of Chilika crabs, studies on Benthos and research on Irrawady dolphin.

(b) Policy and legislation: Policy making today is done at each level of human organization. In this pursuit, actions are needed to be taken by not only national government but also by local authorities, firms, voluntary organizations, communities and individual. However, environmental decision making is only possible in the context of economic and social responsibility inherent in the concept of sustainable development (Robert 2004). Policy and legislation become useful as “freedom in a commons brings ruin to all” (Hardin 1968).

It has been observed that successful commons regime exists because of existence of mutual coercion mutually agreed upon while in open access regimes over-use and tragedy are the general outcome. It is in this perspective that environmental policy making
becomes very important and is influenced by a number of factors. Policy environment is the context in which the policy system is operating at a time. It includes political complexion of the government of the day and prevailing public political ideologies. Other factors like economic circumstances, social and cultural factors including prevailing attitudes and values also shape the policy environment. Policy making is also affected by the citizens who provide support for the system by voting and can make demands by lobbying their elected representatives. Citizens make pivotal role through interest group in representing particular points of view to the government both directly and through media. There is fierce competition between groups and some are much more successful than others in achieving their objectives. Two types of policy instrument can be utilized by a country to attain its pollution control objectives, first, regulatory mechanism and second, effluent charge strategy which uses economic disincentives such as emission charges. Of these two strategies, the most commonly used one is regulatory mechanism. Even in third world countries, it is expected to serve better than relying on industries to control their own pollution (Dwivedi 1997).

Sustainable development of wetlands requires a project to be developed in an environmentally sound atmosphere. Sri Lanka has special significance for this as it still has nature surrounding everywhere and it could be an important source of foreign exchange earnings. Sri Lankan government has enacted some legislation for this such as coastal belt protection ordinance etc. A draft wetland strategy has been developed under Wetland Conservation Plan which prescribes a set of guidelines on wise use of wetlands and measures to safeguard wetland productivity, while ensuring the preservation of ecosystems. The draft strategy resulted in development of “Manual and strategy for Conservation and development of Wetlands in Sri Lanka” published in 1994. The document discusses impacts on various categories of wetlands by irrigation and drainage, aquaculture, fisheries, mangrove clearing, landfill, sand mining, shell mining, coral mining, salt production, siltation, livestock grazing and general types of pollution. Finally, a National Wetland Policy and an institutional mechanism have been established to coordinate wetland conservation activities (CEA 1993).
There are several ranging policies, strategies and action plans prepared in India which
directly or indirectly effects wetland conservation in India. A draft National Strategy has
been prepared under the MoEF-UNDP sponsored Capacity 21 programme which is
under consideration of the Government of India. It has also enacted several legislations
for the protection of environment and conservation of natural resources. The Coastal
Regulation Zone (CRZ) 1991 notification, regulates developmental activities in coastal
stretch of seas, bays, estuaries, creeks, rivers and backwaters.

Being a signatory to the Ramsar Convention all efforts is made to notify these wetlands
under the provision of Environment (Protection) Act, 1986, as ecologically fragile areas.
All existing regulatory mechanism mostly focuses on species or some components. None
of the legislation is specifically meant for values and functions of wetlands ecosystems.
So there is a need to develop a comprehensive unified wetland conservation and wise use
legislation which should take into consideration wetlands as a category in its own right
under land-use classification (Parikh and Datye 2003). The policies and laws enforced in
Chilika are: (1) Indian Wildlife Protection Act, 1972 (2) Water Act, 1974 (3) Forest
Policy, 2002 (6) The Biological Diversity Act, 2003 and (7) Coastal Aquaculture
Authority Act. 2005. These federal acts, rules and policy along with the State Marine
Fisheries Act and Fishing in Chilika Bill, 2002 provide a strong foundation for
implementing a process of conservation and sustainable use (Parikh and Datye 2003).

(c) The Role of Communities in Wetland Management: As human activity is generally
the cause of environmental problems so it is essential to understand working of human
systems by the policy makers (Robert 2004). The role of communities in running wetland
management plan successfully is very important. The surrounding communities need to
be informed, involved, and included in decision making process. All local communities
should be represented in the wetland management committee in order to create consensus
among them to resolve local conflicts and to make them understand wider (regional,
national) interests. In Indian EIA system, public participation in decision making and
appraisal was relatively less until recently. However, in 1997 public hearing were made
mandatory. This is organized by state authorities, before the EIA report is submitted to
the central government competent authority. In South Asia, except India, other countries environmental assessment procedures and practice are strongly influenced by development banks and aid agencies (Lee and George 2000). In this region India has been only such countries having long established EIA system.

In Sri Lanka WCP (Wetland Conservation Plan) has made necessary arrangements to assure that relevant local communities are involved in the process of preparation of Wetland site reports and conservation management plans. Some local groups were made part of the various wetland management committees. WCP have also trained and assisted the NGO’s or other groups in dealing with government agencies, so that they could defend their case in the way that their proposal could not be denied.

In 1997, CEA started a follow up programme of WCP, focusing on people’s participation in wetland management. The follow-up programme is called “Integrated Resource Management Programme in Wetlands” (IRMP) which started in 1998 for a period of five years. The vision of ADB assisted Protected Area Management plan is to conserve BNP through community participation and mission is an adaptive participatory management system to conserve its biodiversity especially with reference to the wetland while providing services to visitors and communities especially in reference to conservation concepts and information on significance of wetland ecosystem. Visitor Services (VS) and the Wetland Conservation Education Center (WCEC) will be achieved through zoning plan of the National Park. DWC staff will be incapacitated to perform as trainers to facilitate further capacity building. Micro-plans for the communities linking with CBOs, NGOs and other local agencies will be developed by DWC field staff through participation and collaboration.

The community organization is being done on the basis of GN division under social mobilization and micro-planning process (DWLC 2005). This is expected to bring in community partnership development. Community outreach programme would include involvement of community in areas like infrastructural development, habitat management, eco-tourism and other activities. Infrastructural development activities like roads, renovation and construction of buildings, and electric fences are the areas that can involve communities. Habitat management activities like removal of invasive species,
enrichment activities, rehabilitation of water holes are some other activities. Eco-tourism activities like participation in the sale of local products to the visitor, and training village youth as volunteer visitor guides, providing jeep, motorcycle, camp equipment etc. facilities are other participating activities for educated village youth.

In India the role of community participation has been adopted in social-forestry programme in which year. However, adoption of community participation approach is very recent in wetland management. In Chilika Lake Participatory management in watershed development was made part of the restoration plan by CDA. The objective is to help the community to prevent, arrest and reverse degradation of life support system particularly land and water, to produce biomass in a sustainable and equitable manner. CDA undertook a pilot participatory micro-watershed management project with the help of community not only to arrest the soil and water degradation but also to enhance the productivity of natural resources in a ecologically and institutionally sustainable manner. CDA aimed at facilitation of CBOs, NGOs and community by involving them in decision making process and empowering them by capacity building training (Iwasaki 1998). CDA adopted an innovative participatory micro-watershed management concept with a “sustainable rural livelihood approach” for the holistic management of natural resources. The objective was to facilitate the community through empowerment to take decisions and build capacity to work collectively.

CDA and Japan International Cooperation Agency (JICA) has started a technical cooperation project in 2006 called ‘JICA-CDA’ project for conservation and wise use of natural resources of Chilika lagoon through Community Participation’ for three years. Under this project a pilot project covering four villages have initiated in and around Chilika for improvement of socio-economic conditions of local communities and for scientific study of fishery resource management. The project also included environment education and awareness among the fishing and rural communities. subsequently a sensitisation workshop was held on environmental education and awareness in fisherman villages in and around Chilika. The main objective of the workshop was as follows: (1) to share knowledge of economically important species of Chilika lagoon, especially their biological information such as migratory routes, habitat and spawning areas, etc. (2) to
promote awareness about harmful fishing activities as well as their impact on the social and environmental aspect of the lagoon, (3) drawing alternative plan for fishers in order to reduce fishing pressure on entire Chilika lagoon, (4) sharing the experience of other villages where CDA-JICA project was implemented.

5.6 WETLAND MANAGEMENT PLAN

(i) Wetland Boundary demarcation:

Wetland identification and delineation are basically required in land use development, planning, exploration, and many other activities. It is both on-site and off-site wetland identification. For an undisturbed site wetland identification are done by applying the criteria of wetland hydrology, hydric soil, and hydrophytic vegetation. However, these criteria cannot be taken for an undisturbed area. Presently differential Global Positioning System (GPS) software is widely used for reference or landscape point location capability. In Sri Lanka, BNP’s present boundary was gazetted in 1992, which covers 62 km² area. There are some private lands included inside the park boundary. The new management plan of BNP proposes for annexation of about 1500 ha. This land is located in the northern boundary in DSs areas Lunugamwehera and Hambantota. The survey has been started by the Survey department but its slow. While CDA have established an in-house image processing and GIS facility. The monitoring of the Catchment and the aquatic vegetation is at present done through the image processing unit. Apart from this, the catchment monitoring is also going through the image – processing and GIS. CDA in collaboration with NRSA, Hyderabad obtains satellite imageries like land use maps, cadastral maps, vegetation maps, water spread area etc. CDA in collaboration with Space Application Centre (SAC) Ahmedabad has undertaken evaluation of hyper spectral data for wetland ecosystem of Chilika lagoon.

(ii) Assembling baseline information:

A baseline study describes the condition of the biodiversity target prior to, or in the early stages of, project implementation. It is a benchmark against which management induced changes can be identified and measured (Parikh and Datye 2003). Preparation or commencement of a biodiversity conservation project often requires a comprehensive
survey to determine factors such as the areas of highest biodiversity value, the types and location of threats to those values, the ecological history of the area, etc.

In India a large number of research institutions and University Departments are involved in various aspects of wetland ecosystems. Zoological Survey of India and Botanical Survey of India of the Ministry of Environment and Forests are repositories of information on flora and fauna in the country. Bombay Natural History Society is involved in wetland research, particularly on waterfowl for several decades. BNHS has undertaken studies on Keoldeo National Park, Chilika lake, Kolleru Lake, Harike and Point Calimere. In addition, Salim Ali Center for Ornithology and Natural History (SACON) at Coimbatore is involved in ornithology study. The Inland Fisheries Research Institute and the Institute of Brackish water Aquaculture under the Ministry of Agriculture have been involved in study of various aspects of fisheries. There are several projects for economic valuation of wetlands. Capacity 21 project of UNDP, the World Bank-sponsored EMCaB project etc. are engaged in it.

In Chilika Lake, Involvement of water exchange and salinity gradient by dredging, with support of mathematical model and bathymetry data has been carried by CWPRS, Pune, and Ocean Engineering Center, IIT Chennai, and CDA. The Environmental Impact Assessment of Chilika Lagoon for dredging of outer channel by water and sediment quantity study, eco-biological quality study and circulation of siltation process has been carried by National Institute of Oceanography in Goa (NIO), CDA. Weed Management and eutrophication study has been carried by RRL (Regional Research Laboratory) (CSIR), Bhubneshwar. Public Awareness, eco-development in peripheral areas has been carried by CDA/CEE (Center for environment education), Community Based Organisations, NGOs. Fisheries development has been carried by Fisheries Department, stakeholders, CFRI. Bird sanctuary management is carried by Forest department, and Bombay Natural History society (Ghosh 2006).

for BNP the current information on flora has been collected by the IUCN survey. The information on birds are also available in the IUCN biodiversity status profile. The park management staff also adds on in the existing inventory by observation carried on. For crocodile population counting there has been no detail investigation carried out in recent
times. Only in 1986, it was carried out by Shekhar Dhatfari and wildlife Ranger Mohammed. The new plan includes development of a plan to assess and manage the crocodile population. To date there is no comprehensive biological diversity assessment of the wetland system. Some research programme by universities, IIWM, NARA etc. have been conducted but none of them has been collated or documented (DWLC 2005).

The new management plan proposes that the past research be collated and a biodiversity assessment beyond the IUCN study be conducted. A bird ringing programme is being carried annually in the BNP but it needs improvement as equipments and methods are highly outdated so new management plan includes formalization and improvement in bird ringing programme. The new management plan of PAMWCP aims at development and implementation of wetland conservation and management training programme with special emphasis on specific targeted faunal and floral species such as birds, crocodiles, turtles etc. The PAMWCP includes development of a programme to manage fishing in lagoon system and a comprehensive research and monitoring programme to assess the status of wetland ecosystem (DWLC 2005).

(iii) Preparing a computerised Database:

In Sri Lanka, new management Plan of BNP aims at establishment of communication and information exchange equipment (MIS). It is specified in component- A, which is for enhancing DWC’s institutional capacity. Electronic Information with fully integrated MIS is essential at DWC for the achievement of the envisaged objectives and goals. Management Information System ensures reliability, integrity, accessibility and availability of information. MIS needs building of hi-tech IT infrastructure in extending improved services and facilities to users. MIS team has worked out an Intermediate Implementation Plan to improve the existing IT infrastructure and create IT awareness among the DWC staff, as a capacity building measure (DWLC 2005).

(iv) Identifying biodiversity value and functions:

Identification of a biodiversity value may be useful in comparison of different areas at the same point in time. All wetlands have some functions and values. Functions are processes inherent to a wetland. They derive from the wetland’s hydrological, geological, biological
and chemical characteristics. Wetland values are functions that prove useful or are important to people. Values may be provided within the confines of the wetland, for example recreation or, beyond the wetland boundaries, for example, flood protection. Another characteristic of wetland value is that they vary with time and circumstances. Thus, wetland value and functions are inextricably linked. Values cannot be provided without there first being a function. There are many functions and values attributed to wetlands such as: aquatic and wildlife habitat, educational and scientific value, elemental transformation and cycling, flood flow alteration, groundwater recharge, particle retention, production export, raw materials, recreation and soil stabilization (Kent 2001).

Table 5.2: Wetland Integrated Monitoring Condition Index (WMCI) Functions, Values, and Measurements

<table>
<thead>
<tr>
<th>Function and Values</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquatic habitat</td>
<td>Animal species list</td>
</tr>
<tr>
<td>Flood attenuation</td>
<td>Flood storage capacity</td>
</tr>
<tr>
<td>Groundwater recharge</td>
<td>Recharge volume</td>
</tr>
<tr>
<td>Nutrient metabolism</td>
<td>Total nitrogen and total phosphorus</td>
</tr>
<tr>
<td>Production export</td>
<td>Total suspended organics</td>
</tr>
<tr>
<td>Sediment retention</td>
<td>Total suspended solids</td>
</tr>
<tr>
<td>Toxicant retention</td>
<td>Heavy metals, volatile organics, and petroleum hydrocarbon analysis</td>
</tr>
<tr>
<td>Wildlife habitat</td>
<td>Animal species list</td>
</tr>
</tbody>
</table>

Source: Kent et al., 1992, pg. 167

Chilika lake is a wetland of international importance listed in the Ramsar Convention of 1982. Chilika is a repository of rich ecological diversity with over 400 vertebrates of both brackish and freshwater species, including several endangered, threatened, and vulnerable species. More than 710 varieties of plants are found here (CDA 2007). Over one million migratory waterfowl and shore birds gather there during winter. The Nalabana island is a designated bird sanctuary. A very large, Chilika lake with a drainage basin of over 4,300 km² provides a livelihood for over 0.15 million fisherfolk and contributes to India's foreign exchange balance through tourism and exports of
prawns and fish (CDA 2007). It has been a focus of cultural, religious and spiritual activities for the local population. Chilika is also home of Irrawady dolphin (Ghosh 2006).

Bundala National Park is a unique coastal ‘wetland of International importance’ in Sri Lanka. It is the only Ramsar site in Sri Lanka. It harbours a large variety of waterfowl, which includes the greater flamingo, besides a large variety of dry zone terrestrial fauna. Its tropical situation provides it with a large variety of micro-flora and micro-fauna.

(v) Identifying major impact and problems:

Bundala wetlands are facing a range of problems currently. Some of these problems are due to degradation of wetlands while others as a result of degradation in the surrounding Bundala national park area. There are several anthropogenic and biological factors for this deterioration. These factors are of 4 major categories; habitat deterioration, direct exploitation of species, prolonged drought and spread of invasive alien species.

Chilika has been subjected to severe ecological degradation over time. The problems included siltation, change in salinity concentration, increase in invasive species, aquaculture activities, eutrophication, excessive extraction of bio-resources and an overall loss of biodiversity. These problems resulting in ecological degradation led to changes in ecological characters and Chilika Lake was included in Montreux Record (threatened list of Ramsar site) in 1993. In fisheries sector growing conflict due to overfishing and reclamation of shoreline areas for agriculture and aquaculture accounts for additional threat to the overall ecology of the lagoon (Panigrahi 2006).

(vi) Determining management Objective and Problems:

The ADB assisted PAMWCP project aims to restore and manage the Bundala wetland ecosystem, to restore and manage terrestrial ecosystem, to effectively administer and protect the habitats and archeological sites of the BNP, to provide visitor services including dissemination of information on wetland ecosystems and to empower the local community to participate in and benefit from the conservation of BNP (DWLC 2007).
Chilika Development Authority was formed in 1992 with the following objectives: (i) For protecting lake ecosystem and its genetic biodiversity; (ii) to survey, plan and prepare a proposal for integrated resource management in and around lake; (iii) to understand multi-dimensional and multi-disciplinary development activities; and (iv) to cooperate and collaborate with other institutions for development of the lake.

(vii) Preparing management Plan:

The Protected Area Management and Conservation Project (PAMWCP) aims to strengthen the DWLC ability to manage Protected Areas in accordance with Management Plans. The Management plans was initiated by the DWC with assistance from the Technical Assistance (TA). The preparation of the management plan was divided into two phases. Phase 1 includes the ‘preparation of a Draft Interim management Plan’ and Phase 2 included the finalization of the Management Plan. Components of phase 1 include data collection and preparation of the ‘Draft /Interim management Plan’. Components of Phase 2 includes the “Draft Interim management Plans” to be consolidated into the “Management Plan”. An operational activities schedule was also developed parallel to draft management plan. This was then subjected to budgeting allocations and scheduling of implementation to enable the preparation of yearly work plans and thus rolling plan for the Park. The management Plan has been compiled based on available information and field observations and as such the implementation must be considered “adaptive”. Thus the recommended actions may be subject to change within the adaptive strategy of implementation. Thus the purpose of the plan is to make it a living document. The management plan was achieved by direct participation by the TA Consultants (DWLC 2005).

CDA developed linkages with more than forty institutions, stakeholders departments, agencies etc., for restoration of the lagoon. The success of CDA has been largely attributed to strategic partnership built up through networking, consultation and coordination with the stakeholders (Ghosh 2006).

For sustainable management of Chilika lagoon, different ameliorating measures have been taken up by the CDA like (i) Catchment treatment, (ii) Opening of new mouth, (iii)
De-siltation of lead channel (iv) Improvement of Nalabana Eco-system, (v) Fishery resource development, (vi) Development of communication network, (vii) Environmental awareness programme for stakeholders and school children etc, from the fund received from Ministry of Environment and Forest, Government of India. The scientific intervention programme was carried out on the basis of major recommendation of ORSAC, Pune and other institutes and practical experience gained from experience in other countries intervention programme by CDA chief.

(viii) Preparing a Monitoring Plan: A monitoring plan is necessary for successful completion of the task. CDA has elaborate measures for Chilika monitoring. A wetland research centre at Chandraput, Balugaon are totally devoted for research and monitoring. GIS techniques are also being utilized for periodical monitoring of the lake basin. In Bundala monitoring has been carried out by University researchers and some nongovernmental organisations. The park staff has also started carrying out monitoring of late.

Finally, the research needs identification for future is very important in successful wetland Management Plan.

5.7 ANALYSIS OF THE REGIONAL INITIATIVE IN COMPARISON TO RAMSAR GUIDELINES

A resolution on "regional initiative for further implementation of the convention" was adopted during the 8th Meeting of the Conference of the Parties (Ramsar Resolution VIII 30). This resolution endorsed "Guidance for the development of Regional Initiatives in the framework of the Convention on Wetlands" (Lei 2005). A comparative analysis of the Bundala management plan and Chilika management plan against this guidance could make it understand where they are and how the initiative been developed. The comparative analysis consists of four parts. The following observations were made during field visit.
On the aim of the initiative:

<table>
<thead>
<tr>
<th>Key factor set by the Guidance</th>
<th>Current situation of the initiative in Chilika</th>
<th>Current situation of the initiative in Bundala</th>
</tr>
</thead>
<tbody>
<tr>
<td>To promote the objectives of the Convention in general and to implement the Ramsar Strategic Plan in particular, through regional and sub-regional cooperation on wetland-related issues of common concern?</td>
<td>YES</td>
<td>YES</td>
</tr>
</tbody>
</table>

On Substantial Elements, the key factors to assess are:

<table>
<thead>
<tr>
<th>Key factor set by the guidance</th>
<th>Current situation of the initiative in Chilika</th>
<th>Current situation of the initiative in Bundala</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Bottom-up Approach?</td>
<td>YES</td>
<td>In process</td>
</tr>
<tr>
<td>Participation of Ramsar Administrative Authorities &amp; other Stakeholders?</td>
<td>YES</td>
<td>Not Yet</td>
</tr>
<tr>
<td>Creating enabling environment For the involvement of all stakeholders</td>
<td>YES</td>
<td>In process</td>
</tr>
<tr>
<td>Seek Cooperation with other Inter-governmental,</td>
<td>YES</td>
<td>YES</td>
</tr>
</tbody>
</table>
### International partner?

<table>
<thead>
<tr>
<th>Based upon Strong Scientific and technical Backing?</th>
<th>YES</th>
<th>Partially</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic and Operational targets should be fully aligned with Ramsar Strategic Plan?</td>
<td>YES</td>
<td>Partially</td>
</tr>
</tbody>
</table>

### On financial and other Support:

<table>
<thead>
<tr>
<th>Key factor set by the guidance</th>
<th>Current situation of the initiative in Chilika</th>
<th>Current situation of the initiative in Bundala</th>
</tr>
</thead>
<tbody>
<tr>
<td>Political and financial Support from CPs and Other Partners in the region?</td>
<td>Partially</td>
<td>Partially</td>
</tr>
<tr>
<td>'Substantial' Support from hosting country is especially important?</td>
<td>Not yet confirmed</td>
<td>Not Yet</td>
</tr>
<tr>
<td>Launching of the initiative should rely upon secured start-up funding for planned activities?</td>
<td></td>
<td>Funded by GEF &amp; ADB</td>
</tr>
<tr>
<td>Financial support from Convention's core budget, should the CoP so decide, will be?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
On governance:

<table>
<thead>
<tr>
<th>Key factor set by the guidance</th>
<th>Current situation of the initiative in Chilika</th>
<th>Current situation of the initiative in Bundala</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establish advisory mechanisms, involving all stakeholders?</td>
<td>In process</td>
<td>Partially</td>
</tr>
<tr>
<td>Coordination between the initiative and the Convention?</td>
<td>Yes</td>
<td>Partially</td>
</tr>
</tbody>
</table>

Multilateral Environmental Agreements (MEA) in Addressing Wetland Issues

The other agreements dealing with wetland protection relates to species migration (Convention on Migratory Species), trade in biodiversity (CITES), sustainable utilization of biodiversity (CBD), protection of world heritage sites (WHSC) and climate change agreements. Different divisions of the Ministry of Environment or other Ministries such as Ministry of Fisheries normally carry out issues pertaining to these conventions. India and Sri Lanka both are signatories of many of these conventions. A status of their participation in these Convention are given below in the table. It is required therefore to develop synergies and interlinkages of activities undertaken to enforce these MEAs. For instance, a Convention Coordination Committee within and between the Ministries could be developed. In addition to these, at least three Intergovernmental initiatives (e.g. SAARC, SACEP and BoBP) provide framework for conservation of environment in the region. These forums can also be used to encourage the governments to comply in to various MEAs.
Table 5.3: The status of participation of MEAs (Multilateral Environment Agreements)

<table>
<thead>
<tr>
<th>MEAs</th>
<th>India</th>
<th>Sri Lanka</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convention on Biological Diversity</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Convention on Migratory species</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>MoU on IOSEA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marine turtles- MoU on Siberian crane</td>
<td>X</td>
<td>na</td>
</tr>
<tr>
<td>CITES</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>UNESCO World Heritage Convention</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>UNFCC</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

X-Party to the Convention; na- Not Applicable

Source: Asian Wetland Symposium Proceedings, 2005

5.8 POLITICAL ECOLOGY SYNTHESIS OF CONFLICT IN THE CHILIKI BASIN

Chilika Lake has been very important from natural resource point of view. However, increasing population pressure has led to vested interest leading to resource conflict. It has been marked by resistance, conflict and uprisings at various point of time. An analysis of human-environment interaction help in understanding resource exploitation and developing sustainable management practices. Interrelationship between social and ecological system give birth to socio-ecological system (SES) (Patra 2003). Though, there has been effort everywhere to maintain the sustainability of resources by
intervention at various level and scale, yet economic globalization and climate change has particularly hastened resource degradation. The development of institutions and governance at various scales have in most of the cases excluded community involvement. However, long term sustainability of resource management is only possible by involving community though their varying claims and disputes cannot be addressed without the intervention of the state (Patra 2003).

Chilika lake management in recent past has traversed from inclusion of the lake into Montreux record of Ramsar Convention in 1992 due to ecological degradation to removal of its name from Montreux record and Ramsar wetland Conservation award and Evian prize-2002 to CDA. Its journey has been marked by conflicts, journey and sacrifices at various level. Chilika’s ecological richness, and its resources and service has attracted many actors in this basin. Some of the actors are: (1) State, which includes Department of fisheries, Tourism, Revenue, Forest (Wildlife) and the Chilika Development Agency, (2) Multilateral institutions like World Bank, UNDP, Ramsar Japan fund for Global Environment, Ramsar Center Japan-Asia, India Canada Environment Facility, Japan International Cooperation Agreement (JICA) etc. (3) Business firms, like Shrimp culture industries, Chilika Aquatic Farms Ltd., Tour operators etc., (4) Civil Societies, such as Environmental NGOs, WWF-India, Palleshree, Meet the students (MTS), Ganatantrik Adhikar Suraksha Sangathan, Orissa Krudsa Mahasangha, Other CBOs, (5) Movements, such as the Chilika Matasyajibi Mahasangh (Fisherman Grand alliance), Chilika Bachao Andolan (Save the Chilka Campaign), Campaign for Conservation of Chilika Lagoon (CCCL), (6) Grassroot Actors, like Communities, Fisherman, Non-Fisherman etc. There are a large number of fishing methods based on caste like Bahni, Jano, Trap fishery-Dhaudi and Baja, Dian, Uthapani, Prawn Khatties. The fishing and property rights are not fixed in space and time and shifts according to shifting property relations, environmental circumstances, and social conflicts among actors both inside and outside. These different actors have not only diverse interests but also diverse goal. The diversity of nature and goal has been the root cause of conflicts among these actors.

There has been reportedly gaps in approaches and opinions between the state based Orissa Krushak mahasangh and the village based Chilika Bachao Andolan which has
been equated as northern “wildernes agenda” and southern “survival agenda” (Patra 2003). In future, with changing socio-ecological system and as a result of everincreasing demand of resources conflict may take some new turns and may pose challenge to survival and management. It is therefore necessary to understand the nature and dynamics of conflict. Here, there is strong bonding within communities and weak linkages with outside agencies, which has played significant role in fisheries management. The role of State in fisheries management has increased in other developing countries and are likely to increase in Chilika as well. So, the significance of linking social capital is particularly important in improved fisheries governance and co-management. Social capital refers to norms and the social networks that facilitate cooperation among individuals and between groups of individual. It is thus needed to strengthen network across groups and agencies in fisheries. Local institutions could be legitimised and fishing communities can be given more rights and responsibilities to strengthen linking social capital for improved management outcomes (Sekhar 2007).

The Chilika wetlands, an internationally important wetland has suffered threat both in physical terms as well as conflict in the basin due to different actors involvement. CDA has done exemplary work in restoring the wetland ecology and minimizing the conflict in the basin by adopting ecosystem approach including adaptive management, participatory management and sustainable development policy. There is need of further carrying forward this approach and taking the lessons from its failure and success and moving forward in the restoration effort.

5.9 POLITICAL ECOLOGY SYNTHESIS OF CONFLICT IN THE BUNDALA BASIN

An important reason behind least progress in this coastal lagoon ecosystem is that Coastal Conservation Departments mainly looks after the coast and this coast being of limited importance, strategically and economically are not given much importance for conservation. The biodiversity component is not valued much as they do not impact directly. City dwelling people who come here for safari tour were really against community involvement in decision making for the park management and community outreach programme. This had led much controversy in commencement of the ADB
assisted project. The ADB assisted project was delayed due to the opposition because of vested interest involvement. Communities in the surrounding area are not very keen in following regulatory measures of the Park and its wetlands. There is an emotional separateness between community people and DWLC staff as earlier it was never ever tried to relate to the community and DWLC acted as regulatory mechanism. The staffs were more interested in fauna protection and least about the damage caused to the community. So, the co-management could not be carried out.

Lack of trust and bonding among the community and the Park staff are the main reason for least implementation of regulatory provisions earlier in the Park. Thus the need for proper implementation of the management plan is to reduce community conflict with park staff and outsiders, and integration of policies of various departments related to drainage basin water in the area. The participatory approach initiated in the new plan will go a long way in achieving such an objective.

Thus the Chilika lake which faced more ecological degradations was and is able to restore its ecosystem through capable management under the auspices of CDA with the help of government support. Bundala lagoon on the other hand has faced less degradation due to lesser human intervention in its catchment area. Though ADB and GEF assisted park management plan was prepared, lesser vertical and horizontal integration of use and management resources by various Sri Lankan institutes and departments in its catchment area has thwarted all management efforts.

5.10 SUGGESTIONS

South Asia has a large number of wetlands, ranging from glacial in Himalayas to mangroves and coral reefs. They support a large number of biodiversity and livelihood of millions of people in the region. These wetlands are severely threatened by the impacts of increasing human population and high economic expansion of the region as well as due to climatic change. There is a need for regional arrangement under the Ramsar Convention on Wetlands for cooperation and collaboration for the conservation and wise use of wetlands particularly in its management and poverty alleviation in South Asia. It will add value to national efforts in areas such as in the management of transboundary wetlands,
conservation of migratory and common species they support, enhance coordination between international and regional wetland programmes, data and experience sharing and inter-linkages between MEAs addressing wetland issues. It could also be used as a forum to mobilize assistance for non signatories' parties to sign and ratify the Ramsar Convention and designate wetland of international importance which could enhance communication and collaboration between existing institutions and programmes (Perera and Lynch 2005). Similarly, a South Asian regional arrangement could be modeled on the existing MedWet Initiative, which mobilizes partners and funds to assist in the implementation of the Ramsar Strategic Plan in the Mediterranean region. However, the structure and modalities needs to be determined only after full consultation between all stakeholders. The intergovernmental programme SACEP (South Asia Co-operative Environment Programme), in which five members are party to Convention can be modeled on this.