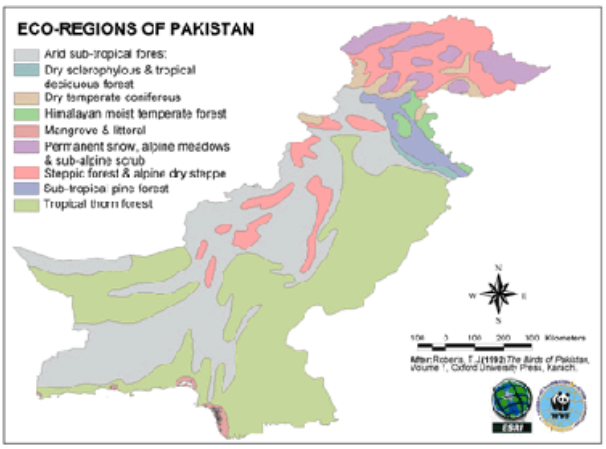
Pakistan has a number of the world's rarest animals and plants but these are now in danger from habitat loss and overuse. One stark reminder of the downslide is Pakistan's ranking as the country with the second highest rate of deforestation in the world. The continuing loss of forest habitat, with its associated fauna and flora, has serious implications for the natural ecosystems.

Chapter 5 Biodiversity – sharing the environment

Pressures



The ecological trend in the country is that of a continuing fragmentation and degradation of natural habitats resulting in loss of biodiversity. This has effects with out exception on forests, rangelands, and freshwater and marine ecosystem. Of equal concern is the decline in many native species of animals and plants. Some species are already extinct, many are internationally threatened, and more still are of national concern. While the loss, fragmentation and degradation of natural habitats in the territory of Pakistan has been taking place for centuries, the last few decades have seen a particularly rapid acceleration in this process. This trend is most evident in the remaining upland, scrub and mangrove forests, arid and semi-arid rangelands (including sand dune deserts), inland wetlands, the Indus Delta and coastal waters.

There are 6 fundamental causes of loss of biodiversity attributable to Pakistan:

- The unsustainably high rate of human population growth and consumption
- Economic systems that fail to value the environment and its resources
- Inequity in the ownership, management and flow of benefits from both use and conservation of biological resources
- Deficiencies in knowledge and its application
- Legal and institutional systems that promote unsustainable exploitation
- The steadily narrowing spectrum of traded products from agriculture, forestry and fisheries

Some of the significant pressures that aggravate rate of loss of biodiversity in Pakistan are highlighted in following sub-sections.

Pollution

Pakistan faces a serious challenge of growing pollution in urban areas and water courses. Likewise discharge of sewage and industrial effluent into aquatic and marine ecosystems is also on the rise. In Pakistan's 1981 census, 415 cities were classed as urban in which less than one third of the population resides, which is increasing by 4.4% per annum is essential. The organic load of sewage depletes oxygen levels in water and indirectly reduces the diversity of animal and plant life.

Major cities dispose of largely untreated sewage into irrigation systems, streams and rivers. Lahore alone discharges 240 million gallons of sewage per day mainly into the river Ravi. The resultant loss of fish and contamination of potential drinking water has considerable economic and health impacts. Most coastal pollution is concentrated in Karachi harbour where an estimated 90,000 tons of oil products from vessels and port terminals are dumped every year. Extremely high levels of toxic heavy metals such as mercury have been documented, especially in the coastal waters and sea near Karachi. These are likely to have both acute and chronic toxic impacts on human beings, marine biodiversity, and fish-eating birds. The impacts of these pollutants on commercial fin-fish and shrimp fisheries are unknown, but likely to be significant.

Deforestation

Principle cause of deforestation in Pakistan is the consumption of fuelwood and timber. Consumption (primarily for household firewood) exceeds production in all the provinces except in the relatively sparsely populated Northern Areas; consumption is expected to increase in line with population growth at about 3% per year. This poses the threat of Pakistan's woody biomass being totally consumed within the next 10 to 15 years. Unfortunately, the moratorium on timber harvesting in Pakistan following the 1992 floods has not been very effective. Further, the moratorium has reportedly resulted in increased timber smuggling from Afghanistan. As most of this wood is extracted by the clear-felling of forests in the Kunar Province, and as these forests fall within the watershed of the Kabul River, the adverse impacts of deforestation in Afghanistan will be felt downstream in Pakistan.

Grazing

Rapidly increasing domestic livestock population is the direct cause of degradation on rangelands and forests. Overall livestock numbers continue to increase at a rate of 2% per year. While much of this increase has been fed by the production of fodder within irrigated areas, persistent overgrazing has reduced forage production in rangelands to 1/3rd the potential loss of almost 50 million tonnes per year and in some areas to as low as 15% of the potential.

Soil Erosion

Both wind and water erosion are exacerbated by a reduction in vegetation cover, resulting from agricultural activities and overstocking. Water erosion is not only a particular problem in the Northern Areas and the NWFP, but it also affects the agro-ecosystems of the barani lands e.g. the Potwar plateau and the Sulaiman *rodkohi* (traditional water harvesting system). About 11 million hectares are affected by water erosion and the consequent washing away of soil. Water erosion results in increasing sedimentation of wetlands and resulting habitat degradation while wind erosion is not as severe a problem as water erosion, some 2 million hectares of Pakistan (of which 1.5 million hectares are in the Punjab) are experiencing moderate to severe wind erosion. The light soils of the Potwar Plateau and the sandy soils of the Thal and Cholistan deserts are particularly vulnerable. The sandy deserts of Thal, Cholistan,

Thar and Chagai-Kharan suffer from the linked problem of shifting sand dunes. In Balochistan, excessive pumping of groundwater has led to falling water-tables, with the result that vegetation cover is decreasing and soil erosion is on the rise. The loss of soil through water and wind erosion implies a loss of soil organisms, plant diversity and the population of animals these plants support.

Dams and Irrigation

The construction of dams and barrages in the Indus basin to control flooding and store water for irrigation have greatly increased the amount of Wetlands habitat in Pakistan. Reduction in freshwater flow to the coast has greatly increased salinity in mangrove forests. The most serious effect has been the consequent conversion of land to agriculture, with removal of extensive tracts of riverine and thorn forests and the resulting disappearence from large areas of the associated fauna.

Agricultural Practices

Pakistan faces degradation of agro-ecosystems caused by irrigation. Irrigation causes degradation of agro-ecosystems when it results in increasing salinity, sodicity and waterlogging. This is an extremely serious problem but has limited direct impact on natural ecosystems. Salinity and sodicity affect 2.1 million hectares in Sindh and 2.6 million hectares in the Punjab. Most of the soils affected are of low agricultural potential, but nonetheless, almost 10% of Class I and II soils are affected. Crop genetic diversity in Pakistan is also dropping and the principal reason is the development and use of high-yield varieties (HYVs). The agricultural use of pesticides and fertilisers has rapidly increased in recent years. Pesticide use in Pakistan has increased 7 fold in quantity between 1981 and 1992.

Externalities

The main economic reason behind the erosion of biodiversity is the underlying disparity between private versus social costs and benefits of biodiversity use and conservation. Private costs and benefits refer to those losses and gains as perceived by the immediate user of the environment: the farmer, the industrialist and the consumer. Social costs and benefits refer to losses and gains that accrue to society as a whole. Social and private interests often do not coincide: what is good for the individual may impose costs on the rest of society so-called 'externalities'. Sometimes, what is good for society as a whole is also good for the individual, but no institutions exist for the individual to capture this 'global value'. From the perspective of the individual, it pays to exploit biodiversity. But from the point of view of society as a whole, it is better to seek ways of sustainably utilising that biodiversity and, on many occasions, of outright protecting it. Society in this respect can be the local society, the province, the nation, or the world as a whole. The main factors in this divergence between private and social interests are market and intervention failures. These are exacerbated by weak property regimes, high discount rates, and the globalization of the world economy.

State

With its dramatic geological history, broad latitudinal spread and immense altitudinal range, Pakistan spans a remarkable number of the world's ecological regions. According to various classification systems, Pakistan includes examples of 2 of the world's eight biogeographic realms: the Indo-Malayan and Palaearctic and 4 of the world's ten biomes: desert, temperate grassland, tropical seasonal forest and mountain. In addition, Pakistan has 225 Protected Areas (PAs) 14 national parks, 99 wildlife sanctuaries, and 96 game reserves. It is a world of rapidly shrinking wetlands, some of them of international significance, of wondrous juniper forests, minute life forms which buzz their way to a magical existence, of stunning mountains, and much more.

Species Richness/Endemism in Major Plant and Animal Groups in Pakistan

	TOTAL REPORTED	ENDEMICS	THREATENED
Mammals	174[1]	6[2]	20[3]
Birds	668[4]	?	25[3]
Reptiles	177[5]	13[5]	6[6]
Amphibians	22[7]	9[8]	1[7]
Fish			
Freshwater	198[1]	29[1]	1[6]
Marine	788[9]	-	5[9]
Invertebrates			
Echinoderms	25[10]	-	2[10]
Marine Molluscs	769[11]	-	8[11]
Marine Crustaceans	287[12]	-	6[12]
Marine Annelids	101[13]	-	1[13]
Insects	>5000[1]	-	-
Plants			
Angiosperms	5700[14]	380[15]	?
Gymnosperms	21[14]	-	?
Pteridophytes	189[16]	-	?
Fungi	>4500[18]	2[18]	?
Algae	775[17]	20[17]	?

[1] Unpublished PMNH data
[2] T. J. Roberts 1997
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[18] A. Naseem

Pakistan is divided into 9 major ecological zones and covers a number of the world's ecoregions, ranging from the mangrove forests stretching from the Arabian Sea to the towering mountains of the western Himalayas, Hindukush and Karakoram.

Critical Ecoregions

Under the Global 200, ecosystems have been ranked to carry out conservation through comparative analysis. It covers all habitats on the land masses and in the ocean. The Earth has been divided into 238 ecoregions, by the United Nation, the National Geographic Society with WWF. Out of them 5 are in Pakistan.

The Global ecoregions of Pakistan are:

1. Rann of Kutch flooded grasslands
2. Tibetan Plateau
3. Western Himalayan Temperate Forests
4. Indus Delta Ecosystem
5. Arabian Sea.

Flora

About 5,500 - 6,000 (Nasir and Ali 1970) species of vascular plants have been recorded in Pakistan including both native and introduced species. The flora included elements of the 6 phytogeographic regions. 4 monotypic genera of flowering plants and around 400 (7.8%) species are endemic to Pakistan. Almost 80% of the endemics are found in the northern and western mountains (Ali and Qaiser,1986). The Kashmir Himalayas are identified as a global centre of plant diversity and endemism. Families with more than 20 recorded endemics are *Papilionaceae* (57 species), *Compositae* (49), *Umbelliferae* (34), *Poaceae* (32) and *Brassicaceae* (20).

Fauna

Around 174 mammal species have been reported in Pakistan. Out of these, there are atleast 3 endemic species and a number of endemic and near endemic sub-species. 668 bird species have been recorded in Pakistan. Out of them, 375 were recorded as breeding.

Breeding birds are a mixture of Palearctic and Indomalayan forms (1/3rd) and the occurrence of many species at one or the other geographical limits of their range shows the diverse origins of the avifauna. The Sulaiman Range, the HinduKush, and the Himalayas in the NWFP and Azad Kashmir comprise part of the Western Himalayan Endemic Bird Area; this is the global centre of bird endemism. The Indus Valley wetlands are the second area of endemism. Around 177 species, being a blend of Palearctic and Indomalayan forms. Out of the total 14 species of turtles, 90 of lizards and 65 of snakes have been reported. While 13 species are believed to be endemic. Being a semi arid country, only 22 species of amphibians have been recorded, of which 9 are endemic. Pakistan has 198 native and introduced freshwater fish species. The fish fauna is predominately south Asian and with some west Asian and high asian elements. Fish species diversity is highest in the Indus river plains and in adjacent hill ranges (Kirthar Range), and in the Himalayan foothills in Hazara, Malakand, Swat and Peshawar. Diversity is lowest in the mountain zone of the northern mountains and arid parts of north-west Baluchistan.There are 29 endemic species. There has been little research on Invertebrates of Pakistan. About 5,000 species of invertebrates have been recorded including insects (1,000 species of true bugs, 400 species of butterflies and moths, 110 species of flies and 49 species of termites). Other includes 109 species of marine worms, over 800 species of molluscs and 355 species of nematodes.

Impact

It is feared that Pakistan is experiencing the world's second highest rate of deforestation. This destruction is leading to the wholesale disappearance of trees, shrubs and ground flora, together with the vertebrate and invertebrate fauna they normally support. The loss of forest habitat has had a severe impact on Pakistan's biodiversity, and has serious implications for the nation's natural and agro-ecosystems.

Critically Threatened Ecosystems in Pakistan

ECOSYSTEM	CHARACTERISTICS	SIGNIFICANCE	THREATS
Indus delta and coastal wetlands	Extensive mangroves and mudflats Inadequate protected area coverage	Rich avian and marine fauna Diverse mangrove habitat Marine turtle habitat	Reduced freshwater flow from diversions upstream Cutting mangroves for fuelwood Drainage of coastal wetlands
Indus river and wetlands	Extensive wetlands	Migratory flyway of global importance Habitat for Indus river dolphin	Water diversion/drainage Agricultural intensification Toxic pollutants
Chagai desert	A desert of great antiquity	Many endemic and unique species	Proposed mining Hunting parties from the Gulf
Balochistan juniper forest	Huge and ancient junipers	Largest remaining juniper forest in the world Unique flora and fauna	Fuelwood cutting and overgrazing Habitat fragmentation
Chilghoza forest (Sulaiman Range)	Rock outcrops with shallow mountain soils	Important wildlife habitat for several species at risk	Fuelwood cutting and overgrazing Illegal hunting
Balochistan sub-tropical forests	Mid-altitude forests with sparse canopy but rich associated flora	Very few areas now remain Important wildlife habitat	Fuelwood cutting and overgrazing
Balochistan rivers	Not connected with the Indus river system	Unique aquatic fauna and flora with high levels of endemism	Water diversion/drainage Overfishing
Tropical deciduous forests (Himalayan foothills)	Extend from the Margalla Hills National Park east to Azad Kashmir	Perhaps the most floristically rich ecosystem of Pakistan	Fuelwood cutting and overgrazing
Moist and dry temperate Himalayan forests	Important forest tracts now becoming increasingly fragmented	Global hotspot for avian diversity; important wildlife habitat	Commercial logging Fuelwood cutting and overgrazing
Trans-Himalayan alps and plateaux	Spectacular mountain scenery	Unique flora and fauna; center of endemism	Fuelwood cutting and overgrazing Illegal hunting Unregulated tourism Habitat fragmentation

Response

Government of Pakistan has depicted its commitment to conserving biodiversity through several tangible steps including fulfilling commitments to international protocols and conventions as well as through launching programs and projects as well as allocating responsibilities to relevant institutions.

Biodiversity Action Plan

The key to protecting the biological heritage of Pakistan lies in the involvement of local people and in the support provided by competent institutions for conservation and sustainable use. The Government of Pakistan has recognized the importance of these measures in the preparation of the National Conservation Strategy and in becoming a signatory to, and ratifying, the Convention on Biological Diversity (CBD) in 1994. Developing the Biodiversity Action Plan for Pakistan, 2000 has been the most significant direct steps towards addressing the biodiversity loss.

Trophy Hunting

In 1983 the Wildlife Wing of the NWFP's Forest Department began the Chitral Conservation Hunting Programme, a trophy hunting programme for Markhor. This was not strictly a community-based conservation program because all proceeds went to the government. The programme lasted for 8 years until the GoP banned the export of trophies along with all big game hunting throughout Pakistan. In July 2000, NCCW recommended that Community-based Trophy Hunting Programme (CTHPs) be exempted from the hunting ban. In August 2000, the Federal Cabinet officially banned big game hunting, except for exemptions recommended by NCCW for CTHPs. This ban applies to all big game species and provides a role to NCCW for regulating harvest of both CITES and non-CITES species such as ibex, blue sheep and urial. The longest running CTHP in Pakistan is the Torghar Conservation Project (TCP) on tribal lands in the Torghar range of northwest Balochistan. The late Nawab Taimur Shah Jogezai initiated this project and Sardar Naseer Tareen in response to concerns about the status of Afghan Urial and Suleiman Markhor population in the Torghar Hills. With technical input from US wildlife biologist, TCP initiated a conservation programme to stop poaching. Using revenue from the sale of a small number of trophy hunts local people were hired as wildlife guards. TCP was formalized as a registered NGO – the Society for Torghar Environmental Protection (STEP). In the first 10 years, STEP generated about US $ 460,000 from hunts for 14 Markhor and 20 Urial. Two senior conservation NGOs are major proponents of CTHPs in Pakistan. Pakistan was the second to develop the CTHPs beginning in the Barr Valley in Northern Areas. Asiatic or Himalayan ibex have been the focus of WWF's CTHPs. IUCN-Pakistan' s involvement in trophy hunting also began and it implemented a Pre-investment Feasibility (PRIF) project- Maintaining Biodiversity in Pakistan with Rural Community Development.

Protected Areas National Park Management

The National Council for Conservation of Wildlife (NCCW) has played a significant role in encouraging the Provincial Wildlife Departments for better management of protected areas particularly national parks of the country. Through a consultative process, several national parks have been short listed for their management at global standards – including Lal Sohanra National Park (Punjab); Kirthar National Park (Sindh); Khunjerab National Park (Northern Areas); Chiltan Hazarganji National Park (Balochistan); Margallah Hills National Park (Islamabad); and Chitral Gol National Park (NWFP).

Protected Areas in Pakistan as of 1999

REGION/ PROVINCE	NATIONAL PARKS	WILDLIFE SANCTUARIES	GAME RESERVES	UN–CLASSIFIED	TOTAL PAs	AREA PROTECTED	
						(hectares)	(%)
Azad Jammu & Kashmir	1	0	8	0	9	51,998	3.91
Balochistan	2	14	8	7	31	1,837,704	5.29
Punjab	2	37	19	0	58	3,315,803	16.14
NWFP	3	6	38	5	52	470,675	6.30
Sindh	1	35	14	4	54	1,307,575	9.27
Federal Territory	1	1	1	0	3	94,186	100
Northern Areas	4	5*	9	0	18	2,092,180	2.97
Total	**14**	**98**	**97**	**16**	**225**	**9,170,121**	**10.40**

* Two of the Wildlife Sanctuaries in the Northern Areas were redesignated as Controlled Hunting Areas in October 1998.

Provincial Wildlife Departments are also being encouraged to bring more areas under the protected areas network. NCCW in collaboration with Provincial Governments got control of bear baiting practice, which was causing a bad name for the country. The effective advocacy and control measures have reduced the bear baiting events in the country, which has been acknowledge by World Society for Protection of Animals (WSPA).

Wildlife Related Conventions

In addition to fulfilling its commitment to the CBD, Pakistan is also taking active steps to implement obligations pertaining to wildlife related conventions including CITES, Ramsar and Convention on the Conservation of Migratory Species of Wild Animals (CMS). NCCW is implementing these obligations on behalf of the Government of Pakistan. A ban on commercial export of CITES Appendix-I and II species was implemented with exception of scientific use. Similarly the export of mammals and reptiles, which are not common in the country, remained closed. The commercial export of common birds, mostly captive bred species was encouraged. This policy was regulated by NCCW in collaboration with Ministry of Commerce and Provincial Wildlife Departments. For better implementation of Ramsar Convention, Pakistan had notified eight Ramsar sites in collaboration with Ramsar Bureau. With the addition of eight new wetlands, now there are 16 Ramsar Sites notified for conservation of wetland associated biodiversity. This recent increase in Ramsar Sites enhanced the image of the country in conservation circle. NCCW also encouraged the Provincial Wildlife Departments to implement the obligations of Convention on Conservation of Migratory Species of Wild Animals (CMS) also known as Bonn Convention. The threatened migratory species like cranes, geese, storks, pelicans etc. are protected in most of the provinces. NCCW, as an obligation of MOU signed under CMS, is trying to protect the threatened Siberian crane in collaboration with WWF-Pakistan and NWFP Wildlife Department. Similarly another Conservation Plan and MOU is under consideration for conservation of marine turtles. NCCW is also trying to minimize the hunting pressure on Houbara bustard and falcon species in collaboration with Houbara/Falcon Foundation International-Pakistan.

Mountain Area Conservancy Project

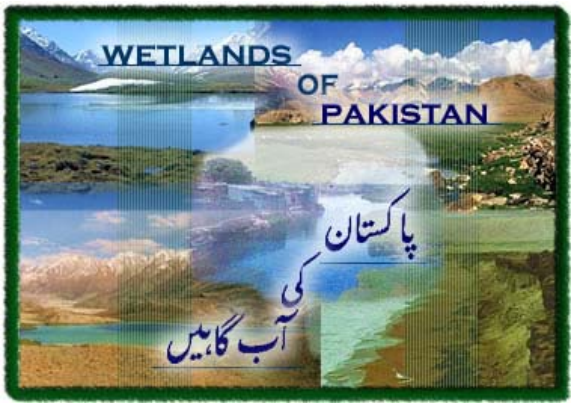
The MACP has been launched for implementation in Northern Areas and NWFP over an area of 16,000 sq.k.m. with a cost of US $ 10.35 million, aiming at protection of the rich ecological landscapes and biodiversity of the Karakoram, Hindu Kush and Western Himalayan mountain ranges. The focus is on empowering local communities to manage biodiversity, making them accountable for the quality of their resource stewardship. Share of communities and government in the revenues from trophy hunting would be 75% and 25%,

respectively. Proceeds from trophy hunting and other sustainable use initiatives will be deposited in community's fund, which they would use on collective development and conservation projects for welfare of the communities.

Protected Areas Management Project

The PAMP has been approved by ECNEC and negotiations made with the World Bank for implementation of the project which is to be commenced soon. The objectives of the project is to conserve globally important species and habitats of three national parks in Pakistan including; Chitral Goal NP (NWFP), Hingol NP (Balochistan) and Machiara NP (AJK). The project has been funded by GEF through the World Bank for an amount of 10.735 million and will be implemented by respective provincial governments for duration of 5 years.
The project will ensure increased involvement of National Research Institutions in Park Management, strengthen park management and tourism amenities in Pakistan, strengthen technical capacity of park staff and establish an effective park communication system. Integration of custodian communities in park management will be done through formulation and effectiveness of village/park level conservation and local advisory committees.

Pakistan Wetlands Project



NCCW in collaboration with WWF-Pakistan is implementing the PDF-B phase of GEF funded "Pakistan Wetlands Project" with a total cost of US $ 367,000. The purpose of this PDF-B phase is to prepare GEF Project Brief for a full-scale project for better management of wetlands, particularly the Ramsar Sites of the country for their wise use and conservation of biodiversity. Since the project is being implemented on participatory approach, a series of workshops was organized by the project for consultation with major stakeholders. The two meetings of Project Steering Committee (PSC) were also convened to monitor the progress of the project. In the second meeting of PSC which was held on 26 July 2001, four wetland complexes were selected for full scale project with expected funding of GEF over 10 million US$.

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