

**Biological Diversity and Tropical Forestry Analysis**  
FAA 118/119 Annex  
**USAID/Pakistan Interim Strategic Plan FY 2003-2005**

## **Executive Summary**

USAID is legally obligated to conduct assessments of tropical forestry and biological diversity in accordance with the requirements of Sections 118 and 119 of the Foreign Assistance Act. This Washington, DC-based desk study, therefore, provides access to reference information, government of Pakistan actions and support by USAID and other donors to the conservation of tropical forests and biological diversity, all intended to inform the strategy development process.

Pakistan has some of the world's rarest animals and plants but these are now in danger of disappearing forever due to overuse and loss of natural habitat. While people are without doubt a most valuable resource in Pakistan, uncontrolled population growth puts ever-increasing pressures on the country's natural resource base. Misguided economic policies have widened inequalities and forced rural people and others to exploit biodiversity at rates that are no longer sustainable. As a result, processes such as deforestation, overgrazing, soil erosion, salinity and waterlogging have become major threats to the remaining biodiversity in Pakistan. The continuing loss of this forest habitat with its associated fauna and flora will have serious implications for the nation's other natural and agro-ecosystems.

The recently completed [Biodiversity Action Plan for Pakistan](#) provides a comprehensive review of the current status and develops proposals for action.

Through a \$27.5 million Forestry Planning and Development project (1984–93), USAID supported creation of a social forestry (now more commonly called farm and community forestry) program within Pakistan's Forest Service. It aimed to convert the Forest Service from *policing* forests to *promoting* tree farming. Today, the World Bank, the GEF and the ADB are the primary external donors of the sector.

While biodiversity conservation and management of natural resources are among Pakistan's developmental needs and in spite of USAID historical activity and predominant capacity in this arena, attention to this sector is beyond USAID's management capacity at this time. Other donor activity and the capacity of the public and private sector in this arena in Pakistan mitigate the impact of the USAID focus under this interim Strategic Plan.

## **Overview**

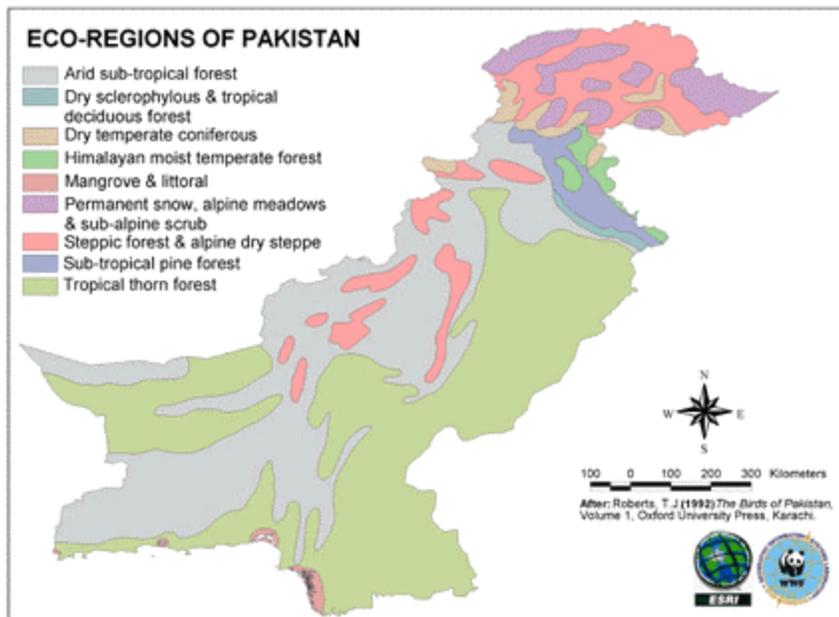
Pakistan stretches from the Arabian Sea to the high mountains of Central Asia, and covers an area of 803,944 km<sup>2</sup>. It lies approximately between 24° and 37° north latitude, and between 61° and 78° east longitude. It neighbors Iran to the west, Afghanistan to the north, China to the northeast, and India to the east and southeast along a 2,000 km, partially contested border. There is a 1,000 km long coastline along the Arabian Sea.

The climate is continental and is characterized by extreme variations of temperature. Winter (January) temperatures range from 68°F along the coast to 4°F in the high mountains (above 460 m). Summer (July) temperatures range from 95°F in the

southeastern deserts to 32°F in the high mountains. The southwest monsoon (July-October) provides rainfall of about 40 inches or more in the mountainous northern areas and about 6-8 inches on the coast. Rainfall varies from year to year, and successive periods of flooding and drought are not uncommon.

Pakistan can be divided physiographically into four regions: the great highlands, the Balochistan Plateau, the Indus Plain and the desert areas. The Himalayan and the trans-Himalayan mountain ranges, rising to an average elevation of more than 6,000 m and including some of the world's highest peaks, such as K2 (8,611 m) and Nanga Parbat (8,126 m), make up the great highlands which occupy the northern most portion of the country. The Balochistan Plateau, a broken highland region about 300 m in elevation with many ridges crossing it from northeast to southwest, occupies the western and southwestern sectors of the country. The Indus Plain, the most prosperous agricultural region of Pakistan, covers an area of 520,000 km<sup>2</sup> in the east and extends to 1,100 km from northern Pakistan southward to the Arabian Sea. In the southeast are the desert areas.

The country as has great diversity of bio-climates and correspondingly a great diversity of vegetation types and fauna. The major habitats in the country range from flood plains, arid plains, sand and piedmont deserts, a variety of forests (tropical thorn, tropical dry deciduous, sub-tropical arid, sub-tropical dry, subtropical plain, dry and moist temperate, and subalpine), grassy tundra and cold deserts, lakes, rivers, swamps, and coastal marine habitats, alpine pastures, high mountains and glaciers.



Notwithstanding the diversity of topography and climate, Pakistan is basically a dry country of the warm temperate zone, Except for a small strip of sub-tropical terrain in the Punjab and the wet zone on the southern slope of the Himalayan and Karakoram mountain ranges, where rainfall averages about 2,000 mm per year, most of the country is arid or semi-arid steppe land. In all, more than three fourths

of the country has less than 250 mm rainfall, and one-fifth has less than 125 mm; The small portion with more than 500 mm is less than 7 percent of the area.

The main administrative divisions are the provinces of Punjab, Sindh, Balochistan and the North West Frontier Province (NWFP) plus the Federal Capital Territory of Islamabad. Two other regions, the Northern Areas and Azad Jammu and Kashmir (AJK) are administered by the Government of Pakistan

### **Context of the Interim Strategic Plan for USAID/Pakistan (FY 2003-FY 2005)**

The Asia Near East Bureau approved the Pakistan Planning Framework (PPF) on May 21, 2002. The PPF presaged the reopening of a USAID Mission in Pakistan in FY 2002 and outlined a three-year plan for assistance in four sectors: education, health, democracy and economic growth. This Interim Strategic Plan continues that basic direction for a focused program, constrained by staff, security and space limitations, in the above sectors but with more defined Strategic Objectives.

USAID is legally obligated to conduct assessments of tropical forestry and biological diversity in accordance with the requirements of Sections 118 and 119 of the Foreign Assistance Act. The amendments require that assessments of tropical forests and biological diversity be prepared on a country-specific basis, be reflected in USAID's strategy document for each country, and addressed in annual reports covering progress on strategic objectives. Specifically, "Each country development strategy statement or other country plan prepared by the Agency for International Development shall include an analysis of: 1. The actions necessary in that country to achieve conservation and sustainable management of tropical forests, and 2. The extent to which the actions proposed for support by the agency meet the needs thus identified" (See ADS 201.3.8.2 Environmental Analysis).

Furthermore Section 117 emphasizes the need for the United States to exercise leadership in reassessing policies related to the environment and natural resources and in "cooperating extensively with developing countries in order to achieve environmentally sound development." To achieve this goal, the section indicates that: "Special efforts shall be made to maintain and where possible to restore the land, vegetation, water, wildlife, and other resources upon which depend economic growth and human well-being, especially of the poor." The section also requires USAID to "take fully into account" the impact of its activities on the environment and natural resources of developing countries.

This Washington, DC-based desk study, therefore, provides access to reference information, government of Pakistan actions and support by USAID and other donors to the conservation of tropical forests and biological diversity, all intended to inform the strategy development process.

### **Biodiversity**

Pakistan lies at the western end of the South Asian subcontinent, and its flora and fauna are composed of a blend of Palaeartic and Indomalayan elements, with some groups also containing forms from the Ethiopian region. Indomalayan forms are found in the east of the country, in the Indus Basin, and Palaeartic forms in the mountains of the north and west. The Palaeartic species contain a mixture of those

common to a large part of Eurasia, along with those with affinities to the Middle East, West Asia (Afghanistan and Iran), Central Asia, and Tibet. The rate of endemism is relatively low (5% for plants, 4% for mammals, 0% for birds, 10% for reptiles, and 11% for fish), but the blending of elements from different origins has ensured a diverse and unique mix of flora and fauna. Since a lot of primary field research still needs to be done, these statistics are likely to under represent the actual biodiversity of Pakistan

The [Convention on Biological Diversity in Pakistan](#) web site has downloadable reports on the National Biodiversity Strategy and Action Plan, the National Report on Biodiversity Conservation, thematic studies on Alien and Invasive Species and another on Forest Ecosystems and contact information for biodiversity focal points.

Pakistan has a rich and varied fauna, affinitive to three faunal regions - namely the Palearctic region west of the Indus, the Oriental region east of the Indus, and the Ethiopian region. Ten of the 18 mammalian orders are represented in Pakistan, including not only the world's smallest surviving mammal, the Mediterranean Pigmy Shrew, but also in the coastal waters the largest mammal ever known to exist, the Blue Whale. The total endemism is not high but a number of taxa including the Indus Dolphin, Chiltan Markhor, and Suleman Markhor are endemic to Pakistan, Of the world's approximately 4,100 mammal species, 188 have been reported in Pakistan.

Of the more than 8,600 species of birds in the world, 666 species of migratory and resident birds Occur in Pakistan. Major groups include waterfowl, waders, raptors, pheasants, partridges, herons, cranes, storks, ibises, pelicans, flamingos, terns, gulls, bustards, sand grouses, parrots, crows, song birds, and fancy birds.

The country is also richly endowed in reptiles. amphibians, insects (20.000 species recorded), marine invertebrates (700 species), marine fish (400 species) and freshwater fish (150 native species plus several introduced species). Fish species diversity is highest in the Indus River plains and the Himalayan foothills.

The diversity of flora has been adversely affected by major irrigation systems, built

Valley - a major wintering ground for a wide variety of central and northern Asian species, as well as being of socio-economic value.

Overall, three ecosystems of unique ecological interest and international importance have been identified in Pakistan: the juniper forests of north central Balochistan; the Chagai desert in southwest Balachistan, and the Indus riverine zone.

The unique, varied and rich biodiversity of Pakistan is increasingly threatened by the following anthropogenic causes which are responsible for habitat degradation and species loss: deforestation, overgrazing, hunting, water pollution and over-use of natural resources (e.g. over-fishing; extractive uses of resources by local communities adjacent to protected areas).

To date, the Government of Pakistan (GoP) strategy on conservation of biodiversity has been defined by the establishment of an institutional framework, legal and policy guidelines and the establishment of a Protected Areas (PA) system. The principal policy response to biodiversity conservation has been formulated through the National Conservation Strategy (NCS) of 1992. The NCS called for strengthening of the PA system and to update the legal and policy instruments to promote conservation of biodiversity. Within the policy arena, GoP prepared a [Biodiversity Action Plan \(BAP\)](#). The BAP provides guidance and a policy framework for initiatives in biodiversity conservation. It complements the Pakistan Environmental Protection Ordinance of 1997 by targeting biodiversity conservation and sustainable use, an issue which in earlier country's legislation had received little attention as this legislation was largely concerned with urban issues.

### **Protected Areas**

Pakistan has a network of 225 Protected Areas comprising 14 National Parks, 99 Wildlife Sanctuaries, 96 Game Reserves, and 16 unclassified (private, proposed or recommended). The total area covered by these categories is 9,170,121 ha which is 10.4% of the total land area (Biodiversity Action Plan for Pakistan, 1998). Based on their global significance, 9 wetlands have been designated as Ramsar sites.

No World Heritage site has yet been designated. Most major habitats are represented within Pakistan's Protected Area system. However the size, distribution and management of these areas do not meet the needs of the ecosystems they are meant to safeguard.

### **Forest Resources**

Pakistan has very low forest cover. Forests cover less than 3 percent of total land area, but their great variety reflects the country's great physiographic and climatic contrasts. Pakistan's forest and woodland types include: littoral and swamp forests; tropical dry deciduous forests; tropical thorn forests; sub-tropical broad-leaved evergreen forests; sub-tropical pine forests; Himalayan moist temperate forests; Himalayan dry temperate forests; sub-alpine forests; alpine scrub. Coniferous forests predominate. The North West Frontier Province has around 40 percent of Pakistan's forests. Man-made plantings are an important wood source in Pakistan. These fall into four categories: irrigated plantations; farmland trees; linear planting; and miscellaneous planting. [FAO Forestry Pakistan](#)

## **Population**

Any consideration of Pakistan's environment must take into account the impact of a population of 130 million (1998). The estimated annual growth rate of 3.0% (Human Development in South Asia, 1997) is one of the highest of any developing country. Almost half of the population is less than 15 years old. The population is concentrated in the fertile Indus River valley and along the river's major tributaries in the northern and northeastern portions of the country. By contrast, western and southwestern Pakistan are sparsely inhabited.

Pakistan has a developing mixed economy based largely on agriculture, light industries, and services. Although the Gross National Product is increasing more rapidly than the population, the GNP per capita, estimated at US\$ 430, is among the lowest for developing countries. Up to 50% of the workforce is employed in agriculture. The industrial sector is growing, with manufacturing now generating half of the country's exports. Development of natural gas, oil and mineral deposits is also contributing to Pakistan's economic growth.

However, growth has been uneven and widespread poverty persists, particularly in the rural areas, where two thirds of the population lives. Pakistan ranks 134th of the 173 countries on the United Nations Development Programme's Human Development Index (Human Development Report, 1998). At least 35 million people live in abject poverty and public access to health, education, clean water, sanitation and family planning remains low.

## **Environmental Challenges**

### **Loss of Natural Habitats**

Pakistan's great diversity of ecosystems are subject to loss of natural habitats and fragmentation, a trend that has accelerated in the last few decades. This deterioration is most apparent in the remaining upland forests, scrub forests and mangrove forests; arid and semi-arid rangelands; inland wetlands, Indus Delta, and coastal waters.

The main causes of habitat loss are deforestation for fuelwood and timber, grazing and fodder collection for the rapidly increasing livestock population, soil erosion, agricultural activities and overstocking which reduce vegetative cover, water diversion and drainage for irrigation and agricultural activities and an over-dependence on and unsustainable use of the natural resources.

### **Depletion of Species, Populations and Genetic Diversity**

The 1996 IUCN Red List of Threatened Animals classifies 37 species and 14 sub-species of mammals that occur in Pakistan as internationally threatened or near-threatened. The Red List is based upon field data that is more than 20 years old and needs to be re-assessed. The country also provides critical habitat to 25 internationally threatened bird species and 10 internationally threatened reptiles. Although there is inadequate data available to demonstrate the precise rate of decline of species in Pakistan, four mammal species (tiger, swamp deer, lion and Indian one-horned rhino) are known to have disappeared within the last 400 years. In addition, the Asiatic cheetah and Kashmir stag have probably become extinct in the last few decades.

The main activities causing species or population loss include hunting and trapping for sport, meat, trade, and eradication of livestock predators, over-fishing in both wetland, freshwater and marine habitats for commercial purposes, and over-collection of plants for medicinal and cosmetic uses apart from their fuelwood and fodder uses.

### **Degradation of Agricultural Ecosystems and Domestic Genetic Diversity**

Agriculture remains the most important sector for employment and income generation. The sector, including forestry, livestock, and fisheries, accounts for about 26 percent of GDP and more than 45 percent of employment. It generates directly and indirectly about 70 percent of export earnings. Growth in the sector has declined from an annual average of 4.1 percent in the 1980s to 3.4 percent in the 1990s, and deteriorating productivity and increasing environmental damage threatens the sustainability of agricultural output. Pakistan's agriculture requires reforms to achieve sustainable production and marketing systems, modernization and diversification to improve competitiveness and higher value added, and a supportive policy and institutional environment for private investment. The constraints in the sector include imperfections in land markets and land distribution; irrigation inefficiencies and increasing deterioration of land quality; an inadequate rural transport network; inefficiencies in public sector marketing of certain agricultural inputs and outputs; poor quality of research and extension; and restricted access to credit by small farmers. The ongoing ADB-financed sector strategy study will develop strategies and action plans to address these constraints:

Agro ecosystems and genetic diversity are being damaged in a number of ways: Soil loss, water logging, and salinity is resulting in lower agricultural productivity. Intensification of agricultural production is reducing floral and faunal diversity in crops and field margins.

Pollution is causing habitat loss, species decline, and reduced genetic diversity. Pollutants strain ecosystems and can decrease populations of sensitive species, as well as contaminating the food chain. Sewage effluent and industrial waste discharge seriously affect aquatic ecosystems by reducing the diversity of plant and animal life. Overuse of pesticides in agriculture is increasing wildlife mortality, destroying the natural biotic balance of soils, and reducing the diversity of invertebrate faunal species.

Pollution associated with industrial and urban activities has emerged as a significant threat to public health, particularly to the poor. The economic cost of water pollution related health issues ranged from \$460 million to \$1.25 billion per year, while air pollution related health costs ranged from \$250 million to \$369 million per year, based on a 1995 estimate. The daily generation of solid waste in the country is about 58,000 metric tons (mt), of which only about 40 percent is transported to the final disposal sites which are generally open dumps. The country is also threatened by health problems related to hazardous and toxic wastes from industries, hospitals as well as residues and unused pesticides from agricultural activities. Among others, increases in these types of wastes have implications for the incidence of cancer, of which there are 30,000 new cases each year. The importation of wastes has continued without proper hazard and toxicity guidelines.

Pakistan is a forest-poor country, with only 0.01 ha of forest per capita and an

annual loss of natural forest cover of about 2.9 percent between 1990-95. Forests are a major source of fuelwood, and the large demand for fuelwood has contributed to rapid deforestation. This, in turn, has contributed to soil erosion in the catchment areas of the major reservoirs, which are vital for generation of electricity, and the regulation of water supply and irrigation. Recent data shows that about 11 million ha of land in Northwest Frontier Province is prone to soil erosion, and about 40 million mt of soil are carried through the Indus Basin every year. Land degradation by wind and water erosion, waterlogging, and salinity pose major hazards for the agriculture sector. Annual losses due to salinity and waterlogging were estimated at \$300 million in 1995. Other sensitive ecosystems such as mangroves, rangelands and wetlands continue to deteriorate, threatening many species of mammals, plants, birds and reptiles.

The increasing environmental problems led to the development of the National Conservation Strategy in 1990 and the Biodiversity Action Plan in 1999. In addition, the revised Environmental Protection Act (EPA), adopted by the Government in 1997, provides a legal foundation for environmental management. However, little has been accomplished in implementing the new policies, and enforcing the EPA, due to inadequate resources including skilled staff and funding. Challenges ahead are how to increase accountability in managing the environment and natural resources, and to strengthen enforcement with limited Government resources. In addition, institutional weaknesses, including the absence of monitoring and enforcement mechanisms, should be addressed. The development of self-monitoring capacity in the private sector, and a sustainable mechanism to finance Government enforcement at the local level, are also essential.

## **Donors**

**USAID** Through a \$27.5 million Forestry Planning and Development project (1984–93), USAID supported creation of a social forestry (now more commonly called farm and community forestry) program within Pakistan's Forest Service. It aimed to convert the Forest Service from *policing* forests to *promoting* tree farming. The project also helped develop markets for tree seedlings, custom tree harvesting, and other inputs and services needed to support private tree farming and reform policies restricting timber commerce in the country.

Project assistance increased awareness of the environmental and economic benefits of tree farming, changed the Government of Pakistan's (GOP) attitudes towards forestry, and helped to break down the overwhelming dominance of the public sector in forestry and its isolation from farmers. Today, activity on the farms, whether it is row planting, block planting or agroforestry, is reasonably understood, gainfully practiced, and praised by farmers, although they still need information from the government on a regular basis.

Due to the enormous interest exhibited by forestry staff and an effective and useful training program, targets for farmer involvement in nursery operations, tree planting and management, training, and construction were not only achieved but well exceeded.

**The World Bank** recently completed the [Northern Resource Management project](#) a \$36 million 1993-99 effort designed to provide the basis for the sustainable and economically efficient use of land resources in Azad Jammu and Kashmir (AJK).

which ranks with the country's poorest and most environmentally fragile areas. The project has three broad fronts: (i) improving the policy framework within AJK for the use of land resources; (ii) restructuring and strengthening the main institutions that help manage and protect the land resources in AJK; and (iii) testing, on a pilot basis, programs whereby communities take full responsibility for planning and implementation of activities covering land resources in the communities.

Active are the IBRD/GEF [Protected Areas Management Project](#) 1997-2005 for \$26.8 million. The project will improve the participatory planning and management of three priority protected areas -- Hingol, Machiara and Chitra Gol National Parks -- across a range of ecosystem types. It will strengthen park management through elaborating detailed management plans, improving park infrastructure and protection, restoring key ecosystem components and degraded sites, and conducting targeted biodiversity research and monitoring. It will support conservation-compatible economic activities, and integrate local communities and authorities and the private sector in park management through advisory committees whose role is to integrate park activities into overall development planning. Finally, it will pursue a public awareness campaign and human resource development for park management staff.

The **UNDP/GEF Pakistan** [Mountain Areas Conservancy Project](#) is a 1999-2006 US\$18.8 million. This project, to be implemented by Pakistan's Ministry of Environment, Local Government, and Rural Development, will work to protect the rich ecological landscapes and biodiversity of the Karakoram, Hindu Kush, and Western Himalayan mountain ranges of northern Pakistan. It comprises a package of interventions to address the underlying causes of biodiversity loss in the region. The principle focus is on empowering local communities to manage biodiversity, making them accountable for the quality of their resource stewardship. Four wildlife conservancies will be established representing the biogeographic zones of the high mountains. Within the conservancies, activities will facilitate the in situ conservation of habitats and species and promote sustainable uses of components of biodiversity.

The [GEF web site for Pakistan](#) lists 9 country projects and 4 Regional and Global Projects with a Pakistan component, major of which are Protected Areas Management Project by IBRD for \$11,138,000 and the Mountain Areas Conservancy Project (MACP) by UNDP for \$8,100,000 as noted above.

The **Asia Development Bank's** Country Assistance Plan for 2001-2003 is online at <http://www.adb.org/Documents/CAPs/PAK/default.asp>. No additional forestry sector activities are planned at this time after completion of the Sindh Forestry Project in 2001 and attention will mostly focus on implementing the ongoing Forestry Sector Project in NWFP. In that Project the ADB is assisting in strengthening the capacity at the federal level to monitor the implementation of the Government's Forestry Water Plan.

**IUCN the World Conservation Union in Pakistan** reports "Programme Agreements were signed with the Norwegian Agency for Development Corporation and are under discussion with the Swiss Agency for Development and Cooperation. At the same time the Canadian International Development Agency-funded Pakistan's Environmental Programme, a key expression of implementation of the National Conservation Strategy, became ever more challenging in turbulent political times. As always, partnerships built up over years and a common cause to which both non-

government organizations and government subscribe, allowed us to weather the storms and look to greater stability.

Two major initiatives came on stream with the start of the Balochistan Conservation Strategy, funded by the Royal Netherlands Embassy, and the World-Bank Global Environment Facility-funded Biodiversity Action Plan which had the additional challenge of developing a Protected Areas Management proposal for Pakistan. The European Community-funded Uplands Rehabilitation Project was started, the latest in the new generation of post-NCS designed and influenced, sustainable development projects.

The Environmental Protection Act was passed by the interim government and the National Environmental Quality Standards were promulgated. With these two important legislative measures, the National Conservation Strategy has found major expression of its institutional recommendations.

To meet this increasingly complex agenda, the programme and the organization have become even more diverse and multilayered. We now have seven offices and close to 200 staff in Pakistan. Our systems are constantly being reviewed and strengthened to cope with this growth while still ensuring coherence and, as always, this is the central challenge for senior management."

## **Conclusion**

While biodiversity conservation and management of natural resources are among Pakistan's developmental needs and in spite of USAID historical activity and predominant capacity in this arena, attention to this sector is beyond USAID's management capacity at this time. Other donor activity and the capacity of the public and private sector in this arena in Pakistan mitigate the impact of the USAID focus under this interim Strategic Plan.

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[Birds of Prey](#) Birds of prey are "top predators" like lions and tigers. Except vultures who feed on dead bodies, they hunt and kill other creatures for food. They are also called raptors, from the Latin word "raptare" which means "to seize", as they seize their prey with their feet.

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[Status Of Environmental Edcation In Sustainable Development Strategies Of Pakistan \(.PDF\)](#) BY: RABIA ARIF. Rabia Arif is a permanent faculty member at the Institute of Education and Research, Punjab University, and visiting faculty for the Department of Environmental Studies and the Women Development Centre. She holds a Masters in Environmental Studies from York University, Toronto, Canada and M.S in Education from Punjab University, Lahore.

World Conservation Monitoring Centre, Cambridge, UK and International Union for Conservation of Nature and Natural Resources, Gland, CH. 1991. Pakistan : Biodiversity guide to Pakistan. 32 p., maps, statistical tables

Abstract: Pakistan is largely arid and semi-arid, but the country's wide geographical and altitudinal range have contributed to a diversity of flora and fauna. Highlights include three ecosystems -- juniper forest, the Chagai desert, and the Indus riverine zone -- which contain unique biotic communities and endemic elements. Following background information on

geography, climate, and population, this report provides a description of Pakistan's biodiversity in terms of ecological zones, critical ecosystems, flora, mammals, birds, reptiles, amphibians, fish, invertebrates, and agricultural biodiversity. The next section analyzes the country's protected area system, which, while extensive, should be enlarged to ensure that adequate examples of all ecosystems are represented. The report then identifies the major threats to biodiversity, which include deforestation, grazing, soil erosion and desertification, dams and irrigation, salinization and water logging, water pollution, hunting, fishing, and agricultural practices. A final section summarizes efforts to conserve Pakistan's biodiversity through legislation and policy, government departments, research and training, nongovernmental organizations, current projects, and international and regional cooperation. Includes references.

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