

# **MARINE BIODIVERSITY CONSERVATION AND MANAGEMENT**

*Edited by*

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## XVI. GUIDELINES FOR AN ACTION PLAN FOR THE CONSERVATION AND MANAGEMENT OF COASTAL WATER BODIES

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*"Conservation and management both stem from value judgement  
made by society and not science" R.L. Edwards.*

### INTRODUCTION

As aptly mentioned by Kenchington (1988) conservation implies concepts of preservation and sustainable use of the resources. The aim of both aesthetic conservation and extractive conservation strategies is both judicious exploitation and guarantee of a sustainable yield. An aesthetic approach in nature and natural resources management advocates preservation to ensure ecological balance ecotourism and scientific research. Extractive conservation is a contemporary expression to denote resource harvest or resource development to promote utilization. Conservation can also be *biocentric aesthetic* or *anthropocentric aesthetic* types. The former underscores the primacy of resource preservation for safeguarding ecological and genetic diversity, while the latter aims at habitat protection for human recreation, traditional subsistence and perhaps for scientific research. (Chuva Thia Eng, 1993)

The coastal zones with their different types of water bodies are being subjected to tremendous pressure due to natural and anthropogenic reasons, resulting in habitat degradation, resource depletion, environmental pollution, loss of biodiversity and the like. Wetlands, lakes, lagoons, bays and ponds have lost their pristine nature in several parts of the world (Pillai, 1985).

Small and large coastal water bodies serve mankind many ways. They serve as protected sites for harbours, recharge aquifer, supply living resources for food and of recent as aquaculture sites of much importance. The coastal zone also harbours useful ecosystems like

coral reefs and mangroves. Dredging of the water bodies, reclamation, industrial pollution, over exploitation of the resources all have converted many of these habitats into the status of endangered or totally altered habitats. Because of their importance as a life supporting system they have to be preserved and conserved at any cost. Several authors (Kenchington, 1988, Kurata, 1993, Bohnsack, 1993, Khoshoo, 1983, Sunilkumar and Antony, 1994) have projected the environmental problems of coastal water bodies and their adjacent ecosystems and have suggested guidelines and action plans for the conservation and management. In this paper a few general guidelines as gleaned from recent literature on the topic for the preparation of an action plan for the conservation of water bodies are given.

### THE NEED

As already stated, increased natural and anthropogenic interferences on water bodies coupled with the threat of potential sea level rise anticipated from green house effect has generated a lot of interest in coastal zone management. Many nations have already initiated positive steps to ward off the evil. Action plans are to be site specific *i.e.* an action plan drawn up for a particular habitat for example an estuary may not hold good for a saline lagoon or freshwater lake. In each instance, planning is concerned with existing status, anticipated changes, measures to regulate the situation in an orderly way. This has been amply stressed in the recent FAD Technical Report for the year 1992 (Barg, 1992) The following basic considerations are required in the preparation of an action plan for conservation.

### BASIC REQUIREMENTS OF AN ACTION PLAN

*Simplicity* : The plan may be as easily operated without ambiguity so that all concerned with the project well understand the course of action.

*Equity* : The plan should operate or should have equal impact on all beneficiaries.

*Capacity* : The resource availability and man power of the implementing agencies and the technical competency may be given due weightage. Strengthening of infrastructure, if required may be taken careof.

***Fair distribution of cost and assessment of benefit*** : The cost-benefit analysis is of prime importance. The financial target should not put undue stress on the implementing agencies, and it should be well within the fiscal means.

***Rationality*** : The scheme should be logical with firm scientific foundation and the technical programmes must be fully operational with the availability of infrastructure. The actionplan should provide testability and should offer predictive power.

***Constituents of an action plan*** : Detailed proposals on the constituents of an action plan for the conservation and management of various ecosystems are provided by Saenger and Siddique, (1983) Chua Thia Eng (1993) Schroder (1992) Kurata (1993) and Barg (1992).

## IDENTIFICATION OF THE PROBLEM

This may have social, economical, scientific and cultural aspects. The site selection and initiation of an actionplan may also be influenced by political and local situations. Normally areas of high risk should be given priority.

***Environmental assessment*** : This is concerned with the assessment of the existing environmental situation as well as the causes for the environmental deterioration and loss of resources. Emphasis is on baseline studies, monitoring and research. The following may be considered:

Description of the site and its extent, boundaries, geographic setting and accessibility, assessment of the living resources, both qualitatively and quantitatively. The physical and biological aspects of the waterbodies, such as, depth, water quality, pH dissolved oxygen, temperature, chlorophyll and primary and secondary production, internal and exported nutrients, pollution threats, sedimentation, dredging and its effects reclamation and habitat shrinkage may be considered for the baseline report. These impacts have to be quantified and their effect on the resources have to be assessed.

***Financial arrangements and institutional involvement*** : Government or NGOs may be approached for sufficient funding to carry out the plan. A sound and viable budget is all the more important in this

regard. When adopting an action plan, a competent organisation should be identified with the responsibility to execute the plan as well as to take decisions on problems that may emerge subsequently. It will also monitor the progress of the plan and may also suggest new activities if required.

***Environmental management*** : This will include a wide range of multidisciplinary activities which are need based. Control of industrial pollution, embankment, ecodevelopment, prevention of excessive nutrients from agricultural uplands or control of sediment load, removal of excessive vegetation to prevent eutrophication, control and prevention of pathogens, regulation of predator prey index may all be of matters of consideration in an aquatic habitat. Zoning and imposition of multiple use pattern may be imposed for effective management.

***Legislation and imposition*** : An overview of the existing legislations to implement effective conservation strategies may be made. Wherever existing legislation is found inadequate new ones may be formulated and ratified. The implementing agencies should have executive powers to impose the legal measures. Effective implementation is equally important as framing rules and regulations in nature conservation. The legal frame work may take care of the traditional rights of local people.

***Regulatory processes*** : Regulatory processes involve adoption of specific goals, identification of specific values and resources, determining opportunities and finding means for the reduction of threats, risk and impacts, monitoring and evaluation. The goal of the action plan is to be specified in clear terms. It can be the protection of the entire habitat or the protection of the valuable resources or species. As already stated priority and criteria for the selection of a water body for conservation and judicious management may involve social, cultural, economics, national or regional importance. As to which habitat should get priority depends on the need for such an action. Monitoring involves collection of information at regular intervals to record the changes. The changes are evaluated from the data on initial studies and such assessment should normally yield information on the effectiveness of the action plan.

## **THE CENTRAL THEME**

The main objectives of an action plan to conserve a waterbody should include the following.

1. Maintain a high quality environment.
2. Protection and identification of threatened and endangered species.
3. Conservation of critical water bodies and their microhabitat.
4. Identify and prevent activities that causes ecosystem damage and resource depletion.
5. Prevention of industrial and organic pollution and thus maintain water quality.
6. Resolve conflicts that may exist among different users.
7. Restore damaged habitat and rejuvenate the living resources that are affected.
8. Evolve safe options for conservation respecting local needs and demands.
9. Raising public awareness on environmental issues and involving them in any action plan.

## **PROBLEMS OF COASTAL WATERBODIES AND SUGGESTED REMEDIES**

By combining the knowledge of environmental hazards derived from the assessments it will be possible to initiate many actions to prevent ecosystems damage as also to effect ecodevelopment in our water bodies. The major natural and human activities that altered the physical and activities of our waters include, over exploitation of the resources, dredging, pollution of different kinds, invasion of exotic plants and the resulting eutrophication and loss of primary productivity, deterioration of water quality, shrinkages of water area, loss of adjacent ecosystems like mangroves coral reefs etc. Deforestation, intensive agriculture, excessive application of nutrients, fertilizers and pesticides are all having deleterious effect on water bodies. On recent

aquaculture is also showing unhealthy and dangerous indications on some of our lakes and estuaries. Any action plan that envisages ecodevelopment and management of our coastal waters should have a holistic approach. This involves that the problem, has to addressed with the assumption that "everything is connected to everything else" and dealing with a single aspect may not give desired result.

*Protection of critical habitats :* Critical habitats like mangroves along the coasts of estuaries serve as spawning and breeding grounds, nesting and nursery areas, feed areas, and refuge areas for several marine and estuarine organisms. Preservation of these critical habitats is very important for the living resources of back waters and coastal zones. Whatever is left of our mangroves have to be preserved at any cost. Sunil kumar and Antony (1994) have suggested several actions for the conservations and mangement of mangroves, including habitat protection, afforestation etc.

*Prevention of alteration of water quality :* The water quality of many of our coastal lagoons and estuaries deteriorated due to many reasons. The release of improperly treated or untreated human sewage and excreta causes release of many pathogenic bacteria in coastal and inland waters. To prevent this effective hygenic schemes have to be implemented. Release of excess organic compounds or industrial effluents should not be permitted. Pollution may have to be controlled at point sources. Plans to be drawn up for the effective control of pollution.

Use of herbicides and pesticides in contiguous and upland agricultural land may be minimized. Guidelines for their use may be made popular among farmers, thus preventing excess use and their ultimate run-off into the water bodies. Area of high primary productivity such as wet lands, underwater grass beds should receive high priority and should be preserved at any cost.

Unnatural salinity alternations may adversely affect the fauna in small waterbodies. It often results from increased or decreased release of freshwater from streams and rivers. Water diversion projects and irrigation projects should be critically evaluated before being taken up.

Aquifers and streams that empty into lagoons and coastal seas should not be allowed to get polluted. Oil spills should be treated effectively.

Construction of bunds dams etc. that regulate the flow of water in and out of the estuaries and lagoons have to be taken up after proper environmental assessment to assess the impact. Beach erosion often causes excessive siltation and filling up of the estuaries and lagoons. Inshore currents and patterns of sediment deposition in coastal and estuarine waters can be seriously affected by the construction of jetties, causeways, certain types of fish taps and piers. (Khoshoo, 1983). This can lead to filling in and stagnation of lagoon circulation. Such structures, if absolutely necessary may be designed in such a way as to allow maximum water movement. Dredging and reclamation are causing shrinkage of our water bodies. Finally, intense mariculture may effect many undesired ecological problems in coastal and inland water bodies. Scientific caution in this regard may be applied and farmers may be informed of the environmental problems and consequent economic loss.

The unique environmental and ecological and economical importance of the coastal waters require their conservation. The trend of active use of these water bodies for various purposes will increase in future due to demographic pressure. There can be several guidelines for a environmentally sound use of these waters. Environmental problems result from cumulative effect of many actions and piece meal treatment to specific issues may not solve the problems.

As already recognised by the Government of India we do not have sufficient basic information on the problem faced by our coastal water bodies. It will be worth attempting the preparation of such basic status reports by institutions or by state or central government agencies. These status reports will help us to identify problems and prepare effective action plans to conserve the required areas. Such reports should reflect the physical resources, ecological and biological resources, human use values and quality of life values as indicated in the "Environmental guidelines for development of beaches" by the Department of Environment of our central ministry (Khoshoo, 1983).

## FACTORS THAT MERIT CONSIDERATION IN PREPARATION OF STATUS REPORT TO IDENTIFY AN ACTION PLAN FOR CONSERVATION OF COASTAL WATER BODIES

*Physical features* : Geographic location with longitude and latitude. Administrative authorities if any. Extent and boundaries adjoining major habitats, physical dimensions such as surface areas, maximum and minimum depth. Nature of bottom. Catchment area, rivers or tributaries contributing inflow of water. Annual mean rainfall of the area. Climatic conditions, macro or micro habitats present. Erosion of the shore and sedimentation.

*Water quality* : Transparency at different depths-seasonal. pH monthly average, Diurnal and average monthly fluctuation of Dissolved Oxygen, BOD. Chlorophyll concentration, Detritis, Nutrients such as nitrates, nitrites, phosphates and their fluctuation. Salinity fluctuation due to tidal variation and water inflow.

*Biological features* : Qualitative and quantitative composition of phyto and zooplankton. Primary production and secondary production. Macrofauna and benthic faunal elements and their distribution and abundance. Bacterial load. Prey predator relationship. Adjoining vegetation like mangroves. Floating and bottom plants and their effect on the habitat.

*Socio- economic condition* : Land use, population pressure. Agricultural impact. Dredging and reclamation and consequent shrinkage to the water area. Extractable and non extractable resources and their state of exploitation. Navigational hazards, fishery hazards. Mariculture and its impact. Other uses if any and their impact.

*Factors affecting deterioration of the environment* : Determination of the extent of damage. Rate of deforestation around. Siltation due to run off from uplands. Loss of biodiversity. Invasion of exotic plants and animals. Toxic contamination both organic and chemical; their source degree and intensity. Nutrient influx and eutrophication. Pesticide problem. Oil pollution. Sanitary facilities and sewage disposal into the lagoon and lakes.

*Research and development* : Basic and applied research done. Development already undertaken. Institutions available to undertake further research and development. Probable source of funding. Existing legislation.

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# FLOW CHART

