CHAPTER VI

CONCLUSION
6.1 CONCLUSION

There are a number of distinctive major landscapes in the world that have caught the attentions of many disciplines as being a focus for their studies. Arid Lands, mountain lands, tundra lands, polar lands, mediterranean lands, mid-latitude grasslands, tropical rainforest and savannas, for example, have all at some time been considered by geographers, ecologists, soil scientists, botanists, biologists, historians, archeologists, economists and land managers, to name but a few, from their varying points of view. Wetlands are another such major landscape, but it is only since the late 1960s that they have engaged the attention of a range of scholars in an effort to understand their variety and complexity, yet essential unity.

The relative recency of this interest has much to do with the character of the wetlands themselves, and with the way they have been perceived in past. Although wetlands occupy 6 per cent of the earth's surface unlike other landscapes of comparable size they are not climatically based or induced and therefore do not occupy large contiguous stretches of land. Giving them their simple definition, wetlands are lands with soils that are periodically flooded. Therefore they are ubiquitous and found in nearly every climatic zone from the tundra mires of the poles to the tropical mangroves of the equator, and in every continent except Antarctica.

With few exceptions, they rarely cover large areas. More often than not they are found in scattered locations, and are intermittent and local in their occurrence. Consequently, the growth of knowledge about wetlands, which has revolved around the problem of defining, classifying and understanding their various functions, characteristics and values, has been delayed until research workers began to see the commonalities which bound them together.
In addition of the real problem of coming to grips with wetlands as a physical entity there has been the problem of their perception. Hitherto, wetlands have been considered wasteland and therefore worthless. Their transformation through draining, dredging and infilling seemed a fitting fate for them. In recent decades, however, wetlands have assumed a new attraction and value. On the one hand, they are still being reduced in size as modern draining techniques make them even more attractive as potential agricultural land, and their flatness, coastal location and perceived worthlessness make them obvious locations for large plants, harbours and waste disposal. On the other hand, they have become more valued as their hydrological-physical, chemical, biological and socio-economic benefits are acknowledged. In addition, wetlands are increasingly perceived as an environment where air, water and land, and their fauna and flora, meet in an attractive and delicate way, and this has caught the scientific and popular imagination. Demands for their conservation and non-use are now widespread.

The emphasis of wetland studies has shifted in line with, and sometimes in advance of, public opinion. Three phases can be detected in the western developed world. Before the mid-1960s, the assumption was simply that drained wetland was superior to undrained wetland. No positive values could be seen in a bog or marsh which in its natural state was 'wasted', it did not fit in with western landscape either or economics.

After the mid-1960s, however, there was a change. The positive functional and ecological values of wetlands, such as the maintenance and improvement of water quality or the mitigation of flood peaks etc. were used as counter arguments to drainage or infill and halted or held up many schemes for transformation. After the mid-1980s, yet another shift in attitude has occurred, that of attempting to assess and order the relative social merits/values of different and competing positive functions with a view to allocating choices.
The 1960s and 1970s phase saw the creation of a massive 'wetland industry' particularly amongst biological scientists, largely as a response to environmental legislation in the United States.

6.2 INTERNATIONAL WETLAND CONSERVATION

6.2.1 THE RAMSAR CONVENTION

Inter-governmental cooperation on wetland conservation has been spearheaded by the convention on wetlands of International Importance, more commonly referred to as the Ramsar Convention because it was initially adopted at an international conference held in Ramsar, Iran, in 1971. The global treaty provides the framework for the international protection of wetlands as habitats for migratory fauna that do not observe international borders and for the benefit of human population dependent on wetlands.

However, the Ramsar Convention should give attention not only to waterfowl and to listing of wetlands of international importance for nature conservation on heritage. There is a need for the convention to pay special attention to the 'wise use' and 'international cooperation' obligations.

The 'wise use' obligation under Ramsar calls on Contracting Parties to establish national wetland policies covering: improved institutional and organizational arrangements; legislation and government policies; increasing knowledge and awareness of wetland values; reviewing status and identifying priorities of all wetlands in a national context; action at particular sites.

However, the following points needs to be emphasized:

(i) the need to coordinate wetland policies between different authorities in one country, taking account of the views of local people.
(ii) the need to relate traditional uses to the wise use concept.
(iii) the potentially damaging effect of high density of human populations on wetlands, whether in developed countries (reclamation, recreation) or low resource countries (intensive productivity); there is hence a need for zonation of activities.

(iv) the exploitation of wetland productivity at community level, notably in Asia.

As far as the 'international cooperation' obligation under Ramsar which calls on contracting parties to consult with each other about implementing obligation arising from the convention, the following points needs to be emphasized:

i) the need to promote North/South collaboration, particularly in respects of funding by donor agencies from the North, of wetland projects in countries with limited resources.

ii) The possibility of re-establishing geopolitical contacts with countries following political rupture or isolation.

iii) The need to strengthen national and international wetland networks and linkages, to foster more effective scientific knowledge of wetland functions and management techniques.

The Ramsar convention is a potentially potent force in the development of wetlands especially gives the support of IUCN's wetland programme. Unfortunately, whilst Ramsar has been extremely successful in 'securing membership among the developed nations there are still relatively few signatories from the developing nations. It is particularly important for the third world where some of the most important wetlands remain and which are being confronted by increasing development pressure.
6.3  THE INDIAN SCENARIO

The management, maintenance and preservation of wetlands cannot be seen in isolation. The management is linked to a much wider national issues and problems. It is imperative to highlight these problems which are inextricably linked to the wetland resources.

**Population**: India is the second largest populated nations. 16 percent of the worlds population is concentrated in 2.42 percent of the total world area. This could be considered a definite advantage over Europe and North America if a balance existed between area and population. But this is not the case. Furthermore this huge population in increasing at the rate of about 80 million per annum. Most of the threats to wetlands in India are a direct consequence of the need to feed and house this massive and ever-increasing number of human being.

**Poverty**: India has major concentration of rural poverty, and one of the greatest number of people living in urban slums. This can be traced directly to people's dependence on land, which is losing productivity due to overuse, for their livelihood. Throughout the region the environment is being increasingly degraded and supplies of natural resources are falling increasingly short of people's needs. Poverty is, therefore, mounting and people living below subsistence level are constantly on the increase, putting pressure on the wetlands.

6.3.1  THREATS

Population and poverty are the major threats to all natural resources including wetlands in India. On the basis of the case study of Sundarbans, the threats to wetlands can be summarized emanating from national policy, collective actions, and individual behaviour.
Among national policies the important threats are:

1) Drainage of wetlands for agriculture, urban development, and industrial sitings.

2) Diversion of water supplies for irrigation, domestic or industrial uses.

3) Award of fishing leases.

4) Award of mining licenses and oil exploration.

5) Commercial logging.

The major threats arising out of collecting actions are:

1) Degradation of watershed and increased siltation of wetlands.

2) Pollution from domestic sewage, pesticides and fertilizers.

3) Grazing by domestic livestock.

4) Disturbance from recreation.

5) Conversion of wetlands to aquaculture ponds.

Threats arising out of individual behaviours include:

1) Cutting of timber and fuelwood for domestic use.

2) Use of poisons and explosives in hunting and fishing.

3) Collection of eggs and young of reptiles and water birds.

4) Cutting of aquatic plants for domestic use.

Deterioration also takes place due to natural causes which may be initiated by human activities or accelerated by human action:

1) Acceleration eutrophication.

2) Infestation with aquatic weeds.
Because of population, pressure and heavy dependence of the population on wetland resources for their subsistence living, the need for wetland conservation and management is more apparent and immediate in India.

6.4 CURRENT SITUATION OF WETLAND MANAGEMENT IN INDIA

For the above reasons listed above, the wetlands in India are neither adequate nor are they well protected or wisely used. Management is a complex task and requires action at several levels, adjusted to national needs, and pursued through a comprehensive national programme addressing: Information, Awareness, Policy, Planning, Funding, Management and Institutional Building. These facilities are non-existent in India.

In India, as yet there is neither a general policy of wetland conservation nor have any general guidelines been framed for their protection. A few of the selected freshwater, marine and coastal wetlands have been declared protected areas as sanctuaries, national parks, or nature reserves. No proper inventory of wetlands have been developed. However, at the macro level planning there are a network of protected areas from species of important conservation interest such as tiger, elephant etc. Such planning has also considered designating wetlands of international importance within the country. The World Heritage Sites, Biosphere Reserves and Wetlands of National Importance in India are a result of such macro-level planning.

For terrestrial designated protected area, there are several guidelines on how to develop a management plan. For wetland management planning, however, there is a paucity of such guidelines. The draft guidelines on (i) Management Planning for Ramsar Sites and other wetlands (Annexure 1) (ii) Government of India's Wetland Committee's draft guidelines for Integrated Management Action
Plan for Wetlands, Mangroves and Coral reefs (Annexure 2) are two useful documents.

6.4.1 WETLAND MANAGEMENT AND CHALLENGES IN THE SUNDARBANS

Almost every wetland in the world is subject to some form of utilisation by people. India, which supports 16 percent of the world's population, such utilisation is very intense and the Sundarban wetland is no exception. Since wetlands are naturally dynamic ecosystems, and any forms of utilisation or management (including strict protection) will affect the ecological character of the wetland in some way.

Sundarban wetland have three distinct components; (i) the Sundarbans Mangrove itself which is the main source of bio-diversity, high productivity and free services; (ii) the upstream catchment area of the Ganges, without which Sundarbans cannot survive; (iii) the downstream component, where many of the benefits of the wetlands services are realised.

The Sundarbans ecosystem has experienced utilisation in all the above three component areas. Thus, the catchments of the Ganga river in Nepal and the U.P. hills have been subjected to deforestation and intensive agriculture leading to erosion and increased sediment and nutrient loads in the river; the Sundarbans itself has been exploited for its timber and fuel forests and for agriculture and aquaculture; and lastly the downstream component of the Sundarban ecosystem is used by migratory fish species which depend on the wetland for breeding. Moreover the function of the Sundarbans as a "storm barrier" is critical given the colossal devastation of cyclonic storms in the coastal Bengal.
6.4.2 TRANSFORMATION OF THE SUNDARBANS AND CHALLENGES FOR MANAGEMENT

Transformation of the Sundarbans over the past two centuries, has certainly been a gain for the region's development and prosperity. When wood was the primary energy source and the most common construction material, the Sundarbans forests were a major supplier for a region otherwise poorly endowed with forests. Land reclaimed from the Sundarbans produced rice surpluses to help feed the entire region. Bunded fields equipped with sluices leading to adjacent rivers and streams permitted a flourishing fish culture in reclaimed lands. The luxuriant orchards and groves of the delta produced arecanuts, coconuts, dates, and fruits for shipment up the river and canal systems to Calcutta. For some decades the society of Bengal delta prospered.

The question, however, arises in view of this transformation, that what was lost? Quite simply, the thousands of square kilometers of wetlands forests that had extended up to the northern Sundarbans boundary in 1793. Vast unmanaged tidal forests have been replaced by domesticated wetlands dedicated to rice production.

The greatest challenge facing the Sundarbans is if not reverse, but to monitor and control the further degradation of the ecosystem.

The easiest conflict to monitor and control, is the bunding (embanking) imperative that historically allowed farmers to exclude salt water from paddies, with a resulting decrease in salinity and soil quality that threatens the Sundarbans flora. Gathering of timber, forest products, and fish may pose a threat to the carrying capacity of the system, but there are limitations in understanding because of gaps in the social scientific and natural scientific literatures. Much of the exploitation of the forests is illegal and therefore cannot be precisely measured. More important, there is no precise notion of the regenerative capacity of the forest, especially in the face of deteriorating hydrological conditions. Thus,
even the problematic concept of "sustainable yield" of timber or fish is difficult to employ empirically. In addition to these challenges for management, shrimp culture for export poses a new threat to the Sundarbans. Moreover the Farakka barrage in India has led to the changes in the downstream hydrology to the Sundarbans which has lead to less discharge of fresh water supply to the Sundarbans. Thus top dying of Sundri trees have been noted. However the precise effects on the ecology of Sundarbans on account of changes in the hydrological regime is not known.

These complex issues highlight two important messages, which are the building blocks for Sundarban wetland, management in the future:

(i) The conservation of Sundarban wetlands can only succeed if wise use is applied at the level of whole catchment (river basin of Ganga). Thus the protected area (National Parks and Sanctuaries) of the Sundarbans is rendered futile in the face of barrages, deforestation and pollution upstream - leading to massive degradation of the Sundarban ecosystem. The reduction in the river flow and changes in sedimentation patterns are causing major changes to the mangrove communities. The problem of resolving such management issues are exacerbated further when considering shared wetland of Sundarbans with Bangladesh and the catchment area of river Ganga in Nepal.

(ii) Successful management of this ecosystem depends upon management measures which integrate the interest of all users, whether upstream in Nepal and in the States of U.P., Bihar and West Bengal, downstream in the delta area or the wetland itself.

While local communities have often evolved traditional techniques for exploiting wetland products potentially on a sustainable basis, population pressure has lead to non-sustainable harvests, and the drive for economic growth
has lead to destructive developments which has given a short term economic gains to a small sector of the community, at a greater long-term cost to the traditional users of the wetland.

The challenge, therefore, is to identity multiple use goals, which can maximise the long-term benefits derived from the wetland to society, while maintaining its ecological character. This requires integrated landuse planning on the basis of detailed resource inventories, leading to the zoning of management measures. This may require the most sensitive core areas of the wetland to receive strict protection, whilst the less sensitive areas will be available for sustainable multiple-use activities.

6.5 AMERICAN EFFORTS FOR WETLAND MANAGEMENT

No country has come anywhere near the United States in its effort to protect its wetlands. The legislation of both federal and state bodies is voluminous and complex, and its interpretation is labyrinthine. Nevertheless it is worth looking at it broadly as it illustrates well the problems of implementation, responsibility and interpretation that bedevil wetland protection measures, particularly in societies in the developed world.

Other than the wetland acquisition programmes of the 1930s (e.g. Migratory Bird Hunting and Conservation Stamps (1934) and Federal Aid to Wildlife Restoration Act (1937) that were the result of the combined pressures of the duck-hunting lobby and a public consensus that migratory birds were an integral part of the wild heritage of America, most legislation has occurred since the early 1970s when there was a major shift in public attitudes to wetlands, and an increase in scientific knowledge about their functions and hence their values. The reasons for this shift were threefold.
First, there was the realization that the US Army Corps of Engineers was making massive modifications to wetlands as it dredged sediments annually out of the shallow channels and navigable waterways and then deposited the material as fill in other wetlands to make suitable land for urban/residential development, often as marinas. This activity was first questioned seriously in 1966 after the Corps refused to consider the ecological implications of its activities, so that eventually it was put under pressure to scrutinize carefully all permits for change.

Secondly, there was a rising public awareness during the late 1960s and early 1970s that wetlands were scenically attractive and had positive natural functions that were valuable. Several polls during the 1970 revealed a high degree of public support for conservation measures. By 1972 seven coastal states from Massachusetts and Georgia had enacted legislation to protect their coastal wetlands. Activity thereafter was encouraged by the passing of the Coastal Zone Management Act of 1972 which applied to all states bordering the ocean and the Great Lakes. To qualify for federal grants-in-aid a state has to adopt and regulate use or establish standards for local regulation. By 1983, all states except Texas, South Carolina, Florida and Oregon has set up coastal zone management plans, which generally speaking prohibited coastal developments (e.g. Delaware) or allowed them only by special permit as in San Francisco Bay, although there seem to be many legal loopholes for reclamation to continue. In addition, many states compiled detailed and comprehensive inventories of their wetlands as a prelude to their legislative programmes.

Thirdly, the concern for the coastal wetlands expanded to the interior freshwater wetlands as part of a general concern over the loss of open space near urban areas (plus the added perturbation over the dumping of toxic wastes in swamps) and concern by hunters and bird-watchers at the draining and infilling of the wildlife habitats by agriculturists.
However, little could be done to control inland wetland loss as opposed to water quality as there was no restrictive legislation. It was different on the coast. Originally the Corps had been given authority to regulate all activity on navigable rivers and coastal waters used in interstate commerce under the River and Harbor Act of 1899. In 1972, Congress gave the Corps the added responsibility of regulating the discharge of dredged and fill material under section 404 of the Federal Water Pollution Control Act. Environmentalists argued that this implied total wetland protection, an interpretation which the Corps resisted, arguing that its responsibility did not extend to the headwaters of rivers where many wetlands were situated. Nevertheless, after legal action by environmental groups, the responsibility had to be admitted, and the Act was strengthened in 1977 (and now called the Clean Water Act). From now on 'all the waters of the United States' were included, which was legal and not a scientific concept. In addition, the Corps could now embark on coastal and river alteration only after schemes had been reviewed by the Environmental Protection Agency (EPA), the Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS). If the impact of any proposed change was considered significant by any of these bodies, the permit for change can be denied or the project altered in order to minimize the impact. In addition the EPA can have an absolute veto over the use of any sites to be used for the dumping of dredged material.

Over and above all this, Executive Order 11990 of 1977 made wetlands protection a matter of national policy. The many positive virtues of wetlands were stressed and each federal agency was required to 'provide leadership' and 'take action to minimize the destruction, loss, or degradation of wetlands' by avoiding 'direct or indirect support of new construction in wetlands where there is a practical alternative'. Funds were provided to further these aims.

In addition, all federal agencies have had to revise their guidelines with respect to wetlands after Executive Orders 11990 and 11988. Thus, greater
awareness of wetland protection is coming about, but at the same time losses are still occurring. The battle is far from won.

6.5.1 THE EVERGLADES – RESTORING A THREATENED LANDSCAPE

For centuries the drainage of wetlands has been seen as a progressive, public spirited endeavor. One such progressive improvement is flood control. As Europeans moved to the United States and colonised low-lying coastal and floodplain environments, they sought protection from floods. This led in turn to swamp drainage. The swamplands were originally owned by the federal government, and petition to congress were eventually brought for compensation for improvements undertaken by states. The resulting legislation - the Federal Swamp Land Acts of 1849-50 and 1860 - was intended not only to alleviate flood dangers, but to improve sanitation and reclaim land for agriculture. But large-scale flooding remained a problem, spurring the building of levees and canals.

Thus the 'flood protection' increasingly provided from state and federal money has been a major factor in the enormous loss of United States Wetlands since the mid - 1800s. Average national losses for the US hide much greater regional losses. Most Florida developers and politicians have been trying to drain the Everglades and turn it over to farmland since the annexation of Florida to the United States in 1821. Severe floods in 1928, 1947 and 1948 resulted in the Central and South Florida Flood Control Project, which built or rebuilt almost 1,300 km of levees and 800 km of canals. Some 16,200 hectares of wetland were lost directly through the channel digging, and an additional 40,500 hectares were drained.

Flood control inevitably encouraged urban and agricultural expansion. Furthermore, 'flood control' in Florida severely disrupted the natural flood cycle and water regime of the Everglades National Park. The flow of water from Lake Okeechobeen had long been affected by development, but further reputation and
the building of a new levee completely blocked water flow into the Park in 1963. Despite agreement by the Army Corps of Engineers to maintain minimum water levels, water has frequently been too little, and in the wrong place at the wrong time to meet the needs of the natural biological system.

Water is the keystone of the Everglades ecosystem. Changes in the volume and timing of water flow have led to declining population of several species of birds, declining fish and crustacean populations, changes in bay and estuaries salinity, and invasion by exotic plant species. The pressures on what remains of the Everglades ecosystem, now largely contained within the national park boundaries, increased dramatically in the 1970s, reaching crisis level in the 1980s. The causes; increasingly uncertain water supplies controlled by the Army corps of Engineers, expanding farmland and cities demanding more water and reducing water quality and the threat of new development in the undeveloped East Everglades wetland.

In 1983, the Florida State government launched a multi-million dollar 'Save our Everglades' project, emphasizing the need for cooperation between the state and federal governments to guarantee the water regime needed to maintain the Everglades wetlands.

One aspect of the new approach is a two-year trial, begun in June 1985, of water delivery to the park based in part on actual recorded rainfall. This information is fed into a computer model, and the gates controlling water flow into the park are accordingly adjusted weekly.

However, scientist at the 1989 symposium were beginning to understand that enough data had been amused for the ecosystem recovery project. The word "recovery" reflects a new, more aggressive attitude toward the preservation of biologically rich landscapes. Early this century, land in the United States was simply set aside, or "conserved"; when that proved insufficient to protect it from
politically powerful miners, ranchers, and lumber companies, it was "managed" to balance wildness with the resource needs of a rapidly expanding human population. Now, as the world's bio-diversity continues to decline, scientists are embracing the more ambitious goal of not just stopping but reversing the degradation of ecosystems, of returning them to a state that averts the extinction of their native flora and fauna.

However, renewal does not come cheap, however. Restoring this south Florida wilderness, it now seems, will require billions of dollars of mostly public funds, the development of new technologies, and the forging of new political alliances. Its success depends on three formidable technical achievements: gathering information on the plants and animals living in the Everglades; integrating that information into a rough but useful description of how the entire ecosystem works; and developing a management scheme that, while clearly articulating specific restoration targets, remains flexible and patient enough to adapt to new information and inevitable mistakes.

Given its complexity, an ecosystem recovery project this sweeping and this expensive represents a huge environmental gamble. If it fails, the experiment will certainly add to the knowledge of the region's hydrology and ecology, while teaching scientists something about the limits of ecological restoration. But failure will also bring with it accusations of wasted spending in a world of limited government budgets—a result that fills environmentalists with dread.

If it succeeds, Everglades recovery will mean creating a new 18,000-square-mile ecosystem that includes farm and city as well as swamp. The most compelling argument for the public investment in Everglades recovery is its potential as a model for preserving bio-diversity elsewhere, particularly in the rapidly growing list of places where the natural environment is dwarfed by crowded human settlement.
6.6 FUTURE ISSUES FOR THE 21st CENTURY WETLAND MANAGEMENT

The future of wetlands has become a global issue in need of global information sharing, cooperation, policy setting and action. Future direction for the 21st century include:

- refine wetland classification and evaluation systems;
- develop sustainable economic uses of wetlands while protecting the natural features of wetlands;
- train and educate government officials, land owners, engineers, lawyers and biologists on wetland function and value and techniques for management;
- complete inventories for the world's wetlands;
- improve international cooperation and information exchange;
- view wetlands as part of a broader landscapes;
- develop better techniques for building and construction wetlands that imitate natural wetlands;
- develop improved tools such as ecosystem models and geographic information systems are becoming available for better management of wetlands;
- better involvement of local people in wetland management and decisions.