CONSERVING ECOLOGICALLY FRAGILE ECOSYSTEMS

REPORT OF THE TASK FORCE

PLANNING COMMISSION

NEW DELHI

OCTOBER 1996

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1. INTRODUCTION

The Planning Commission Steering Group for the IX Five Year Plan, on Environment and Forests, set up a task force to consider of ecologically fragile ecosystems of the country. The members of the task force were:

Shekhar Singh Indian Institute of Public Administration New Delhi	Chairman
S.C. Maudgal Senior Advisor Ministry of Environment and Forests Government of India New Delhi	Member
Shyam Chainani Bombay Environmental Action Group Bombay	Member
R.C. Jhamtani Jt. Advisor (E&F) Planning Commission New Delhi	Member
S.C. Sharatchandra Bangalore Karnataka	Member
Uma Shankar Singh Dy. Advisor (E&F) Planning Commission New Delhi	Member
Tarsem Chand Research Officer Planning Commission New delhi	Member Secretary

The terms of reference of the task force were:

a) To identify the ecological fragile areas such as mangroves, wetlands, hazardous waste sites etc. and their present status.

b) To identify possible threat perceptions and their source.

c) To suggest remedial measures in their regard.

d) To enlist the legal remedies required and encourage people's action in this regard.

e) Any other related issue with the permission of the Chairman.

Copy of the notification is at annexure I.

The task force had five meetings, all at Delhi.

At the outset, the task force identified the areas that qualified as ecologically fragile and needed consideration. Broadly speaking, three categories of areas were considered. First, ecosytems which were inherently fragile, in the sense of being both rich in bilogical values and sensitive to biotic and other human pressures. These included

- Wetlands
- Rivers
- Corals
- Mangroves
- Coasts
- Oceans
- Rangelands
- Deserts
- Islands
- Hills and mountains
- Estuaries & backwaters
- Forests

In addition, certain special categories of sites, which required critical attention, were also identified. These included:

- Human made Heritage Sites
- Hill Stations and Scenic Areas
- Catchment Areas

Finally, in keeping with the detailed terms of reference for the task force, those areas were identified which had special environmrntal problems because of the use they were being put to. These included:

- Hazardous Waste Sites
- Harbours
- Shipping Lanes
- Command Areas
- Urban Areas

- Mining & Oil Extraction Areas
- Industrial Belts
- Chemical\ nuclear hazard sites
- Disaster prone areas

Due to the paucity of time, it was not possible to consider the problems and status of all these areas with the same degree of attention. Therefore, a further short listing was done. However, basic information and some broad recommendations have been provided for all these categories of areas.

The report, apart from identifying the various areas, gives their current status, describes the current efforts at conservation, and gives specific recommendations. In addition, it also gives general recommendations relevant to all ecologically fragile areas.

This report has extensively used a report titled ***Conservation of Wild Biodiversity in India : A Status Report*** , prepared by the Indian Institute of Public Administration, New Delhi, for the Ministry of Environment and Forests, Government of India [IIPA 1994].

2. OF ECOLOGICALLY FRAGILE AREAS

As already mentioned, in this report areas have been considered ecologically fragile if:

2.1 they contain significant ecological values, and

2.2 are areas whose ecological balance is prone to be easily disturbed,

or

2.3 their use is such that it threatens their own and other area's ecological balance.

From this it follows that we are considering two types of fragile areas: those which are inherently fragile, and those which might not be inherently fragile but where human use pressures are so great that their ecological balance is threatened.

It must here be admitted that it is not easy to come by a definition of fragility that is universally applicable. After the best of efforts, the final identification will always have some amount of subjectivism and perhaps even arbitrariness. Also, though this report deals with broad ecosytems, within each ecosystem the degree of fragility would differ significantly. For example, all forests or coastal zones will not be equally fragile, some being actually quite robust. It is for this reason, among others, that one of our first and most important recommendations is that India must prioritise sites from among each fragile ecosystems so that those actually needing attention can be urgently taken up for conservation and the resources available can be optimally utilised.

3. STATUS

FRAGILE ECOSYSTEMS	LAWS	POLICY	INSTITUTIONAL STRUCTURE	FISCAL MECHANISMS	SCHEMES	PEOPLES PARTICIPATION
1. Forests	**H**	**H**	**H**	**M**	**H**	**M**
2. Wetlands	**L**	**L**	**L**	**L**	**L**	**L**
3. Corals	**L**	**L**	**L**	**L**	**L**	**L**
4. Mangroves	**M**	**L**	**L**	**L**	**L**	**L**
5. Coasts	**H**	**L**	**L**	**L**	**L**	**L**
6. Oceans	**L**	**M**	**L**	**L**	**L**	**L**
7. Rangelands	**L**	**L**	**L**	**L**	**L**	**L**
8. Deserts	**L**	**L**	**L**	**L**	**L**	**L**
9. Islands	**L**	**M**	**M**	**L**	**M**	**L**
10. Hills and mountains	**L**	**L**	**M**	**L**	**L**	**L**
11.Estuaries & backwaters	**L**	**L**	**L**	**L**	**L**	**L**
12.Rivers	**M**	**M**	**M**	**L**	**H**	**L**
PROTECTED AREAS						
13.National Parks and Sanctuaries	**H**	**H**	**H**	**M**	**H**	**M**
14.Biosphere Reserves	**L**	**M**	**M**	**L**	**M**	**M**
15.Sacred Sites	**L**	**L**	**L**	**L**	**L**	**H**
SPECIAL SITES						
16.Human made Heritage Sites	**L**	**L**	**L**	**L**	**L**	**L**
17.Scenic Areas	**L**	**L**	**L**	**L**	**L**	**L**
18.Catchment Areas	**L**	**H**	**M**	**L**	**M**	**L**
AREAS WITH SPECIAL PROBLEMS						
19.Disaster prone	**M**	**M**	**M**	**L**	**M**	**L**
20.Harbours	**M**	**M**	**H**	**M**	**M**	**L**
21.Shipping Lanes	**L**	**L**	**M**	**L**	**L**	**L**
22.Command Areas	**L**	**M**	**H**	**L**	**M**	**L**
23.Urban Areas	**M**	**M**	**H**	**M**	**M**	**L**
24.Hill Stations	**L**	**L**	**M**	**L**	**L**	**L**
25.Mining & Oil Extraction Areas	**M**	**M**	**M**	**L**	**M**	**L**
26.Industrial Belts	**M**	**M**	**M**	**L**	**M**	**L**
27.Chemical\ nuclear hazard sites	**M**	**M**	**M**	**M**	**M**	**L**
28.Hazardous Waste Sites	**L**	**L**	**L**	**L**	**L**	**L**

H = high, M = medium and L = low

4. GENERAL RECOMMENDATIONS

The conservation objectives for fragile ecosystems must be four:

1. to identify, catalogue and prioritise sites
2. to determine and monitor the ecological status of these sites
3. to identify and minimise threats and pressures, and thereby help conserve these sites.
4. to restore, regenerate and recover degraded sites

In keeping with these, some broad recommendations, relevant to all fragile ecosystems, are given below.

General Recommendation

REC 1. Based on clearly defined indicators for determining fragility, following from the definition used in this report , an **identification of fragile areas and sites must** be urgently done for the country, with clear provisions for periodic updates.

REC 2. Further, **a priority must be established from among these areas** so that initial conservation resources and efforts can be focussed on those areas and sites most deserving of attention. The prioritising must be done taking in to consideration both ecological and socioeconomic values of an area, and balancing between its ecological value and the threats and pressures. The final priority lists must contain a mix of some areas which have high value and low pressures, and others which might have lower value but have high pressures, and thus need urgent action if they are to be saved at all. Obviously, areas with both high pressure and high ecological[1] and socio-economic value must be top priority.

Priorities must be determined separately for each category of ecosystems, ensuring that the network of priority sites and areas is representative of the country's environmental diversity. Such a prioritisation activity must be supported by the government but must involve scientists and experts from institutions and organisations outside the government, and must be done in collaboration with local communities, giving due weightage to the views of the communities living in and around these areas.

[1] These values would include ecological richness, representativeness, uniqueness, naturalness, and linkages with other valuable areas.

REC 3. The **prioritised sites and areas not already notified by law must be given an appropriate protection status under the Environment (Protection) Act or some other relevant legislation, rule or regulation.** However, protection should not invariably mean the exclusion of the local people from the area. Depending on the conservation objectives and the carrying capacity of the area, use of the area by the local people should be regulated within the bounds of sustainability. However, the best form of regulation would be self regulation by the communities. The people should always be involved in the protection and management of the area, along the lines of the joint forest management and ecodevelopment strategies currently prevalent in India.

REC 4. To overcome the lack of effective monitoring of ecologically fragile areas. **A comprehensive monitoring programme and network must immediately be designed and operationalised**. The monitoring of an ecologically fragile area must be preceded by:

1. The determination of its carrying capacity.
2. The identification of the major threats and pressures.
3. The determination of indicators of the health of the ecosystem and of the minimisation of threats and pressures.
4. The development of a multi-disciplinary monitoring methodology.

For such a monitoring network to be effective and sustainable, it must involve institutions, universities, NGOs, colleges, and even schools, and must also link up with the people living in and around these fragile areas. For the purpose, as required, training programmes must also be organised to develop the expertise of participants.

Though the Government of India and the state governments, through the Central and State Pollution Control Boards, have a monitoring system of sorts, this is very inadequate. In the ninth plan a people's monitoring system should be set-up where NGOs and educational institutions are provided support for regularly monitoring specific, ecologically fragile, areas. There should be certain state and national coordinating NGOs who not only prepare an annual report but also help in raising an alarm whenever ecologically fragile areas are threatened.

REC 5. To ensure that ecologically areas are not degraded or destroyed by inappropriate or badly designed and implemented "development activities" a

major thrust should be on strengthening the Environmental Impact Assessment procedure and practices in India not only at the project or the regional level but also at the policy level. Notwithstanding EIA having become mandatory, it suffers from the following serious **draw-backs:**

- Project proponents still consider EIA to be a formality which is presumed to be completed as soon as environmental clearance is granted. They rarely understand that EIA, as a decision making tool, can significantly enhance the benefits of the project while ensuring environmental protection.
- The consultants preparing the environmental impact statements on behalf of the project proponents often act as "hired guns" of the project proponents with the result that their reports are often biased, unreliable and remain unimplemented. The consultants tend to tow the line of the project proponents because their future prospects and often even their consultancy fees are dependent on the project being approved.
- Lack of transparency, objectivity and "public participation", which are pre-requisites for making the EIA process successful. Informed and meaningful public participation assumes that there is free access to all relevant information. This demand for the public's right to information has also been supported by various court orders.
- Lack of objectivity, accountability and transparency in the screening and assessment processes used by regulating agencies for approving or rejecting projects.
- Ineffective monitoring of the stipulated remedial measures.

Accordingly, **the following steps need to be taken**:

A) The **stipulations in the EIA notification to penalise the proponents and/or their consultants for furnishing false data need to be seriously implemented** to make the EIA reports objective.

B) (I) Despite their being efforts to make the process of EIA more transparent and participatory, the rules under the Environment (Protection) Act were first amended to allow this and then very quickly again amended to minimise this. Consequently, this remains a high priority. All bureaucratic efforts to ensure that proper EIA of projects and activities is done would neccessarily fail if the process is not transparent.

Secrecy in these matters only encourages manipulation by vested interests.

Therefore, **rules under the Environment (Protection) Act must be suitably amended and provisions must be made, if necessary through a special scheme, for making available all information on which EIA is based** and for ensuring that there is adequate discussion with non-governmental experts and with the affected communities, before a project is given environmental clearance.

The project authorities as well as the regulatory agencies like the Ministry of Environment & Forests should **make available, unfailingly, requisite reports and data to the public** to ensure transparency and informed public participation.

(ii) Transparency and accountability in decision-making should be strengthened by permitting **public scrutiny, of files regarding projects approved or rejected, for at least one month before the decision becomes effective**. Action, including imprisonment, should be taken against those responsible for indefensible technical and/or administrative decisions.

C) The **practice of granting "pari-passu", or "conditional", approval in cases where environmental action plans are to be submitted later, should be discarded altogether**. Past experience has shown that the spirit of such conditional clearances is never honoured.

D) Even when projects are being scrutinised and cleared after stringent environmental scrutiny, the experience is that project authorities often flout the conditions of clearance. There exists, at the moment, a very inadequate system of monitoring projects and activities in order to ensure that they comply with the conditions of environmental clearance. Consequently, it is important to **develop a new scheme through which NGOs, educational and research institutions, and interested and qualified individuals could be involved, as a part of the earlier described monitoring network**, which would monitor development projects and activities respect the environmental parameters within which they have been approved. This would, of course, require that information about, and access to, these

projects and activities be granted to members of this network. Specifically, **the letters containg the conditions of clearance must be made public** so that citizens can monitor compliance.

E) Being part of the Government set-up, the regulatory agencies are often subjected to political pressures which sometimes result in biased decisions. It is necessary, therefore, to **set up an independent and autonomous Environmental Protection Agency** with, among others, the following functions :

- To review the environmental action plans and missions of various agencies.
- To adjudicate on controversies regarding the environmental impacts of development projects..
- To appoint environmental appraisal and other expert committees for evaluation of various development policies and programmes in diverse sectors.
- To monitor the implementation of stipulated mitigation plans and compliance with conditions of environmental clearances.

REC 6. In addition to EIA, **appropriate zoning is required to ensure that development projects and activities do not impact on fragile areas**. In the ninth plan the whole country should be zoned in terms of its ecological vulnerability and areas where industrial, infrastructural and other development projects can be allowed to come up, should be clearly indicated. Even in these zones, the technology acceptable, the levels of effluents and emissions allowed and the number of units possible should be clearly specified. To provide incentive for complying with this zonation, rules and laws should be amended so that a less detailed clearance is required where a project or an activity conforms to the zonation and where it is within the prescribed parameters.

Keeping in mind the constraint that, at present, adequate expertise is not available in the country to carry out the required carrying capacity studies or for developing proper zones, it is thought that initially the zones might basically be **exclusion zones,** specifying the types of activities not permissible in each zone. Meanwhile, a major programme should be taken up, if necessary though collaboration with institutions outside the country, to develop indigenous

capacities to do comprehensive carrying capacity studies. These carrying capacity studies must lead to and form the basis of a rational and scientific land use plan for the country.

REC 7. Commercial activities, and activities of corporations and of the government, threatening fragile ecosystems, must be prevented through conducting proper EIAs and by ensuring that only those proposed activities are given environmental clearance that are harmonious with the conservation objectives of the area. As already described, there must be proper monitoring to ensure that unauthourised activities do not degrade the environment. **However, as far as pressures form subsistence activities of local populations are concerned, these must be dealt with differently, as most often these people are solely or primarily dependent on the resources of the area for their survival.** First, it must be determined to what extent the needs of the local people can be met without transgressing the carrying capacity of the area. The area should be managed to restrict its use to be within its carrying capacity and, as far as possible, should be jointly managed by the government and the local people. Where the local natural resources are not enough to meet the needs of the people in a sustainable manner, ecodevelopment strategies must be adopted and alternate income generating activities and sources of biomass must be established.

REC 8. Research efforts, especially with regards to issues critical for the proper identification and management of ecologically fragile areas, are sadly lacking in India. Regeneration and restoration methods for ecologically fragile areas must be urgently developed. For the purpose, **centres of research must be set up in the ninth plan, within existing institutions, each working on one or two types of fragile ecosystems.** The research should be aimed at developing better techniques for protecting, monitoring and restoring fragile ecosystems.

REC 9. Though a large amount of external funds are now becoming available for forestry, very little funds have been available for the identification, conservation and restoration of degraded fragile ecosystems. Though special funds for this purpose would have to be found, from the ninth plan **a proportion of the funds, say 10%, sanctioned for forestry should be earmarked for the identification,**

conservation, regeneration and restoration of fragile ecosystems within legally designated forest areas.

REC 10. It must be recognised that the proper management and conservation of ecologically fragile areas demands scientific expertise. The practice of giving responsibilty for such areas to generalists or to persons without appropriate expertise has itself taken a heavy toll on the health of these areas. **Proper institutional arrangements involving personnel with adequate and appropriate expertise must be urgently set up, along the lines recommended later, for the management and conservation of these areas.**

REC 11. Institutional arrangements for conserving and regenerating ecologically fragile areas need to be significantly strengthened, both outside and within the government and, within the government, both at the central and at district and state levels.

At the Planning Commission, an apex committee needs to be set up to review and co-ordinate efforts of various ministries and departments for the conservation of ecologically fragile areas. This apex committee should be headed by the Member (E&F).

At the central government level, the existing committees need to be scrapped and new committees set up, one each, for the following:

- Coastal regions (including coastal wetlands, islands, mangroves, coral reefs, estuaries and back waters).
- Wetlands and rivers
- Grasslands and hot deserts
- Mountains and cold deserts (including alpine pastures)
- Human made and natural heritage sites

Though, at present, there is a committe at the ministry and at state and district levels to manage wetlands, mangroves and coral reefs, experience with the present committee system suggests that as long as they are headed by, and composed primarily of, officials of the ministry, they do not meet regularly and are not very effective. Perhaps this is because of the various other preoccupations of the officials and the relative low priority given to the conservation of ecologically fragile areas. It is, therefore, recommended that additional commitees be set up, as suggested above, and the newly constituted committees should be headed by

committed experts from outside the government and also have significant non-government representation.

These committees should meet at least once every two months and should be responsible for reviewing action taken to identify, catalogue, prioritise, conserve and regenerate ecologically fragile areas. The committees should have the ability to approve research and monitoring activities and to advise the ministry on potential threats to specific sites and the preventive measures to be taken.

The functioning of such committees should be transparent and their proceedings made public. This would ensure that the public is in a position to support the efforts of these committees.

Adequate administarative support should be available within the ministry for the functioning of these committees and to take forward their recommendations.

Apart from these committees, the ministry should also set up expert groups to monitor and plan for specific regions of great ecological value (for example for the Western Ghats, Andaman and Nicobar Islands, Eastern Himalayas, etc.). These expert groups should be given the task of producing status reports on each of these areas and these status reports should be updated every five years.

The existing committees at the state level, for wetlands, mangroves and corals, are again not very active or effective. They must also be reconstituted and expanded along the lines of the national committees. Besides, in selected districts, district level committees should be set up along the same lines. The few districts that still have mangroves or corals, must all be covered through such committees. For other categories, such as wetlands, the most important districts with the most significant wetlands, should be taken up first. Local universities and colleges should be involved in this and consrvation should become a people's movement, or at least a student's movement. Existing programmes such as the National Service Scheme can be associated and, where required, new schemes can be supported.

It should be the responsibility of these district level committees, headed by experts from outside the government, to reach out to and involve local communities in conserving their own ecological resources.

REC 12. The neglect and indifference towards ecologically fragile areas suggests that there is great ignorance about their ecological and socio-economic value . Therefore, significant efforts need to be made to educate various categories of people, especially the policy makers and the urban dwellers, of the value of these areas, and of their vulnerability to human misuse.

The Planning Commission should take the lead in organising workshops for ministers, MPs, MLAs, and for government officials of the central and state governments, towards this end. Professionals, especially engineers, journalists and economists, must also be targeted. Schools and colleges, especially in the urban centres, must also be covered appropriately. The printed, electronic and audio-visual media should be used extensively for this purpose.

5. SPECIFIC ECOSYSTEMS AND SITES

5.1 WETLANDS

Wetland type	**Area (in ha.)**
Areas suitable for fish culture:	
Freshwater	1,600,000
Brackishwater	2,000,000
Area of capture fisheries	2,900,000
Mangroves	356,000
Estuaries	3,900,000
Backwaters	3,540,000
Human-made impoundments	3,000,000
Area under paddy cultivation	40,990,000
Total	**58,286,000**

[IIPA, 1994]

STATUS

No accepted figure for the loss or degradation of wetlands is available for India. This is mainly because monitoring of wetlands remains minimal. A very rough estimate is that one-third of Indian wetlands are already wiped out or severely degraded (Agarwal and Chak,1991). In the Asian Directory of Wetlands, Scott and Poole (1989) estimated that of the 88 Indian wetlands they had listed, as many as 45 were facing moderate to high threats to their existence. Of these, the following were shortlisted for special concern:

1. Dal Lake, Kashmir

2. Wular Lake, Kashmir
3. Haigam Rakh, Kashmir
4. Mirkund Lake, Kashmir
5. Hokarsar, Kashmir
6. Harike Lake, Punjab
7. Dahar and Sauj *jheels*, Uttar Pradesh
8. Southern Gulf of Kutch, Gujarat
9. Gulf of Khambhat, Gujarat
10. Wetlands of eastern Uttar Pradesh
11. *Chaurs* of North Bihar and West Bengal
12. Khabartal, Bihar
13. Dipor Bheel, Assam
14. Logtak Lake, Manipur
15. The Sunderbans, West Bengal
16. Chilka Lake, Orissa
17. Kolleru Lake, Andhra Pradesh
18. Estuaries of the Karnataka coast
19. Kaliveli tank and Yedayanthittu Estuary, Tamil Nadu
20. The Cochin backwaters, Kerala
21. Wetlands in the Andaman and Nicobar Islands

Jheels in the vicinity of Haidergarh in Barabanki district of Uttar Pradesh, and the Salt Lake swamps near Calcutta are "considered to be already too degraded to merit any special conservation effort" (GOI, 1990).

THREATS

Wetlands, especially freshwater wetlands, have been severely abused in many parts of India. A survey of 93 wetland areas around the country revealed the following break-up of types of threats (GOI, 1990):

THREAT	**NO. OF SITES WITH THREATS**
No information available on threats	**5**
No threats known	**4**
General disturbance from human settlement/encroachment	**23**
Drainage for agriculture	**23**
Reclamation for urban/industrial development	**14**
Construction of roads/airports/ waterways	**3**
Construction of dams/barrages for storage/hydroelectricity	**3**
Dredging	**2**
Mining activities & oil exploration	**2**

Conversion to aquaculture ponds	**1**
Conversion to salt pans	**5**
Diversion of water supply for irrigation/domestic/industrial	**9**
Degradation of watershed, soil erosion & increased siltation	**22**
Pollution - all forms	**33**
- domestic sewage	**14**
- solid wastes (rubbish)	**2**
- industrial waste	**13**
- oil	**2**
- pesticides	**10**
- fertilizers	**13**
Accelerated eutrophication	**9**
Infestation with aquatic weeds	**12**
Cutting of aquatic plants	**8**
Wood cutting for domestic purposes	**12**
Commercial logging/forestry	**12**
Overgrazing by domestic livestock	**28**
Burning of aquatic vegetation	**6**
Fishing & associated disturbances	**23**
Hunting & associated disturbances	**32**
Use of poisons/explosives in fishing & hunting	**-**
Harvesting eggs, hatchlings or nestlings of birds or reptiles	**2**
Exploitation of corals & shells	**1**
Introduction of exotic species	**3**
Disturbances from tourism/recreation & associated development	**11**
Flood control	**-**
Others	**6**

Some of the major threats are described below in greater details.

Siltation is extremely high in many water bodies in India, steadily increasing as catchments get degraded. Studies, on both natural lakes and artificial reservoirs, have shown a drastic reduction in capacity and a shrinkage in waterspread as a result of excessive silt inflow (Chatrath, 1992:2-6).

Freshwater wetlands all over India have been severely degraded by **pollution**. By the late 1970s, over 70% of the country's surface freshwater bodies were polluted in various degrees (CSE, 1982). With increased urban and industrial growth and a sharp rise in the use of agricultural chemicals since then, the situation today is probably worse.

Entire waterbodies are, as a result, simply dying - eutrophied to the point of turning into dry land, or rendered devoid of most of their living constituents.

Reclamation has been another major threat to wetlands. The Kerala backwaters and the Salt Lake swamps near Calcutta have shrunk to half their original spread in the last 30 years, due to urban reclamation and conversion to paddy cultivation (De Roy, 1990).

The introduction (deliberate or accidental), of exotic species into water bodies has affected them, either through changes in constituent elements, or physical damage. The South American plant, water hyacinth *Eichhornia crassipes,* introduced for its decorative flowers, has spread unchecked in a vast number of lakes and rivers in India, greatly helped by the creation of artificial reservoirs all over the country (Ramakrishnan, 1991). Many wetlands have simply been choked to death; the decrease in dissolved oxygen has been detrimental to fish populations and phytoplankton production (Baruah and Singh, 1989: 63).

CURRENT CONSERVATION MEASURES

The discussion on conservation measures is divided into two parts. The first part is a discussion of those general measures which help in the conservation of wetlands but are not exclusively aimed at wetland conservation and, in actual fact, conserve much else besides. These include measures such as pollution control, soil conservation or the regulation of hunting.

The second part of the discussion deals with those measures which are exclusively aimed at the conservation of wetlands, like the regulation of dredging, of fishing and trawling, or on the withdrawl of water from wetlands. This part also includes a discussion of those measures which are aimed at the conservation of a specific wetland, even though the measures themselves may be general.

Many of the wetlands are within national parks, sanctuaries, reserved/protected forests, or other legally protected areas. Such wetlands get the benefit of the protection that the law provides for such areas. The measures being described below, therefore, are relevant for only those wetlands that are not a part of any protected area.

For such efforts, the Ministry of Environment and Forests has, in recent years, taken several important steps. A National committee on Wetlands, Mangroves and Coral Reefs has been constituted to advise the Government on appropriate policies and programmes for the conservation of these ecosystems, to suggest specific sites for

conservation action and to identify research and training priorities. The specific tasks of this committee, in relation to wetlands, are:

i) To lay down broad policy guidelines for implementing programmes of conservation, management and research of wetlands.

ii) To decide priority of wetlands to be taken up for intensive conservation measures.

iii) To monitor the implementation of the programme of conservation, management and research.

iv) To advise on the preparation of an inventory on Indian Wetlands.

[MOEF 1989]

State-level Steering Committees headed, in most cases, by the Chief Secretary of the concerned State, have been set up to formulate, implement, and monitor the programmes. District-level committees have also been constituted for coordination and monitoring of programme activities at the field level. The Ministry of Environment and Forests is providing financial support, through centrally sponsored schemes, to the State Governments for carrying out activities related to the conservation and management of wetlands, mangroves, and coral reefs. Some of the specific conservation measure for wetlands, are listed below

1. **Disturbance from human settlements:**

There is no law regulating human settlements across the country. However, specific areas have regulations, like municipal areas or certain designated ecologically fragile areas (like the Doon valley or the Aravallis in Haryana and Rajasthan, and the Dahanu Taluka and Murud Janjira region of Mahrashtra).

There is no law or regulation regulating human habitation around wetlands, except for the Coastal Regulation Zone (CRZ) notification, notified under the Environment (Protection) Act. Within the CRZ various activities, including construction, are regulated.

Apart from this, many of the wetlands, especially most of the wetlands identified as ecologically vulnerable, are on or surrounded by public lands where adequate legal authority exists to regulate various types of activities, including habitation, and to prevent encroachments. Unfortunately, the relevant laws and provisions do not appear to be adequately used, as is witnessed by the fact that a large proportion of the surveyed wetlands record disturbance due to human habitation and encroachments.

The Ministry of Environment and Forests, in its "National Conservation Strategy" states that:

> "The steps to be taken for sustainable use of land and water should include the following:
>
> Protection of land near water bodies and prevention of construction thereof" [MOEF 1992: 5.2.1.4]

However, apart from the coastal regulation zone earlier mentioned, no other action seems to have been taken towards this end.

2. **Watershed degradation and soil erosion:**

Again, there are no universal laws protecting watersheds or soils across the country. The earlier mentioned "National conservation Strategy" identifies "enactment of laws for appropriate land uses to protect soil from erosion.." as a step that needs to be taken. However, there are various schemes of the Central Government and state governments aimed at watershed and soil conservation. Though these schemes are not explicitly aimed at conservation of wetlands, in so far as they are successful, their benefits will accrue also to the wetlands.

3. **Pollution:**

Wetlands are affected by both water and air pollution. Five types of water pollutants contaminate wetlands,

- Silt - due to soil erosion and degraded catchments
- Domestic Waste - from cities, towns and other human settlements
- Industrial effluents- from industries, thermal power stations and other polluting enterprises.
- Agricultural Pollutants - especially run-offs of chemical pesticides and fertilizers.
- Oil from spills and leaks.

As already discussed, there is almost no legal regulation relating to siltation. However, there are various schemes for protecting watersheds and for soil conservation.

There are fairly comprehensive laws and procedures regulating domestic and industrial effluents. However, despite these laws and the attendant regulatory mechanisms, a very large proportion of the wetlands surveyed reported threat from pollution. This is partly due to the fact that, laws notwithstanding, the enforcement of

standards has been poor in relation to many of the industries and municipalities. Also, laws relating to solid waste pollution, which often results in toxic run-offs into wetlands, and those relating to non-point pollution (like much of agricultural pollution) are still weak.

Air Pollution also affects wetlands, especially by raising the acidity level and by increasing the load of particulate matters. In extreme cases, high levels of air pollution can block the sunlight and can interfere with the process of oxidisation.

As in the case of water pollution, stringent laws exist for regulating air pollution. However, the levels of air pollution, especially in some of our cities and in industrial belts, continue to be much above the permissible standards.

4. **Grazing:**

Another very common threat was overgrazing by livestock. As many of the wetlands are inundated only during a part of the year, in the remaining months they often get a lush vegetation which attracts livestock. Perennial wetlands often have rich vegetation around them, especially along the banks during the dry seasons. This also attracts livestock.

Except in national parks, grazing is allowed in all other categories of protected areas. In sanctuaries and in reserved forests there is a legal ability to regulate and even prohibit grazing, keeping in mind the requirements of ecological conservation. However, outside protected areas there is no law which can effectively control or prohibit grazing (see section on grasslands for greater details).

There are various schemes of the government of India and of the state governments which aim at replacing conventional scrub cattle by high yielding varieties of cattle which, are stall fed. There are also various schemes for enhancing availability of fodder by developing fodder plantations (for details see section on grasslands).

5. **Hunting:**

Though over the years hunting appears to have lost its popularity, a significant proportion of the wetlands surveyed indicated hunting to be a threat. Hunting of most species of animals is either prohibited or regulated under the Wild Life (Protection) Act, 1972. Unfortunately, shooting of certain species of water fowl is permitted, in season, on the basis of a licence. However, ability to ensure that shooting is restricted to the licensed amount or period is difficult as the regulatory machinery, especially outside protected areas, is almost non-existent and regulation or prevention difficult. Besides,

even licensed shooting can often negatively affect the ecological balance of a wetland especially by searing away birds and animals critical to its ecological balance.

6. **Tourism:**

Over 10% of the wetlands surveyed reported threat from activities related to tourism and recreation. Though coastal regions are protected to some extent from infrastructure related to tourism, like hotels, by the earlier mentioned CRZ notification, there is no legal regulation in other areas. In fact, in most cases, there is a move towards developing tourism and tourist infrastructure as this is seen as a revenue earning activity.

SPECIFIC MEASURES:

It is important to note here, that most of the threats listed below are regulated or prohibited in the Coastal Regulation zone.

1. **Drainage for agricultural, urban or industrial development**.

Wetlands, especially marshes and shallow lakes, have often been seen as potential agricultural land. Many of these areas, when drained, make very rich agricultural lands due to high levels of soil moisture and rich silt deposits. This has encouraged the conversion of large tracts of wetlands into agricultural land.

Contemporary land hunger for urban and industrial development was also led to "land reclamation" schemes where coastal areas, marshes, creeks, lakes and even portions of river-beds have been colonised.

Unfortunately, despite the ecological damage that such activities do, there is no legal control over such activities, especially when they are being executed, as they often are, by the government or with its support.

2. **Dredging:**

Wetlands, including rivers and waterways, are often dredged either to deepen them and thereby facilitate the storage or movement of water, the passage of ships and boats, or for collecting earth-fill material.

Except where a wetland has been choked up with silt far beyond what is natural and in excess of its carrying capacity, dredging can be very damaging to the of the wetland. Despite this, there is no legal ability to regulate or prohibit dredging of wetlands, except for those lying between the low and high tide lines which are covered by the CRZ notification, especially if this dredging is being carried out by, or with the approval of, the government.

3. **Fishing:**

Over 25% of the wetlands surveyed reported threats from activities connected with fishing. In coastal areas there is the additional threat by trawling.

Generally speaking, there is little legal ability to control fishing in wetlands. For trawling, certain laws have been framed keeping in mind the spawning seasons of fish and the interests of the small fisher-folk. However, reports suggest that these laws are not being vigorously applied.

4. **Extraction of Salt**

Many saltwater wetlands face degradation from **excessive salt extraction**. The Sambhar Lake in Rajasthan, declared a Ramsar Site for its impressive biotic diversity including amongst the country's largest congregations of flamingos, is also one of India's major salt sources. Salt pans now cover almost 8000 ha. of the lake, severely affecting its ecosystem (WWF-I, 1992).

5. **Exploitation of Corals and Shells**

This is a major threat primarily to marine areas and is discussed in the section on coral reefs. However, it is banned in the areas covered by the CRZ notification.

Summary of Conservation Measures for Wetlands

General threats from	Legal control	Preventive schemes	Other regulations	Institutional Structure
1. Human Settlements	P[1]	N	P[2]	P
2. Development activities	P[3]	N	P[3]	P
3. Watershed degradation & soil erosion	N	Y	N	P
4. Pollution	Y	Y	Y	Y
5. Logging	Y	Y[4]	N	Y
6. Grazing	N	Y	N	N
7. Hunting	Y	N	N	Y
8. Tourism	N	N	P	N

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1. Power to control on government land/municipal land/ coastal regulation and designated ecologically fragile zones
2. Impact assessment required for certain categories of human settlements, like industrial townships. Controlled in coastal regulation zone
3. Environmental clearance mandatory for certain categories of public sector Projects. Legally controlled in coastal regulation zone
4. There are schemes for setting up plantations in wastelands

Y=Yes,N=No,P=Partial

Specific threats from	Legal control	Other regulations	Preventive schemes	Institutional Structure
1. Drainage	N	N	N	N
2. Dredging	N	P[1]	N	N
3. Diversion of water	N	N	N	N
4. Fishing	P[2]	P[3]	P	Y

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1. Environmental clearance required in relation to certain public sector projects like industry, power, or ports and harbours.
2. For trawlers
3. Fishing permits given in certain areas/seasons

Recommendations

1. Clearly, adequate legal support for conservation of wetlands is lacking, except for those wetlands which happen to be in legally protected areas or zones, like in national parks and sanctuaries or in the coastal regulation zone. Considering their ecological importance and high ecological fragility, designated wetlands should be given legal protection by issuing a notification to the effect under the Environment (Protection) Act.
2. A proper identification and prioritisation, of wetlands with significant biological or socio economic value, needs to be done so that legal and other conservation measures can be focused on these.
3. Current investment in wetlands conservation, both at the centre and state, are woefully inadequate. Considering the extent and importance of wetland ecosystems in India, investment for their conservation must be significantly stepped up. As the required levels of investments cannot come solely from the environment and forestry sector, and given the importance of wetlands in other sectors like fisheries, water resources, agriculture and tourism, specific allocations need to be made in each of these sectors so that wetlands, of importance primarily to these sectors, can be conserved through their budgetary allocations.
4. As the health and integrity of wetlands is directly dependent upon the health of the micro watersheds in which they are located, it is essential to protect and manage these watersheds also. Accordingly, outlays for wetland conservation should also include investments for the conservation of micro-watersheds.

5. Wetland ecology is a specialised area without adequate educational and training facilities in India. The Government of India should, especially in states with significant wetland areas, promote wetland studies and consider setting up a new institution, or designating existing institutions, as national institutions for wetlands studies. As one major impact on the ecology of wetlands is due to degradation of catchments and pollution from industries and cities, a management plan should be developed for each important wetland in the country, and such a plan should also cover areas and activities impacting on the wetland.

5.2 RIVERS

India has been blessed with an extensive network of rivers and streams, many of which are snow fed and have their origins in the high himalayas. These rivers not only provide life and sustenance to the whole country but are also habitat to a large number of plants, fish and animal species. The rivers of India have a high capacity to regulate their own ecological balance by cleansing themselves, assimilating waste and oxygenating their waters.

Status

Unfortunately, in the last few decades the riverine ecosystems of the country are facing significant threats. The major threats include:

- Industrial, urban and agricultural pollution.
- Degradation of catchments leading to enhances silt runoffs and erratic water runoffs.
- Over extraction of water
- Impoundement and diversion leading to disturbance of the ecological balance
- Introduction of exotic species
- Extraction of sand, stone and mud.
- Dredging
- Pressures from river transport systems.
- Encroachments for agriculture and habitation on river beds and banks.

Current Conservation Measures

The Government of India launched, in 1985, an ambitious Ganga Action Plan with the objective of cleaning the Ganga river. This plan was later transformed into the National River Action Plan with many more rivers being covered. Though it is perhaps too early to assess the National River Action Plan, unfortunately the Ganga Action Plan seems to

be falling much below expectations. Various assessments suggest that it has failed to raise resources from state and local governments, to make polluters to pay for cleaning up pollution, to involve people in the conservation efforts, and to come up with a sustainable strategy for progressively improving the water standards in rivers.

The Ministry of Water Resources, Government of India, has a policy statement on water which, however, while listing the various priority uses of rivers, unfortunately does not mention the maintenance of the rivers ecological balance as a priority objective. Consequently, rivers in many parts of the country are being diverted of water to such an extent that their internal ecological balance is being disrupted and in some cases destroyed.

Recommendations

1. The National River Authority should have a wider brief than mere control and prevention of pollution. It should have the ability to regulate land use around the rivers and to prevent activities that significantly affect the well being of the river.
2. The cleaning up of the river and the maintenance of its ecological balance should start from the origin of the river so that the gains made are sustainable. This is at variance with the current practice where efforts are made to divert the various effluents of the river at the edge of the river, rather than to prevent these from breaching the river edge in the first place.
3. Banks of the rivers should get local protection by the creation of a notified river regulation zone along the lines of the coastal regulation zone notified earlier by the Ministry of Environment and Forests.
4. Much more investment needs to be made in the protection and regeneration of major catchments as their destruction is perhaps the single most significant factor negatively affecting the rivers in India. Currently, the investments in catchments, as also the methodology used, are not very effective. It is necessary to significantly enhance investments in catchment area treatment and regeneration.
5. The conservation and management of the catchment must be done with the participation of the local people so that it is sustainable. This must become a policy of the various departments involved in catchment area treatment.
6. They should immediately be set up an extensive monitoring network to measure the silt and water flows from different catchments. This will help to measure the economic and financial costs paid by country in terms of floods, droughts, siltation

of dams, soil erosion and because of the destruction of catchments. Data so collected would provide the economic justification for investment in the protection and regeneration of catchments and also indicate how uneconomical it is to deforest or otherwise disturb significant catchments.

5.3 COASTS

India has over 7,000 kms of coasts. These areas assumed special importance since 1983 when the Ministry of Environment & Forests issued their environmental guidelines for development of beaches. These areas assumed even greater importance once the CRZ Notification was issued in February 1991 by the Ministry of Environment & Forests.

STATUS

The available information points to an alarming situation. India's coastal areas are subjected to severe pressures from reclamation, dredging, siltation, pollution, mining, over-exploitation, construction on or near the coast, salt-extraction and other factors. The backwaters of Kerala, the *kayals*, are degraded or destroyed by dredging, pollution, water withdrawal for industrial and power station use, and siltation from degraded catchments (Kurup and Samuel, 1987; Gopalan, *et al*. 1983). They have also been subject to reclamation for various purposes (Das and George, 1993), with Vembanad backwaters, western India's largest estuarine system, having been reduced to one-third its original size.

Off the coast, ecologically unsound techniques like large-scale trawling have caused drastic ecosystem damage, destroying marine beds and breeding grounds of aquatic organisms (Bensam, *et al.* 1993: 10).

THREATS

Some of the major threats are:

- Dredging
- Collection of sand, corals and other material
- Pollution
- Oilspills
- Unsuitable construction
- Excessive and inappropriate tourism
- Aquaculture

Pollution of various kinds has been a major threat to coastal waters in India. About 17 crore (170 million) people, 25% of India's population, live on the country's coastline. (Sen Gupta and Qasim, 1985).

An estimated 513 million tonnes of oil are transported across the Arabian Sea to or from different parts of the world, annually. Small amounts of oil are constantly leaking from ship ballasts and engine rooms, totaling up to nearly 2.1 million tonnes yearly (Sen Gupta, 1984).

There have been several **oil spills** in Indian waters, including one of 5,500 tonnes in 1989 off the coast of Bombay (Chengappa, 1993). One of the first such accidents, in 1974, was when the US tanker *Transhuron* ran aground and spilled about 3000 tonnes of furnace oil in the Lakshadweep Islands, causing substantial (though largely undocumented) ecological damage (Singh, D. 1993).

One of the recent spills was by far the most serious in Indian waters: a spill of 40,000 tonnes of lightcrude about 110 km south of the Great Nicobar Island (Chengappa ,1993). The other was of lesser magnitude, in the Arabian Sea off the coast of Bombay (Anon., 1993).

The impact of **aquaculture projects**, along the South-east coast of India, on the natural marine ecosystem is yet to be adequately assessed.

Besides overexploitation, **pollution from land-based sources** is another major threat to marine resources. It was estimated at the global level that 70 percent of the marine pollution is due to land based sources, while 10 percent each is contributed by maritime transport and dumping activities. In an interesting study on world wide tanker oil spills, it was estimated that for every million tonnes transported, 12 tonnes were spilled within 80 km of the coast.

Construction near the high tide line also threatens the coastal ecosystem, apart from blocking public access to the sea and contributing to the depletion of ground water resources in the coastal region.

The **population influx and increased tourism** in some coastal places are responsible for indiscriminate destruction of marine biological resources.

CURRENT MANAGEMENT STRATEGIES

Coastal zone management and conservation of marine diversity are of recent origin. The first Marine Sanctuary was constituted by the state Government in 1980 in the Gulf of Kutch. Coastal and marine ecosystem are poorly represented among the

protected areas network in India. Except for the Andaman & Nicobar Islands, where there area over a hundred parks and sancturies containing coastal ecosystems (though only two with marine ecosystems) , the rest of the country has only two other marine national parks and a handful of parks and sanctuaries protecting the coasts.

The Government of India notified, in 1991, the coastal regulation rules which regulate activities in coastal regions. The main features of these rules are:

***Prohibited Activities**:*

The following activities are declared as prohibited within the Coastal Regulation Zone, namely:

(i) setting up of new industries and expansion of existing industries, except those directly related to water front or directly needing foreshore facilities:

(ii) manufacture or handling or storage or disposal of hazardous substances as specified in the Notifications of the Government of India in the Ministry of Environment & Forests No. S.O. 594(E) dated 28th July, 1989, S.O. 966(E) dated 27th November, 1989 and GSR 1037(E) dated 5th December, 1989.

(iii) Setting up and expansion of fish processing units including warehousing (excluding hatchery and natural fish drying in permitted areas);

(iv) setting up and expansion of units mechanisms for disposal of waste, and effluents, except facilities required for discharging treated effluents into the water course with approval under the Water (Prevention and Control of Pollution) Act, 1974; and except for storm water drains;

(v) discharge of untreated waste, and effluents from industries, cities or towns and other human settlement. Schemes shall be implemented by the concerned authorities for phasing out the existing practices, if any, within a reasonable time period not exceeding three years from the date of this notification;

(vi) dumping of city of town waste for the purposes of landfilling or otherwise; the existing practice, if any, shall be phased out within a reasonable time not exceeding three years from the date of this Notification;

(vii) dumping of ash or any wastes from thermal power stations;

(viii) land reclamation, bunding or disturbing the natural course of sea water with similar obstruction, except those required for control of coastal erosion and maintenance or cleasing of waterways, channels and ports and for prevention of sandbars and also except for tidal regulators, storm water drains and structures for prevention of salinity ingress and for sweet water recharge;

(ix) mining of sands, rocks and other substrata materials, except those rare minerals not available outside the CRZ areas;

(x) harvesting or drawal of ground water and construction of mechanisms therefore within 200 m of HTL; in the 200 m to 500 m zone it shall be permitted only when done manually through ordinary wells for drinking, horticulture, agriculture and fisheries;

(xi) construction activities in ecologically sensitive areas as specified in Annexure-I of this Notification;

(xii) any construction activity between the Low Tide Line and High Tide Line except facilities for carrying treated effluents and waste water discharges into the sea, facilities for carrying sea water for coolines and facilities essential for activities permitted under this Notification; and

(xiii) dressing or altering of sand dunes, hills, natural features including landscape changes for beautification recreational and other such purpose, except as permissible under this Notification.

3. Regulation of Permissible Activities:

All other activities, except those prohibited in para 2 above, will be regulated as under:

(1) Clearance shall be given for any activity within the Coastal Regulation Zone only if it requires water front and foreshore facilities.

(2) The following activities will require environmental clearance form the Ministry of Environment & Forests, Government of INdia, namely:

(i) Construction activities related to Defence requirements for which foreshore facilities are essential (e.g. slipways, jetties etc.); except for classified operational component of defence projects for which a separate procedure shall be followed. (Residential buildings, office buildings, hospital complexes, workshops shall not come within the definition of operational requirements except in very special cases and hence shall not normally be permitted in the CRZ);

(ii) Operational constructions for ports and harbours and light houses requiring water frontage; jetties wharves, quays slipways etc. (Residential buildings & officer buildings shall not come within the definition

of operational activities except in very special cases and hence shall not normally be permitted in the CRZ);

(iii) Thermal power plants (only foreshore facilities for transport of raw materials facilities for in-take of cooling water and outfall for discharge of treated waste water cooling water); and

(iv) All other activities with investment exceeding rupees five crores.

(3) (i) The coastal State and Union Territory Administrations shall prepare, within a period of one year from the date of this Notification. Coastal Zone Management Plans identifying and classifying the CRZ areas within their respective territories in accordance with the guidelines given in Annexures-I and II of the Notification and obtain approval (with or without modifications) of the Central Government in the Ministry of Environemnt & Forests;

(ii) Within the framework of such approved plans, all development and activities within the CRZ other than those covered in para 2 and para 3(2) above shall be regulated by the State Government. Union Territory Administration or the local authority as the case may be in accordance with the guidelines given in Annexures-I and II of the Notification; and

(iii) In the interim period till the Coastal Zone Management Plans mentioned in para 3(3)(i) above are prepared and approved, all developments and activities within the CRZ shall not violate the provisions of this Notification. State Governments and Union Territory Administrations shall ensure adherence to these regulations and violations, if any, shall be subject to the provisions of the Environment (Protection) Act, 1986.

By virtue or this notification, the State Governments and Union Territory Administrations were supposed to prepare Coastal Zone Management Plans within a period of one year. However, even though more than five years have elapsed, till recently very few States/Union Territory Administrations had prepared these vitally important Coastal Zone Management Plans. This was, consequently, the subject of considerable litigation in the Supreme Court. It is only after the Supreme Court orders that the process of preparing these management plans has been speeded up and it is understood that almost all the states have submitted their plans by 30 September, 1996, which was the deadline set by the Supreme Court.

Summary of Conservation Measures for Coastal Zones

Threats from	**Legal control**	**Other regulations**	**Preventive schemes**	**Institutional structure**
Pollution	P	N	P	P
Oil spills	P	P	N	P
Aquaculture projects	P	P	N	P
Construction	P	P	N	P
Population influx	N	N	N	N
Tourism	P[2]	P	N	P
Dredging	P[3]	N	N	P
Collection of sand/				

[2] Only with regards to tourism infrastructure in the CRZ.

[3] Only regulated in the CRZ

corals/other material	P[4]	P	N	P
Trawling	P	P	N	P
Over-fishing	N	P	N	P
Erosion	P	N	P	P

RECOMMENDATIONS

1. A vital component of the Coastal Zone Management Plan is the demarcation of the high tide line. This has been the subject or considerable controversy. Programmes are therefore urgently needed -
    a) for assistance in the preparation of coastal zone management plans by State Governments/Union Territory Administrations.
    b) for demarcation of the high tide line throughout the country.
    c) for implementation and monitoring of the coastal zone management plan.
2. A special programme is needed to prepare master plans for ecologically sensitive areas in the coastal regions, especially those given protection under the Environment Protection Act.

    To give just two examples, Dahanu Taluka and the areas of Dighi-Murud-Janjira were declared as environmentally sensitive areas but no funds were allocated for the preparation of Master Plans to regulate further development on an environmentally sustainable basis.
3. A programme is needed to provide compensation/rehabilitation of people who are affected by declaration of areas as ecologically fragile.
4. The efforts of the Ministry of Environment and Forests, Government of India, towards classifying all the coasts, as part of the coastal regulation zone, should go a long way in helping to conserve coastal ecosystems. However, the enforcement of these regulations and the monitoring of coastal ecosystems needs to be stepped up if effective conservation is to be achieved. For the purpose, it is important to designate existing institutions as coastal monitoring institutions, each with a specified geographical jurisdiction. These institutions should be networking institutions which involve local universities, colleges, NGOs, and other interested

[4] Only regulated in the CRZ

persons including fisherfolk cooperatives and organisations, in monitoring the health of coastal ecosystems and in ensuring that the coastal regulation zone's provisions are complied with.

5. As the communities who suffer most when coastal ecosystem are degraded are the fisherfolk and the coastal inhabitants, an effort should be made to promote joint management of coastal areas involving these two categories of people and the designated government authority. This would work especially well in areas where local communities are dependent on the coastal region for their livelihood, especially through fisheries, tourism, agriculture and other such.

6. There is weak and unclear institutional responsibility for coastal regions. Infact, in the states which have a coastline, there appears to be no authority within the government specifically responsible for protecting the coastal ecosystem. For this purpose, departments of environment in each coastal state should be strengthened and provided with a special cell for overseeing the implementation of the CRZ provisions and for otherwise regulating activities potentially affecting coastal regions.

5.4 CORAL REEFS

The precise area covered by Indian coral reefs is not known. A rough estimate of 19,000 sq.km. is given by Wafar (1992). These are distributed patchily off some parts of the mainland coast (the Gulf of Kutch in the northwest, and off the southern and central western coast), and around the two island clusters of Andaman and Nicobar, and Lakshadweep. A break-up of the areas is given below (no estimate given for the patchy reefs off the central western coast):

Gulf of Mannar:	100 sq.km.
Gulf of Kutch:	1,000 sq.km.
Lakshadweep Islands:	4,200 sq.km.
Andaman Islands:	11,000 sq.km.
Nicobar Islands:	2,700 sq.km.

STATUS

There appears to be no estimate available of the extent of reefs which have been degraded or destroyed, either worldwide or in India. It is, however, known that there has been considerable loss. Some assessments for this loss throughout the world are given in UNEP/IUCN (1988). In the case of India, it is known that the reefs at Gulf of Mannar and Gulf of Kutch are severely threatened (Wafar, 1992), with the latter having declined to only 30 to 40% of its former extent (WWF,1992).

THREATS

Major threats to coral reefs are from:

- Mining of corals to use for construction of roads and buildings, and for industrial use. For example, an estimated 25,000 tons were removed annually from the Gulf of Mannar and Palk Bay for use in calcium carbide production,
- Blasting and dredging.
- Collection of corals for decoration and sale.
- Siltation due to inland deforestation.
- Pollution from industry, agricultural runoffs and from towns and cities.
- Effluents from desalinisation plants.
- Pollution from ships and oil spills..
- Destruction by star fish.

Mining has been a major threat. In the Gulf of Mannar, some 25,000 tonnes of coral were mined every year in the 1970's and 1980's (Wafar,1992: 280-82). Particularly damaging was the fact that much of the mining was in waters less than 1 m. deep, thus affecting live corals more. Similarly, at Tuticorin (Tamil Nadu), annual mining of 15,000 tonnes of coral blocks and 10,000 tonnes of coral debris takes place, while in the Gulf of Kutch, the removal of about 0.6 to 1 million tonnes to feed a local cement factory In the latter area, the reef size has diminished from 11,100 ha. to 5,300 ha. within a decade (Baqri, 1993). Corals has destroyed over half the live coral (Wafar, 1992: 280-82 : Kothari, *et al.*). Corals near Mandapam (Tamil Nadu) were always used for preparing lime, but a severe blow was dealt with the establishment of the calcium carbide factory in Tirunelvelli district (Pillai,1993). During the 1960's about 250 to 300 cubic meters of coral were removed every day. Today, the area is covered with sand, and the coral reefs almost obliterated.

Dredging has had a serious effect on the reefs of Lakshadweep Islands, especially in the Minicoy lagoon and Kiltan atoll (Pillai, 1993). So too has siltation in almost all of the reefs of India. The absence of *Acropora* in the Gulf of Kutch is probably due to this; in the Andaman Islands, excessive silt deposition on reefs, caused by deforestation further inland and mining of sand from the shore for construction, has resulted in severe localised damage to *Acropora, Montipora*, and *Porites* formations (Pillai, 1993).

Pollution from various sources are another serious threat to Indian reefs. Heavy damage is reported in the Andaman Islands, due to effluents from timber and match

factories around Port Blair and in Middle Andaman Island (Dorairaj *et al.*, 1987). Recent studies on the corals of Manauli Island has shown that they are heavily infected with coliform bacteria, *E. coli*, which could be a result of sewage deposition on the reefs. In the Gulf of Mannar, disappearance of live coral reefs near Tuticorin harbour is partly a result of oil and industrial pollution (Wafar 1992). Oil spillages are also reported to have affected reefs near Great Nicobar Island and the Kavaratti atoll in Lakshadweep Islands (WCMC, 1988).

Other current threats include **destructive fishing practices**, such as the breaking off of branched corals to drive out resident fish; it is feared that the recent encouragement of fishing for aquariums by the Lakshadweep Administration, for export, could cause widespread reef destruction (Wafar, 1992).

Potential future threats include the **rise in global sea temperature**, which has caused coral mortality all over the world and could already have started doing so in India (Pillai, 1993).

Also threatening is the **spread of diseases** (Williams & Williams 1990, quoted in Pillai 1993, in press); the White band disease, in which a 1 cm. wide band advances from the base to the tip of the coral formation and weakens or kills it, has been noticed in the Wandoor area of Andaman Islands (Wood 1989).

Finally, **predator infestations** could be serious in the future; the crown of thorn *Acanthaster planci*, a star fish, which preys on coral polyps, has spread in unnaturally large numbers and killed vast reefs in the Indo-pacific region. In the Andamans too, it is spreading and has caused localised damage (Dorairaj *et al.*, 1987). Though recent surveys by CMFRI scientists indicate that the situation is not yet alarming, they also warn that a "severe catastrophe" could result if the *A. planci* population shoots up. A possible connection between silt (including nutrient) inflow into the coastal waters from degraded forest areas inland, and the explosion of the *A. planci* population, needs to be seriously investigated (Soundararajan, 1989).

Corals are extensively **collected for presentation**, decoration, fancy sale and **educational study**. In some islands, large quantities of live corals were used for the **construction of roads**.

The construction of jetties, wharfs, harbours and dredging activities deposit large quantity of **silt**, which destroy the ecologically sensitive corals in those areas. One NGO, Society for Andaman and Nicobar Ecology (SANE) reported in 1987 that Military

Engineering Service (MES) had been extracting thousands of cubic metres of coral off Kamorta islands, near Naval Helipad at INS Kardip, for use in construction of shore protection pillars (Kothari, 1989).

CURRENT CONSERVATION MEASURES

As already mentioned, the major threats to coral reefs, requiring general protection measures, are from various types of pollution, especially from

- industrial and agricultural chemicals
- desalinisation effluents
- Oil from ships
- domestic sewage
- silt from degraded/worked land and construction activities

There are various laws for controlling industrial and domestic pollution. However, the standards prescribed, even when they are enforced, do not take in to consideration the fragile nature of coral reefs. Often, therefore, coral reefs can be damaged by effluents which meet the prescribed standards.

There are no laws regulating desalinisation effluents, oil spillage from ships,or silt flow. Also, there are weak laws regulating agricultural pollution, especially non-point run-offs.

Specific measures required to conserve coral reefs include those aimed at controlling physical destruction through mining, blasting, dredging, filling etc., and through the collection of corals for souvenirs. Except for those coral reefs which are within protected areas and within the CRZ, there is no legal protection against physical destruction of corals in much of India. However, in the Andaman & Nicobar Islands, which contain one half of the coral reefs in India, there are regulations which prohibit the collection and destruction of corals.

A project has been undertaken by Deptt. of Oceans Development through Space Application Centre, Ahmedabad for mapping and characterisation of coral reefs in the country. The project is under implementation. However, based on the recommendations of the National committee on Wetlands, Mangroves and Coral Reefs, following four areas have been identified for conservation and management:-

i. Andaman & Nicobar
ii. Gulf of Kutch (Gujarat)
iii. Gulf of Mannar (Tamil Nadu)

iv. Lakshadweep

Management action plan for Andaman and Nicobar has been prepared and was recommended for financial assistance by the National Committee on Wetlands, Mangroves and Coral Reefs. The project is expected to survey and monitor corals and take of their protection. [MOEF 1994b]

The MOEF has initiated activities to conserve specific coral reefs, through their National Coral Reefs Programme.

NATIONAL CORAL REEFS PROGRAMME

A national strategy for the conservation of corals and coral reefs in India has been developed in recognition of the fact that these constitute the most productive marine ecosystems, which are deteriorating rapidly, The main elements of the strategy are:

- Survey and demarcation of coral reefs
- Identification of problems afflicting reefs
- Detailed study of flora and fauna
- Preparation of a status report on corals in India
- Control of over-exploitation of corals for industry and other activities by administrative notification and, later, legislation
- Investigation of the impacts of pollutants on corals and determination of point and non-point sources of pollution
- Regulation of fisheries in coral reef areas
- Establishment of marine parks (three have already ;been created: Gulf of Kutch, Gulf of Mannar and South Andaman)
- Education and awareness programmes

Management action plans are in the process of finalisation for the coral reefs of the Andaman & Nicobar Islands, Gulf of Kutch, Gulf of Mannar, and Lakshadweep Islands. The National Institute of Oceanography, Panjim (Goa), has been identified as the nodal research institution for the first two areas, and the Central Marine Fisheries Research Institute, Cochin (Kerala), for the others. [Adapted from WWF 1992]

Unfortunately, despite all the good intentions, not much progress seems to have been made at least partly due to the paucity of funds.

Summary of Conservation Measures for Coral Reefs

Threats from	Legal control	Other regulations	Preventive schemes	Institutional structure
General				
1. Industrial pollution	Y	N	Y	Y
2. Domestic pollution	Y	N	Y	Y
3. Agricultural pollution	P	N	Y	P
4. Oil pollution	N	N	N	N
5. Silt Pollution	N	N	Y	P
Specific				
6. Physical destruction from mining, dredging, etc.	P[1]	P[2]	N	P
7. Physical destruction for souvenirs	P[1]	N	N	P

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1. Within CRZ and in Andaman & Nicobar Islands
2. Environmental clearance required for certain types of activities

Recommendations

1. A comprehensive law banning the direct or indirect degradation and destruction of corals should be immediately legislated. The CRZ notification should also be amended to ban the direct or indirect degradation and destruction of corals.
2. There should be an assessment of the coral reefs in India, especially in terms of the threats they face, both through direct physical damage and through pollution, siltation and other factors. Those segments which are under heavy pressure should have special schemes developed for their conservation, based on a coral reef management plan specific to the area.
3. Use and sale of corals for any purpose whatsoever should be banned by law and should attract stringent penalties so as to be an adequate deterrent. Similar to ivory and other animal products, even the possession of corals which are not registered should be considered an offence.
4. Diversion of effluents affecting coral reefs and the conservation of catchments, which threaten coral reefs with siltation, should be taken up on a war footing. There is hardly any funding available specifically for the conservation of corals, and this lack of support should be rectified.

5. Based on an identification and prioritisation exercise, significant and representative coral areas should be included into national parks and sanctuaries so that their legal protection is ensured.

5.5 MANGROVES

In India, various figures have been given for the total area under mangroves. WCMC (1992) provides a figure of 3,560 sq.km., with about 3,060 sq.km. along the mainland coast, and about 500 sq.km. surrounding the Andaman and Nicobar Islands. An expert committee set up by the Government of India provided a figure of 674,000 ha., about 7% of the world's mangroves (GOI,1987). This committee based its estimate on "field surveys, studies and information available in the field".

However, the latest available satellite imagery (of the period 1987-89), interpreted by the Forest Survey of India, shows a mangrove cover of 424,400 ha. (FSI, 1991). This wide difference between various figures is not entirely explainable, especially considering the fact that the GOI committee estimate appears to have been very carefully put together. It is not known whether this committee availed of the first round of satellite estimates (based on imagery of 1981-83 period) which, though published only in 1987, must already have been available with the relevant authorities. These estimates put the Indian mangrove coverage at 404,600 ha.

Mangroves are widely distributed in India, though on the west coast they are comparatively scattered, degraded and small in area. The area of mangroves in different parts of India as estimated by both the GOI committee as also by FSI, is given below:

State	**Area in hectares**	
	FSI (1991)	GOI (1987)
West Coast		
Gujarat (Narmada, Tapti, Gulf of Khambat)	39,700	26,000
Maharashtra (Ratnagiri, Vijayadurg, Malvan, Devgad)	11,300	33,000
Goa	300	20,000
Karnataka (Coondapur, Malpe, Karwar, other patches)	0	6,000
Kerala (stray patches)	0	Negligible
East Coast		
Tamil Nadu (Cauvery and adjacent coastal stretch)	4,700	15,000
Andhra Pradesh (Godavari and Krishna delta)	39,900	20,000
Orissa (all deltaic and coastal)	19,500	15,000
West Bengal	211,900	420,000
Andaman & Nicobar Islands	97,100	119,000
Total	424,400	674,000

Of the total coverage of mangroves in India, therefore, according to the FSI (1991) figures, the western coast has about 12%, the eastern coast nearly 65%, and the Andaman and Nicobar Islands almost 23%. According to earlier GOI (1987) figures, the distribution is 13% on the western coast, nearly 70% on the eastern coast, and about 18% in the islands. The Sunderbans mangrove formation in West Bengal, considered the largest such block in the world, alone makes up almost half of the country's mangroves according to FSI, and two-thirds according to GOI.

STATUS

In India, the reduction in mangroves area has been drastic, about 40% of the original cover having been lost or badly degraded (GOI, 1987), though the basis of this estimate is unclear.

There appears to be plenty of evidence that there has been a serious loss of mangroves all over India. The Sunderbans mangroves (combined for India and Bangladesh), are recorded to have the following areas in the last three centuries (GOI, 1987):

End of 18th century: 36,000 sq.km.
End of 19th century: 24,000 sq.km.
Current (1987?): 12,000 sq.km.

Two-thirds of these forests have therefore been destroyed. This is not an isolated occurrence, as severe losses have characterised most of the mangrove patches in India. The GOI document estimates about 6000 ha. of mangroves, in patchy distribution, off the coast of Karnataka, which the FSI interpretation does not have at all; this could be an indication of a real loss rather than a computational or methodological error. Similarly, extremely patchy stands of mangroves in Kerala are a testimony to what was possibly a much larger coverage in the past.

Looking at satellite imagery alone, the situation is mixed, with the early 1980s heralding a reversal in the declining trend, but the decline setting in again at the end of the decade. Satellite imagery since 1981-83 shows the following changes in mangrove extent:

Year of estimate	**Area (in ha.)**
1981-83 (FSI 1987)	404,600
1985-87 (FSI 1989)	425,500
1987-89 (FSI 1991)	424,000

This earlier increase in mangrove area (over 20 thousand hectares or about 5% of the total), if indeed it has taken place on the ground and is not a result of interpretational changes or mistakes, is heartening. Not so optimistic is the conclusion of the latest imagery that the decline has restarted, with nearly one thousand ha. of mangroves in a very brief period. Given these contrasting trends within the same decade, the future of mangroves in India seems uncertain.

THREATS

Mangrove ecosystems have been subjected to serious attack in most of the zones of their distribution in India. As mentioned earlier, over 40% of India's mangroves have already been lost (GOI, 1987: p.3), and latest satellite imagery (FSI, 1991) reveals a continued loss (to the extent of 1300 ha. between the periods 1985-87 and 1987-89). The factors behind this loss have been more or less the same that affect mangroves worldwide, though in varying degrees of intensity (GOI, 1990).

The major threats to mangroves are:

- Clearfelling.
- Felling for firewood.
- Diversion of freshwater flowing into mangrove areas, especially for agricultural use.
- Coversion of mangrove areas into farmland.
- Conversion of mangrove areas into aquaculture ponds.
- Conversion to salt pans.
- Coversion for urban use.
- Destruction due to the construction of harbours and shipping channels.
- Destruction or degradation due to mining in and around the area.
- Pollution from urban areas, industry, agriculture and transport.
- Oil and chemical spills.

In India, **reclamation for urban development** has claimed large stretches of mangroves, e.g. those flanking the Vembanad Lake in Kerala (De Roy 1990), those off and near Bombay and Cochin, and those around Port Blair in the Andaman Islands. In the *mangals*, the rich mangroves of the Krishna estuary, Andhra Pradesh, the Forest Department logged trees from the 1920s to the 1970s, to provide fuelwood to nearby urban areas (Prasad, 1992: 219). The result was widespread destruction, including the

near eradication of one species, *Suaeda monoica* and its replacement by the exotic *Prosopis juliflora*.

The same *mangals* are today threatened by **overgrazing**, wood collection by local villagers, and a proposed road cutting across some of the habitat. This situation is particularly alarming in view of the significance of these mangroves - they are one of the only two places where three species of *Avicennia marina, A.officinalis, A.alba*) occur together, and the only habitat for the endangered plant *Myriostachya wightiana*.

In the Gulf of Kutch, mangroves have been severely depleted **by fuelwood and fodder collection** (allowed from inside the Marine National Park and Sanctuary during the drought years of the mid-1980s), **chemical and thermal pollution, urban and agricultural reclamation, expansion of salt works, overgrazing, and oil spillages around ports**; the result has been a reduction of mangrove coverage from 13,900 ha. to just 3,300 ha. within a decade (Chavan 1985; Baqri, 1993; Kothari, *et al.*); A similar multiplicity of activities has reduced the mangroves off the coasts of Karnataka, Goa, and Maharashtra (WCMC, 1988), and affected the stretches in the Mahanadi delta off Orissa.

Mangroves, like other wetland areas, have also been severely affected by **inappropriate aquaculture**, including conversion into shrimp and prawn culture farms and pollution by fertilisers and other inputs (WWF-I,1992). This is likely to be greatly intensified in future as the country goes in for a major thrust in export-oriented aquaculture.

CURRENT CONSERVATION MEASURES

Of the threats requiring general measures, watershed degradation and soil erosion, pollution, and tourism are the same for mangroves for wetlands, and the status of conservation is as described for wetlands.

Threats requiring specific measures are also mostly common with wetlands, especially threats from drainage and dredging. In addition, mangroves are also threatened by clearfelling for development projects and activities, by human habitation and by diversion of land for various other uses.

Fortunately, the Coastal Regulation Zone (CRZ) declared under the Environment (Protection) Act, covers coastal regions upto 500 m above the high tide line of the sea or 100 m from the banks of rivers, creeks, or backwaters (or their width, whichever is

less) and, thereby, covers virtually all the mangrove areas in the country. In this zone, various activities are banned or regulated.

Unfortunately, though protecting mangroves from various threats, the CRZ notification does not explicitly protect them from felling, nor can it protect them from the impact (like pollution) of activities outside the CRZ.

Mangroves which are within protected areas (reserved forests, sanctuaries, national parks) get protection under the laws governing these areas. However, there are mangroves outside protected areas and, to ensure conservation of these, MOEF has started the National Mangroves Programme. There is also a central scheme :*Conservation and Management of Mangroves* (Centrally Sponsored (100%)): This scheme proposes to assist state governments to protect and regenerate the mangroves and coral reefs in their states.

NATIONAL MANGROVES PROGRAMME

On the basis of the National Committee's recommendations, 15 mangrove areas have been identified for conservation and preparation of management action plans. The selected mangrove areas are:

Coringa, Godavari delta and Krishna estuary (Andhra Pradesh); coastal Goa (Goa); Gulf of Kutch (Gujarat); Coondapur (Karnataka); Vembanad (Kerala); Achra/Ratnagiri (Maharashtra); Mahanadi delta and Bhitarkanika (Orissa); Pichavaram and Point Calimere (Tamil Nadu); Sunderbans (West Bengal); and North Andaman and Nicobar (Andaman and Nicobar Islands).

Action plans have been developed for all these areas. The plans address issues related to survey and demarcation, natural regeneration in selected areas, afforestation, protection measures (such as fencing, watch and ward facilities), and awareness programmes.

Nodal academic/research institutions have been identified for each area. Some examples are Andhra University, Waltair, for Coringa, Godavari delta and Krishna estuary mangroves; Annamalai University, Annamalai (Tamil Nadu) for Pichavaram; and Department of Marine Sciences, Calcutta University for Sunderbans. These institutions are taking up research with a view to providing inputs for the development of mangrove ecosystems on sound ecological lines.

[Adapted from WWF 1992]

Summary of Conservation Measures for Mangroves

General Threat from	Legal Control	Other regulations	Preventive schemes	Institutional Structure
1. Watershed degradation and soil erosion	N	N	Y	P
2. Pollution	Y	Y	Y	Y
3. Tourism	P[1]	N	N	P
Specific				
4. Clearfelling	N	N	N	N
5. Diversion of water	P[2]	N	N	P
6. Conversion to other uses	Y[2]	N	N	Y
7. Development projects	Y	P	N	Y
8. Human habitation	Y[2]	P[3]	N	Y

1. Construction of tourist facilities regulated in CRZ
2. Regulated/prohibited within CRZ
3. Regulated in public lands.

Recommendations

1. We have a fairly good idea of where mangroves exist in India? Unfortunately, many of the mangroves still have no legal protection. Significantly, protection of mangroves should be specifically legislated upon perhaps by declaring priority mangrove areas as wildlife protected areas (national parks and sanctuaries) or as special protection areas under the Environment (Protection) Act.
2. Though a significant proportion of the mangroves would be in the coastal regulation zone, the CRZ notification does not protect the mangroves from all the various threats including clear felling, siltation, pollution, and change of water availability and composition. The coastal regulation rules should be expanded to specifically cover these elements for mangrove ecosystems.

5.6 OCEANS

India has an exclusive economic zone estimated to be about 2.02 million sq. km. Of this, the west coast including Lakshadweep constitutes the maximum (42.5 percent), followed by Andaman and Nicobar islands (29.7 per cent) and east coast (27.8 percent).

THREATS

Same as those listed for coastal regions above. Mainly pollution, especially oil spills.

CURRENT MANAGEMENT STRATEGIES

Although marine ecosystems have a larger coverage than the terrestrial ecosystem, these are poorly represented among world's protected areas. Only about 100 of the 1162 National Parks of United Nations List include or adjoin reef ecosystem.

Recommendations

1. There are almost no conservation efforts at the moment for ocean ecosystems. This is partly due to the vastness of the ocean areas and partly due to the belief that the ocean ecosystem is not significantly threatened. Unfortunately, the latter is no longer true, especially with numerous oilspills, dumping of hazardous wastes, and growing maritime traffic. It is high time, therefore, that some preventive measures are taken for securing the ocean ecosystem. The first need, therefore, is to prepare a status report on the ocean areas within the Indian exclusive economic zone, identifying present and potential future threats and those parts of the ocean that are most significantly threatened.
2. National and international laws regarding the dumping of hazardous wastes and oilspills affecting ocean ecosystems need to be strengthened.
3. The institutional structures designated for protecting the oceans also need to be upgraded, perhaps with the involvement of the Indian Navy, the merchant fleet, and the civil and military air force.
4. Satellite and other remote sensing methods must be increasingly used to monitor the health of the oceans and some investment must also be made in sea worthy vessels which can patrol the seas and thereby keep a close watch over various threats to the ocean ecosystems.

5.7 GRASSLANDS

Olson *et al.* (1983) put the spread of grass and shrubland in India at 12% of its total landmass; however, the Planning Commission (1989) estimates grassland coverage at 3.7%, and scientists at the Indian Grasslands and Fodder Research Institute, Jhansi, give an estimate of 3.9%, or about 120 lakh (12 million) hectares (Singh and Misri, 1993, in press). The discrepancy in figures between Indian sources and Olson may not be due only to the difference in period of estimation (a full decade's gap), but also due to difference in definition, and to the fact that Olson has included shrubland in his category. The working figure for this report will be 120 lakh ha., given by Singh and Misri.

The distribution of grasslands is quite uneven in India. For instance, in the western region, Rajasthan and Gujarat have 5.4 and 3.5%, respectively, of their land area under grasslands. In the eastern region, grasslands and pastures comprise less than 1% of the area, except in Sikkim, where they cover 13.3% of the land.

STATUS

Unfortunately, due to a greater neglect than even forests, the status of grasslands is not so well known and accurate figures for India are not available, largely because no base data exists for grassland coverage in the past, but also because grassland monitoring has been virtually non-existent even in the recent past. To some extent, the analysis of Gadgil and Meher-Homji (1990), though focusing on forest types, is relevant for grasslands too. Thus, for instance, it is known that the semi-arid grasslands of western India are severely threatened, and are now restricted to a few small protected tracts only. This is also the case with the tall swamp grasslands of the *terai* belt, which have been seriously threatened with fragmentation and conversion to various human-dominated land uses.

THREATS

Extensive stretches of grassland have been destroyed or degraded in most parts of the country. Given below is a list of the major threats:

- Conversion to agriculture
- Human settlement
- Flooding by dams
- Diversion for other development projects
- Surface irrigation
- Fire

- Tree\bush plantation
- Introduction of exotics
- Grazing
- Grass cutting

In addition to the above human-generated factors, **droughts and floods** also seriously affect grasslands in many parts of the country.

As stated earlier, at present only 11-12 million ha., or about 3.7 to 3.9% of India's land mass, is under permanent pastures and grasslands (Planning Commission, 1989; Singh and Misri, 1993). As in the case of forests, the absence of an earlier database makes it difficult to estimate the total loss of grasslands. However, trends in the last few years give some indication. The semi-arid grasslands of western India, for example, face amongst the world's heaviest biotic pressures (CAZRI, 1993). Livestock density here is very high (over 4 heads per ha., taking semi-arid and arid rangelands together; and there are clear signs of **overgrazing** in many areas.

Added to this has been the threat posed by the massive **Indira Gandhi Canal Project**, slated to be one of the longest canal systems in the world. Heading towards completion, the canal has caused extensive waterlogging (Baqri and Kankane, 1993). The accompanying **hydrological changes** have been detrimental to the survival of the rich sevan *Lasiurus hirsutus* grasslands, which are especially adapted to dry (less than 100 mm annual rainfall) conditions.

The high-altitude grasslands in the Himalayas face heavy seasonal **grazing pressure** from nomadic herds. In Jammu and Kashmir, for instance, pastures have to bear a pressure of 7.70 Adult Cattle Units (ACU) per ha., while their carrying capacity is only 0.31 ACU per ha. (Singh and Misri, 1993). The result is a serious loss in regeneration capacity as soil gets compacted by livestock hooves and new growth is hampered; also resulting are changes in composition favouring species which are not palatable to, or favoured by, livestock.

The tall grasslands of the Indo-Nepal border and the north-east states, have faced extensive **diversion for agricultural purposes**, e.g. for sugarcane cultivation in the Uttar Pradesh *terai* area. Where cultivation has not reached, other development related diversions have taken place for urban spread, industrial infra-structure, and energy projects.

The **Ramganga hydro-electricity dam** in Uttar Pradesh, for instance, is known to have submerged possibly the only tall grass land stretch there which could have supported the endangered Hispid hare *Caprolagus hispidus* and Pigmy hog *Sus salvanius* (Bell and Oliver, 1992: 120).

Large parts of grassland systems in both the north and the south have been subjected to **commercial plantations**, in a bid to "improve" the area's productivity. Teak *Tectona grandis*, eucalyptus hybrid, and Wattle *Acacia auriculiformis* have been consciously promoted on grasslands in south India, at times with the plea that these lands are wastelands !

South Indian *shola* grasslands (typical of the Western Ghats) have been subjected to another serious threat: **invasion by exotics**. The exotic `weed' *Chromolaena odorata* is extremely widespread, even inside relatively untouched national parks such as Eravikulam in the Western Ghats of Kerala.

Finally, **fire** has been a major threat to the grassland ecosystem, especially in semi arid and arid regions of the country. Not only does fire directly destroy grasslands, it also paves the way for weeds which eventually may cause as much damage as the fire itself. Unfortunately, regular burning is resorted to by villagers for a variety of reasons, and also by the wildlife and forest authorities to benefit some big mammals .

CURRENT MANAGEMENT STRATEGIES

Grasslands continue to be one of the most neglected ecosystems in India. Some of the major threats and the conservation measures taken, in relation to grasslands, are described below. The description is relevant for those grasslands which are not a part of any protected area.

1. **Converstion to agricultural land:**

There is no law or regulation preventing or regulating the conversion of grasslands into agricultural lands. In the 1950s and 1960s, under the grow more-food programme, such conversion was actually encouraged. Even today, many grasslands are being converted into agricultural lands.

2. **Fire:**

Where as natural fires are a part of the ecological process, accidental and deliberate fires cause huge damage to grasslands. Though accidental fires cannot be easily prevented, unfortunately there is little regulation or control over the practice of deliberately setting fire to grasslands. This is often done either to prevent accidental

fires or for making the collection of certain types of seeds easier. Firing of grasslands is also common in order to have access to new grass for grazing.

3. **Afforestation:**

Very often grasslands are seen as "forest blanks" or, worse, as "wastelands". This leads to their being planted up with trees. Unfortunately, there is no law or regulation to prevent or control this. Infact, for many development projects and for meeting social forestry & compensatory afforestations targets, grasslands are being increasingly seen as "available lands".

4. **Introduction of exotics:**

Various species of grasses have and are being promoted for soil conservation (eg. Khus), commercial use (eg. bhabbar, lemon grass), aesthetics etc.

There is no ability, at present, to control or regulate the introduction of exotic species of grasses(or other flora) into grasslands, and also little concern.

5. **Grazing:**

There is little regulation or control of grazing in grasslands outside protected areas. Though many villages in India have "ghasnis" or community grasslands, most of these are extensively grazed.

Even within PAs, grazing can be, and often is, permitted within reserved forests and sanctuaries. Only in national parks grazing is prohibited, but even then it is prevalent in many.

6. **Diversion for development projects:**

Unlike forests, where there is a law regulating diversion for non-forestry purposes, there is no such regulation for grasslands. Consequently, where grasslands are being submerged under the waters of a dam, or otherwise being diverted for some other purpose, there is no special scrutiny nor a consideration of the biological value of the particular grassland.

However, where the grassland is within a forest or wildlife protected area, its diversion is regulated by various acts including the Forest (Conservation) Act and the Wildlife (Protection) Act.

Summary of Conservation Measures for Grasslands

Threat From	Legal control	Other regulations	Preventive schemes	Institutional Structures
1. Conversion to agricultural land	N	N	N	N
2. Deliberate fires	N	P	N	N
3. Afforestation	N	N	N	N
4. Introduction of exotics	N	N	N	N
5. Grazing	N	P	P	N
6. Diversion for development projects	N	P[1]	N	P

1. Environment clearance is required for certain categories of Projects.

Recommendations

1. Grassland ecosystems have suffered most significantly due to their non-recognition as a distinct and significant ecosystem. Very often grass lands are considered to be blank spaces which deserve to be afforested or otherwise used. This must change and to bring about such a change it is important to recognise that grasslands are a distinct and valuable ecosystem. For the purpose, a separate classification of grasslands should be developed and important grasslands identified and prioritised across the country.
2. Grasslands, across the country, should also be covered under various environmental laws, especially under the Forest Conservation Act and the Environment (Protection) Act, and degradation, destruction or change of land use of grasslands should attract deterrent penalties.
3. Though institutes for the study of grasslands exist, the thrust is mainly on utilisation and regeneration of grasslands for animal husbandry and agriculture. There is little research and training regarding the management of grasslands as ecosystems. For this purpose, certain prime institutions should be designated as grassland ecosystem management institutions so that they can develop understanding and expertise for managing different types of grassland ecosystems.
4. The diversion of grasslands for afforestation should be particularly discouraged, if necessary by an appropriate amendment of the Forest (Conservation) Act.

5. The Conservation of natural grasslands is almost impossible if the intensity of grazing pressures is not controlled or diverted. Various studies have catalogued grazing pressures in different parts of the country. What is required is a livestock management plan, initially for specific grasslands of high ecological and social value. Such a plan must include provisions for developing alternate grazing sites and for reducing cattle units and the consequent grazing pressures on existing natural grasslands.

5.8 DESERTS

In India, deserts extend over about 2% of the landmass (Olson *et al.*,1983). At least three distinct kinds of desert are noticeable:

1. The sand desert of western Rajasthan and neighbouring areas,
2. The vast salt desert of Kutch in Gujarat, and
3. The high-altitude cold desert of Jammu & Kashmir and Himachal Pradesh.

The first two form a part of Indian Desert biogeographic zone distinguished by Rodgers and Panwar (1988), and by Gadgil and Meher-Homji (1990). Together, they are the eastern extremity of the Great Palaeatropical Desert which extends from North Africa (Sahara) via the Arabian Desert and Pakistan to North-west India.

Sprawled over a vast area north of the Himalayan ranges, the cold desert is an ecosystem of exceptionally low temperatures (down to -75` C) and rainfall (500-800 mm annually). It forms a plateau at the height of 4,500 to 6,000 mts above sea level, and is encompassed by the Trans-Himalayan Biogeographic Zone of Rodgers and Panwar (1988). This zone extends into the Tibetan plateau, to cover an area of 2.6 million sq km, from which originate the great river systems of Indus, Sutlej, Brahmaputra and Yangtze.

In India, cold deserts cover a vast area of 1,09,990 sq.km., about 87,780 sq.km. in Ladakh (Kashmir), and 22,210 sq.km. in Lahul-Spiti and Kalpa (Himachal Pradesh). The Great Himalayan Range divides the better watered mountain systems of the Himalayas from this cold arid desert area, which itself contains three mountain ranges - Zanskar, Ladakh and Karakorum. To the east, the Ladakh and Zanskar ranges diminish to the southern margin of the Tibetan plateau and the beginning of an internal drainage marsh and lake system. To the north, much of the area is above the snowline. Throughout the area, precipitation is mostly in the form of snow.

STATUS

Desert ecosystems in India have not been subjected to as severe pressure as the other ecosystems described earlier. Nevertheless, various human activities have posed localised threats which, if intensified, could in future create serious damage.

As is the case worldwide, no overall estimate is available on the loss of each of these types, though it is clear that such loss has taken place especially in the Indian (sand) desert. In the estimation of Gadgil and Meher-Homji (1990), almost none of the hot desert of western India remains intact, but this seems to be an overstatement. Certainly vast areas of the salt desert are still relatively untouched, though much of its sparsely wooded stretches along the Rann periphery and on the bets has been transformed into exotic *Prosopis* scrub. Much of the sand desert has also been similarly transformed or severely degraded, and very little has been left intact.

Unfortunately, not even a cursory assessment of the status of the cold desert appears to be available.

THREATS

The major threats to the desert ecosystem are form:

- Rapid increase in human population, especially in the desert regions of Rajasthan. The population in this region is increasing at nearly twice the rate of the national average.
- A rapid increase in livestock population, resulting in the over utilisation of the grass lands and decrease in the population of wild herbivores.
- Water logging, especially by the Indira Gandhi Canal, and the change in the natural vegetation due to increase in soil moisture and salinity.
- Indiscriminate mining.

The sand desert of western India, primarily in the Thar region of Rajasthan, is in fact the most densely populated of the world's deserts, with a density of 75 persons per sq.km. (compared to an average of 3-5 per sq.km. in other deserts). In addition, the livestock population is also far in excess of the desert rangelands' carrying capacity, about 10 times the carrying capacity of 0.43 heads per ha. There is therefore **heavy biotic pressure**.

This pressure has now been compounded by **developmental activities: irrigated cropping, mining, oil exploration, industrialisation, and urbanisation**. Changes in food webs, energy flows, and biochemical cycles due to these activities are not yet well

known (CAZRI, 1993). The Indira Gandhi Canal is reported to be bringing about drastic changes in the desert ecosystem, including waterlogging, salinisation, and introduction of new weeds and pests (Baqri and Kankane, 1993).

The salt desert of Gujarat, the Rann of Kutch, has been relatively secure from human pressures due to its inaccessibility and inhospitable terain. But even here damage has been caused of late, by a combination of activities. An increasing number of **salt works**, producing over 10 million tonnes of salt, have encroached into the Rann, bringing with them serious **human and vehicular traffic** (Sinha and Goyal, 1993; Baqri, 1993, in press).

Army activities, including **target practice and vehicular movement**, have caused widespread disturbance, and the exotic tree *Prosopis juliflora* has spread like wildfire (Baqri 1993, in press; Kothari *et al*.,). Nomadic *maldharis*, once probably living sustainably off the meagre resources of the desert, are beginning to overuse and degrade the isolated *bets* (islands of non-saline grassland inside the Rann), the monsoon home of the Wild ass (Baqri, 1993).

Coupled with all these anthropogenic factors are the **periodic droughts**, including amongst the century's worst drought period in the mid-1980s, which reduced forage and water availability for the desert's wildlife.

Two new, potential threats loom on the horizon. One is the extensive **canal network** which is proposed to be built under the Sardar Sarovar (Narmada) Project. This will cross the Little Rann of Kutch, and could cause the sort of havoc which the Indira Gandhi Canal is causing in the Thar desert including waterlogging, conversion of natural habitat into agricultural fields, and other damage to arid grasslands (Sinha and Goyal,1993).

Another threat is the proposed **tidal power project** at the mouth of the Gulf of Kutch, which includes extensive barriers and embankments that will cause drastic changes in water movement in and out of the Rann (Sinha and Goyal, 1993). The consequences of this on the Rann's ecological balance could be severe.

The major threats to the cold desert ecosystem include:

- Road construction. In the last thirty five years, especially after the war with China, in 1961, there has been extensive road building activities in the cold desert areas, which are on the Indian border with China. One estimate suggests that between 40,000 and

80,000 sq. m. of debris is removed from the mountains for every km of road constructed.

- Though the human population in the cold desert region is sparse, in recent times tourist demands and demands from the armed forces for milk and meat has resulted in increases in livestock population, resulting in overgrazing.
- Demand for firewood, mainly from outsiders, has resulted in the over extraction of fuelwood.
- Pressure from tourists.
- Disturbance due to activities of the armed forces.

CURRENT MANAGEMENT STRATEGIES

Different State Governments have declared a number of areas as protected in the Thar desert region. They are as follows:-

State	Name of Protected area	Legal Status	District	Area sq. km.
Rajasthan	Tal Chappar	Sanctuary	Churu	7.90
	Todgarh	do	Ajmer	405.27
	Desert	National Park	Jaisalmer	3162.00
Gujarat	Balram Ambaji	Sanctuary	Banaskantha	542.82
	Barda	do	Junagarh	192.31
	Kutch Desert	do	Kutch	7506.22
	Khijadiya	do	Jamnagar	6.05
	Nalsarovar	do	Ahmedabad & Surendranagar	120.82
	Rampura	do	Rajkot	15.01
	Thol	do	Mehsana	6.99
	Gir	National Park	Junagarh	258.71
Punjab	Abohar	do	Ferozpur	185.50

The Hemis National Park in J&K and the Pin Valley National Park in Himachal Pradesh give some modicum of protection to the cold desert ecosystem.

Recommendations

1. Important desert areas, reperesentative of the various types of desert ecosystems in the country, must be identified and prioritised.
2. The conservation of desert ecosystems must also be included in the Environment (Protection) Act so that specific legal protection can be accorded to prioritised and designated desert areas.

3. Various schemes of the central and state governments, designed to bring irrigation, afforestation and other "development" inputs to desert areas, must be critically examined from the point of view of their ecological impact. Many such activities negatively affect desert ecosystems and involve the government and the people in unsustainable interventions. For the purpose, detailed guidelines need to be prepared to assess environmental impact on desert ecosystems and these should be mandatory under law for all development activities and projects.

4. Specific attention needs to be paid to the cold deserts of Jammu & Kashmir and Himachal Pradesh, and to the deserts of Kachh, which have been neglected in the past. It is important to ensure that some authority at the state and central level is monitoring the health of desert ecosystems and is in a position to ensure that regulations formulated, regarding activities in these deserts areas, are being followed. For the purpose, the Ministry of Environment & Forests should set up a desert conservation cell with a corresponding cell in the concerned state departments of environment.

5.9 ISLANDS

India has two major group of islands, the Andaman & Nicobar islands in the Bay of Bengal and the Lakshadweep islands in the Arabian sea. The Andaman & Nicobar group comprises of 349 islands of which only 34 are inhabited. The Lakshadweep group comprises of 36 islands, of which 10 are inhabited and one is used partially as a tourist resort.

CURRENT STATUS:

The Lakshadweep islands are currently under great pressure, with forest cover disappearing, beaches and coral reefs are eroding and degrading and both land and water pollution is on the increase.

Relatively speaking, much of the Andaman & Nicobar Islands are still in good condition, primarily because of their inexcessibility and the lack of human population in most of the islands. However, the inhabited portion of these islands and also others relatively more accessible islands have significant pressures. Deforestation, destruction of coral reefs, pollution of the waters, soil erosion, and the destruction of mangroves are all pervalent.

THREATS:

These islands are comprised primarily of forests, coastal ecosystems, mangroves, and oceans. The threats and recommendations regarding these can be found in the sections specifically dealing with these types of ecosystems. However, general threats to these island ecosystems are primarily from:

- Excessive and inappropriate tourism. This is especially true of the Lakshadweep islands, where there is a proposal to develop tourism and other activities even in the uninhabited islands. It is also a long standing threat to the Andaman and Nicobar Islands, where there is great commercial interest, supported sometimes by the government, to expand tourism activities.
- Increase in human population. Various scientific studies suggest that the human populations, both in Lakshadweep and in the Andaman & Nicobar islands, have already exceeded the carrying capacity of the islands. Despite this, their continues to be, almost unchecked, immigration of people from the mainland to the Andaman & Nicobar islands. These immigrants are known to colonise forest areas, not only destroying the forests but also causing severe soil erosion.
- Pollution. Given the fragility ecosystems of these islands, their ability to assimilate solid and liquid pollutants is limited. Unfortunately, due to the growing human population, increase in tourist traffic and increase in the per capita waste produce, the island ecosystems are facing a significant threat.
- Inappropriate land use. In the Andaman & Nicobar islands natural forests have been cleared in the past to develop agriculture and for plantations, including palm oil plantations. Unfortunately, such activities are not conducive to the agro climatic profile of the islands. These islands are primarily tropical rain forest areas where the soils are thin and with few nutrients. As rainfall is high and the terrain is sloping, deforestation results in the rapid loss of top soil. Agricultural activities are also not sustainable in most part of the islands, as also are not plantations like palm oil.
- Fresh water shortages. Despite heavy rainfall, there has been little effort at water conservation and harvesting in these islands. This has resulted in acute water shortages during the dry spells.
- Inappropriate building practices. Buildings constructed in Andaman and Nicobar islands were earlier mostly made of wood, extracted from the local forests. Given the rising value of wood current construction is of brick and concrete.

Unfortunately, corals and sand are being excavated and used for construction purposes, causing serious ecologicaldamage.

- Inappropriate industrialisation. There have been a spate of forest based industries set up in the Andaman & Nicobar islands. These industries have put heavy pressure on the forests of the islands.
- Excessive forest working. Despite a decision taken by the Island Development Authority (IDA), Chaired by the then Prime Minister, in the mid 1980s, to phase out forestry operation in the Andaman and Nicobar islands, after an initial reduction the current levels of extraction are even higher than before.
- At Androth Island, in Lakshadweep, it is proposed to build an air strip. This would involve the cutting of thousands of trees.
- Inadequate exploitation of sea based resources. Pressure on the land in the Andaman and Nicobar Islands also comes from the local inhabitants who do not have many ways of earning a livelihood. This is despite the fact that the Andaman and Nicobar Islands have, around them, oceans very rich in marine resources. However, there seems to be an inadequate effort at creating employment opportunities for the local people to exploit these marine resources.
- In Andamans, there is a proposal to import and breed exotic fish, thereby significantly endangering the ecosystem.

<u>CURRENT MANAGEMENT STRATEGIES</u>

The Government of India set up, in 1985, an Island Development Authority (IDA), Chaired by the Prime Minister, to oversee the development activities in these islands and to ensure that they were sustainable and within the ecological carrying capacity. Initially, a large number of studies were sponsored by the IDA and almost every important aspect relating to the social and economic development, and the ecosystems, of these islands were studied. However, in the last some years the IDA seems much less effective and, in any case, the recommendations made as a part of various studies have by and large not been acted upon.

In the late 1980s, the protected areas network was significantly enlarged and the Andaman and Nicobar Islands currently have over 100 national parks and sanctuaries. However, despite this the resources available to manage these national parks and sanctuaries are woefully inadequate, resulting in many of these areas being protected areas only in name.

Rules and regulations have been formulated to prevent extraction of corals and extraction of shells in the islands. Much of the island's area are also covered under the coastal regulation zone. However, all reports indicate that there are inadequate facilities and institutional resources to enforce these rules and regulations and sometimes, perhaps, inadequate will on the part of the local administration.

Recommendations:

1. The Planning Commission should immediately set up a committee to review all the studies that have been done on these island ecosystems, especially through the Island Development Authority, and to consolidate the recommendations made thereof. These recommendations should be reviewed and those found appropriate should be accepted by the government and relevant provisions made in the Environment (Protection) Act.
2. Those issues that have not been adequately and properly studied must immediately be taken up for detailed assessment, so that a scientific view can be taken on how best to balance economic growth and environment protection, in these islands.
3. Each of these two group of islands, and perhaps the Andaman group and the Nicobar group separately, should be treated as distinct ecosystems and a detailed management plan should be developed and should be statutorily enforceable.
4. As it is difficult for the Island Development Authority to meet often, especially as it is chaired by the Prime Minister, a Standing Committee chaired by the concerned member of the Planning Commission should be set up and he authorized to monitor and review implementation of the decision of the IDA. This Standing Committee should meet once in three months and concerned citizens from within the island and from elsewhere should be encouraged to place their views before the Standing Committee.
5. As tourism continues to be one of the most significant threats to these island ecosystems, a proper assessment, of the type and level of tourism appropriate to the social and environmental condition continues prevailing should be immediately carried out. Based on the findings of such an assessment, a tourism action plan should be prepared. Specifically, before any tourism activity is

initiated, an environmental impact assessment of the proposed activity must be carried out and environmental clearance sought and received from MoEF.

6. Forest operations must be phased out, as already decided by the IDA, in the Andaman and Nicobar islands. There should be no further granting of licenses to forest based industries nor extension of existing licenses, once these have expired.
7. The wildlife wing of the forest department of the Andaman and Nicobar Islands must be significantly strengthened especially by the provisions of sea worthy vessels, an effective wireless network and ability to get help from the coastguard, the navy and other civil and military forces.
8. The immigration of people from the mainland to these islands must be checked and regulated so that the already overstrained ecosystem is not further pressurised.
9. A Building Development Board, which was proposed for Lakshadweep several years ago, needs to be immediately constituted so as to provide alternate building material in place of corals, shingles and sand, which are currently being used.
10. The coral reefs and mangroves in these islands are particularly under threat. Their conservation should be taken up on a priority basis along the lines indicated in the sections on corals and mangroves. Specifically, a marine national park should be established in Lakshadweep to protect the corals
11. In the long run, the conservation of the island ecosystems can only be ensured if the local inhabitants are provided opportunities to meet their social and economic aspiration in a manner which does not disturb the ecosystem. This must, therefore, be an important part of any conservation plan for these islands. On the face of it, this would imply that fisheries related activities, especially those run and managed by the local people, need to be encouraged so that pressure on land can be minimised.
12. All uninhabited areas and islands in these two groups should immediately be made into protected areas so that they can be appropriately conserved.
13. Our knowledge of the flora, fauna and micro-organisms, especially of the Andaman & Nicobar group, is very scanty. Appropriate surveys should be taken up on a priority basis.

5.10 HILLS AND MOUNTAINS

Apart from Himalayas, which can be further sub divided into the eastern and the western Himalayas, some of the most significant mountains and hill ranges in India include the Aravallis, the Western Ghats and the Eastern Ghats.

CURRENT STATUS

Despite the fact that each of these mountain and hill ranges have exceptional environmental value, especially the Western Ghats and the Eastern Himalayas, which are considered “biodiversity hotspots”, these areas are under significant pressure.

THREATS

The most significant threat to these mountain and hill ranges is from **deforestation** and the destruction of other vegetative cover due to commercial, infrastructural and other human pressures. Historically, the very valuable forests, especially of the Himalayas, have been extensively exploited for timber. Given the fragility of the ecosystem, regeneration is slow and not always possible due to clear felling and significant soil erosion.

Another major threat to the mountain and hill ecosystems is from extensive **quarrying and mining**, especially when these are done unscientifically.

In addition, the **building of an extensive road network** in the hilly regions has taken its toll, especially because very often the roads have been inappropriately aligned, and constructed in a manner careless to the environment. The rapid expansion of **human populations**, especially the huge influx of seasonal **tourists**, and the **infrastructure** and **pollution** that goes with them, have also taken a significant toll of the hill areas having the misfortune of being in the vicinity of a popular hill station.

The construction of **river valley projects**, especially dams, and the pursuance of inappropriate **agricultural and animal husbandry practices** has also threatened the ecosystem. **Plantations**, usually in monoculture formations, of exotic species of commercial value, and the **over exploitation pine trees for resin**, have been other significant factors in the degradation of mountain and hill ecosystems.

CURRENT CONSERVATION STATUS

Apart from banning green felling in some parts of the Himalayas there seems little focused attention at protecting these fragile ecosystems. The setting up of the G.B. Pant Institute of Himalayan Ecology near Almora, in the UP hills, and the sponsoring of a large

number of research studies on the ecology of the Western Ghats, though welcome steps, have limited use as the findings of these institutions and studies are rarely acted upon.

Integrated Action Oriented Research Demonstration and Projects for Himalayan Regions

G.B. Pant Institute of Himalayan Environment and Development was established at the end of the Seventh Five Year Plan. The Institute has been identified as the focal agency for studying development strategies and technologies for achieving ecologically sound development of the Himalyan region. The present efforts revolve around six core programmes, viz. land and water resource management, sustainable development of rural ecosystems, conservation of biological diversity, ecological economics, environmental impact analysis, environmental physiology & bio-technology, institutional networking and human investment.

In recent times, at least two reports have been produced on the Himalayas, one by the Planning Commission and the other by the G.B. Pant Institute of Ecology (Planning Commission 1993).

Though in the Planning Commission and through the North Eastern Council, special focus has been sought to be given to the planning and development process of the Western Ghats and the Eastern Himalayas respectively, ecological concerns, though supposedly an important part of such a special focus, are rarely evident in the resultant schemes, programmes, and activities.

Fortunately, there are a significant number of national parks and sanctuaries in the mountain and hill ecosystem. Himachal Pradesh, itself, has 31 protected areas, most of which cover representative Western Himalayan ecosystems. Similarly, there are many PAs in the North Eastern states covering the Eastern Himalayas, and in U.P. and Jammu and Kashmir. There is also a biosphere reserve - the Nandadevi biosphere reserve, which encompasses parts of the Western Himalayas, and the Nilgiri biosphere reserve and various protected areas
in the Western Ghats.

Recommendations:

1. It is important to urgently review the status of protection being accorded to the hill areas and to prioritize sites, representative of all the different types of ecosystems, to be included in the protected area network.

2. For the whole fragile region, development strategies need to be formulated which balance the needs for regional socio-economic development with the imperatives of maintaining the ecological balance. The Planning Commission, along with the Ministry of Environment and Forests and the environment and forest departments of states, should get involved in formulating sustainable development plans for these regions and in monitoring their implementation.
3. The relevant provisions of the Environment Protection Act should be used for notifying the fragile mountain ranges so that mining, road construction, building activities, deforestation and other types of environmentally destructive activities can be regulated. This notification could perhaps be along the lines of the coastal regulation zone notification issued in 1991 by the Ministry of Environment and Forests, Government of India.
4. Though there is recognition that hilly areas need special attention in terms of development, and for this purpose the Planning Commission allocates special funds for hill regions and has some focused development programmes there, a corresponding recognition of the ecological fragility of the hills and mountains is not reflected in the financial allocations. It is important for the Planning Commission to make special provisions in the State and Central budgets for promoting sustainable development in the hill areas and for ensuring that projects based in, and affecting, the hill and mountain ecosystems have the resources required to be executed in an environmentally friendly manner.
5. The Ministry of Environment and Forests should prepare guidelines covering projects and activities in hill and mountain areas, and set up a special committee, like it has for various types of projects and areas, to assess all proposed projects and activities in hill areas and to ensure that they solicit and get environmental clearance prior to implementation.

5.11 ESTUARIES AND BACK WATERS

Given the huge coastline India has of over 7000 kms and the large number of rivers and streams flowing into the sea, India also boasts of a very rich and varied estuarine ecosystem.

STATUS

Though the national status of estuaries and back waters is not known, detailed information exists regarding the estuarine ecosystem and the back waters of certain parts

of the country, especially the western coast. This suggests that there is rapid deterioration of these ecosystems affecting not only biodiversity values but also the fisheries potential of the coastal regions.

THREATS

Estuaries and backwaters have been significantly affected by urban, agricultural and industrial pollution, by dredging, by landfills, by extraction of water for thermal power stations and other industrial uses, and sometimes by over fishing. Use of these areas as water ways and the consequent heavy traffic of barges, boats and ships, has also taken its toll especially through pollution, physical disturbance, dredging and flushing.

CURRENT CONSERVATION MEASURES

The coastal regulation zone notification of the Ministry of Environment and Forests gives some protection to estuaries and back waters (see section on Coastal zones). However, this notification only regulates physical construction and use adjacent to these estuaries and backwaters. Much of the damage is done by pollutants coming from further away and flowing into these waters. The passage of boats and ships and the consequent pollution and disturbance is also not subject to regulation under this notification.

A very limited proportion of these ecosystems has been covered by wildlife protected areas in India (See section on Marine ecosystems). Consequently, much more needs to be done to protect these areas, especially considering their acute fragility and their huge value both as “biodiversity hotspots” and as seed banks for our fisheries.

Recommendations:

1. An identification of, and prioritisation from among, estuaries and backwaters of high environmental and socio economic value needs to be done so that conservation efforts can be focused where they would do the most good.
2. Those estuaries and backwaters which have either high biodiversity value or high socio economic use, or both, need to be given an appropriate protected status enforceable by law.
3. Considering the sensitivity of these ecosystems to various types of pollutants, special standards need to be developed to regulate effluents into estuaries and backwaters.
4. Special schemes need to be developed to divert threats, especially in the form of liquid and solid pollutants, from estuaries and backwaters.

5.12 FORESTS

A discussion of forests, *per se,* is not within the purview of this report. There are other task forces and working groups dealing with that. However, much of the discussion on forests neglects the biodiversity values of forest ecosystems and fails to adequately provide for the conservation of those forest ecosystems which still retain their biodiversity values. This report intends to deal with such sites.

STATUS

The officially recorded forest area is 770078 Sq. Km which constitutes about 23.4% of the total geographical area of the country.

FOREST TYPES

On the basis of climate the forests of the country could be broadly divided into following 16 forest types.

Table I

Table Showing Forest Types and their distribution

Sl No.	Forest Types	Area in Sq. Kms	Percentage
1	2	3	4
1.	Tropical wet Evergreen Forest	51,249	8.0
2.	Tropical semi-evergreen Forest	26,424	4.1
3.	Tropical Moist Deciduous Forest	236,794	37.0
4.	Littoral and Swamp Forest	4,046	0.6
5.	Tropical Dry Deciduous Forest	186,620	28.6
6.	Tropical Thorn Forest	16,491	2.6
7.	Tropical Dry Evergreen Forest	1,404	0.2
8.	Sub-Tropical Broad leaved Hill Forest	2,781	0.4
9.	Sub-Tropical Pine Forest	42,377	6.6
10	Sub Tropical Dry Evergreen Forest	12,538	2.5
11	Montane Wet Temperate Forest	23,365	3.6

12	Himalayan Moist Temperate Forest	22,012	3.4
13	Himalayan Dry Temperate Forest	312	-
14	Sub Alpine Forest]		
15	Moist Alpine Scrub]	18,628	2.9
16	Dry Alpine Scrub]		

In most of the States the dense forest cover has shown a declining trend. Table II shows the state-wise detail.

Table II
FOREST COVER CHANGE ANALYSIS

State/ UT	Total Gross Change				Break up of Change	
	Dense Forest	Open Forest	Mangrove	Total	Real	Interpre-tational
Andhra Pradesh	-9	-4	-21	-34	-34	-
Assam	+156	-399	-	-243	-243	-
Bihar	-113	+32	-	-81	-81	-
Goa	-1	-4	-	-5	-5	-
Gujarat	+77	+38	+22	+137	+137	-
Haryana	-	-	-	-	-	-
Himachal Pradesh	+654	+68	-	+722	+22	+700
Jammu & Kashmir	-33	+412	-	+379	-6	+385
Karnatka	-4	+148	-	+144	+144	-
Kerala	-	+44	-	+44	+44	-
Madhya Pradesh	+152	-541	-	-389	-145	-244
Maharashtra	-492	+265	+42	-185	-185	-
Manipur	-2	-62	-	-64	-64	-
Meghalaya	-	-106	-	-106	-106	-
Mizoram	-41	-115	-	-156	-156	-
Nagaland	-44	+71	-	+27	+27	-
Orissa	-198	+138	-	-60	-60	-
Tamil Nadu	-335	+374	-26	+13	+13	-
Tripura	-6	+9	-	+3	+3	-
U.P.	+316	+36	-	+352	+352	-
W.B.	-19	+190	-	+171	+171	-
A & Nicobar	-16	+23	-5	+2	+2	-

THREATS

One of the major reasons for the loss and degradation of forest cover is that against an annual demand of 235 million cu.m. of fuelwood, the annual production from forests is 40 million cu.m. Similarly, the annual production of timber is 12 million cu.m. against a demand of over 27.58 million cu.m. The illegal withdrawal of timber from the forest has never been estimated very accurately. In U.P., for example,

roughly 5000 young poles of 0-10 cm diameter class are cut illegally everday. Also, the diversion of forest land (as shown in table III) is another major threat to forest ecosystems.

Table III

Diversion of Forest Land

Year	Forest Land Diverted in Hectares
1981	2,672.0400
1982	3,246,5400
1983	5,702.0100
1984	7,837.5900
1985	10,608.0700
1986	11,963.1100
1987	72,780.0500
1988	18,765.3500
1989	20,365.0500
1990	1,38,551.3800
1991	625.2100
1992	5,686.9390
1993	11,785.6407
1994	13,527.6915
1995	33,750.9615
	3,57,867.6230

As regards species, the tiger census of 1993 indicates a declining trend in their population. Similarly, 81 species of mammals, 47 birds, 15 reptiles, 3 amphibians and a large number of butterflies, moths and beetles, besides 1500 plant species, are considered vulnerable and endangered. Unfortunately, illegal trade still continues in ivory, rhino's horns, bones of tigers and many threatened plant species.

CURRENT MANAGEMENT STRATEGIES

Following CSS/CS schemes are run by the Ministry of Environment & Forest for the conservation of ecologically fragile regions and biological diversity.

(i) Biosphere Reserves: The setting up of bio-sphere reserves is a part of International Scientific Programme. The main objectives in establishing of bio-sphere reserves are to provide in-situ conservation of plants, animals and micro-organisms, not in isolation but in their totality as part of one natural ecosystem. The scheme was initiated in 1993-94 and so far 14 areas have been identified for creation into bio-sphere reserves. Of these, to-date 8 have been set up in the following areas:

(1) Nilgiri, (2) Nanda Devi, 3) Nokrak, 4) Gulf of Manar , 5) Manas

(6) Sunderbans, 7) Great Nicobar, 8) Simlipal.

In this scheme, two other types of eco-systems are also taken care of, namely wetlands and mangroves.

(2) Association of Scheduled Tribes and Rural Poor in the Regeneration of degraded Forest

This scheme was launched during 1992-93. The scheme envisages association of Scheduled Tribes and the rural poor in regenerating degraded forest on a usufructs sharing basis.

(3) Modern Forest Fire Control Methods

This is a new centrally sponsored scheme launched in the Eighth Five Year Plan. This has been implemented in five States and 100% central grant is given to the States for fighting forest fires.

(4) Development of National Parks and Sanctuaries

The main objective of this scheme is to assist the States in development of National Parks and Sanctuaries through financial assistance, to facilitate and encourage states to expand the protected area network , and the creation of infrastructure facilities for better management of these protected areas.

(5) Project Tiger

The scheme was launched during 1973. The main objective is to ensure maintenance of viable populations of tigers in India and to preserve for areas of biological importance as a national heritage for the benefit of education and recreation of people.

(6) Beneficiaries Oriented Scheme for Tribal Villages of project areas, national parks and wildlife sanctuaries.

The objective of the scheme is the rehabilitation of villagers and others under relocation plan, to shift them from inside the protected areas to outside it.

(7) Eco-Development around national parks including tiger reserves

The main objectives are:

(i) to provide alternate source of sustenance to the communities living at the fringes of national parks and sanctuaries, including tiger reserves.

(ii) to improve the ecological productivity of the buffer zones of protected areas through the use of sustainable economic activities.

(iii) to enlist the active involvement of these communities in protecting these sanctuaries and national parks and their wildlife.

(iv) to provide a well designed package of activites aimed at providing sustenance to communities dependent on forests and ameliorating their hardships.

It also aims at minimising conflicts between these communities and the protection staff.

(8) Project Elephant

The basic objective of this scheme is to assist States having free ranging populations of wild elephants to ensure long term survival of identified viable populations of elephants in their natural habitats. Under this scheme, the States are given financial as well as technical and scientific assistance in achieving the objectives.

(9) National Afforestation & Eco-Development Board

There are many schemes with the mandate of conservation of ecologically fragile areas. They are (i) Integrated Afforestation and Eco-Development Project Scheme. (ii) Fuelwood and Fodder Projects (iii) Aerial Seedling (iv) Non-Timber Forest Produce including medicinal plants.

All the above schemes are supposed to address basic issues of conservation of degraded forest area.

State Plan Schemes

The State Governments also have many programmes which help in the conservation of ecologically fragile areas. Some of the important schemes of the State Plans are:

(a) Afforestation and regeneration of degraded forests

(b) Greening of rural and urban areas

(c) Social forestry

(d) Minor forest produce

(e) Development of national parks and sanctuaries

(f) Regeneration of sal and oak Forest

(g) Rehabilitation of common lands in Aravallis

(h) Watershed management

(i) Western Ghat forestry project.

If the Plan allocations are any indicator of the importance attached to any sector, the forest and wildlife sector is one sector which has been neglected so far. From the First Plan onwards till the 8th Five Year Plan, the forestry outlay has never gone beyond 1% of the total central allocations. The following table gives the details:

TABLE IV

Statement showing the Plan outlays of Forestry & Wildlife and all Sectors together since First Five Year Plan onwards.

Rs. in Crores.

Sl. No	Plan period	Total Outlay in Forestry	Total Outlay (all sectors)	% Forestry outay to the Total outlay
I.	1951-56	2.00 - C	1241 - C	0.16
		9.69 - S	828 - S Part-A;Part-B; Part-C, J&K	1.17
		11.69 - T	2069 - T	0.565
II.	1956-61	2.40 - C	2559.13-C	0.09
		24.73 - S	2240.87-S	1.10
		27.13 - T	4800.00-T	0.565
III.	1961-66	46.00 - C	3600.00-C	1.27
		42.04 - S	3725.00-S	1.13
		0.24 - UT	175.00-UT	0.14
		112.04 - T	7500.00-T	1.494
IV.	1969-74	5.12 - C	8870.69-C	0.06
		73.12 - S	6606.47-S	1.11
		14.31 - UT	175.00-UT	8.18
		92.55 - T	15902.00-T	0.582
V.	1974-79	29.12 - C	19954.10-C	0.15
		164.52 - S	19333.39-	0.85
		12.05 - UT	S and UT.	
		205.90 - T	39287.49-T	0.524
VI.	1980-85	105.00 - C	47250.00-C	0.22
		559.54 - S	48600.00-S	1.15
		28.10 - UT	1650.00-UT	1.70
		692.64 - T	97500.00-T	0.71
VII.	1985-90	446.71 - C	95534.00-C	0.47
		1340.08 - S	80698.00-S	1.66
		72.31 - UT	3768.00-UT	1.92
		1859.10 - T	180000.00-T	1.03
VIII.	1992-97	525.00 - C	247865.00-C	0.21
		3356.87 - S	179985.00-S	1.87
		44.56 - UT	6250.00-UT	0.71
		4126.43 - T	434100.00-T	0.95

C - Central Sector
S - State Sector
UT - Union Territories
T - Total

The above table shows total outlays in forestry and wildlife sector range from 0.565% in the First Five Year Plan to 0.95% in the Eighth Five Year Plan.

Similarly, the outlays in state plans range between 1.10% and 1.87% during First to Eighth Five Year Plans. Though Forest Departments control 23.4% of the total geographical area, its share of Plan allocation is negligible.

Recommendations

1. Unfortunately, current assessments of forests, at the national level, are done for only canopy cover density (by the Forest Survey of India). Clearly this is not adequate to assess the quality of the forests, especially their biodiversity value. Consequently, a system of forest assessment should be introduced where naturalness and species richness is also recorded.
2. Even canopy cover assessment is done in three broad categories of below .10, between .10 and .40, and above .40. This does not give a clear indication of those areas which are relatively undisturbed, atleast in their canopy cover, and therefore likely to be rich in natural biodiversity. Consequently, it is important to identify and prioritise forest areas with canopy cover of .8 and above, especially if the high level of canopy cover density is matched by a corresponding lack of disturbance at the ground level.
3. A competent gap analysis of the protected areas status for India was done by the Wildlife Institute of India in 1987 (Rodgers & Panwar). Unfortunately, many of the recommendations made therein, though accepted by the Government, have not yet been implemented. It should be a target under the ninth Plan to fully implement the recommendations made in this report. Special financial allocations, where necessary, should be provided for the purpose.
4. Joint forest management and ecodevelopment have been established as important strategies for forest conservation. In the ninth plan they must be significantly strengthened both through higher allocations and by integrating them as elements of all conservation strategies.
5. Poaching of animals, especially tigers and rhinos, seems to have reached alarming proportions in various parts of the country. It is important to take up anti poaching as a consolidated and comprehensive exercise with a separate specialised body of dedicated officers and conservationists and with the active involvement of local communities. The recommendations of the Subramanyam Committee report are also relevant for this purpose.

Accordingly, a new centrally sponsored scheme should be created for anti poaching activities and a special task force developed by taking officers on deputation from forest, police, and revenue departments, and by involving institutions and individuals outside the government.

6. Control of poaching, especially of commercially valuable species, is difficult as long as there are markets for them in India and abroad. In order to curtail the demand, special training must be given, and resources made available, to the police and the revenue service officials so that they can effectively tackle trade in endangered species even while performing their other duties. The Ministry of External Affairs must take a greater responsibility in confronting countries, which are major markets for Indian species, with hard evidence of the illegal trade, and get action initiated there.

5.13 HUMAN MADE HERITAGE SITES

Human made heritage is an essential component in our urban eco-systems where 34% of our population live.

STATUS

To give an example of the inadequacy of protection given to our man-made heritage, it should be noted that in England, the number of heritage sites listed for protection is more than 700,000; purely on an areawise calculation, the number of protected heritage sites protected in India should come to nearly 10 million. Actually, the figure is only about 11,000.

CURRENT CONSERVATION EFFORTS

The National Conservation Strategy has drawn special attention to the need for protecting man-made heritage sites, which states inter alia, as follows :

"Para 2.9 : The Man-made heritage in India has been often gravely and even irrevocably damaged".

Para 4.3-Page 11 : "To prevent further damage to and conserve natural and man-made heritage."

Para 6.9-Page 29 : Action points should include the following:

"Conservation of heritage sites and buildings through regulation to ensure that these are not demolished, encroached upon and affected by indiscriminate construction and building".

"Stock taking of buildings, areas and monuments of heritage value in the country".

The Maharashtra Government has for the first time enacted a regulation to accord statutory protection to man-made heritage, open spaces etc. This is of vital importance to protect the urban environment i.e. heritage buildings and heritage precincts, open spaces and natural features that are of importance. Government of Andhra Pradesh have enacted similar regulations for Hyderabad as have been framed for Bombay, except that the Hyderabad Regulations have been expanded to cover natural features also.

In the Development Control Regulations for Greater Bombay, more than 600 buildings and about 20 precincts (which comprise of dozens of buildings and open spaces) have been gazetted for protection. The concept of compensating owners of these heritage buildings has been built into the D.C. Regulations in the form of Transfer of Development Rights, which does not form a burden on the local, state or national exchequer.

However, what is sadly lacking is even basic information on the number of heritage buildings, heritage precincts, open spaces and natural features in other parts of Maharashtra and even the rest of the country. It is essential to compile a list of such heritage buildings, heritage precincts, open spaces and natural features, which qualify to be included for protection, based on certain definite criteria that have been formulated. The "listing" is also carried out in a certain specified format and the list would be accompanied by numerous photographs highlighting the different aspects of heritage buildings, heritage precincs, open spaces and natural features that make them eligible for heritage protection.

RECOMMENDATIONS

An urgent programme for the stock-taking and pilot conservation schemes of human-made and natural heritage sites in the country is urgently needed before this vital component of our urban and natural environment is destroyed.

The first step to get protection for heritage buildings, heritage precincts, open spaces and natural features and to protect these features of the environment, is to undertake a comprehensive listing exercise.

5.14 HILL STATIONS AND SCENIC AREAS

India is blessed with a large number of important hill stations and scenic sites. These include - Shimla, Mussoorie, Nainital, Ranikhet, Almora, Kasauli, Mount Abu, Shillong, Mahbaleshwar, Panchgari, Lonavla, Ootacamand, Kodaikanal, and Darjeeling.

CURRENT STATUS

Almost without exception all the various hill stations in the country are progressively becoming dirtier, more crowded, less green, and less aesthetic. Almost all of them are having water problems and, during the tourist season, serious traffic jams. Air and water is being polluted and the hill sides are becoming full of litter.

THREATS

A major threat to hill stations is from increasing human populations, especially the transient population of tourists. Most hill stations, whereas encouraging the influx of tourists for commercial uses, invest inadequately in developing the infrastructure required to absorb the tourist pressures.

This is especially true about water supply, sewage treatment, parking and road space, and even facilities to collect and dispose of litter and garbage.

Inadequate investment in such infrastructure is exacerbated by an over investment in construction of hotels and guest houses, most of which are not only unaesthetic and not in harmony with their surrounding areas, but are often perched precariously in unsuitable sites, leading to congestion and soil erosion.

Increased human pressures have also led to deforestation and destruction of other vegetation. The hectic construction activity in these hill stations has also depleted neighbouring areas of their vegetative cover, stone, mud and sand, used for construction. It has robbed the hill stations of their distinctive character and made them almost indistinguishable for other urban centres. Electricity and fuel has also become a major problem in many of the areas. This has led to increased pressure on the forests, which are being cut now not only for construction material but also for fuelwood. As most of the tree species in these areas are slow growing, the prospects of forest regenerating is bleak. This has also resulted in aggravated land slides which not only disrupt links with the rest of the country but also result in heavy expenditure in repairs and maintenance of roads.

Recommendations

1. In the case of Shimla and Panchmari, it is understood that the Ministry of Environment and Forests, Government of India, are in the process of issuing notifications under the Environment (Protection) Act. Several other hill stations are in need of similar protection and should also be covered by such a notification.
2. A focused, time-bound, survey should be undertaken to identify the environmental status of hill stations in India, the nature and severity of threats that they are facing and the possible mitigative and protection measures. Based on such a survey, hill stations should be prioritised so that legal regulations and investments can be focussed to where they are most needed.
3. For prioritised hill stations, a master plan must be developed in participation with the inhabitants and with technical support from government institutions and individuals. To fund the implementation of such a master plan, an environment regeneration tax should be levied on each visitor to the hill station, and the collected revenues should be made directly available for the protection and regeneration of the area.

5.15 HAZARDOUS WASTE SITES

Of the various areas with special problems, as listed earlier, ones that deserve most urgent attention are hazardous waste disposal sites. In the last year or so there has been an increase in awareness about the problems being posed by hazardous waste disposal sites across the country, for many of which there is little or no information. The Central Pollution Control Board has provided a list, given below, indicating the status of known sites:

State	Hazardous waste disposal site	
	Identified	Notified
Bihar	2	-
Orissa	2	-
West Bengal	1	-
Punjab	1	1
Tamil nadu	9	-
Andhra Pradesh	2	-
Gujarat	6	5
Maharashtra	3	-
Uttar Pradesh	2	-
Karnataka	14	-
Rajasthan	1	-

[Source: CPCB]

Clearly these are a very small part of the total number. The impact that such sites are having on the environment and on human health is also not well documented.

Recommendations:

1. It is imperative to immediately identify the hazardous waste sites in different parts of the country, especially those posing an immediate threat to human health and those located in fragile ecosystems. As this is a huge task, it should be taken up as a campaign by involving concerned citizens and NGOs, and by using scientific and technical facilities available with NGOs, institutions, colleges and universities.
2. The laws and regulations relating to the dumping of hazardous wastes need to be urgently reviewed and very stringent penalties, including rigorous imprisonment, need to be provided. The procedural delays and difficulties currently involved in prosecution must also be examined and, where required, streamlining of the procedures must take place.

3. Considering the seriousness of the problem and its magnitude, initially some special courts must be designated to look at the problems of hazardous waste dumping. This will not only help clear backlogs that are bound to build up once the identification process gets underway, but would also develop a body of judicial precedence and act as a deterrent to potential dumpers.
4. A clearer understanding of the impact of hazardous waste substances on human health and the environment must be developed and preventive and mitigative methods must be widely understood and practiced.
5. Despite these efforts, the problem of illegal or inappropriate hazardous waste sites will not go away unless facilities are made available for the proper disposal of hazardous wastes, and stringent screening is done for waste substances being imported into the country.

ANNEXURE 1

No. M-12016/1/95-E&F
PLANNING COMMISSION
(E & F UNIT)

Yojana Bhavan,
Sansad Marg,
New Delhi-110 001

March 4, 1996

O R D E R

Sub : Constitution of Task Force under the Steering Committee to consider the problems of ecologically fragile eco-system of the country.

In pursuance of the decision taken in the Steering Committee chaired by Dr. S.Z.Qasim, Member, Planning Commission on 19.2.1996 it has been decided to set up a Task Force on the "Problems of Ecological Fragile Eco-System of the country.

The composition of the Task Force will be as under :

Composition :

1.	Prof. Shekhar Singh Indian Institute of Public Administration, Vikas Marg, New Delhi	Chairman
2.	Representative of Ministry of Environment & Forests, New Delhi	Member-Secretary
3.	Representative from Planning Commission, New Delhi	Member

Terms of Reference :

a) To identify the ecological fragile areas such as mangroves, wetlands, hazardous waste sites etc. and their present status.

b) To identify possible threat perceptions and their source.

c) To suggest remedial measures in their regard.

d) To enlist the legal remedies required and encourage people's action in this regard.

e) Any other related issue with the permission of the Chairman.

TA and DA for the non-official members would met as per the Government rules from the budget of the Planning Commission at per with the Group A officials of the Government of India

The Task Force will submit its report to the Steering Committee by 30th April, 1996.

(Gurjot Kaur)
Director (Admn.)

Copy forwarded to :

All Members of the Task Force.

Copy also to :

OSD to Deputy Chairman
PPS to MOS (P&PI)
PPS to Member Secretary
PS to Spl. Secretary
PS to Principal Adviser (Agri & E&F)
PS to Adviser (PC)/(I&CAD)/(PP)/(RD)
Joint Adviser/SROs/ROs in Agri./E&F Units
Head of all Divisions
SPA to Director (Admn.)/SO (Admn. I)

(Gurjot Kaur)
Director (Admn.)

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