Chapter 6

Conclusion

Bio-diversity is the multiplicity of life forms existing on the planet and consists of ecosystem species and genetic diversity. Genetic diversity may be defined as the sum of the genetic variation within a species. Unfortunately, the earth's biological diversity is being lost at a rate unprecedented in human history. Leading scientists predict that, at the current rate of extinction, the Earth will lose about 20 per cent of all its living species by the year 2000. Past episode of extinction in the Earth's history were largely due to natural causes. Today, the loss of species is directly and indirectly attributable to the only onslaught of human activities leading to habitat loss and fragmentation, invasion by introduced species, over exploitation of living resources, pollution and global climate change. These destructive activities have also led to major declines in genetic diversity within species, especially domesticated crops. Decline in diversity can have a devastating impact on agriculture, natural vegetation, and natural resource-bared industry.

There are many causes for the destruction of natural habitats, including population pressure, Urbanization, industrial development, Conversion to agriculture, etc. Habitat destruction in enable reduce biological diversity. The only defensible reason for the destruction of natural habitats, is the improvement of the human condition, and in many cases the above factors can make significant Contributions to improvements in the quality of life. However, there are many situations in which the conclusion of natural habitats to other use results in no improvement in the human condition, and many actually cause a deterioration in the quality of life of the people most directly affected.

By far the most extensive and biologically destructive use to which natural habitats are converted is agriculture, ranging from permanent cropping to shifting cul-
tivation, to conversion to pasture, to extraction of wood and other natural products. This is very much true in the case of Mauritius, where the indigenous forests were deliberately converted into large sugar-cane fields. On the other hand in Andaman and Nicobar islands group the indigenous forests are being converted into a variety of development works, i.e., agriculture, Urban development, tourism, exotic plantation, commercial and industrial development. The coastal areas in both island groups are being developed for tourism industry at the cost of local mangrove destruction.

As it has already been mentioned in previous Chapters that one sixth plant species grows on oceanic islands and one there of all known threatened plants are island endemic. This is a measure of the biodiversity and fragility of island ecosystems and their importance in plant conservation. Damage to Mauritius island floras occurred in the era of European exploration and colonisation, When Mauritius island became strategically important to the maritime powers. Mauritius island floras evolved in the absence of large grazing animals and few endemic plants had defences against grazing animals. But introduced animals have caused a great damage to all endemic flora's in Mauritius while the case of Andaman and Nicobar island floras have different picture. Because the introduced animal are few and they have not damaged the local flora to that extent as in Mauritius. In Mauritius the rich green thickets and forests Covering the hills but virtually all this vegetation is of introduced plants. The endemic flora accounts only for 1 per cent of the total forest cover. The only viable strategy for saving the Mauricean endemic flora in the short term is to make small weeded plots within the forests, a few hectares at a time where as Andaman and Nicobar island the endemic plants cover almost 78 per cent of the total area. But the destruction of there forests with present alarming rate does not show a good sign amount the future of there forests. This discussion show that Mauritius island his more extinct as well a other categories of plants species than the Andaman & Nicobar islands group. Out of the 236 total Plant species in Mauritius 12 has extincted 1 endangered or extincted, 75
endangered, 45 vulnerable, 55 rare, 1 littermate, 6 insufficiently known and 24 species are neither rare nor threatened. The endemic fauna in these is land & has met the same treatment from excessive exploitation as endemic flora. This is because of rapid population growth and ensuing industrial agricultural & hotel development to cope with unemployment, the pressure on biological resources has become increasingly intense. To contain this alarming destruction many steps have been taken by various agencies at various levels.

There has been great concern at Government level regarding the continuing destruction and degradation of habitats and the Government has taken timely measures not only to prevent further degradation but also to protect and preserve genetic resources thereby preventing further genetic erosion of our bio-genetic diversity.

There are many reasons for the destruction of natural habitats, including population pressure, urbanisation, industrial development, conversion to agriculture, etc. Habitat destruction inevitable reduces biological diversity. The only defensible reason for the destruction of natural habitats, is the improvement of the human condition, and in many cases the above factors can make significant contributions to improvements in the quality of life. However, there are many situations in which the conversion of natural habitats to other uses results in no improvement in the human condition and may actually cause a deterioration in the quality of life of the people most directly affected.

The Mauritian Government has promoted the conservation of biological diversity by establishing protected areas, where endemic flora and fauna are present. To provide further protection, many of these protected areas have now been upgraded and will form part Black River Gorges National Park. Similarly, outer islets like Round Island and iles-aux-Aigrettes which sustain a rich diversity of plants and animals and been set aside and are being managed as protected habitats.
The habitats earmarked for conservation, especially the areas around the Black River Gorges, afford hardly any incentive or scope for exploitation. Furthermore, beside the rich biodiversity these areas support, they are of breath-taking natural scenic beauty. Last but not least there is the commitment of the Government to preserve the biogenetic diversity and wildlife for posterity and to provide necessary funds for the actual implementation of conservation projects. It can therefore conclude, on an optimistic note, that all the conditions are prevalent in Mauritius for the realisation of conservation activities thereby enabling the preservation of biogenetic diversity and wildlife for future generations. On the other side Andaman and Nicobar is bestowed with varied natural ecosystems like, rainforests, mangrove and coral reefs and also man-made ecosystems pertained to forestry, agriculture and fisheries. Different type of communities such as aboriginal, old settlers and opportunistic people inhabit the islands. The last type along tourist population mostly rely on inputs from mainland. It is the aboriginal and permanent settlers who have stake in the sustainable maintenance and development of island ecosystem. The Government of India has promoted the conservation of biological diversity by establishing protected areas in the form of National parks and wildlife sanctuaries, where endemic flora and fauna are present. To preserve marine biodiversity the Government of India has established few Marine National Parks. Six National Parks and 94 wildlife sanctuaries covering 708 sq. km. have already been created on the Andaman and Nicobar islands. Of the existing protected area system 500 sq. km. is terrestrial. This represents 6 per cent of islands combined area. However the vast majority of protected areas are small islet reserves (57 small islet reserves have an area of less than 1 sq. km., only eight covers more than 10 sq. km). Furthermore, the larger and biologically more significant, Andaman group of islands have only three small national Parks and tiny wildlife sanctuary. The biggest island, middle Andaman has no protected area except the Jarawa a Tribal reserves, which is not designed specifically to protect biotic resources.
At the same time, the developed world has become increasingly apprehensive about the accelerating rate of loss of biodiversity and its global consequences. For example, impact of tropical deforestation upon global climate change. Developed countries want to see the use of biological resources placed on a sustainable basis and are linking their overseas development assistance to this tenet. But this often clashes with the sovereign rights of developing countries to their resources as they deem best on behalf of their citizens. Besides it the developed countries have until recently been able to exploit the genetic resources of tropical countries for agricultural and pharmacological advantage at little cost. But developed countries have now become concerned both about the continued erosion of these resources and the increasing restrictions developing countries are placing on their use.

These paralleled concerns about the exploitation of biological resources expressed by both the industrialised and under industrialised countries have led to the negotiations for a convention on biological Diversity. Because of the very different interests and expectations of producer and consumer nations, these negotiations have become increasingly polarised, but little apparent willingness to compromise. On the one hand, the developed countries as consumers of biological resources are concerned about the sustainability of supplies and continued unrestricted access to genetic materials. On the other hand the developing countries as producer nations are more concerned with the transfer of the biotechnology to enable them to develop their resources more effectively for themselves and the equitable distribution of benefits arising from the use of their resources. Redistribution of these benefits must provide the economic incentive to reinforce the conservation of biodiversity throughout the developing world. The obvious difficulties of achieving such redistribution have greatly retarded progress.

The origin of the convention negotiations goes back to the initial drafts prepared in 1987 by IUCN (International Union on Conservation of Nature) in response to
a resolution adopted at its 16th General Assembly. But the actual convention on Biological diversity entered into force on 29 December 1993. It is a historic date in the evolution of international environmental law and international co-operation. The convention itself provided a new impetus to conservation and sustainable use of biodiversity resources, but many challenges lie ahead. For resolving many of the central issues under the convention, particularly the sustainable use of biodiversity resources, we need the emergence of new partnerships between and among local communities, governments, non governmental organisations (NGOs), indigenous peoples, international organisations, business and the sciences. We also need partnerships between the North and South, and among other sectors of the local, national and international community. The six chapters deal with particular regional problems and activities related to wetland habitats, to the specific issues faced by island states in the South Pacific and in the caribbean, to the particulars of Africa.

The biodiversity convention provides framework which will enable each government to decide for itself how best to conserve its own biodiversity, though the convention itself provides few, if any, specific means of implementation. In the convention, governments affirms that they have sovereign rights over their own biological resources, but are responsible for conserving biodiversity and for using their biological resources in a sustainable manner. Governments agree that it is vital to address the causes of biodiversity loss at their source and that in situ maintenance of ecosystems and habitats is the foundation for conserving bio-diversity. Further, the conventions recognises the traditional dependence of many indigenous and local communities on biological resources and desirability of enabling local communities to share equitably in the benefits arising from the use of indigenous knowledge. The convention commits governments to promote more intergovernmental cooperations as well a with the NGO and with private corporations. Finally, the convention recognises that more money is
Island has no such pronounced mangrove along its coast area. It has been destroyed to a great extent by unplanned development by successive colonial regimes and more recently by tourism industry.

As for as fishery is concerned, the fishermen in Andaman & Nicobar islands have been operating small boats along the island to make a living. They do not catch more fish because they do not have adequate methods of preservation and good market. Therefore the setting up of an ice-facing cold storage and freezing plant and also a canning factory is being considered. This should develop with the participation of the local people. The case in Mauritius is different because modern techniques of fish catching have exploited the local seas beyond and optimum level that has compelled Mauritius Government to formulate a quota policy on fisheries. Now over fishing here is under control.

Around these islands, oceans are a large storehouse of resources, both living and non-living. The utilisation of these resources need application of commercially viable and environment friendly technologies, which are capable of producing results both during the long and short periods of time. Global attention has been paid towards harnessing the energy from the sea and extraction of minerals. Considerable research and development work has been undertaken to determine the potentialities of seabed mining and also utilising hydrocarbon, particularly near the coasts, have become a major source which have influenced the world economy.

The tropical islands are famous all over the world for their beauty and rich biodiversity including corals. Therefore, it is necessary to develop marine parks for conservation and pleasure and underwater activities so that the tourist can see natural beauty in their natural habitat without causing any damage. It is also to generate tourist literature on variety of life in and around islands. Essentially tourism in the islands should depend upon ocean based activities.
These islands are in the initial stage of development and therefore, great care is necessary to launch an extension strategy which is unique to the environmental and Socio-economic conditions of the people of these areas. An integrated development of these islands is called for resources and cultural pattern of the people. A long-term strategy, preservation of natural beauty and ecological balance should find an important place in the scheme of development. These islands being small, both area and natural resource wise, the design for development should be "sustainable and community development" type-attacking all the development problems simultaneously but with due priorities to important sectors. For this purpose, awareness and education must be created among local people about biodiversity conservation & sustainable development. This will pay positively in both long term as well as short term development strategies and planning.

**Biodiversity Conservation and Role of the Global Community**

Growing numbers of people in all parts of the world are beginning to realise that society is reaching a crisis point in its relationship with living resources. The International community is responding by showing greater concern about biological diversity, which offers an entry point into addressing some of the most important political, economic and social issues of our time. The International organisations and agencies, contributing in the field of biodiversity conservation and sustainable development, are Global Environment Facilities, IUCN, the world bank, the Asian development Bank, WWF and other such institutions. It is more important that the International community is firmly committed to supporting biodiversity conservation and sustainable development action in India and Mauritius.

While biodiversity is a global issue, it is also very much a local issue. Though global forces may be driving the loss of biodiversity, the impacts of this loss are felt at the local level. The local knowledge that people have about their resources and how
4. The peculiarity of soil in these island groups have had favored a peculiar type of natural vegetation and related fauna. The original flora of the islands is tropical in nature, i.e., ebony is common in both island groups. Both the archipelago are the repository of an immense variety of flora and fauna. The pristine nature of rainforests is very important in the context that in many parts of the world the rainforests are among the most swiftly disappearing biodiversity. The A & N islands have a mixed flora of both Indian main land on the one hand and Malay of Burmese on the other. But Mauritius has also mixed flora, indigenous and introduced flora.

As far as the lost of indigenous forests is concerned, it is because of human interference, in both island groups, to a great extent. The indigenous forests in Andaman and Nicobar are gradually receding because of plantation of exotic plants by people and by Andaman and Nicobar Island Forest and Plantation Development Corporation Limited. But the total loss of indigenous flora is less than that of Mauritius. Still A & N islands have about 75 per cent of land area covered by forests. But this is not true with the case of Mauritius. Mauritius has a long colonial history and it was captured by different colonial power’s at different times. These successive colonial powers exploited this islands biodiversity according to their need and with different rates. This sort of excessive exploitation led to the present situation of indigenous flora that is less than 1 per cent of land area is covered by indigenous forest. Mauritius is a small island and this type of biological fragility is obvious-if exploitation is excessive.

The endemic and indigenous natural vegetation has been replaced by exotic plants, i.e. clove, coconut, black pepper, cashewnut and palm, etc., in A & N islands and Sugarcane, tea coffee, palm, coconut, etc., in Mauritius. Sugarcane is being cultivated almost on 80 per cent land area of Mauritius. Therefore, Mauritius has developed a monoculture type of agriculture.
This difference, between these island groups, have many causes behind it. The Andaman and Nicobar islands have more recent colonial history than Mauritius, which was discovered back in 16th century by Portuguese. The A & N island always remained a part of India. Because of being a part of a large country like India, this island group enjoy certain privileges over Mauritius. The Andaman and Nicobar islands have a history of late entry of human modern) than that of Mauritius. Therefore, the rate of exploitation is less than the Mauritius. On the basis of above discussion we can draw a conclusion that Mauritius has been exploited much more than Andaman and Nicobar island.

The exploitation of fauna is entirely dependent on the extent of floral exploitation, because faunal life depends on floral composition of an area. Mauritius had only mammal fauna, i.e. flying bats which has extincted long back. There is no reptile, expect lizards, in Mauritius. Tortois has extincted to a large extent. No carnivorous animal found there in Mauritius. Three main endemic bird species are rare or endangered, i.e. Pink Pigeon, Kestral and Echo Parakeet. The birds which have extincted are the mass carene Parrot, the dodo, the Bourbon crested, the Red Rail and the Dutch Pigeon. On the other hand Andaman and Nicobar islands have green lizards and many varieties of snakes (cobra, Krait, etc). In Andaman and Nicobar islands the faunal richness is much more. Among birds, 9 bird species are threatened. In Andaman island group these are, Narcondam Horbill, Nicobar Pigeon, Brown cherted Flucatcher and in Nicobar island group these are Nicobar shrubfowl, Nicobar Pigeon and Nicobar Parakeet. Among carnivorous fauna wild cat is prominent. A wide variety of sea birds are found in both island groups.

A wide variety of marine flora and fauna might be seen in both island groups. Among these, sea grasses, weeds, coral reefs, fishes, etc. are prominent to mention. But the coastal mangrove exploitation in A & N islands is growing fastly due to increas-
ing development of industries and tourism along the coastal areas. The coastal areas in Mauritius has the same activities which in turn has increased excessive exploitation of marine resources, i.e. sea limestone and fishes, and at the same time polluting the coastal water by constructing hotels, bungalows and dumping industrial waste and other obnoxious materials. Now Mauritius Government has fixed quota on fishing and underwater mining under the rules and regulations of sustainable development. But, there is no such rules and regulations have implemented to control the excessive exploitation of biodiversity in Andaman and Nicobar islands.

A great difference between these two island groups, as far as local biodiversity is concerned, is that in Mauritius the endemic and indigenous flora is being replanted or regenerated as a part of conservation process, because the present level of indigenous flora is so miserable that one can say it is at the verse of total extinction. But the case of Andaman and Nicobar islands is different. Here the indigenous flora is being replaced by exotic plants it is because vast tracks of indigenous forests still exist and accounts for about 75 per cent of the total land area. With the ever increasing population the depletion of these rainforest is also increasing. If timely and effective measures will not be taken to control their exploitation, the situation of these islands would be same as it is of present Mauritius. The only solution or method to control excessive exploitation of existing flora and fauna (including marine biodiversity) is the conservation of these resources with sound methods of sustainable development.

Sustainable Development of Small Islands

Island territories have their own peculiarities. Andaman & Nicobar islands are still being inhabited by tribes, some of them below 100 in number and are in the danger of extinction due to modern civilization. These islands, however, represent a great potential of genetic diversity, which needs to be preserved. The carrying capacity of the islands is limited. Large scale resettlement in recent times has threatened the
biodiversity and ecological balance in these islands. Therefore, the problem of human influx on the assumption that the islands are thinly populated has to be carefully dealt with. The growth rate in these islands is the highest in the country. The situation, however takes an adverse turn when man made disturbances of deforestation are added to natural disturbances (cyclones).

Both the island groups have substantial marine and coral growth and they represent fragile eco-systems. Methodologies to develop land and land interaction and sea and land interaction are necessary. If the terrestrial system are disturbed, it will become difficult to control the ecology.

The general philosophy of development is to attain a high growth rate in terms of trade turn-overs. Suggestions have been made to convert A & N Islands into a free port, like Hongkong. That can result in a number of buildings coming up and converting the island into a concrete jungle. Suggestion has also been made to promote tourism to attract foreign tourists and build a chain of 5 star hotels, casinos, bars and even airlift food for the tourists. This type of tourism development may not be conducive to overall growth of islands.

The island waters are rich living resources and hence fishing these areas need ot be properly organised. The catch should not cross beyond the sustainable limit. For this it is necessary to organise vocational training for the people of these islands. A modest beginning has been made by the Department in this direction by providing inputs to the educational curriculum regarding the awareness of the sea and its resources.

Most of the islands have either fringing coral reefs or are entirely of coral origin (atolls). The coral reefs are known to be sensitive eco-systems and have become very vulnerable to destructive forces of pollution and indiscriminate removal of
tions. They must define development goals and consider the ways to retain or in-
crease future development options.

Sustainable development will be a hit-or-miss affair without a thorough un-
derstanding of the resources available for development. Understanding of the vulner-
ability of insular biological resources and resource system to adverse impacts of hu-
man activities is also essential.

Planning for development is fundamental to sustainable development. Each
planning study must be made on an island by island or development-by-development
basis. Sustainability of island development ultimately depends upon the abilities of
island residents (Mauritians) and institutions to choose wisely among alternative ac-
tivities and to implement choices. but it is worthless to discuss policies for sustainable
development unless Mauritians are clear about the meaning of the concept. It may, for
example, refer to economic sustainability, ecological sustainability, sustainability of
biological resource base and sustainability of cultural and community life.

The major hinderence in economic development of a small island, like
Mauritius, is meager resource base which limits their scope for all round development
and may make them permanently aid dependent. Dependency of outside aid leads to
exploitation of biological resources by that outside power.

Global conference on the Sustainable Development of Small Island Devel-
oping States held in bridgetown, Barbados from 25 April to 6 May 1994. In this very
conference it was decided that small island states would adopt a programme of Action
in 15 key areas. These 15 key areas have already discussed in previous chapter.

Mauritius, once heavily reliant on sugar export, successfully diversified its
economy through an export processing zone based on textile, and is now developing
an offshore banking operation. Many international experts think that such services
rather than product base export, hold the key to sustainable development for Mauritians. But without proper planning and regulation, export processing zones can lead to sub-standard working conditions and environmental damages. The proper planning and regulation can be laid only by well-equipped Island Development Authority, in which meaningful participation of local community in the sustainable development of the island. The island community should also have a say in controlling the immigrant population and the introduction of outside technology into the Mauritius. The local community should be encouraged to develop eco-tourism with indigenous inputs. The role of NGOs, to educate, guide, and mediate to local people, is very much important. They can play another important role in increasing interaction between the island community and government for effective co-management of the island ecosystem for preserving and conserving the natural resources in general and biodiversity in particular. Above all, the respective government should provide the necessary inputs and incentives for sustainable development of these islands.

**Sustainable Development of Andaman and Nicobar Islands**

Andaman and Nicobar Islands are gradually losing their indigenous flora and fauna. This is because of increasing population through emigration and mis-management of natural resources. The process of overexploitation of both terrestrial and marine biodiversity can lead a situation that Mauritius is facing today.

Therefore to identify the value of sustainable development, Government of India has established many "Wild-Life Sanctuaries and National Parks" these islands. But with the establishment of these natural reserves, the government must define development goals and consider the way to retain or increase future development options with sustainable development.

The conservation of biodiversity and sustainable development must be improved through the following fundamental strategies.
does not so pollute the environment as to make impossible the continuance of the very activities, which depend on the biodiversity.

The conservation of biodiversity, which is fragile and vulnerable in small islands, need proper attention by respective governments, non-government organizations and local communities with the help of international communities and institution. Development is the only way to improve the life conditions of the people and overall economic conditions of a country. But when it try to interfere with the limits set up by nature, it become hazardous to every aspect of environment and human life. Therefore, economic development should be sustainable which means without damaging the natural environment. Mauritius and Andaman & Nicobar islands are small in size and highly vulnerable. The Government's of these two island groups should follow the outline's given by Global conference on the Sustainable Development of Small Island Developing States held in 1994. The proper programme of actions in 15 key areas, can avoid disasters related to excessive exploitation of biodiversity.

In future these islands will avoid any such action which can devasted the remaining biodiversity in these islands. Both Mauritian as well as Indian Government's have taken a lot of steps to contain unmindful exploitation of biological diversity and emphasising on sustainable development. Mauritian Governement has fixed quota's for exploitation of marine as well as land resources. The island government has started the process of reforestation of endemic plants and established a captive breeding centre in Black River Gorges area, where endemic birds are facilited to breed. In Andaman and Nicobar islands wherever the endemic flora has been cleared, the local and Indian Government's are trying to restore reforestation by exotic plants. If the present process of conservation and sustainable development remain continue, we can expect in future these islands can get back their past memories to some extent.