

Government of Pakistan

Biodiversity Action Plan Pakistan

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Executive Summary

With its dramatic geological history, broad latitudinal spread and immense altitudinal range, Pakistan spans a remarkable number of the world's broad ecological regions. These range from the coastal mangrove forests of the Arabian Sea to the spectacular mountain tops where the western Himalayas, Hindu Kush and Karakoram ranges meet. This variety of habitats also supports a rich variety of different species which contributes to the overall biological diversity (or "biodiversity") of the country.

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. It is now feared that Pakistan has the world's second highest rate of deforestation. 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.

Just as more and more people may be part of the problem, they must also be part of the solutions. 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 the conservation and sustainable use of biodiversity. The Government of Pakistan recognized the importance of these measures in the preparation of the *National Conservation Strategy* (1992) and in becoming a signatory to, and ratifying, the *Convention on Biological Diversity (CBD)* in 1994.

The current *Biodiversity Action Plan (BAP)* is a first attempt to meet the planning requirements of the Convention. It tries to roll into one, the three sequential processes called for under the Convention (the country study, national strategy, and action plan). As such it provides a brief assessment of the status and trend of the nation's biodiversity (Chapter 2), outlines strategic goals and objectives (Chapter 3), and identifies a plan of action that includes coordination arrangements and implementation measures (Chapters 4, 5, and 6). Preparation of the BAP has been carried out under an agreement between the Government of Pakistan and the World Bank under the Global Environment Facility Trust Fund (GEF). The World Conservation Union, Pakistan (IUCN-P) was selected as the lead agency in collaboration with the World Wide Fund for Nature Pakistan (WWF-P).

The process leading up to preparation of the BAP has involved broad participation from governments, academia and civil society through national and regional-level consultative workshops to develop and review the draft document. A number of background papers were prepared for BAP by national experts on sectoral and cross-cutting issues. Periodic oversight during the drafting of BAP has been provided by a national Biodiversity Working Group constituted by the Ministry of Environment, Local Government and Rural Development and consisting largely of government representatives.

This Biodiversity Action Plan sets out a strategy for action under 13 main components which correspond to the Articles of the CBD: planning and policies, legislation, identification and monitoring, *in-situ* conservation, *ex-situ* conservation, sustainable use, incentive measures, research and training, public education and awareness, environmental impact assessment, access issues, exchange of information, and financial resources. For each component, the issues relevant to Pakistan are identified and a list of objectives and corresponding actions are recommended to deal with the identified issues. Slowing the rate of biodiversity loss in Pakistan will require policy and institutional reform as well as institutional strengthening to better understand the elements of biodiversity and the most effective means for ensuring the conservation and sustainable use of these elements. The active participation and support of local communities will be essential for *in-situ* conservation. The Plan calls for greater collaboration between government agencies, local communities and NGOs to work together as partners in biodiversity conservation.

Overall responsibility for implementation of the BAP will fall on the Ministry of Environment, Local Government and Rural Development (MELGRD) which is also the national focal point for implementing the CBD. The Plan proposes establishing a small Biodiversity Secretariat within MELGRD using existing resources to coordinate BAP implementation and foster linkages between, and within, different sectors affecting biodiversity. The location and structure of the Secretariat should be finalized by the Ministry itself. The Secretariat would report to a Federal Biodiversity Steering Committee and receive technical support from a broad-based, re-notified Biodiversity Working Group. Since most implementation measures will take place at the provincial level, the Plan also proposes Provincial Steering Committees to be constituted (or merged with those created under provincial conservation strategies).

Finally, the Plan provides an implementation schedule of proposed actions to prioritise those that could be implemented immediately and at low cost following government endorsement of the first Biodiversity Action Plan for Pakistan.

Table of Contents

List of Annexures.....	iv
List of Figures.....	iv
List of Tables.....	iv
List of Abbreviations and Acronyms.....	v

Chapter 1

Introduction.....	1
1.1 What is Biodiversity?	1
1.2 Why is Biodiversity Important?	1
1.3 The Convention on Biological Diversity (CBD)	2
1.4 A Biodiversity Action Plan For Pakistan.....	3

Chapter 2

Biodiversity in Pakistan - A Review	4
2.1 Current Status	4
2.2 Recent Trends in Pakistan.....	11
2.3. Direct Causes of Biodiversity Loss in Pakistan.....	16
2.4 Indirect (Root) Causes of Biodiversity Loss in Pakistan	21

Chapter 3

Principles, Goals And Broad Aims.....	27
3.1 The Goal of The Biodiversity Action Plan (Bap)	27
3.2 Broad Aims of The Biodiversity Action Plan	27

Chapter 4

Proposals For Action	29
4.1 Planning And Policies	29
4.2 Legislation	31
4.3 Identification And Monitoring.....	34
4.4 <i>In-situ</i> Conservation	37
4.5 <i>Ex-situ</i> Conservation	42
4.6 Sustainable Use	43
4.7 Incentive Measures	46
4.8 Research And Training	48
4.9 Public Education And Awareness	50
4.10 Environmental Impact Assessment.....	53
4.11 Access Issues	54
4.12 Exchange of Information	56
4.13 Financial Resources.....	57

Chapter 5

Coordinating Biodiversity Conservation Efforts	60
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Chapter 6

Implementation Measures	61
--------------------------------------	-----------

References.....	76
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List of Annexures

Annexure 1:	Report on Stakeholder Participation	68
Annexure 2:	Other International Biodiversity-related Conventions to which Pakistan is a Party.....	74

List of Figures

Figure 1:	Map of Pakistan.....	5
Figure 2:	Major Vegetative Zones of Pakistan	7
Figure 3:	Organogram for BAP Implementation.....	64

List of Tables

Table 1:	Species Richness and Endemics for Major Plant and Animal Groups in Pakistan.....	10
Table 2:	Critically Threatened Ecosystems in Pakistan	15
Table 3:	Human Use of Wildlife in Pakistan. Most of the species included are believed to be declining partially (or wholly) due to this use	18
Table 4:	Summary of Protected Areas in Pakistan (based on NCCW data)	37
Table 5	BAP Implementation Schedule. Numbers refer to specific actions as described in Section 4.....	65

List of Abbreviations and Acronyms

AIOU	Allama Iqbal Open University
AJK	Azad Jammu and Kashmir
BCS	Balochistan Conservation Strategy
BWG	Biodiversity Working Group
CBD	Convention on Biological Diversity
CERC	Centre for Environment Research and Conservation
EIA	Environmental Impact Assessment
GATT	General Agreement on Trade and Tariffs
GBS	Global Biodiversity Strategy
GEF	Global Environment Facility
GoNWFP	Government of North West Frontier Province
GoP	Government of the Islamic Republic of Pakistan
HESS	Household Energy Strategy Study
HYVs	High Yielding Varieties
ICBP	Inter-governmental Council for Bird Preservation
IEE	Initial Environmental Examination
IPCC	Inter-governmental Panel on Climate Change
IUCN-P	The World Conservation Union, Pakistan
MELGRD/MoE	Ministry of Environment, Local Government and Rural Development
NACS	Northern Areas Conservation Strategy
NCCW	National Council for the Conservation of Wildlife
NCS	(Pakistan) National Conservation Strategy
NCSU	National Conservation Strategy Unit
NEQS	National Environment Quality Standards
NGO	Non Governmental Organisation
NIAB	Nuclear Institute for Agriculture and Biology
NIBGE	National Institute of Biotechnology and Genetic Engineering
PA	Protected Area
PEPA	Pakistan Environment Protection Agency
PMNH	Pakistan Museum of Natural History
PRA	Participatory Rural Appraisal
SDPI	Sustainable Development Policy Institute
SPCS	Sarhad Provincial Conservation Strategy
UNEP	United Nations Environment Programme
VOs	Village Organizations
WAPDA	Water & Power Development Authority
WRI	World Resources Institute
WTO	World Trade Organization
WWF-P	World Wide Fund for Nature, Pakistan
ZSD	Zoological Survey Department

Chapter 1

INTRODUCTION

1.1 WHAT IS BIODIVERSITY

Biological diversity or “biodiversity” has been defined as:

“the variability among living organisms from all sources including *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems”. (CBD 1992).

Diversity within species (or **genetic diversity**) refers to variability in the functional units of heredity present in any material of plant, animal, microbial or other origin. **Species diversity** is used to describe the variety of species - whether wild or domesticated) within a geographical area. Estimates of the total number of species (defined as a population of organisms which are able to interbreed freely under natural conditions) range from 2 to 100 million, though less than 1.5 million have actually been described. **Ecosystem diversity** refers to the enormous variety of plant, animal and micro-organism communities and ecological processes that make them function.

In short, biodiversity refers to the variety of life on earth. This variety provides the building blocks to adapt to changing environmental conditions in the future.

1.2 WHY IS BIODIVERSITY IMPORTANT?

Richness of species in an area indicates the total biodiversity of that particular area. However, it increases with the complexity of an ecosystem and vice versa. All species display genetic variation among individuals and populations. Genetic variation brings natural selection and adaptability to changes in the environment, which ultimately ensures species survival. Genetic diversity in domestic species and their wild relatives enables researchers to develop improved varieties of animals and plants for human needs. Diversity in wild plant species is major medicinal resource in ‘Yunani Tib’, and 40% of the allopathic drugs were originally made from wild medicinal plants, and it is insurance for further food security.

Biodiversity provides free of charge services worth hundreds of billions of rupees every year that are crucial to the well-being of Pakistan’s society. These services include clean water, pure air, pollination, soil formation and protection, crop pest control, and the provision of foods, fuel, fibres and drugs. As elsewhere, these services are not widely recognized, nor are they properly valued in economic, or even social terms. Reduction in biodiversity (including local extinction of species) affects these ecosystem services. The sustainability of ecosystems depends to a large extent on the buffering capacity provided by having a rich and healthy diversity of genes, species and habitats. In that respect, biological diversity is like economic diversity in a city; it is essential for long term survival and a sound investment in the future.

Conservation of biodiversity also makes good environmental sense. The air we breathe, the water we drink and the soil that supports crop production are all products of the complex interactions that occur among various living organisms on earth. If these vital ecological services are damaged, so are the physical conditions maintained by the world’s species and ecosystems. Losing biodiversity is a bit like losing the life support systems that we, and other species, so desperately depend upon.

The conservation of biodiversity is fundamental to achieving sustainable development. It provides flexibility and options for our current (and future) use of natural resources. Almost 70% of the population in Pakistan lives in rural areas, and a large part of this population depends directly or indirectly on natural resources. Conservation of biodiversity is crucial to the sustainability of sectors as diverse as energy, agriculture, forestry, fisheries, wildlife, industry, health, tourism, commerce, irrigation and power. Pakistan's development in the future will continue to depend on the foundation provided by living resources and conserving biodiversity will ensure this foundation is strong.

1.3 THE CONVENTION ON BIOLOGICAL DIVERSITY (CBD)

The future of life on Earth captured worldwide attention at the Earth Summit in Rio de Janeiro in 1992 when 155 nations, states and the European Union signed the *Convention on Biological Diversity* (CBD). This act signalled their intention to form a global alliance to protect habitats, species, and genes, to shift to sustainable modes of resource use, and to make the necessary policy, economic and managerial adjustments to guarantee that the benefits to be gained from the use of components of biological diversity are equitably shared across local, regional, and global societies. The CBD was signed by Pakistan in 1992 and ratified by the Cabinet in 1994.

Pakistan and other nations at Rio also adopted a comprehensive global work plan for sustainable development and global environmental protection well into the 21st century. Named 'Agenda 21', the plan contains 40 chapters of non-binding recommendations spanning the full range of social, economic, and environmental issues. One chapter is devoted to the conservation of biological diversity, and biodiversity-related activities are featured throughout other chapters.

Having agreed to conserve biodiversity, foster the sustainable use of forests, fisheries, agriculture and other resources, transfer related technologies, and share in financial investments, Pakistan faces the question: how can the nation determine what steps to take? Article 6 of the Convention calls for parties to:

develop national strategies, plans or programmes, or adapt existing plans, to address the provisions of the Convention; and to integrate biodiversity work into sectoral and cross-sectoral plans, programmes and policies.

The preparation of conservation and development strategies and action plans is not new to Pakistan. Pakistan has a well established procedure for the preparation of Five Year Plans and Annual Development Plans. Pakistan has a *National Conservation Strategy* (GOP/JRC-IUCN 1992) adopted as national policy in 1993 and accepted by the World Bank as the *National Environmental Action Plan*. A *Sarhad Provincial Conservation Strategy* (GoNWFP 1996) has been completed and other regional strategies (Northern Areas, Balochistan) are in preparation. There are also a number of sectoral plans for biological resources such as the Forestry Sector Master Plan (GOP 1992).

Pakistan has been involved in many aspects of biodiversity conservation including national park planning, endangered species protection and recovery, and plant and animal propagation and breeding. In some sectors, such as forestry, Pakistan has worked at larger scales to manage watersheds. However, experience with planning and implementing biodiversity-related measures has been limited. Pakistan has not yet approached biodiversity planning and implementation in the comprehensive, integrated manner required by the Convention.

Three processes used in sequence have been recommended for adoption in the Convention: country studies (biodiversity assessment), national strategies (developing goals and operational objectives), and action plans (identifying actions and implementation measures). All three are components of a larger and quite flexible process that can help countries build on existing institutions, programmes, investments,

and capabilities. This process is *cyclical*. It leads countries to periodically assess their biota and capacity, identify an evolving set of priorities and actions for responding to new opportunities, and prepare different reports to government, society and the Convention on their findings and conclusions. The process is multi-sectoral, involving a wide range of government ministries, private resource-using industries, and civil-society. And finally, it is *adaptive*. It is revised and reformulated as new information arrives, and the results of previous activities and investments are continually assessed.

1.4 A BIODIVERSITY ACTION PLAN FOR PAKISTAN

This *Biodiversity Action Plan* (BAP) for Pakistan is a first attempt to meet the planning requirements of the Convention. It rolls into one the three sequential processes called for under the Convention (the country study, national strategy, and action plan). The Pakistan BAP provides a brief assessment of the status and trend of the nation's biodiversity (Chapter 2), outlines strategic goals and objectives (Chapter 3), and identifies a plan of action that includes coordination arrangements and implementation measure (Chapters 4, 5, and 6).

Preparation of the BAP has been carried out under an agreement between the Government of Pakistan and the World Bank under the Global Environment Facility (GEF) Trust Fund. The World Conservation Union, Pakistan (IUCN-P) was selected as the lead agency in collaboration with the World Wide Fund for Nature Pakistan (WWF-P).

Broad participation has been sought through a consultative process which has included: periodic oversight by the national Biodiversity Working Group constituted by the Ministry of Environment, Urban Affairs, Forests and Wildlife (now the Ministry of Environment, Local Government, and Rural Development); a national level consultative workshop attended by 87 scientists and managers concerned with biodiversity issues; the preparation of a number of background papers by experts on sectoral and cross-cutting issues; and distribution of a draft BAP and its review at five provincial consultative workshops attended by 172 participants. For a full review of the consultative process leading up to BAP preparation, see Annex 1.

While the *BAP* necessarily covers much of the same ground covered by the National and Provincial Conservation Strategies, it is more focused on biodiversity and therefore provides a new and important perspective. Biodiversity conservation in Pakistan will be better served, at least initially, by a distinctive and focused action plan. Such a plan can promote awareness, unleash political will, and funding. The planning exercise will also be the subject of Pakistan's first National Report to the Conference of the Parties on the implementation of the CBD.

Chapter 2

BIODIVERSITY IN PAKISTAN - A REVIEW

2.1 CURRENT STATUS

Biogeography

Pakistan covers a land area of 882,000 km² (**Fig. 1**), almost all of which might be considered part of the watershed of the River Indus. From the Arabian Sea coast and the mouths of the Indus near the Tropic of Cancer, Pakistan extends some 1,700 km northward to the origins of the Indus among the mountains of the Himalayas, Hindu Kush and Karakorum, whose peaks exceed 8,000 metres (K-2, 8,611 m, the second highest in the world). Pakistan has a coastline of about 1,046 km with 22,820 km² of territorial waters and an Exclusive Economic Zone (EEZ) of about 196,600 km².

The land mass of Pakistan originated in the continent of Gondwanaland which is thought to have broken off from Africa, drifted across the Indian Ocean, and joined mainland Asia some 50 million years ago. With the creation of a land-bridge between Gondwanaland and south-east Asia, Indo-Malayan life-forms are thought to have invaded the evolving subcontinent, and these now predominate in Pakistan east of the River Indus. The north and west of the country is dominated by Palaeartic forms. Some Ethiopian forms have become established in the south-western part. Some 20 million years ago, the gradual drying and retreat of the Sea of Tethys created the Indus lowlands, and a violent upheaval 13 million years ago gave rise to the Himalayas. A series of Pleistocene 'ice-ages', the last ending just 10,000 years ago, gave rise to some unique floral and faunal associations.

With its dramatic geological history, broad latitudinal spread and immense altitudinal range, Pakistan spans a remarkable number of the world's broad ecological regions. According to various classification systems (UNEP 1995), Pakistan includes examples of three of the world's eight biogeographic 'realms' (the Indo-Malayan Realm, Palaeartic Realm and Africotropical Realm), four of the world's ten 'biomes' (the desert biome, temperate grassland biome, tropical seasonal forest biome and mountain biome) and three of the world's four 'domains' (the polar/montane domain, humid temperate domain, and dry domain).

Pakistan's seas fall biogeographically within the 'Arabian Seas Region 11' (Kelleher *et al.* 1995). The coastal area from Pakistan west to Somalia is considered by Hayden *et al.* (1984) to be the coastal-margin realm, 'Eastern Monsoon (J)'. Regarding its fauna, the Pakistani coast is considered the western-most extent of the vast Indo-Polynesian province.

Ecological Zones and Agro-ecosystems

Pakistan supports a wide array of ecosystems. However, any description of the natural ecological zones of Pakistan must be qualified by the statement that these zones have been so widely affected by human activity that very few truly natural habitats remain. To date, no systematic attempt has been made to define the ecological zones of Pakistan. Roberts (1991) has provided an initial classification of terrestrial ecosystems within 12 major vegetative zones (**Fig. 2**). These range from the permanent snowfields and cold deserts of the mountainous north to the arid sub-tropical zones of Sindh and

Figure 1: Map of Pakistan

Balochistan; from the dry temperate coniferous forests of the inner Himalayas to the tropical deciduous forests of the Himalayan foothills, the steppe forests of the Suleiman Range and the thorn forests of the Indus plains; and from the swamps and riverine communities of the Indus and its tributaries to the mangrove forests of the Indus delta and Arabian Sea coast.

The coast of Pakistan forms the northern boundary of the Arabian Sea, where oceanographic influences dominate over those of the continent, which is essentially a sub-tropical desert. The only major freshwater input comes from the Indus at the eastern extremity, which discharges some 200 km³ of water and 450 million tonnes of suspended sediment annually. This creates the Indus Cone, a 2,500 m deep pile of loose sediment on the floor of the Arabian Sea which fans away from the mouth of the river as a vast, sub-aqueous delta.

Coastal ecosystems include: numerous deltas and estuaries with extensive inter-tidal mudflats and their associated wetlands (the Indus Delta has an estimated 3,000 km² of delta marshes); sandy beaches; rocky shores; mangroves (four species); and seagrasses (as yet not well described). The seas of Pakistan are the richest in phytoplankton and zooplankton in the Arabian Sea Region (Pernetta 1993).

Through the conversion of natural habitats to agricultural use, a number of distinct agro-ecosystems have been created in Pakistan. The 1992 Forestry Sector Master Plan identifies nine main agro-ecological zones. The irrigated plains of Pakistan constitute the largest irrigated system in the world. Here, agro-ecosystems have almost entirely replaced the original tropical thorn forests, swamps and riverain communities of the Indus plains.

Species Richness and Endemism in Pakistan

Species richness is only one measure of biological diversity but the use of this parameter to assess biodiversity is limited by the fact that many species, particularly insects, fungi and micro-organisms, remain to be identified. Little work has yet been done to evaluate other measures of biodiversity in Pakistan, including *taxonomic* and *functional* diversity, and the amount of genetic variability within species and their sub-divided populations.

Because Pakistan is largely bounded by man-made borders and does not comprise an isolated entity in biogeographic terms, relatively few species are found only in Pakistan. Thus, Pakistan has relatively low national rates of endemism for some species (about 7% for flowering plants and reptiles, and 3% for mammals; **Table 1**) but higher for fresh-water fish (15%). However, the proportion of 'restricted range' species occurring in Pakistan is much higher, and for many of these species, Pakistan contains the bulk of the global population.

Mammals

Up to 174 mammal species (including yet to be published information from PMNH) have been reported to occur in Pakistan (**Table 1**). There are at least three endemic species & a number of endemic and near-endemic subspecies. Species belonging to the Palaearctic realm occur largely in the Himalayan and Balochistan uplands; those belonging to the Indo-Malayan realm occur primarily in the Indus plains including the Thar desert and Himalayan foothills. In addition, species with affinities to the Ethiopian region occur in the dry southwest and along the Makran coast and Thar desert of Pakistan (Roberts 1997).

Figure 2: Major Vegetative Zones of Pakistan (after Roberts 1991)

Birds

At least 668 species of birds have been recorded in Pakistan (**Table 1**), of which 375 are recorded as breeding (Roberts 1991, Z.B. Mirza, pers. comm.). A high percentage of Pakistan's bird fauna is migratory, with a huge invasion of Palaearctic winter visitors (over 30% of recorded species; Roberts 1991).

One third of Pakistan's bird species have Indo-Malayan affinities, and the remaining Palaearctic; of the latter, about one third are more specifically Sino-Himalayan in distribution (Roberts 1991). The Suleiman Range, Hindu Kush, and Himalaya in NWFP and Azad Kashmir comprise part of the Western Himalayan Endemic Bird Area; this is a global centre of bird endemism with 10 restricted range species in Pakistan. The Indus valley wetlands constitute a secondary area of endemism, with one restricted range species.

Reptiles and amphibians

Over 177 species of reptiles are known in Pakistan, (Chelonia 14, Crocodylia 1, Sauria 90, Serpentes 65). Of these, 13 species are believed to be endemic (**Table 1**). As with other groups, these are a blend of Palaearctic, Indo-Malayan and Ethiopian forms. One genus, the monospecific *Teratolepsis*, is endemic, while another, *Eristicophis*, is near-endemic. The Chagai Desert is of particular interest for reptiles, with six species endemic to Pakistan and a further six species found only here and in bordering parts of Iran. Important populations of marine turtles nest on Pakistan's southern beaches. As Pakistan is a predominantly arid and semi-arid country, it is not surprising that only 22 species of amphibians have been recorded, of which 9 are endemic.

Fish

Pakistan has 198 freshwater fish species, including introduced species. This fish fauna is predominantly south Asian, with some west Asian and high Asian elements. There are 29 endemic species. Also noteworthy are the 9 species of snow trout (sub-family Schizothoracinae) which occur in rivers of the northern mountains. Species richness is highest in the Indus river plains, the Kirthar Range and the Himalayan foothills, while the river systems of north-east Balochistan have the highest levels of endemism. Almost 800 species of fish have been recorded in Pakistan's coastal waters; however, no analysis of their population status and distributional range is available.

Invertebrates

Known species of invertebrates represent only a small proportion of the actual number likely present in Pakistan. However, some taxa are better known than others, especially for marine invertebrates (**Table 1**). Among the best known are also the Lepidoptera (butterflies), and at least two books on the butterflies of Pakistan are in preparation. The total number of butterfly species probably exceeds 400, with high rates of endemism in the Satyrids, Lycaenids and Pierids (PMNH data). Butterflies of high altitudes are largely either endemic or are derived from boreal fauna from the west. In the northern mountains alone, 80 species with many endemics, have been recorded (Hasan 1997).

Sofar, more than 5000 species of insects have been identified in Pakistan including 1000 species of Heteroptera, 400 species of Lepidoptera, 110 species of Diptera, 49 species of Isoptera, 109 species of Polychaetes, over 700 marine molluscs, 100 species of land snails, and 355 species of nematodes (see also section on Soil Biodiversity).

Plants

About 5,700 species of flowering plants (Angiosperms) have been reported to date in the 'Flora of Pakistan' (Nasir and Ali 1970), including both native and introduced species

(Table 1). In a preliminary analysis of the flora of Pakistan, Ali and Qaiser (1986) found that the number of species per genus is much lower than the global average, indicating a high diversity at the generic level; and that the flora includes elements of six phytogeographic regions, being in order of importance: the Mediterranean, Saharo Sindian, Euro-Siberian, Irano-Turanian, Sino-Japanese, and Indian. The families with the largest numbers of species are the Compositae (649 species), Poaceae (597), Papilionaceae (439), Brassicaceae (250), and Cyperaceae (202). Among the lower plants, there are at least 189 pteridophytes (ferns and their allies), of which 153 are Sino-Himalayan elements and 36 Euro-Siberian.

Four monotypic genera of flowering plants (*Douepia*, *Suleimania*, *Spiroseris*, *Wendelboa*), and around 400 species (7.8%) are endemic to Pakistan (R. Rafiq, pers. comm.). Most endemics are Irano-Turanian and Sino-Japanese elements. Almost 80% of Pakistan's endemic flowering plants are confined to the northern and western mountains (Ali and Qaiser 1986). Here, two phytogeographic provinces can be distinguished: the Balochistan Province and the Western Himalayan Province. The Kashmir Himalayas in particular are identified as a global centre of plant diversity and endemism. Families with more than 20 recorded endemics are Papilionaceae (57 species), Composite (49), Umbelliferae (34), Poaceae (32) and Brassicaceae (20); 31 of the endemics belong to the genus *Astragalus*, the largest genus in Pakistan with about 134 species (R. Rafiq, pers. comm.). New endemics are still being discovered.

Soil Biodiversity and Microbes

Soil biodiversity comprising populations of nematodes, annelids, snails and slugs, micro-arthropods, millipedes, centipedes, termites, and other micro-organisms such as algae, fungi, protozoan, and bacteria represents the largest group of living organisms. Estimates suggest that only 10% of the soil biodiversity and of other microbes has, so far, been studied and described. These organisms can be both extremely beneficial as well as damaging in different environments.

The fauna of plant parasitic nematodes in Pakistan includes 191 species belonging to 56 genera, 36 sub-families, 21 families, 9 super-families, 3 sub-orders, and 3 orders (Maqbool et al., 1992). Plant parasitic nematodes are known to affect crop yields, quality of the product produced and limited utilization of the nutrients. Burrowing, cyst, dagger, lance, reniform, root-knot, seedgull, sheath, and stunt nematodes are common in Pakistan and can cause 5-20% damage to host plants. Damages due to root rot disease produce a loss of up to 10-80% in different vegetable crops and fruit trees (Abdul Aziz Khan, pers. comm.).

In Pakistan, the information on soil biodiversity and microbes is very limited except for soilborne fungi and nematodes for which reliable and published research data are available (Mirza and Qureshi 1978; Ghaffar 1984). For root infecting fungi, Soilborne Diseases Research Centre, Department of Botany, University of Karachi, have identified more than 169 host plants. More than 4500 species of fungi (Naseem, pers. comm.) have been reported from Pakistan including: 24 genera and 68 species of *Ascomycetes*; 216 genera and 881 species of *Basidiomycetes*; 256 genera and 1321 species of *Deutromycetes*; and two genera and four species of *Myceliasterilia*. A total of 775 species of algae has also been reported (Shameel, pers. comm.).

According to the Greek philosopher Aristotles, earthworms are the soil builders and ecosystem engineers. They maintain and enhance soil fertility by way of adding nitrogen, phosphorus, potash, and magnesium and sodium to the soil. Not more than 20 species are known from Pakistan. Studies on their distribution and their relation with different ecosystems have not been attempted. A total of 50 termite species have so far been recorded from Pakistan (Ahmad & Akhtar 1994).

Table 1: Species Richness and Endemics for Major Plant and Animal Groups in

Pakistan. Reviewed by M. Farooq Ahmad (ZSD)

	Total Reported in Pakistan	Endemics	Threatened
Mammals	174 ¹	6 ²	20 ³
Birds	668 ⁴	?	25 ³
Reptiles	177 ¹	13 ⁵	6 ⁶
Amphibians	22 ⁷	9 ⁸	1 ⁷
Fish (freshwater)	198 ¹	29 ¹	1 ⁶
Fish (marine)	788 ⁹	-	5 ⁹
Echinoderms	25 ¹⁰	-	2 ¹⁰
Molluscs (Marine)	769 ¹¹	-	8 ¹¹
Crustaceans (Marine)	287 ¹²	-	6 ¹²
Annelids (Marine)	101 ¹³	-	1 ¹³
Insects	>5000 ¹	-	-
Angiosperms	5700 ¹⁴	380 ¹⁵	?
Gymnosperms	21 ¹⁴	-	?
Pteridophytes	189 ¹⁶	-	?
Algae	775 ¹⁷	20 ¹⁷	?
Fungi	>4500 ¹⁸	2 ¹⁸	?

¹ PMNH data

² T. J. Roberts, 1997

³ Mallon 1991

⁴ Z. B. Mirza (CERC)

⁵ Hafizur Rehman (ZSD)

⁶ IUCN Red List 1996

⁷ Fahmida Iffat (ZSD)

⁸ M. S. Khan (Herpetological Lab)

⁹ M. Farooq Ahmad, 1998

¹⁰ Qaseem Tahira (Karachi Univ.)

¹¹ Itrat Zehra (KU)

¹² Naseem Ghani, Sabahat(KU)

¹³ Javed Mustaqim (KU)

¹⁴ S. I. Ali (KU)

¹⁵ Rubina Rafiq (National Herbarium)

¹⁶ Fraser - Jenkins, 1991

¹⁷ Mustafa Shameel (KU)

¹⁸ A. Naseem

Genetic Diversity of Domesticated Species

Crop genetic diversity

Cultivated plant biodiversity may be characterised as the genetic variation existing among species, local land races, primitive cultivars and microbial species that have been domesticated, often including their immediate wild relatives. The conservation and sustainable use of crop genetic diversity is key to improving agricultural productivity and food security. Pakistan is rich in indigenous crop diversity with an estimated 3,000 taxa of cultivated plants (U.K. Baloch, pers. comm.). There are around 500 wild relatives of our cultivated crops, most of which are found in the Northern Areas of Pakistan (Ayub Q. Pres. Comm.). As a matter of fact, northern and western Pakistan comprise one of the world centres of the origin and diversity of cultivated plants. The oldest civilizations of Taxila, Harappa and Mohenjodaro domesticated species such as wheat, egg plant, pigeon pea and cucumber, whereas Northern Areas became the centre of diversity for several nut fruits. Many wild and local cultivars survived in Pakistan up to the era of the green revolution. However, with the introduction of new high yield crop varieties of food and cash crop, expansion of land for cultivation, deforestation and construction of dams, severe threats to wild and weedy land races of cultivated crops have been posed. The

principal crops in Pakistan are wheat, rice, maize, barely, pulses, oil seeds, cotton, sugarcane, tobacco, vegetables and fruits (both tropical and temperate). The genetic diversity of these crop plants are still prevalent in the form of wild relatives and local land races.

Recognizing the importance of preserving crop genetic diversity, Government of Pakistan started collections of indigenous plant germplasm in the early 1970's. Today, there are over 15,600 germplasm accessions from more than 40 different crops maintained by the Plant Genetic Resources Institute (NARC, Islamabad). Over 50% of the germplasm has been evaluated and presented in respective crop catalogues (U.K. Baloch, pers. comm.).

Livestock genetic diversity

The Indian subcontinent was one of the first places to domesticate cattle, buffalo and chicken. Pakistan now has two breeds of buffalo, eight cattle, one yak, 25 of goat, 28 of sheep, one of horse, four of camel, and three of indigenous poultry. The buffalo breeds Nili-Ravi and Kundi are dairy breeds. Among the cattle, there are two dairy breeds (Sahiwal, Red Sindhi), five draught breeds (Bhagnari, Dhanni, Dajal, Lohani, Rojhan) and one dual-purpose breed (Tharparkar or Thari); however, pure-bred animals are believed to constitute only 20-25% of the cattle population. Of the sheep breeds, 14 are thick-tailed and 14 thin-tailed. Almost 75-80% of Pakistan's domestic livestock breeds are derivatives of established breeds and the proportion of "non-descript" livestock to pure stock is on the increase, (I. Husain, pers comm.).

2.2 RECENT TRENDS IN PAKISTAN

The ecological trend of greatest concern in Pakistan today is the continuing loss, fragmentation and degradation of natural and modified habitats: the forest area, already greatly reduced and fragmented, is suffering further loss and degradation; most rangelands are suffering further degradation; and many freshwater and marine ecosystems have already been lost or are threatened with further destruction. Also of great concern in Pakistan today is the continuing 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. The degradation of agro-ecosystems and the accelerating loss of domesticated genetic diversity are also of grave concern in Pakistan.

Loss of Natural Habitats

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 forests, scrub forests and mangrove forests, arid and semi-arid rangelands (including sand dune deserts), inland wetlands, Indus Delta and coastal waters.

Forests

According to the Forestry Sector Master Plan (GOP 1992), forests, scrub, and planted trees on farmlands cover 4.2 million ha or 4.8% of the country. However, if plantations (generally single species, and hence of limited biodiversity value) are excluded, the total area of natural and modified coniferous, scrub, riverine and mangrove forests is less than 3.5 million ha (4% of the country). If scrub forests are excluded, the total area of 'tall-tree' forest falls to just 2.4 million ha (2.7%), of which four-fifths (2 million ha) have 'sparse' cover (patchy forests with <50% cover). More specifically, more than half of Pakistan's remaining mangrove forests, more than two-thirds of remaining riverine forests, and more than nine-tenths of remaining coniferous forests have less than 50% canopy cover. Good quality (>50% cover) 'tall tree' forest in Pakistan covers less than 400,000 ha (under one two-hundredth part of the country). The remaining forests,

fragmented and degraded as they are, appear to be rapidly disappearing.

Two recent studies suggest that Pakistan's woody biomass is declining at a rate of 4 to 6% per year (GOP 1992, Hosier 1993). Consumption (primarily for household firewood) exceeds production in all provinces except in the relatively sparsely populated Northern Areas; consumption is expected to increase in line with human population growth at about 3% per year. Both studies concluded that Pakistan's woody biomass could be totally consumed within the next 10 to 15 years.

The Household Energy Strategy Study (HESS; Hosier 1993) drew five lessons for sustainability. First, sustainability is only possible if more trees are planted, and conversion from old-growth biomass to farmland plantations will result in serious environmental degradation. As old growth forests are far more valuable for biodiversity than new growth, it is critical that this transition takes place as soon as possible. Second, a high level of planting must be maintained. Third, good tree management is vital; if the survival rate is less than 75%, commensurately more trees would need to be planted. Fourth, consumption can be significantly reduced by improved efficiency of fuelwood use and substitution with more modern fuels. And finally, no matter what the level of planting, population growth will eventually drive fuelwood demand so high that forest stocks will be destroyed. Hosier (1993) derives two policy implications: first, that family planning programmes must be given a high priority, and second, that economic growth is essential to enable more households to shift to modern fuels.

Regional case studies support the growing body of evidence for this approaching national disaster. In the upland coniferous forests, for example, a systematic study of the Siran project area (Hazara Division, NWFP) has indicated a 52% decline in the forest resource between 1967 and 1992. The study concludes that if present trends continue, the Siran forests will be gone within eight years (by the year 2005) (Archer 1996). Similar trends have been observed in the Kaghan and Allai valleys in Hazara Division. Moreover, plantation survival rates are well below the 75% target set by the HESS study.

The mangrove forests of the Indus Delta show a similarly dramatic decline. In the last 20 years, mangrove cover has been halved from 2,600 km² in the late 1970s (Pernetta 1993) to 1,300 km² in the mid 1990s. Once the largest mangrove forests in arid areas of the world, this national heritage is now quickly disappearing (Saifullah, 1997).

It is now feared that Pakistan is having 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 other natural and agro-ecosystems.

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 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.

Arid and semi-arid rangelands

Trends in biodiversity in Pakistan's arid and semi-arid rangelands, and to some extent in Pakistan's northern alpine grasslands, are no less disturbing than those in Pakistan's forest ecosystems. Pakistan has some 28.5 million ha of rangeland, of which 12.6 million ha are in Balochistan, 5.8 million ha in Punjab, 2.9 million ha in Sindh, 4.9 million ha in NWFP, 1.6 million ha in the Northern Areas and 0.8 million ha in AJK; of the rangelands in NWFP, Northern Areas and AJK, 1.05 million ha are alpine grasslands (GOP 1992). Of Pakistan's non-alpine rangelands, 90% (27% of the total land mass of

Pakistan) have been degraded.

Degradation of rangelands reduces the diversity of flora, and changes the vegetative composition. Increased competition for grazing affects wild herbivore populations (rodents, lagomorphs, ungulates) and the reduced prey base can then only support smaller populations of predators.

Wetlands and coastal waters

Freshwater flows in Pakistan's rivers have been substantially reduced by water diversion in recent decades. This has degraded and fragmented freshwater habitats, and caused increasing salinity in the Indus Delta. Many riverain wetlands have been drained and converted to agriculture. Major barrages, such as the Taunsa and Guddu Barrages, act as barriers to migrating fish and the Indus River Dolphin. This blockage of Indus River flow to the ocean by dams and barrages is considered to be the most important man-made threat to biodiversity in the marine ecosystem of Pakistan (Ahmed, 1997). Most of the natural lakes in Pakistan have disappeared over the last 50 years. However, several new lakes have been created upstream of dams constructed in recent years on the major rivers. Some of these have become important wintering areas for waterfowl, and these and other wetlands, particularly in the great valleys of Sindh and Punjab, are feeding grounds for large concentrations of ducks (Anatidae) and coots (Podicipitidae).

Among coastal ecosystems, mangrove forests are the most vulnerable to severe changes (Amjad 1996). Along the coast of Sindh, mangroves play an economically significant role protecting ports from excessive siltation, providing breeding grounds for commercially important penaid shrimps and fish larvae, and sanctuaries for migratory birds.

Depletion of Species, Populations and Wild Genetic Diversity

Extinct species

As an example of species loss, at least four mammal species are known to have disappeared from Pakistan within the last 400 years: Tiger (*Panthera tigris*); Swamp Deer (*Cervus duvauceli*); Lion (*Panthera leo*); and Indian One-horned Rhinoceros (*Rhinoceros unicornis*). A further two species have probably gone extinct in recent decades: Asiatic Cheetah (*Acinonyx jubatus venaticus*); and Hangul (*Cervus elaphus hanglu*). The Blackbuck (*Antelope cervicapra*) has been listed as locally extinct but has now been bred in captivity while the Asiatic Wild Ass (*Equus hemionus*) is believed to be threatened with extinction in Pakistan (Ahmad 1997).

Internationally threatened species

The latest 'IUCN Red List of Threatened Animals' (IUCN 1996) lists 37 species and 14 sub-species of internationally threatened or near-threatened mammals as occurring in Pakistan. Of these, two are critically endangered, nine endangered, 11 vulnerable, 24 near-threatened, five data deficient and one conservation dependent. The critically endangered mammals are Balochistan Black Bear (*Ursus thibetanus gedrosianus*) and Chiltan Goat (*Capra aegagrus chiltanensis*). Other endangered mammals include Snow Leopard (*Uncia uncia*), Indus River Dolphin (*Platanista minor*), Markhor (*Capra falconeri*), Urial (*Ovis vignei*), and Woolly Flying Squirrel (*Eupetaurus cinereus*)

Internationally threatened bird species occurring in Pakistan include 25 internationally threatened (one critically endangered, two endangered, 22 vulnerable) and 17 internationally near-threatened bird species (IUCN 1996). The critically endangered bird is the Lesser Florican (*Eupodotis indica*), while the Siberian Crane (*Grus leucogeranus*) and Great Indian Bustard (*Ardeotis nigriceps*) are listed as endangered.

Ten internationally threatened reptiles occur in Pakistan (three endangered, three vulnerable, three near-threatened and one data deficient), but there are no internationally threatened amphibians.

Species of national concern

Lists of internationally threatened species show only the tip of the iceberg. While there is little data available to demonstrate the decline of species' populations in Pakistan, the accelerating loss and fragmentation of natural habitats clearly implies such declines. Habitat fragmentation isolates populations of a species, exposing the species to a higher rate of loss of genetic diversity and a higher risk of extinction. While a few preliminary attempts have been made to draw up national lists of threatened species, including a list of some 500 species of plant species believed to be nationally rare or threatened (Davis *et al.* 1986), no comprehensive and systematic list of species of national concern has been compiled for Pakistan. Such a list would include: species which are nationally rare and declining; those which are nationally rare, not declining, but otherwise at risk (e.g. from population fluctuations, natural catastrophes, persecution, etc.); those which are highly localised in distribution; and those which are still widespread and common but are suffering significant decline.

Degradation of Agro-ecosystems and Domestic Genetic Diversity

Pakistan's agro-ecosystems are experiencing a number of trends damaging to biodiversity. These include soil loss, waterlogging, salination, intensification of production, and the increased use of pesticides. Soil degradation, waterlogging, and salination all reduce the productivity of agricultural lands, reducing the capacity of these lands to sustain soil micro-organisms, invertebrates and higher trophic levels, and indirectly placing greater human demand on natural biodiversity resources. Intensification reduces floral and faunal diversity in crops and field margins.

Globally, the genetic diversity of many crops is eroding. This is mainly due to the development during this century of very uniform cultivars, grown in very uniform environments, created by using the same sophisticated agricultural practices throughout.

The spread of cultivars in Pakistan is expected to lead to an erosion of primitive crop genetic variety. It is estimated that more than 90% of primitive cultivars/landraces of major food crops in Pakistan has already disappeared.

Critically Threatened Ecosystems

Given the widespread historic conversion of natural ecosystems to agriculture in Pakistan, the already highly advanced and rapidly accelerating depletion of habitats, and the continuing depletion of species and populations, almost all remaining natural or modified ecosystems in Pakistan are now critically threatened.

No systematic and comprehensive assessment has yet been made with the aim of objectively ranking the biodiversity importance of Pakistan's remaining natural ecosystems and habitats. However, based on various reports (e.g. Mallon 1991, ICBP 1992) and the opinions of recognised authorities (e.g. Roberts, pers. comm., R. Rafiq, pers. comm.), at least ten ecosystems of particular value for their species-richness and/or unique communities of flora and fauna are threatened with habitat loss and degradation (**Table 2**). Given their biodiversity importance and the high level of threat, these ecosystems are considered to be of critical concern for conservation.

Table 2: Critically Threatened Ecosystems in Pakistan

	ECOSYSTEM	CHARACTERISTICS	SIGNIFICANCE	THREATS
		Extensive mangroves	Rich avian and	Reduced freshwater

	ECOSYSTEM	CHARACTERISTICS	SIGNIFICANCE	THREATS
1	Indus delta and coastal wetlands	and mudflats Inadequate protected area coverage	marine fauna Diverse mangrove habitat Marine turtle habitat	flow from diversions upstream Cutting mangroves for fuelwood Drainage of coastal wetlands
2	Indus river and wetlands	Extensive wetlands	Migratory flyway of global importance Habitat for Indus river dolphin	Water diversion/drainage Agricultural intensification Toxic pollutants
3	Chagai desert	A desert of great antiquity	Many endemic and unique species	Proposed mining Hunting parties from the Gulf
4	Balochistan juniper forest	Huge and ancient junipers	Largest remaining juniper forest in the world Unique flora and fauna	Fuelwood cutting & overgrazing Habitat fragmentation
5	Chilghoza forest (Suleiman Range)	Rock outcrops with shallow mountain soils	Important wildlife habitat for several species at risk	Fuelwood cutting & overgrazing Illegal hunting
6	Balochistan subtropical forests	Mid-altitude forests with sparse canopy but rich associated flora	Very few areas now remain Important wildlife habitat	Fuelwood cutting & overgrazing
7	Balochistan rivers	Not connected with the Indus River System	Unique aquatic fauna and flora with high levels of endemism	Water diversion/drainage Overfishing
8	Tropical deciduous forests (Himalayan foothills)	Extend from the Margalla Hills NP east to Azad Kashmir	Perhaps the most floristically rich ecosystems of Pakistan	Fuelwood cutting & overgrazing
9	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 & overgrazing
10	Trans-Himalayan alps and plateaux	Spectacular mountain scenery	Unique flora and fauna; center of endemism	Fuelwood cutting & overgrazing Illegal hunting Unregulated tourism Habitat fragmentation

2.3. DIRECT CAUSES OF BIODIVERSITY LOSS IN PAKISTAN

The current losses of biodiversity have both direct and indirect (root) causes. The direct causes include activities resulting in the loss and degradation of habitats, over-exploitation of plant and animal species, agricultural intensification, pollution, invasion by

introduced species, and climate change.

Activities Causing Habitat Loss

Loss of habitats is the principal cause of the present high rate of global extinctions, and poses a severe threat in all biomes (UNEP 1995). There is no 'safe', non-trivial level of habitat loss which would not increase the risk of extinction of some species. No network of carefully selected reserves would suffice to protect all species. Changes in habitat quality, while less extreme than habitat loss, affect plant and animal populations. For many species, the consequences of even subtle changes in habitat quality can be confidently predicted from existing knowledge of their habitat requirements. Habitat fragmentation increases the risk of extinction by isolating small pockets of previously more connected populations. Small, isolated populations are more vulnerable to the loss of genetic variability, and run a greater risk of extinction.

Deforestation

The principal direct cause of deforestation is the consumption of fuelwood and timber. This consumption has already been detailed in relation to trends in forest loss, fragmentation, and degradation (see 2.2).

Grazing and fodder collection

The principal direct cause of degradation of Pakistan's rangelands and forests is the rapidly increasing domestic livestock population. Between 1945 and 1986, numbers of cattle almost doubled, while the numbers of buffaloes, sheep and goats more than tripled (GOP/JRC-IUCN 1992). 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 over-grazing has reduced forage production in Pakistan's rangelands to one-third the potential (a loss of almost 50 million tonnes per year), and in some areas to as low as 15% of potential forage production (GOP/JRC 1992). The problem is particularly acute in Balochistan.

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 of the Northern Areas and NWFP, but it also affects the agro-ecosystems of the *Barani* lands (eg. the Potwar plateau) and the Suleiman Rod Kohi (GOP/JRC 1992) e.g. about 11 million ha of Pakistan are affected by water erosion and the consequent mass wastage of soil. Water erosion results in increasing sedimentation of wetlands and resulting habitat degradation.

While wind erosion is not a major problem as water erosion, some two million ha of Pakistan (of which 1.5 million ha 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, falling water-tables due to the excessive pumping of water are causing a loss of vegetation cover and accelerated erosion. The loss of soil through water and wind erosion implies the loss of soil organisms, plant diversity, and the population of animals these plants support.

Water diversion and drainage

The diversion of water for irrigation, and the drainage of wetlands, are major causes of wetland habitat degradation in Pakistan. The mean quantity of water entering the Indus basin in Pakistan is 137.2 million acre-feet (MAF), of which 104 MAF are diverted at the

canal heads. Thus, 75% of the water entering the Indus basin in Pakistan is now diverted and only 25% reaches the Indus Delta and the Arabian Sea (GOP/JRC-IUCN 1992). Further major diversions are planned (e.g. the Ghazi Barotha project). Many small but valuable wetlands created by seepage or overflow from the massive irrigation system in the Punjab are threatened by drainage for agricultural land use. Others are threatened by the discharge of saline water into the wetland, or by falling ground water levels due to drainage programmes.

Activities Causing Species or Population Loss

Globally, many extinctions have resulted from human over-exploitation for food through hunting and collection. The search for precious commodities and for zoo specimens, medicinal plants, etc., has also impinged on some populations and obliterated others.

Hunting and trapping

Many bird and animal species are experiencing population declines in Pakistan due to illegal hunting for sport, meat, trade and even persecution. There is a strong tradition of hunting in Pakistan, and the impact of hunting has increased with the spread of modern guns and greater mobility. Virtually all large mammals have declined in number and had their range reduced as a result. A list of species thought to be declining due to unregulated human use is given in **Table 3**.

Fishing

Marine catches have steadily increased, and further catch increases are not possible without depleting stocks (Mallon 1991). However, the valuable shrimp fishery has begun to show signs of over-exploitation: the number of boats has risen rapidly; there is a tendency to fish in shallower waters; and there is an increased proportion of young shrimp in the catch (Amjad 1996). Concern has also been expressed about the incidental take of marine turtles by commercial shrimp trawlers using mechanised nets. The introduction of new technology and bigger fishing trawlers have also increased the tendency to over-exploit the fishery resource.

No data are available for native freshwater fish stock levels, but over-fishing is thought to threaten native fish species in some rivers (e.g. in Balochistan) and inland wetlands (e.g. Khinjar Lake).

Table 3: Human Use of Wildlife in Pakistan. Most of the species included are believed to be declining partially (or wholly) due to this use.

Human Uses	Species Affected
Illegal hunting	Most ungulates, game birds, and waterfowl
Persecution (in response to livestock and crop losses)	All predators (including brown and black bear, grey wolf, snow leopard, common leopard and leopard cat) as well as rhesus macaque.
Falconry	Saker, lagger and peregrine falcons
Domestication	Cranes, rhesus macaque, parrots, bears (dancing and baiting)
Medicinal purposes	Rhesus macaque, bears, musk deer, dolphins, pelicans, and lizards
Decoration	Most felids and mustelids (for fur); ungulates (for trophies); crocodiles and snakes (for skins); turtles (for shells and oil); and monal pheasant (for

Human Uses	Species Affected
	feathers).

Over-exploitation of plants

Pakistan is rich in medicinal plant resources due to its varied climatic and edaphic factors. Of the almost 6000 species of vascular plants reported to occur in Pakistan, about 1000 species have been recognized to possess phyto-chemical properties. Between 350-400 species are traded in different drug markets of the country and are used by leading manufacturing units of Unani and Homeopathic medicines. Besides, a number of medicinal plants and their derivatives required by pharmaceutical industries are also imported under a liberal import policy of the Government for those drug plants whose cultivation is not feasible in the country. Furthermore, about 40,000 - 50,000 tabibs (practitioner of Greco-Arabic medicine), voids (practitioner of Ayurvedic and folk-medicine) and a number of un-registered practitioners scattered in rural and remote hilly areas use more than 200 drug plants in traditional and folk-medicines as household remedies for several diseases.

In recent years, there has been a consistent growth in the demand for plant-based drugs and several plant products from a variety of species. This has given rise to large scale collection and habitat degradation. It has resulted in the scarcity of a number of valuable medicinal plant species and their wide range of chemical diversity is diminishing with the present scale of selective extraction from natural habitats (R. M. Ashfaq, pers. comm.).

Agricultural Intensification

Irrigation causes degradation of agro-ecosystems when it results in increasing salinity, sodicity, and waterlogging. This is an extremely serious problem in agro-ecosystems, but has limited direct impact on natural ecosystems. Salinity and sodicity affect 2.1 million ha in Sindh and 2.6 million ha in the Punjab (GOP/JRC-IUCN 1992). Most of the soils affected are of low agricultural potential, but nonetheless, almost 10% of Class I and II soils are affected. WAPDA classify all areas with a water table within 1.5 m of the surface as 'disastrous zones' and put this area at 5.3 million ha, against a total gross canal command area of 16.4 million ha. The NCS gives a much lower 'disaster area' of 200,000 ha, defined as the area for which the water table lies within 1 m of the surface.

The principal cause of loss of crop genetic diversity in Pakistan, is the development and increasing introduction and spread of High Yielding Varieties (HYVs) of crops. These HYVs respond better to water and fertilizer, but has posed a tremendous genetic threat to indigenous land races and primitive cultivars which were selected and maintained by exploiting heterosis by Pakistan's farmers. The genetic erosion is well pronounced in wheat, rice, sorghum, sugarcanes, and vegetables.

Though cross-breeding can lead to relatively rapid gains in productivity, it also increases the rate of loss of genetic purity if the parental stock is not maintained. Some 75-80% of Pakistan's domestic livestock are cross-breeds. There is an immediate need to monitor this situation by conducting scientific surveys.

The agricultural use of pesticides and fertilisers has increased rapidly in recent years. Pesticide use in Pakistan increased seven-fold in quantity between 1981 and 1992, from 915 million tonnes to 6,865 million tonnes (active ingredient), of which 80% were organophosphates (Baloch 1995). Direct mortality of wildlife, especially birds, has been frequently reported following the use of organophosphates. Pesticides destroy the natural biotic balance in agricultural soils and reduce the diversity and abundance of invertebrate fauna with a knock-on effect at higher trophic levels. The increasing presence of pesticides in agricultural run-off results in both acute and chronic effects in aquatic fauna and in fish-eating birds. It is estimated that 25% of all pesticides used in

Pakistan end up in the sea (M. F. Ahmad, pers. comm.).

The use of fertilisers grew at over 7% per year during the Sixth Five Year Plan (GOP/JRC-IUCN 1992). Excessive use of nitrogenous fertilisers leads to eutrophication of water channels and wetlands, the spread of aquatic vegetation, and reduced aquatic diversity; Khurshid (1991) cites Haleji, Drigh and Patisar Lakes as examples. Effect of hazardous chemical pesticides, fertilizers and those present in industrial effluents on biological diversity, especially on microbial populations and varieties, is well established. Preservation and quantification of the microbial population as a bench mark to see the effect of these chemicals is essential.

Pollution

Pollutants can have direct negative impacts on ecosystems and may reduce or eliminate populations of sensitive species as contamination reverberates along the food chain. Globally, soil microbes have suffered from pollution as industry sheds heavy metals and irrigated agriculture brings on salinisation. The excessive use of man-made chemicals, such as pesticides (synthesized to kill insects, diseases and weeds), is not only a direct threat to biodiversity but can also be toxic to human health through direct exposure or as residues in food and drinking water. Marine pollution (particularly from oil) has defiled many estuaries and coastal seas throughout the world.

In Pakistan, pollution is a growing problem particularly in urban areas and water courses (both freshwater and marine). The discharge of sewage effluent and industrial waste into aquatic and marine ecosystems in Pakistan is rapidly growing. The organic load of sewage depletes oxygen levels in water and so reduces the diversity of animal and plant life. Fish catches are reduced as a result of effluents added to the streams/natural waters. 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 (GOP/JRC-IUCN 1992). The resultant loss of fish and contamination of potential drinking water has considerable economic and health impacts on people in Pakistan.

Industrial pollution is particularly severe in the large industrial centre of Karachi with a population of over 12 million people. About 80% of the total wastewater remains untreated and is discharged into the sea through sewers and rivers (mainly Lyari and Malir). Many creeks and coastal waters in the Karachi areas exhibit eutrophication due to high levels of organic pollution. The characteristic smell of hydrogen sulphide in parts of the city is a sign of the intense bacterial activity from the presence of organic wastes.

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 floor 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 the commercial fin-fish and shrimp fisheries are unknown, but likely to be significant.

Introduced (Invasive) Species

Introduced, or alien invasive, species can have a significant negative impact on global biodiversity. This form of "bio-pollution" has increased in recent years as the global economy is spreading more creatures around - in ship ballast water, in containers and even in commodities. Introduced species are responsible for many recorded species extinctions, especially on islands, and are second only to habitat loss as a global cause of extinction (Simberloff 1995). In Lake Victoria (Africa) for example, the introduction of the Nile perch, a voracious predator, eliminated about 200 native fish species in the largest single vertebrate extinction ever recorded (Bright 1998).

The introduction of exotic species can also be done on purpose by natural resource managers most often to increase commercial production in agriculture, livestock, and forestry. In countries such as South Africa, Chile, Taiwan, Australia, Sweden and Finland, a majority of commercially planted forest tree species are introduced. This has resulted in higher production of woody biomass than would otherwise have been possible using only native tree species.

The effects of exotic species on the native fauna and flora of Pakistan have not been well documented. In attempts to meet the increasing demands of a rapidly growing human population, fast growing exotics have been introduced to alleviate shortages in timber, fodder, and fuelwood. Prominent tree species include *Eucalyptus*, hybrid poplar and *Paulownia* planted on farmlands and irrigated plantations. While these species do not appear to have threatened indigenous vegetation so far, the introduction of *Robinia*, *Ailanthus*, and *Eucalyptus* in the sub-tropical chir pine zone may pose threats to natural habitats in the future (R.M. Ashfaque, pers. comm.).

Many primitive land races/cultivars and wild relatives of agricultural crops (such as wheat, rice, pulses, sugar cane, and cotton) have suffered from genetic erosion due to introduction of high yielding varieties of these crops, habitat degradation and the excessive use of pesticides and herbicides (U.K. Baloch, pers. comm.). As the genetic traits of local species are lost, the ability to adapt to local environments and climates, and to tolerate diseases is greatly reduced.

Extreme care is required in the selection of species to be introduced to minimize any impacts on native species. Introductions should be considered only if absolutely necessary and should be accompanied by strategies to assess the magnitude of any threats to indigenous species. Where practical, indigenous flora and fauna should be restored to reduce loss of native biodiversity.

Global Climate Change

Average global temperature has been rising for more than a century, either as a result of natural fluctuation or the build-up of greenhouse gases. Climate change is likely to reduce biodiversity, and the goods and services that ecosystems supply in Pakistan by:

- increasing desertification in arid and semi-arid areas;
- flooding of the Indus Delta by rising sea waters with a consequent reduction in mangrove cover, and the loss of sandy beaches;
- increasing summer flooding in monsoon-affected areas;
- the retreat of glaciers and an upwards shift in ecological zones in the Himalaya-Hindu Kush-Karakorum;
- the desiccation and die-back of forests;
- reduced agricultural production; and
- changes in marine fisheries.

2.4 INDIRECT (ROOT) CAUSES OF BIODIVERSITY LOSS IN PAKISTAN

The direct mechanisms of biodiversity loss described above are not the root of the problem. As the *Global Biodiversity Strategy* points out, the roots of the crisis are not 'out there' in the forest or the rangelands, but embedded in the way we live. The *Global Biodiversity Strategy* identifies six fundamental causes of biodiversity loss:

- 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 the use and conservation of biological resources;
- deficiencies in knowledge and its application;

-
- legal and institutional systems that promote unsustainable exploitation; and
 - the steadily narrowing spectrum of traded products from agriculture, forestry and fisheries.

While these causes are common to most countries, the relative importance of each cause, and the particular ways in which each is manifest, are particular to each country and will be discussed for Pakistan below.

Increasing Demand for Natural Resources

Population growth

Though people are without doubt the most valuable resource in Pakistan, uncontrolled growth in their numbers puts undue pressures on all other national resources. Unrestrained population growth cannot continue without irreversible changes in Pakistan's ecosystems, with dire consequences for the people themselves (GOP/JRC-IUCN 1992). Pakistan's population grew from 31 million in 1951 to 110 million in 1991 and is estimated to be about 130.6 million today based on the 1998 census (National Institute of Population Studies data). With a growth rate of 2.6%, among the highest in Asia, Pakistan's population is expected to reach 200 million by the year 2010. The proximate cause of this growth is a high fertility rate, about 5.3 living children per woman. A corollary is a youthful age structure (about 45% of the population is under the age of 15), creating the potential for further rapid growth. The use of contraceptives among married women have doubled, from 12% in 1991 to 24% in 1998 (Hakim et al. 1998).

Increasing natural resource consumption

While per capita consumption of natural resources in Pakistan is much lower than in developed countries, the combination of population growth and growth in real economic demand means a doubling of the demand for natural resources every 12 years. We have already seen how the consumption of woody biomass for fuel and timber is reducing the total growing stock at the alarming rate of 4% per year (GOP 1992). As an energy-poor country, Pakistan has few alternatives, and these alternatives also pose potential threats to biodiversity. The burning of animal wastes reduces soil biodiversity by depriving soils of much-needed organic matter. The development of hydro-electric power threatens considerable adverse impacts on biodiversity, unless siting alternatives and mitigating measures are addressed early in the planning stage. The impact of these growing energy demands on biodiversity will be particularly acute where higher population densities and/or large-scale energy demands coincide with areas of high biodiversity.

Low primary productivity

Increasing natural resource consumption is exacerbated in Pakistan by low primary productivity in agriculture, rangelands, forestry, and fisheries. Increased productivity in agriculture, animal husbandry, silviculture, and pisciculture would reduce pressures on natural resources.

The low productivity of Pakistan's rangelands resulting from overstocking has already been discussed. While there is very little scope for increasing the area of agricultural land in Pakistan (almost all cultivable land is already cultivated), productivity per hectare is among the lowest in the world (GOP/JRC-IUCN 1992). There are three main contributing factors to this low productivity: limited availability of water; poor land and crop management; and soil degradation. Because of the limited availability of water under current water management regimes, only one-third of the available land suitable for double-cropping is actually double-cropped. Low yields result from many factors, including: soil deficiencies; inadequate seed-bed preparation in clay soils; limited application of modern cropping techniques; the system of absentee landlords;

fragmentation of land holdings; poor access to capital for expansion and improvement; poor level of new technology transfer to farmers; and, lack of advice concerning the use and timing of farm inputs. Application of fertilizers and pesticides (for increased production of food to feed increasing populations) has adversely affected soil microbial population in the crop fields. Applying naturally occurring microbes for increased production could be one solution to the diminishing microbial population in the ecosystems. Many of the most harmful pesticides have now been banned in Pakistan through recent amendments to the Pesticide Ordinance, 1971.

The scope for increased forest productivity, in particular through increased farm forestry, is substantial. The main reasons given by farmers for not growing trees are lack of water and land, while a shortage of advice and support to farmers are also identified as constraints (GOP 1992). However, many marginal lands, including waterlogged and slightly saline lands, have potential for plantation.

Forest productivity in irrigated forest plantations can be increased through additional inputs in the form of better irrigation water management, regular tending operations and timely felling and regeneration works. In the sub-mountainous forest and range areas, scientific grazing management based on participatory principles could effectively increase range productivity. Watersheds in the mountainous areas could be protected and productivity increased by regulating the yield from the forest areas and applying modern planting/regeneration techniques where possible. Wildlife production and harvesting on a scientific basis and with the participation of local communities could also increase the overall productivity of natural areas. There is also substantial scope for increasing production of fish in Pakistan, particularly in fish ponds.

The Economic Causes of Biodiversity Loss

The main economic cause of the erosion of biodiversity is that there is an 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, 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'. So, from the perspective of the individual, it pays to exploit biodiversity. But from the point of view of society as a whole, it often pays to seek ways of sustainably utilising that biodiversity and, on many occasions, it pays to protect it in some outright fashion. '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 failure, and intervention failure. These are exacerbated by weak property regimes, high discount rates, and the globalization of the world economy (McNeely 1988).

Market failure

Freely functioning markets are based on narrow self-interest. The upstream polluter has no incentive to account for the costs he imposes on a downstream user of the river. The downstream 'externality' is being ignored by the upstream polluter. This failure arises from the free functioning of the market place (Pearce and Moran 1994).

'Local market failures' of this kind are evident in the 'pollution' of many kinds of 'resource streams' in Pakistan. For example, the so-called 'timber mafia' exploiting the Himalayan forests do not need to concern themselves with the downstream siltation they are causing, or the species they are depleting; once they have logged 'their' forest, they will leave, and the nation will have to pay for the siltation of reservoirs and the reduction of biological diversity. Similarly, the industrial effluents discharged in streams, natural

waters and canals lead to losses of biodiversity and productivity, especially in fish catches. For example, the fish catch from River Ravi and its tributaries has been reduced by 5,000 tonnes annually. Decisions are often taken to exploit natural resources in Pakistan without taking full account of the social costs of habitat losses or extinction. Conversely, the social benefits of conserving biodiversity are rarely taken into account. Further, conventional methods of measuring national income in Pakistan (such as per capita GNP) do not recognise the drawing down of the stock of natural capital, and instead consider the depletion of national resources, i.e. the loss of national wealth, as net income.

Many conservation activities yield 'global benefits'. If, for example, biodiversity is conserved in Pakistan's Himalayan forests, it yields a benefit to people in other countries, both because they simply want it, and because they provide potentially important goods (e.g. medicinal properties of plants) and biogeochemical services (eg. carbon sequestration). But if Pakistan receives no financial or other resources to pay the 'incremental cost' of these 'global external benefits', it will have less incentive to look after these biological resources. This has been called 'global market failure' (Pearce and Moran 1994). This failure arises not from the functioning of the free market, but from the fact that the markets are not there at all. They are 'missing markets'. When these global missing markets coincide with local market failure and with intervention failure, as is the case in relation to Pakistan's most important and unique ecosystems, they do much to explain why biodiversity is disappearing.

Intervention failure

Governments have a habit of intervening in markets. They may do so with the best of intentions. Indeed, they often intervene to remove the main elements of the externality caused by market behaviour. This is exactly what environmental regulation does. Unfortunately, a great many other interventions are contrary to the interests of biodiversity, even where those interventions appear to serve some social purpose (Pearce and Moran 1994).

The principal form of intervention failure is 'sub-optimal pricing' - for example, of timber, agricultural products, water and energy. Underpricing is often deliberate, with the intention of promoting greater use and thus contributing to national development. In Pakistan, for example, irrigation water is underpriced (Pearce and Moran 1994), leading to overuse, wastage, and the consequent degradation of aquatic habitats and agro-ecosystems. Energy is similarly underpriced to stimulate development, leading to policies that obscure the environmental costs of energy production - whether based on fossil fuels or hydro power (Banuri 1997).

Weak ownership

Market and intervention failures are exacerbated by the weak ownership regimes characteristic of much of Pakistan's remaining natural habitats. A large proportion of Pakistan's forests, rangelands, wetlands and coastal waters are open access resources, or are ineffectively controlled under crumbling common property regimes, the centralised state or absentee landlords. Exploitation is allocated to those who pay most for the rights, not to those who most value the resource (McNeely 1988). The costs of protecting species and ecosystems from exploitation can be prohibitive for owners, be they government, communities or individuals, who often lack sufficient resources and capacity to enforce regulations or other restrictions (McNeely 1988).

There is a growing tendency for multinational firms to take biological and genetic materials as well as knowledge from indigenous cultural groups for their own study and exploitation without acknowledging their sources. Many instances have surfaced recently where multinationals have secured patents and intellectual property rights for the commercial distribution of medicines and genetic materials derived from indigenous flora

and fauna. (A. H. Cheema, pers. comm.). National legislation is needed to check this biopiracy; to regulate bioprospecting; and to protect sovereign property rights.

High discount rates

Market and intervention failures are also exacerbated by uncertainty linked, for example, to changing patterns of labour, policies and prices. In an uncertain future, the time horizon of people shrinks, and the discount rate increases. The discount rate is the percent by which we prefer current consumption over future consumption. A higher discount rate means that future consumption has less value, and therefore that people would prefer immediate benefits rather than greater delayed benefits. Where high discount rates coincide with low biological growth rates - as, for example, in the juniper forests and chilgoza forests of Balochistan - the economic activity is devoted entirely to immediate interests at the expense of future generations. A high discount rate is presumably a factor in the deforestation caused by Afghan refugees in Pakistan.

Globalisation of the world economy

Finally, market and intervention failures are exacerbated by various trends in the global economy. These include: the growth in international trade; the associated GATT agreement and establishment of the WTO; the internalisation of finance; the growing volume of inter-country financial flows; and the growing indebtedness of developing countries. These trends are influencing governments and economic agents to behave in ways that are highly destructive to the social and natural environment in general and to biodiversity in particular.

International trade has been growing at a rate much higher than global income. This affects biodiversity in many ways. First, by increasing international competition, it exposes Pakistan's industries to bankruptcy and induces government to provide hidden subsidies, such as cheap electricity, free water and lax pollution control standards, i.e., it exacerbates intervention failure. Second, it shifts production from subsistence towards commercial products, and thus reduces the concern of the producers for the long-term sustainability of resource use. Third, it encourages government leaders to pursue high trade and growth at the expense of all other benefits. Fourth, it diverts attention from the primary products derived from natural and agro-ecosystems, towards the production of secondary and tertiary goods and services. The recent GATT agreement, with the establishment of the WTO, restricts governments from using trade policies to protect the environment. The CBD Secretariat is developing cooperation with the WTO Committee on Trade and Environment to include the CBD's views on processes that have an impact on biodiversity (IUCN 1996 - 5Y).

Since the 1970s, there has been an even more dramatic growth in *international financial flows*. This further reduces the policy effectiveness and policy autonomy of the government. The government cannot use capital controls, interest rate policies or discriminatory practices to protect natural resources, as these would invite market retaliation in the form of damaging financial outflows.

Equally significant has been the growth in *foreign debt*. Though Pakistan has been far more restrained in terms of exposure to foreign debt than, for example, many Latin American countries, debt levels had risen to over 50% of national income by the 1990s. This has been matched by a similar growth in domestic debt, increased budgetary deficits and a general reduction in the solvency level of government.

The consequences of all these changes are that: (1) the government of Pakistan has far less room for manoeuvre today than two or three decades ago; (2) there is strong pressure on producers to compete in international markets and earn foreign exchange; and (3) conventional forms of cash subsidies have become impossible, and subsidies in kind have become difficult. Consequently, the only way of subsidising local producers is

to obscure and hide environmental costs. This is creating increasing pressures on natural resources and so on biodiversity.

Inequity in Ownership and Management of Biological Resources

In Pakistan, a weakening of customary community responsibilities for the use of natural resources can be attributed to several causes. With development, new sources of income have weakened reliance on local biodiversity resources, eroding the need and concern for sustainable use of these resources. This concern has been further eroded by the dis-empowerment of local communities, for example, by state intervention in the management of community forests. Increasing uncertainty (due, for example, to changing prices and inconsistent government policies) discourages a long-term view of resource use. And the free market, with its associated economic incentives, encourages a competitive race for natural resources at the expense of traditional sharing (SDPI 1995).

Chapter 3

PRINCIPLES, GOALS AND BROAD AIMS

The national goals and aims for the conservation and sustainable use of biodiversity in Pakistan should first and foremost relate to the specific problems affecting biodiversity in Pakistan. The needs of the people and their activities must be reconciled with the maintenance of biodiversity. Most often, successful conservation is achieved by changing human attitudes and use regimes and by promoting collaborative management. Conservation must be carried out with the cooperation of government, NGOs and local people. For this to happen, there is a need to agree upon a set of guiding principles, goals, and broad aims.

The principles that could provide guidance to Pakistan's efforts to conserve and manage its biodiversity include the following:

- Every form of life is unique and warrants respect from humanity.
- Biodiversity is a key indicator of the health of the environment in which we live. We depend on biodiversity for a vast array of goods and services, and should, therefore, accord priority to its conservation, management and sustainable use.
- Conservation of biodiversity is a common concern to all citizens of Pakistan. While governments are accountable for its conservation and management, all Pakistanis have stewardship responsibility for the country's natural heritage.
- Biodiversity conservation is an investment that can yield substantial benefits; ensuring a larger market share of benefits to local communities can reduce biodiversity losses.
- All sectors that influence biodiversity should help plan its conservation.
- Biodiversity management actions must be based on sound ecological principles, scientifically valid information, and local knowledge.
- Natural resources cannot be sustainably managed exclusively by communities or governments. The government must recognize the interests and rights of the local communities, while the communities must recognize that such management is part of a larger political and environmental framework.

3.1 THE GOAL OF THE BIODIVERSITY ACTION PLAN

In becoming a signatory to the CBD, Pakistan has endorsed the global priority accorded to biodiversity conservation and sustainable use. Through this *Biodiversity Action Plan*, Pakistan will evolve its own strategy for containing the erosion of biological diversity and ensuring its conservation for the benefit of present and future generations.

The overall goal of the Biodiversity Action Plan is, therefore:

To promote the conservation and sustainable use of Pakistan's biodiversity, and the equitable sharing of benefits arising therefrom, for the well-being and security of the nation.

3.2 BROAD AIMS OF THE BIODIVERSITY ACTION PLAN

Because most actions for the conservation and sustainable use of biodiversity are closely interlinked, it is difficult to find a satisfactory way of classifying actions within a few broad categories. The *Global Biodiversity Strategy* (WRI/IUCN/UNEP 1992), the most advanced global strategy for biodiversity conservation, classifies actions under five broad headings. The system of classification adopted by the GBS is not internally consistent, in that three of the objectives are defined by *level* of action (local, national, and international), while the other two are defined by *type* of action ('to apply the tools and technologies', and 'to build human capacity', for conserving biodiversity). Despite this

inconsistency, the GBS approach has its advantages. The use of *levels* of action helps to indicate *by whom* actions must be taken, and so goes some way towards the next step of identifying specific agencies to take forward specific actions. It is appropriate to highlight the 'tools and technologies' (which include, for example, protected areas and species recovery plans) as these must surely be central to any biodiversity strategy. Similarly, it is appropriate to highlight 'building human capacity' as this is vital to all other actions.

The major aims of the BAP can therefore be stated as:

- 1) **To create a policy framework that fosters the sustainable use of biological resources and the maintenance of biodiversity;**
- 2) **To strengthen and promote National Biodiversity Conservation Programmes and develop international and regional cooperation;**
- 3) **To create conditions and incentives for biodiversity conservation at the local community level;**
- 4) **To strengthen and apply more broadly the tools and technologies for conserving biodiversity; and**
- 5) **To strengthen human knowledge, will and capacity to conserve biodiversity.**

The specific objectives and actions that will be required to meet these broad aims are described in the following sections, which have been organized according to the principal articles of the Convention.

Chapter 4

PROPOSALS FOR ACTION

4.1 PLANNING AND POLICIES

Identifying the Issues

Article 6 of the *Convention on Biological Diversity* requires parties to develop national strategies, plans or programmes for conservation and sustainable use, and to integrate these into other relevant sectoral plans. This requirement is partially met by the current *Biodiversity Action Plan for Pakistan*.

Integration with the national and provincial conservation strategies

The *National Conservation Strategy* was adopted as national policy in 1993 and has been accepted by the World Bank as the National Environmental Action Plan. As expected, since it addresses the broad spectrum of issues relating to the environment, the goals of the NCS are expressed in broad terms: “conservation of natural resources”, “sustainable development” and “improved efficiency in the use and management of resources”. There are 14 core programmes in the NCS, and though one of them deals with conserving biodiversity and many of the other touch on biodiversity related issues, they are clearly inadequate to address in a deeper and more comprehensive way the issues relating to the depletion of biodiversity in Pakistan. The BAP will fill this void and give direction and set out an action programme for conserving the nation’s biodiversity.

The Eighth Five Year Plan identifies the need to develop provincial conservation strategies to carry forward the NCS into implementation. The *Sarhad Provincial Conservation Strategy* has been completed and others (Balochistan, Northern Areas) are in preparation. Though the SPCS is rather more specific than the NCS about actions needed, with a chapter devoted to 'biological diversity, parks and protected areas', it too does not comprehensively address the requirements of the Convention. Indeed, the SPCS refers to the current national biodiversity action planning process and the need to develop a similar provincial Biodiversity Action Plan. At a more local level, the preparation of district conservation strategies has commenced in Chitral and Abbotabad, and these are expected to provide ground-level support to the BAP.

Integration with sectoral policies and plans

Existing *sectoral* policies and plans in Pakistan most pertinent to the conservation and sustainable use of biodiversity are those relating to wildlife, forestry, fisheries and agriculture.

At the federal level, the formulation and coordination of wildlife policy and plans have been, since 1974, the responsibility of the National Council for Conservation of Wildlife (NCCW). At the provincial level, wildlife policy and planning are the responsibility of the provincial wildlife departments and/or the Wildlife Management Boards, wherever they exist. Pakistan's existing wildlife policies and plans tend to place heavy emphasis on fauna to the exclusion of flora, and on game animals as opposed to non-game species. They relate almost exclusively to the establishment of protected areas, and taking and trade controls for listed species. Many of the more comprehensive requirements of the CBD are therefore not addressed. A new national *Wildlife Policy* has been drafted by GOP and circulated to provinces for their comments. This policy is more comprehensive in that “wildlife” is defined to include all wild species and their habitats; however, it does not include domesticated fauna or flora, or genetic material.

Other sectoral policies dealing with biological resources tend to address biodiversity as a marginal issue. The Forestry Sector Master Plan (GOP 1992) formulates programmes for soil conservation and watershed development, wood production, ecosystems and biodiversity, and institutional strengthening. While all these programmes are of relevance to biodiversity conservation and sustainable use, the specific provisions for ecosystems and biodiversity are limited in scope and scale to: replanting 75,000 ha of mangroves in the Indus Delta and the associated planting of 5,000 ha of fuelwood plantations; protecting 20,000 ha of juniper forest and 5,000 ha of chilgoza forest in Balochistan; and unspecified actions to survey and protect species and ecosystems. The total financial allocation for these programmes was under Rs.350 million for the five year period 1993-1997. These technical and financial provisions are clearly inadequate, and there is a critical need to raise the priority given to biodiversity issues in forest policies and plans. A Forestry Sector (Forest, Watershed, Rangeland and Wildlife) Policy of Pakistan has been prepared by the Ministry of Environment, Local Government and Rural Development for Cabinet approval.

Agricultural policy, as reflected in the Eighth Five Year Plan, addresses a number of issues relevant to the CBD, including increasing primary production, reducing land degradation, improving irrigation and drainage, improving soil management, and expanding integrated pest management; however, it does not adequately address the issue of biodiversity *per se*. Fisheries policy, as reflected in the same plan, focuses on aquaculture and makes no reference to the conservation of indigenous aquatic biodiversity.

Integration with national development plans

The main planning instruments in Pakistan are the Perspective Plan, Five Year Plan and Annual Development Plan. Prior to Cabinet approval of the NCS in 1992, these plans gave scant attention to environmental issues in general, and even less to biodiversity in particular. However, the influence of the NCS is clearly seen in the Eighth Five Year Plan (1993-1998), which identifies the environment as a 'critical issue'. Conservation of natural resources and protection of the environment are clearly identified as plan objectives. The plan prioritises the development of a coherent legislative framework, institutional strengthening, and the promotion of environmental awareness. Mention is made of the expansion and management of protected areas, *ex-situ* measures for plant conservation, and 'action' for the preservation of endangered species.

The total provision for NCS-related environment projects is Rs 21.585 billion, of which Rs 1.624 billion is allocated for 29 (unspecified) schemes for 'conserving biodiversity'. A further Rs 95.195 billion is allocated for environment related programmes but a substantial study would be required to assess the relevance of these to biodiversity conservation. Despite these provisions, the Eighth Five Year Plan remains weak on the conservation and sustainable use of biodiversity and falls far short of addressing in a comprehensive manner the full scope of the CBD. It is critical to ensure the integration of the provisions of the current *Biodiversity Action Plan* into the Ninth Five Year Plan and into both national and provincial Annual Development Plans.

OBJECTIVES AND RECOMMENDED ACTIONS

Objective 1: Adopt appropriate policies and plans that promote the conservation and sustainable use of biodiversity and integrate biodiversity conservation measures into sectoral plans and programmes.

Action 1.1 Secure high level and multi-sectoral support for its implementation.

Action 1.2 Prepare and adopt the new Wildlife (or "Biodiversity") Policy, at both the provincial and federal levels.

Action 1.3 Institutionalise the biodiversity strategy process initiated by the current BAP, at both the national, provincial and local levels.

1.3.1 This process should complement the National and Provincial Conservation Strategies. It should also be both iterative and cyclical, involving the preparation, periodic review and development of a country strategy and action plan to address the provisions of the CBD. It should ensure broad, multi-sectoral involvement as well as wide participation from all sectors of society.

1.3.2 Promote coordination among the institutions involved in conservation of biodiversity at federal and provincial levels.

Action 1.4 Integrate biodiversity considerations into the Perspective Plans, Five Year Plans and Annual Development Programmes (ADPs), and into relevant sectoral plans, particularly those for wildlife, forestry, fisheries and agriculture.

Action 1.5 Promote the preparation of provincial conservation strategies with strong elements of biodiversity conservation and cross-reference to Five Year Plans and provincial ADPs.

4.2 LEGISLATION

Identifying the Issues

Legislative support is required for the implementation of many of the articles of the CBD. Although the term “biological diversity” is new and therefore does not find expression in much of the existing legislation, Pakistan has a wide range of laws relating to the conservation of the different components of biodiversity (forests, fisheries, wildlife etc). A review of existing legislation is provided in **Annex 2**. What is required is to review the relevant existing laws, to relate them to the CBD, and where necessary to amend them or to enact new laws.

The first piece of legislation targeting environmental conservation as a whole was the Pakistan Environmental Protection Ordinance of 1983. This has very recently been replaced by the Pakistan Environmental Protection Act of 1997. The relevance of this Act to biodiversity conservation is primarily through the screening process (for proposed projects) which it introduces. In the implementation of the provisions of this Act in relation to biodiversity conservation, it is important to ensure that IEEs and EIAs adequately address the relevant issues and that the Environmental Protection Agency (EPA) has the required skills to evaluate these reports in relation to the conservation of biodiversity in Pakistan.

The legislative framework for the conservation of wildlife consists of the various provincial Acts and Ordinances. These laws provide for the establishment of Provincial Wildlife Management Boards with the responsibility for the formulation of policy and the supervision of activities relating to the conservation and management of wildlife. In practice, boards have not been set up in some provinces, and even where they have been set up, they are largely ineffective.

With regard to the conservation of species, a serious weakness in the law is that it deals excessively with animal species and no provision is made for the protection of threatened and endangered plant species. The existing laws attempt to control the hunting of designated game animals, but most of these regulatory measures have proved difficult to enforce. Some rules have been framed under the existing laws to protect a few selected

species (falcons, cranes); the need for introducing additional control measures for other key threatened species should be examined.

Under the existing wildlife law in Pakistan, there are three categories of Protected Areas: National Parks, Wildlife Sanctuaries, and Game Reserves. Current thinking on Protected Area management is that, to be effective, the communities living alongside the area should have a hand in management and should derive some benefits from the area. None of the existing categories of protected areas make allowance for participatory management by communities. A draft Model Wildlife Law empowering local communities to participate in joint wildlife management with governments has been prepared and is currently under review by provincial governments.

The Forest Acts and other related legislation of the provincial government deal primarily with the exploitation of the forests. In practice, there is no clear jurisdiction over the forests, and different government agencies use this resource for their purposes through the mandates provided by their own pieces of legislation. Conservation of forest biodiversity therefore goes by default.

In 1993, the Federal Government adopted the policy (through a long term Master Plan) to “recognize, safeguard and manage animal and plant diversity in forest areas under the conservation area and working plan systems”. The Ecosystem and Biodiversity Action Programme formulated under the Master Plan includes schemes for the rehabilitation of mangrove forests of the Indus Delta, preservation and protection of the juniper and chilgoza pine forests in Baluchistan, protection of all endemic and endangered species of flora and fauna and ecosystems through designated conservation areas and scientific management of these areas. The Plan also recommends updating provincial forest legislation to promote, amongst other things, the conservation of natural forest ecosystems and suggests a model law for this purpose. It, therefore, assumes that the groundwork has been laid for an effective programme for the conservation of forest biodiversity outside the protected area system. It is now necessary to move into action, particularly at the provincial level.

Fisheries constitute an important component of Pakistan biodiversity. The Federal Government is responsible for marine fisheries beyond the provincial jurisdiction limits of 12 miles from the coast. Freshwater and estuarine fisheries come under provincial jurisdiction. The existing laws prohibit the capture of certain species of fish below a prescribed size and the use of poison or explosives, regulate fishing craft and fishing gear, and empower the government to designate any water body as a sanctuary. These measures, both in terms of coverage and enforcement, are inadequate for affording protection to Pakistan’s aquatic biodiversity and failure to address the issues would eventually lead to a serious erosion of the resource base on which the fisheries industry rests.

Considerable potential for the conservation of biodiversity exists at the local government level. The functions delegated to local government coincide with many aspects of biodiversity conservation and these could promote a window of opportunity for the implementation of conservation measures at the local level.

OBJECTIVES AND RECOMMENDED ACTIONS

Objective 2: Develop an Effective Legal Framework for the Implementation of the CBD and Related Conventions

Action 2.1 Review the 1973 Constitution to make the conservation and sustainable use of biological diversity the concern of the state and the citizen.

Action 2.2 Review all relevant existing legislation in Pakistan against the obligations under the CBD and other biodiversity-related conventions to determine

the need for amendments and/or new legislation to meet these obligations.

2.2.1 As part of this process:

- existing legislation should be reviewed to identify deficiencies and other shortcomings in relation to biodiversity conservation in Pakistan and to define clearly the jurisdictional limits of different law enforcement agencies;
- local government laws should be amended to provide for greater community level participation in activities supporting biodiversity;
- the laws relating to communal ownership and access to biological resources should be reviewed and revised so as to protect and encourage customary natural resource management systems;
- detailed supporting rules and regulations for legislation implementing the objectives of the CBD should be framed in order to provide clear guidelines and effective implementation.

Action 2.3 Ensure that the draft Model Wildlife Law currently under review embodies conservation measures suggested for adoption by the CBD and other related conventions.

Action 2.4 Update and rationalise legislation on endangered and exploited flora and fauna in Pakistan, in line with the CBD and according to the specific requirements of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), and other relevant conventions mentioned in Annexure 2 of this document. Enhance penalties for violations and introduce a system of rewards for compliance.

Action 2.5 Ensure, as far as possible, that reforms in the forestry sector are integrated with reforms in the wildlife sector and that new forestry laws are also framed fully within the context of the CBD and other international conventions.

Action 2.6 Finalise detailed rules, regulations, and guidelines for the implementation of IEE/EIA under the Environmental Protection Act, 1997 paying due regard to the need for addressing matters relating to the conservation of biodiversity.

Action 2.7 Develop access legislation as a matter of priority to comply with Article 15 (genetic resources), Article 16 (technology) and Article 19 (handling of biotechnology and distribution of its benefits) (see Section 4.11).

Action 2.8 Develop guidelines/regulatory measures with regard to biosafety relating to the development, use, transport and import of Living Modified Organisms (LMOS).

Objective 3: Enhance the Enforcement of Biodiversity-related Laws

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- Action 3.1 Improve the effectiveness of existing legal mechanisms by creating greater awareness of conservation regulations and enhancing the capacity of law enforcement agencies (including the departments of wildlife, police, customs and quarantine). This should include the provision of training to relevant officers in identifying the species listed in CITES Appendices I and II.*
- Action 3.2 Recognize the right of citizens, Community-Based Organizations (CBOs) and NGOs to challenge administrative decisions which they believe have been taken in violation of conservation law.*
- Action 3.3 Take immediate remedial measures to protect species that are presently being subject to illegal trade.*
- Action 3.4 Take all necessary measures to fulfil the commitments of the agreements already signed under related International Conventions.*

4.3 IDENTIFICATION AND MONITORING

Identifying the Issues

Two of the objectives of the CBD relate to the conservation of biological diversity and the sustainable use of the components of biological diversity. In order to target conservation and sustainable use measures, each country party has to have a clear idea of the ecosystem, species, and genomes that are under threat through overuse, habitat degradation, and spread of invasive species. Annex 1 of CBD gives guidelines to the parties on identifying the component of biodiversity which should be the target of attention. They are described as:

- 1) **Ecosystems and habitats:** containing high diversity, large numbers of endemic or threatened species, or wilderness; required by migratory species; of social, economic, cultural or scientific importance; or, which are representative, unique or associated with key evolutionary or other biological processes;
- 2) **Species and communities** which are: threatened; wild relatives of domesticated or cultivated species; of medicinal, agricultural or other economic value; of social, scientific or cultural importance; or of importance for research into the conservation and sustainable use of biological diversity, such as indicator species; and
- 3) **Described genomes and genes** of social, scientific or economic importance.

Article 7 goes on to stress the need for monitoring changes in the components of biological diversity which are under threat and identifying processes or activities that continues to cause adverse impacts on biodiversity, so that effective remedial measures could be taken through the other Articles of the Convention.

In Pakistan, information about the component of biodiversity is very incomplete; at best, only a provisional identification can be made of the components of biological diversity requiring special conservation measures. There is no biodiversity information and monitoring centre to maintain, store, and organise data or to analyse, evaluate and disseminate data in a usable form. Data derived from the identification and monitoring of biological diversity, and of activities having or likely to have adverse impacts on biological diversity, are scattered among a large number of organisations. Data on the flora of Pakistan, for example, are held by the National Herbarium and the University of Karachi (Department of Botany). Additional data are available with botanical departments in other universities and museums, provincial forest departments, companies collecting and trading in medicinal plants, natural resources projects, and overseas herbaria and botanical gardens with collections from Pakistan.

Similarly, Pakistan has a number of different institutions working on particular biodiversity topics. Many of these institutions hold valuable collections. However, the capacity of these institutions to organise, analyse, evaluate and disseminate data requires strengthening. Although Pakistan has a pool of excellent taxonomists, their numbers are insufficient to address the tasks at hand. As a result, the scientific accuracy of biodiversity-related publications has sometimes been problematic; the botanical checklists contained in forest working plans, for example, are often in error. Similarly, published checklists of birds often contain doubtful records. There is also a tendency to publish 'new' species without observing standard procedures.

It is first necessary to collate and authenticate the available data on biological diversity in Pakistan. This should be followed up by a biodiversity assessment that would identify the ecosystems, species, and genomes for which special conservation measures are needed. Simultaneously significant gaps in the data should be identified and remedial action taken.

OBJECTIVES AND RECOMMENDED ACTIONS

Objective 4: Expand and Improve the Information Base on the Biodiversity of Pakistan

Action 4.1 Appoint a national centre (or several provincial centres) to coordinate biodiversity identification and monitoring activities.

4.1.1 The centre could:

- strengthen other institutions or organizations involved in biodiversity work;
- provide guidance on the design and maintenance of national and provincial inventories;
- coordinate existing and new specimen collections;
- promote standardization of data collection and storage to ensure the comparability and transferability of information among databases;
- provide support for local initiatives in database establishment and networking;
- create and manage meta-databases;
- disseminate information on biodiversity to policy makers, natural resource managers, educators, and other parties;
- implement Actions 4.2 to 4.6 below.

Action 4.2 Identify national priorities for biodiversity conservation, including threatened ecosystems and species, "hot spots", and zones of endemism (in accordance with Annex 1 of the Convention).

4.2.1 This should include:

- the use of existing data (scientific papers, species lists, museum collections, etc.), to update species distribution, status, and taxonomy;

- the use of satellite imagery to develop a definitive map of the remaining natural and semi-natural ecological zones of Pakistan;
- the identification of key information gaps; and
- the implementation of additional surveys and research studies as required.

- Action 4.3 Create a National Red Data List of threatened flora and fauna.*
- Action 4.4 Advance knowledge of indigenous microflora for use in biodiversity conservation.*
- Action 4.5 Store and catalogue information in computerized databases, to be maintained by “custodian” agencies.*
- Action 4.6 Foster the sharing of information on biodiversity among research institutions, government agencies, NGOs, and local communities. The incorporation of traditional (local) knowledge with science has great potential for strengthening the information base on biodiversity.*

Objective 5: Develop and Institutionalize Systems to Monitor Key Elements of Biodiversity

- Action 5.1 Develop and institutionalize regular resource monitoring by the agencies responsible for the conservation and sustainable use of natural resources in Pakistan. Particular attention should be accorded to monitoring the status of protected areas and the components of biodiversity identified in Annex 1 of the Convention. Monitoring should also be carried out with the active participation of local communities.*
- Action 5.2 Provide periodic assessments (e.g. through a “State of the Environment” report) of key elements of biodiversity and indicators of progress/failure, including resources allocated by government towards biodiversity conservation.*

4.4 IN-SITU CONSERVATION

Identifying the Issues

The *Convention on Biological Diversity* recognises *in-situ* conservation as the primary approach to biodiversity conservation (Article 8). Of particular importance is the balance to be struck between conservation measures within protected areas (PAs) and measures beyond PAs in the wider countryside.

It is generally recognized that activities which occur in areas adjacent to protected areas may be critical to the viability of the protected areas themselves. Adjacent communities ultimately control the protected area to the extent that if the local population is negatively affected by the protected area, then this area may be destined to fail. However, if local people are involved in the management of protected areas and other forms of development compatible with the goals of the protected area are promoted in adjacent areas, then the protected area’s long-term viability is likely to be enhanced.

The majority of Pakistan’s protected areas were created in the 1970s, and paid insufficient attention to ecological criteria and the requirements of local communities. Today, many of the PAs are too small and isolated to be effective. Most ecological zones

are not adequately represented within the protected area system, including a majority of the critically threatened ecosystems identified in this plan (**Table 2**). For example, there are no marine PAs, very few coastal PAs, and no formal designation to protect the remaining juniper forests in Balochistan.

There is also considerable regional disparity in the distribution of PAs across Pakistan. For example, whilst over 16 % of Punjab is protected as one of three PA categories (National Park, Wildlife Sanctuary or Game Reserve), about 6% of NWFP and less than 6% of Balochistan is formally protected (**Table 4**). This is unfortunate, since these are the regions where most of Pakistan's remaining biodiversity is concentrated.

Table 4: Summary of Protected Areas in Pakistan (based on NCCW data)

Region/ Province	National Parks	Wildlife Sanctuaries	Game Reserves	Un Classified	Total PAs	Total Area Conserved (ha)	% of Total Land Area Protected
Azad Jammu Kashmir	1	0	8	0	9	51,998	3.91
Balochistan	2	15	7	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
Totals	14	99	96	16	225	9,170,121	10.40

a. One of the Wildlife Sanctuary in Balochistan has been redesignated as Game Reserve in 1998.

b. Two of the Wildlife Sanctuaries in Northern Areas have been redesignated as Controlled Hunting Areas in October 1998

By definition, a Wildlife Sanctuary offers greater protection than a National Park, while a Game Reserve affords no protection to habitat but merely regulates hunting. As a result, the value of Game Reserve for long-term conservation of biodiversity is very limited. If only National Parks and Wildlife Sanctuaries are taken into account, then Pakistan lags behind many other Asian countries (including Nepal, Sri Lanka and Bhutan) in terms of the percentage of national land area which has been designated for conservation.

The three categories of PAs used in Pakistan are too limited for contemporary needs. Most of the remaining unprotected areas of biodiversity significance are currently used and managed by local communities in one way or another. The best way to protect these areas will be through the establishment of collaborative management regimes. However, the existing wildlife legislation in Pakistan does not provide for a protected area category in which sustainable use and community involvement can take place (along the lines of IUCN Category VI: Managed Resource Protected Area).

Finally, there are a number of important gaps and needs relating to the management of protected areas in Pakistan. First, existing wildlife laws do not provide an adequate framework for management. The laws give authority for protected area management to the provincial wildlife departments, but give no authority to these departments over the management of adjacent areas. Consequently, development activities in areas adjacent to protected areas often conflict with biodiversity conservation. Second, provincial wildlife departments lack the capacity to carry out their functions effectively, and in particular, suffer from a shortage of suitably trained personnel.

Third, most protected areas in Pakistan lack comprehensive management plans, and where plans do exist, they are not fully implemented. There is also a tendency to regard

management plans as blueprints rather than adaptive strategies requiring constant updating. In recent years, some efforts have been taken to redress this situation, and plans have been developed for the Margalla Hills National Park (Federal Territory) and Khunjerab National Park (Northern Areas). WWF-Pakistan is also currently working on plans for the Kirthar National Park in Sindh and the Hazarganji Chiltan National Park in Balochistan.

Fourth, and perhaps most critically, local communities rarely have any role in the management of protected areas in Pakistan. Little progress has been made on instituting collaborative management regimes for protected areas (Borrini-Feyerabend, 1996). Few efforts have been directed at raising public education and awareness in areas adjacent to protected areas, providing environmentally sound and sustainable development assistance to local communities, or formulating appropriate packages of incentives and disincentives. Consequently, local communities either continue to disregard protected area provisions leading to degradation of the protected area or, where those provisions are enforced against local communities' interests, conflicts have arisen. The conflict between local communities and park authorities in the Khunjerab National Park, arising from the loss of grazing rights, is well known. An attempt has been made to resolve and manage the conflict at Khunjerab, but deep-rooted problems remain.

OBJECTIVES AND RECOMMENDED ACTIONS

Objective 6: Strengthen the Protected Areas System in Pakistan and Its Contribution to Biodiversity Conservation

Action 6.1 Ensure that legislation providing for protected areas includes:

- objective criteria for the selection of protected areas;
- an updated and rationalised system of protected area categories with reference to the international categorization system developed by IUCN, and provide for the establishment of private and community protected areas;
- provisions for collaborative management systems involving government authorities, NGOs and local communities; and
- mandatory preparation and implementation of iterative management plans.

Action 6.2 Carry out a thorough protected areas system review to identify existing gaps. On the basis of the review, prepare a protected areas system plan for Pakistan.

Action 6.3 Expand Pakistan's protected area system to improve its representativeness, viability, and connectivity.

- 6.3.1 Expand Pakistan's protected area system to ensure representation of all terrestrial, freshwater, coastal, and marine ecological zones. Priority should be accorded to the critically threatened ecosystems identified in **Table 2**, marine and coastal ecosystems, and other insufficiently represented ecological zones identified by the system plan. Particular attention should also be accorded to expanding the protected area systems in Balochistan, NWFP, and southeastern Pakistan.

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- 6.3.2 Expand the PA system to ensure protection for all nationally and internationally threatened species of fauna and flora, and other components of biodiversity identified in Annex 1 of the Convention.
 - 6.3.3 Re-define protected area boundaries based on species-area and species-perimeter considerations, and establish corridors and 'stepping-stones' to optimise the viability and connectivity of Pakistan's protected areas.
 - 6.3.4 Identify priority areas for international designation under the World Heritage Convention, the UNESCO Man and Biosphere Programme, and the Ramsar Convention. In particular: take measures to promote the designation of the Central Karakorum National Park as a World Heritage Site; initiate a feasibility study to assess the potential of the Indus Delta as a Biosphere Reserve; and adjust and expand the list of designated Ramsar sites according to the revised criteria adopted at Montreux in 1990.
 - 6.3.5 Explore the potential for establishing trans-frontier "peace parks" with neighbouring countries.
 - 6.3.6 Take interim measures to ensure that new sites being considered for PA status are not damaged by development activities.
 - 6.3.7 Encourage private individuals, corporations, and NGOs to establish nature conservation areas under private/charitable/corporate ownership.

Action 6.4 Enhance the management of existing protected areas.

- 6.4.1 Develop collaborative management regimes for selected PAs and adjacent areas. Collaborative management regimes should involve the protected area authority, relevant government departments, research institutions, NGOs, and local communities.
- 6.4.2 Build the management capacity of the protected area authorities through the provision of funding, equipment, staff, and training. Particular emphasis should be placed on developing capacity in approaches to collaborative management.
- 6.4.3 Encourage collaboration between government departments (especially Forest and Wildlife/Parks) and research institutions in order to strengthen their capabilities in protected area management.
- 6.4.4 Decentralize and place more management responsibility in the hands of provincial, local, and community authorities, including NGOs and the private sector. Monitor and evaluate different management models to determine which management structures are most appropriate for individual protected areas.
- 6.4.5 Ensure that priority protected areas (for conservation) are soundly managed. Effective management should include:
 - resource inventories and management-oriented research;

- socio-economic surveys of communities living in and adjacent to the protected area;
- boundary revisions and finalisation in consultation with local communities;
- boundary marking;
- the development and implementation of management plans;
- specific activities for the recovery of threatened species;
- the development of educational facilities (in high use zones);
- the implementation of appropriate buffer zone activities and collaborative management regimes.
- strengthening management regimes of the priority protected areas identified by the Biodiversity Working Group, in connection with the World Bank/GEF-funded "Protected Areas Management Project."

6.4.6 Ensure that management plans specify the personnel, resource, and training needs of each protected area and how these needs are to be met. These estimates can then be expanded into an estimation of personnel requirements for the whole protected area system, leading to specifications for a national training programme at all levels to strengthen management capabilities.

6.4.7 Zone protected areas (as appropriate to their management category) to accommodate a range of uses (from intensive use to no use). Take special measures to protect the land tenure and traditional harvesting rights of local people, where such actions are compatible with the management objectives of the protected area.

Action 6.5 Restore degraded ecosystems within protected areas and in adjacent lands and corridors.

Action 6.6 Take measures to control invasive alien species of fauna and flora, and to prevent further introductions.

Objective 7: Conserve Biodiversity outside Protected Areas

Action 7.1 Develop regional conservation programmes to integrate conservation activities and protected area management with regional land use planning.

Action 7.2 Adopt agricultural, forestry, and fishery practices that will enhance the conservation of biodiversity.

7.2.1 These might, for example, include:

- the adoption of Integrated Pest Management approaches;

- the provision of incentives for the use of traditional cultivars;
- the creation of more diverse forest plantations, using indigenous species wherever possible;
- the incorporation of biodiversity concerns into forest management plans; and
- ensuring that irrigation systems take account of the freshwater requirements of adjacent wetlands;

Action 7.3 Enhance the capacity of local communities and NGOs to conserve, manage, and sustainably use biodiversity.

7.3.1 This could include:

- providing technical assistance and training to local communities;
- enhancing local awareness of, and commitment to, biodiversity conservation and sustainable use; and
- building bridges between government and communities to foster joint management of biodiversity.

Action 7.4 Ensure that protected areas and adjacent buffer zones are treated as a single planning unit. Of particular importance in this regard, is to support implementation of an Integrated Coastal Zone Management (ICZM) plan for the entire coast of Pakistan.

Action 7.5 Ensure that activities in natural areas outside protected areas are governed by management plans that pay adequate attention to the conservation of biodiversity; identify the most appropriate management authority for buffer zone areas.

Action 7.6 Ensure that development personnel, land-use planners, aid agencies and the national and provincial planning authorities have access to information about biodiversity. This should include information about the location of biological "hot spots" and rare and endangered species.

Action 7.7 Promote the conservation of biodiversity on military bases and other land owned or managed by the defence agencies.

4.5 EX-SITU CONSERVATION

Identifying the Issues

The *Convention on Biological Diversity* specifically recommends that *ex-situ* measures be adopted to support *in-situ* conservation programmes. These measures have most extensively been applied to conserve cultivated and domesticated species, employing techniques such as seed banks, field gene banks, *in-vitro* storage, and captive breeding measures. Other groups in need of *ex-situ* conservation measures include: threatened species, wild relatives of cultivated plants and domesticated animals; medicinal plants; plant crops of local and regional importance; ornamental plant species; tree species; and micro organisms. *Ex-situ* conservation is complementary to the rehabilitation and restoration of degraded ecosystems, and promoting the recovery of threatened species;

the ultimate purpose of these *ex-situ* conservation measures is to re-introduce wild species into the wild.

Ex-situ conservation facilities provide excellent opportunities for researchers to study plants, animals, and micro-organisms in controlled conditions, and to improve collection, storage and regeneration techniques. *Ex-situ* facilities can also be used for germplasm evaluation, as centres for documentation and information systems, and for providing information on genetic resources on a commercial basis.

Captive breeding of wild animals can be used to restore endangered species populations. It is important to increase populations as quickly as possible and re-introduce the animals back to their original habitat, to minimise genetic erosion. Plants can also be re-introduced to their natural areas of occurrence. Such re-introductions should, however, be carried out in such a way that other indigenous species are not harmed or adversely affected. Similarly, care must be taken while collecting material/animals for *ex-situ* conservation not to endanger other native species and genetic resources. The regulation and management of such transactions requires accurate information to determine the impact of collection on populations and ecosystems. The establishment of a National Microbial Culture Collection would be essential for the preservation and use of the rich microbial diversity present in Pakistan.

Ex-situ conservation should preferably be undertaken in the country from which the biological resources and genetic materials have originated. In Pakistan, institutions involved in *ex-situ* conservation of biodiversity include: the National Agricultural Research Center (NARC), the Plant Genetics Resource Institute, and the Animal Sciences Research Institute. Microbiological collections are held at the Nuclear Institute for Agriculture and Biology (NIAB), National Institute for Biotechnology and Genetic Engineering (NIBGE), the Ayub Agricultural Research Institute (AARI) and the Karachi and Islamabad Universities. There are also a number of botanical gardens, zoos, captive collections, wildlife parks, and breeding centres as well as private collections of wildlife species. However, there is little coordination or integration among these institutions, particularly with respect to identifying conservation priorities in Pakistan. Many of these facilities also require significant strengthening, if they are to make an effective contribution to biodiversity conservation.

OBJECTIVES AND RECOMMENDED ACTIONS

Objective 8: Strengthen Ex-situ Programmes and Their Contribution to Biodiversity Conservation

- Action 8.1* *Develop a national policy on ex-situ conservation.*
- Action 8.2* *Compile a directory of existing ex-situ conservation initiatives, including herbaria, livestock breed farms, genome banks, germplasm collections, plant breeding centres, zoological gardens and private collections.*
- Action 8.3* *Evaluate the scope and effectiveness of existing programmes at conserving key components of Pakistan's biodiversity.*
- Action 8.4* *Identify priority species and genetic resources in need of further ex-situ conservation efforts. This should include an assessment of the need for captive breeding programmes for commercially valuable, threatened species of indigenous wild fauna and medicinal plants.*
- Action 8.5* *Strengthen the capacity and scope of ex-situ conservation programmes through the provision of additional funding, equipment, and training.*
- Action 8.6* *Promote integration of ex-situ conservation efforts among institutions.*

Action 8.7 *Ensure that institutions involved in captive breeding of rare species set aside resources for rehabilitation schemes and for protection of natural habitats of those species.*

Action 8.8 *Initiate measures to ensure that the collection of genetic resources from the wild does not endanger the survival of remaining wild populations.*

4.6 SUSTAINABLE USE

Identifying the Issues

The CBD recognizes the need for countries to use their indigenous biological resources for socio-economic development, and, in fact, key sectors of the economy of Pakistan (such as agriculture, fisheries, and forestry) are dependent on the use of biological resources. While recognizing the need to use resources, the CBD requires parties to ensure that the use of biological resources does not deplete the country's biological diversity.

The sustainable use of the components of biological diversity is specifically established in Article 10 of the Convention which *inter alia* requires parties to integrate consideration of the conservation and sustainable use of biological resources into national decision making and to adopt measures relating to the use of biological resource to avoid or minimize adverse impacts on biological diversity.

Being one of the objectives of the Convention, the sustainable use of biodiversity figures prominently in other Articles of the Convention, besides Article 10. For example, in the Article on *in situ* conservation (Article 8), such conservation is never meant to be carried out by excluding use of the resource. Article 8(c) states: "Regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use".

In practice, in Pakistan as in many other developing countries, conservation of biological diversity is traditionally considered to be the exclusive role of organizations such as the Wildlife Department, Forestry Department, and Zoological/Botanical gardens. Institutions that use biological resources (e.g. the agriculture and fisheries sectors) have paid little attention to aspects of depletion of biological diversity and of the resources base. Clearly, there is a need for integrating sustainable use considerations into national decision making in different sectors of the economy. The adoption of the BAP should remedy this problem.

The CBD requests parties to respect, preserve and maintain knowledge, innovation and practices of indigenous and local communities for the conservation and sustainable use of biological diversity. In Pakistan, traditional natural resource management systems have declined with the advent of state-controlled protected areas and the creation of centralized management agencies. Although many rural communities have developed specialized, area-specific systems of use and conservation, few of these systems - or the customary rights and traditions which comprise them - are recognized by current laws. As a result, many traditional activities have become illegal and are now sources of conflict between the authorities and local communities. A new approach is clearly needed in which local people are no longer considered to be the problem but, rather, part of the solution. A number of recent, innovative projects (e.g. the UNDP/GEF funded project, "Maintaining Biodiversity with Rural Community Development") are now testing this approach in Pakistan. The results to date have been encouraging, and demonstrate that local communities can be effective custodians and managers of biological resources, once an appropriate, enabling framework (e.g., policy reform, technical assistance) has been created.

Among the factors which can help to promote sustainability of use regimes at the species and ecosystem levels are the following:

Social/Policy Factors

- defined "ownership" to land and resources;
- effective information exchange between users, decision-makers, and the public.

Economic Factors

- adequate income/incentives for communities to sustain conservation of the resource;
- reinvestment of income earned into the conservation of the resource.

Biological Factors

- establishing the biological basis for use (i.e. status, trend, and biological requirements);
- setting objectives for the size of the target population.

Management Inputs

- training;
- monitoring.

As a general rule, sustainability has been accorded insufficient emphasis within those sectors which use biological resources. There is a need to strengthen the regulation and management of Pakistan's resource utilisation programmes, taking into consideration the criteria and factors outlined above.

OBJECTIVES AND RECOMMENDED ACTIONS

Objective 9: Develop a Policy and Legal Framework to Encourage Sustainable Use of Biological Resources

Action 9.1 With the adoption of the BAP, formulate policies in the different resource sectors which would promote the sustainable use of biological resources (see also Actions 2.2 and 2.3).

Action 9.2 Review, and where necessary, revise existing laws to ensure that an effective legal framework is in place which: promotes sustainable use; establishes clear rules on jurisdiction and responsibilities among agencies and permitted users; and clarifies rights of ownership to biological resources (see also Action 2.3).

Action 9.3 Introduce legal measures requiring the development of management plans for harvested species (see also Action 2.3).

Objective 10: Establish, Monitor, and Regulate Sustainable Use Limits of Selected Biological Resources

Action 10.1 Enhance capacity of government agencies, research institutions, NGOs, and local communities to determine and monitor harvest levels of biological resources.

Action 10.2 Develop criteria for sustainable use and prioritize the types of uses (local subsistence versus commercial) that will be allowed in different areas.

Action 10.3 Ensure that biological resources are harvested according to scientifically-sound management plans.

Action 10.4 *Take measures to reduce the incidental take of non-target species (e.g., the incidental take of marine turtles in the commercial shrimp fishery).*

Objective 11: Protect and Encourage Community-based Biodiversity Management Systems

Action 11.1 *Review and revise the laws relating to ownership and access to natural resources (e.g., tenure rights to fuelwood, fodder, wildlife, and trees), to recognise community property rights and traditional natural resource management systems (see also Action 2.2).*

Action 11.2 *Evaluate traditional systems of harvesting biological resources (terrestrial and marine) and disseminate information on practices which promote the sustainable harvesting of these resources.*

Action 11.3 *Use traditional land tenure arrangements as a basis for planning and implementing conservation projects that promote sustainable use of biological resources.*

Action 11.4 *Promote community-based conservation projects in which sustainable use of natural resources can be demonstrated (e.g. the UNDP/GEF-funded project “Maintaining Biodiversity in Pakistan with Rural Community Development.”).*

Objective 12: Develop Mechanisms to Incorporate Biodiversity Values Into National Accounting and Decision Making at Different Levels

Action 12.1 *Develop, document, and adopt standardised methodologies for economic valuation of biodiversity, tailored to the requirements of individual decision-making agencies.*

Action 12.2 *Initiate measures to “green” the system of national accounts.*

Objective 13: Strengthen Inter-sectoral and Federal/Provincial Coordination in Biodiversity Conservation and Management

Action 13.1 *Create inter-sectoral steering committees at both the federal and provincial levels to oversee the implementation of the BAP (see Chapter 6 on Implementation Measures).*

4.7 INCENTIVE MEASURES

Identifying the Issues

Article 11 of the *Convention on Biological Diversity* requires that incentives be adopted to promote conservation and sustainable use of biological diversity; the Convention stresses that these incentives should be economically and socially sound.

Incentives are measures which promote desired practices and behaviour, and may be direct (e.g., the provision of grants or subsidies) or indirect (e.g. tax exemptions). Disincentives, such as fines or pollution charges, are used to discourage practices which deplete biodiversity or lead to unsustainable use. “Perverse” incentives are measures which have been taken to promote other social objectives, but which have a negative impact on biodiversity; for example, many countries provide grants or tax breaks for land clearance and the replacement of local crop varieties by HYVs - activities which can severely reduce biodiversity.

The integrated use of incentives and disincentives is a particularly powerful means of promoting conservation and sustainable utilisation, and is being accorded increasing attention by many governments. Pakistan, however, has made relatively little use of this approach to date. Because the benefits of biodiversity are not widely understood or accounted for, very few incentives have been instituted to encourage conservation or sustainable use; similarly, appropriate disincentives are scarce and weakly enforced. “Perverse” incentives are also widespread, particularly in the agricultural sector; irrigation subsidies, for example, encourage the wastage of water, and contribute to the degradation of freshwater and coastal ecosystems.

An additional cause of biodiversity depletion in Pakistan is the disproportionate distribution of costs and benefits associated with the conservation and use of biological resources. Those who benefit from the exploitation of biodiversity do not bear the proportional costs of biodiversity depletion; rather, they pass on many costs to other segments of society which do not have an equal share in the benefits. At the local level, for example, communities often bear the ecological costs of unsustainable resource use practices carried out by external organisations, but receive few of the benefits. At the national level, there is no pricing and valuation system for biodiversity; as a result, the government does not determine and, therefore, does not charge for, the real costs of biodiversity use.

The appropriation of natural resources by the state and the subsequent development of centralized structures have also deterred communities from taking an interest in the long-term sustainability of their natural resources. This has had detrimental effects on biodiversity conservation in Pakistan.

OBJECTIVES AND RECOMMENDED ACTIONS

Objective 14: Create an Integrated System of Incentives and Disincentives at the National and Local Level to Encourage the Conservation and Sustainable Use of Biodiversity

*Action 14.1 Introduce a system of **direct incentives** to promote the conservation and sustainable use of biodiversity that could include:*

- the provision of subsidies to encourage farmers to retain local cultivars and crop varieties, and to adopt practices such as Integrated Pest Management, agro-forestry, and multi-species cropping;
- the provision of subsidies to encourage land owners to manage their properties in ways which are sensitive to biodiversity, or to refrain from changing existing land-uses;
- the provision of grants for the protection of threatened species or habitats, and the restoration of degraded lands;
- the development of programmes to ensure that local communities receive direct benefits from biodiversity, e.g., through sustainable use activities;
- incentives to encourage ex-situ propagation/breeding programmes for traded species of wild plants and animals, in order to reduce the drain on wild populations; and
- the provision of incentives for staff (particularly field staff) working in institutions dealing with biodiversity. Possibilities include:

upgrading employees to regular functional staff; the provision of extra training opportunities; and public recognition for outstanding service.

*Action 14.2 Introduce a system of **indirect incentives** to promote the conservation and sustainable utilisation of biodiversity that could include:*

- **fiscal incentive measures**, such as tax exemptions or deductions for the conservation of particular habitats or species; tax reductions for the importation of equipment used in conservation programmes; and tax deductions for donations to conservation NGOs;
- **service-oriented incentives**, designed to link community development programmes with the conservation of biodiversity. For example, communities living adjacent to protected areas could be accorded priority for public education programmes and technical assistance in agriculture, forestry, and other fields.
- **social incentive measures**, designed to improve quality of life. These include measures such as clarification of land tenure and the creation of new institutions to manage biodiversity.

*Action 14.3 Introduce a system of **disincentives** to discourage unsustainable utilisation and practices which deplete biodiversity. These could include:*

- increasing the size of fines for the violation of conservation laws;
- revising the tax schedule to penalise undesirable land-use practices;
- using fiscal disincentives (e.g, pollution and effluent charges) for activities which are damaging to biodiversity. This could also include the use of a “polluter pays” policy, requiring developers to take measures to mitigate the environmental damage caused by their activities; and
- promoting and strengthening traditional customs and practices which serve as disincentives to unsustainable use.

Objective 15: Identify “Perverse” Incentives and Minimize their Impacts on Biodiversity

Action 15.1 Carry out a comprehensive review of GoP programmes and policies, to identify “perverse” incentives and suggest measures to ameliorate their impacts.

4.8 RESEARCH AND TRAINING

Identifying the Issues

Article 12 of CBD focuses on the need for research and training, recognising the special needs of developing countries in this regard.

Much is yet to be learned about biodiversity conservation and sustainable use. The study and management of the interactions between people and biological resources requires training in both the social and biological sciences and forms the basis for the multi-

disciplinary field of conservation biology.

In Pakistan, current opportunities for training professionals in the area of conservation biology are very limited. There are institutions offering strong programmes in forestry and agriculture, but there are no degree programmes in wildlife management, bio-systematics, biodiversity conservation or community-based conservation of natural resources.

A shortage of funding and lack of trained staff have also limited the amount of research on the identification, conservation, and sustainable use of biological diversity in Pakistan. There is little integration of research among institutions and disciplines, and very limited use of traditional knowledge in defining management programs.

OBJECTIVES AND RECOMMENDED ACTIONS

Objective 16: Strengthen Research on the Conservation and Sustainable Use of Biodiversity, Particularly Indigenous Species under Threat

Action 16.1 Evaluate, institutionalize, and strengthen current programmes of research on native biodiversity.

Action 16.2 Identify gaps and initiate new research programmes in priority areas.

16.2.1 Initiate new (or enhance existing) research programmes in priority areas related to the conservation, management, and sustainable use of biodiversity. Topics identified during the course of BAP formulation included:

Identification, Distribution, and Status of Pakistan's Biodiversity: Location of biological "hotspots" and other sites of conservation importance; the composition, distribution, and status of non-woody and non-vascular flora, invertebrate fauna, micro-organisms, marine fauna (particularly marine mammals), and flora;

Ecology and Ecosystem Functions: The biology and ecology of threatened species; the impact of introduced exotic species; ecosystem dynamics of wetlands, forests and mountains;

Human/Natural Resource Interactions: Status, abundance, and population trends of traded species (this information is required for active participation in CITES); the use of forest resources other than timber and fuelwood; traditional knowledge and the use of indigenous plant species for medicine and food; the benefits and risks associated with the application of modern biotechnology; the costs and benefits of conserving natural resources (economic valuation studies); *ex-situ* breeding/cultivation of economically important species; scale of the incidental catch of marine turtles by the shrimp fishery; the impact of Pakistan's international debt on biodiversity and natural resource utilization.

Action 16.3 Draft, enact, and implement legally binding regulations to ensure that research on any component of indigenous biodiversity carried out by non-nationals of Pakistan is only done on the basis of an agreement with a local institution and in close collaboration with Pakistani scientists, and that the outcome of such research, including information and type specimen that are generated, is made available to

Pakistani scientists and institutions. Access to the genetic material should be free of charge for the country of origin (see also Action 2.2).

Objective 17: Strengthen Human Capacity in Biodiversity Conservation and Management

- Action 17.1 Assess current capacity and the biodiversity-related training needs of natural resource managers, conservation professionals and other concerned staff, and the extent to which these are currently being fulfilled.*
- Action 17.2 Design and implement in-service training courses to address immediate gaps and priority requirements.*
- Action 17.3 Enhance existing training programmes in natural resource management, through the provision of funding, staff, and equipment. Explore opportunities for “twinning arrangements” with institutions in other countries (universities, botanical gardens, national park authorities, etc).*
- Action 17.4 Develop at least one university degree programme in biodiversity and conservation biology particularly as it relates to community-based management of natural resources. Promote the integration of biodiversity themes into other, tertiary-level courses and programmes.*
- Action 17.5 Create at least one vocational diploma-level course to train protected area managers.*
- Action 17.6 Promote, through grants and other means, post-graduate specialization in biodiversity-related fields, e.g. taxonomy.*
- Action 17.7 Strengthen the capabilities of NGOs and community institutions to play an effective role in the conservation and management of biodiversity; in particular, initiate training programmes with “umbrella NGOs” which have large networks of Community-Based Organisations and VOs.*
- Action 17.8 Integrate biodiversity concerns into the training curricula of rural development and extension staff, particularly in the fields of agriculture, forestry, and fisheries.*

4.9 PUBLIC EDUCATION AND AWARENESS

Identifying the Issues

Pakistan has already developed an overall strategy for environmental education and awareness under the National Conservation Strategy; more detailed plans are contained in the provincial conservation strategies (e.g. SPCS, BCS, NACS). However, the Biodiversity Action Plan needs to ensure that the particular needs of biodiversity are not marginalized in a more general “greening” of public education and awareness.

In the formal education systems, teacher training is perhaps the weakest area. Problems include quantity (not enough trained), quality (training has been seriously neglected), deployment (reluctance to serve in rural areas), and supervision (lack thereof). Although organizations such as IUCN, WWF, and PMNH have been working to incorporate environmental education into in-service teacher training, most courses still do not reflect environmental concerns.

Given the low literacy rates in Pakistan, informal education (particularly that not based on

the written word) will remain a vital component of any strategy for environmental education and awareness. The challenge lies in finding ways to reach this majority that largely resides in rural areas.

Transmitting new information on biodiversity is not necessarily the most effective means of achieving “education”. Fostering appreciation for traditional knowledge on biodiversity, its local uses and management can be equally effective. Helping communities to document their knowledge raises community awareness of the importance and values of biodiversity.

Another potential tool for awareness raising is the development of interpretive facilities in and around protected areas and *ex-situ* conservation sites (such as zoos and botanical gardens). With more resources, much better use could be made of the educational opportunities which these sites provide.

OBJECTIVES AND RECOMMENDED ACTIONS

Objective 18: Develop a Comprehensive Strategy for Public Education and Awareness

Action 18.1 *Develop a strategy on biodiversity conservation and sustainable use within the framework of the environmental education and communication programmes of the NCS and provincial conservation strategies, and incorporate the specific actions described in the following sections.*

Objective 19: Use the Formal Education System to Increase Awareness about Biodiversity and the Need for Its Conservation

Action 19.1 *Develop national curricula which emphasise biodiversity's contributions to local and national welfare, emphasise biodiversity's contributions to the health of ecosystems, and tie ecological, economic, and social themes together.*

19.1.1 At the primary level, build opportunities into the curricula for interaction with the local natural environment.

19.1.2 At the secondary level, incorporate biodiversity themes into the curricula of all relevant subjects, including the natural sciences, Pakistan Studies, Islamiyat, maths and languages.

19.1.3 At the tertiary level, strengthen biodiversity themes in existing courses. Create at least one degree or Masters-level course in Pakistan which focuses on the conservation and sustainable use of biodiversity.

19.1.4 For teacher training: integrate biodiversity themes into environmental education units for all pre- and in-service teacher training courses and B.Ed. courses. Provide training in the use of practical, field-oriented methods of teaching biodiversity.

19.1.5 For administrators, managers, and the armed forces: integrate relevant biodiversity themes into the curricula of courses at institutions for the in-service training of public administrators, private sector executives, and the armed forces.

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- 19.1.6 Support initiatives linking environmental education with basic literacy and development programmes (e.g. through the AIOU basic functional literacy programme).
- 19.1.7 Use orientation courses for teachers to create awareness of biodiversity and the CBD.
- Action 19.2 As far as possible, develop local curricula directly relevant to students' local ecological, cultural and economic environment, to supplement the national curricula, and develop co-curricula activities on biodiversity issues of immediate local concern; in particular, develop pilot local curricula for schools in and around protected areas or areas of particular importance for biodiversity.*
- Action 19.3 Develop course materials relevant to the conservation and sustainable use of biodiversity. In particular: revise school textbooks according to the proposed curricula revisions; and develop course materials relevant to local curricula, and co-curricula activities.*
- Action 19.4 Encourage public-private partnerships in curricula development, the development of co- and extra-curricular activities, and the development of course materials, including partnerships between educational and environmental authorities, between the government and NGOs, and between public and private schools, and international collaboration.*
- Objective 20: Use Informal Channels to Increase Awareness about Biodiversity and the Need for Its Conservation**
- Action 20.1 Develop and promote a comprehensive informal biodiversity education programme, tailored to the particular key audiences and ecological conditions of Pakistan.*
- Action 20.2 Develop more focused campaigns designed with a particular goal in mind, such as working with a local community adjacent to a protected area to foster local knowledge relating to the protected area, and promote understanding of the need for the protected area.*
- Action 20.3 Encourage the role of the media and in particular of radio, through the establishment of information clearinghouses.*
- Action 20.4 Make better use of traditional channels; identify key audiences and the most effective traditional channels for each audience. These might include customary community institutions and meeting places.*
- Action 20.5 Document the local knowledge, cultural, and religious bases of biodiversity conservation and sustainable use in Pakistan.*
- Action 20.6 Exploit the opportunity to link biodiversity themes with community assistance programmes, including primary health care programmes, primary education programmes and agricultural and forestry extension programmes. Integrate biodiversity concerns into the training curricula for rural development extension workers.*
- Action 20.7 Encourage the growth of membership groups, including NGOs, school clubs, and outdoor groups, involved in the conservation and sustainable use of biodiversity.*

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- Action 20.8 Develop biodiversity interpretive facilities, including field centres, at selected protected areas and interpretive programmes in all botanical gardens, zoos, herbaria, genebanks, natural history museums, etc.*
- Action 20.9 Develop locally relevant resource materials on the conservation and sustainable use of biodiversity for the use of agencies developing informal education programmes.*
- Action 20.10 Develop affordable, popular, accessible, and comprehensive field guides to the birds, animals, and flora of Pakistan.*
- Action 20.11 Encourage public-private partnerships in the above activities, including partnerships between educational and environmental authorities, between the government and NGOs, and international collaboration.*

4.10 ENVIRONMENTAL IMPACT ASSESSMENT

Identifying the Issues

Article 14 of the CBD requires parties to introduce appropriate Environmental Impact Assessment (EIA) procedures for projects, programmes, and policies that may have significant adverse impacts on biodiversity.

EIA is most commonly used as a tool at the project level, to identify the environmental effects of a proposed project and to plan ways of reducing negative impacts. Most projects are typically designed in a series of stages, involving needs identification, pre-feasibility and feasibility studies, appraisal, and approval. In many cases, EIAs have been undertaken very late in this design process, when it has become too expensive to re-design or halt the project - even if significant negative impacts have been identified (Glowka *et al.* 1994). To be most effective, EIAs need to be initiated at an early stage in project development and include adequate means for public participation in the review of potential effects of the development on human health, property, and local livelihoods.

EIA has now been made mandatory for all development projects in Pakistan. The Pakistan Environmental Protection Act (1997) provides that:

- 1) No proponent of a project shall commence construction or operation unless the proponent has filed with the Federal Agency an Initial Environmental Examination (IEE) or, where the project is likely to cause an adverse environmental effect, an Environmental Impact Assessment.
- 2) The Federal Agency shall:
 - i) review the IEE and recommend the approval of the project, or require submission of an EIA by the proponent;

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- ii) review the EIA, with public participation where it may deem appropriate, and recommend that the project be approved subject to such conditions as it may deem fit to impose, or rejected in the interest of such modifications as may be stipulated, or rejected in the interest of environmental objectives.
 - 3) The provisions of sub-sections (1) and (2) shall apply to such categories of projects and in such manner as may be prescribed.

A particular strength of the 1997 Act is that it specifically includes damage to biodiversity in its definition of “adverse environmental effect”.

OBJECTIVES AND RECOMMENDED ACTIONS

Objective 21: Institutionalize and Strengthen EIA Procedures for Projects, Programmes, and Policies.

- Action 21.1 Finalise detailed rules, regulations and guidelines for the implementation of IEE/EIA under the 1997 Act, to include a checklist of processes and activities which have or are likely to have significant adverse impacts on biodiversity (e.g., major power and road-building projects).*
- Action 21.2 Strengthen institutional capacity to evaluate the environmental impacts of development activities, especially in relation to biodiversity. Particular emphasis should be placed on training Environmental Protection Agency and Federal/Provincial Planning and Developing Department's staff in biodiversity issues and ensuring EIAs are also referred to relevant natural resource management institutions for review.*
- Action 21.3 Encourage effective public participation in the EIA process. This should include public review of EIA reports and access to information on planned development projects. Data should be made freely available to local communities and NGOs concerning planned development projects impacting on biotic resources in their areas, so that they may play an active and informed role in their own development.*
- Action 21.4 Expand the concept of Strategic Environment Assessment (SEA) to address the environmental impacts of programmes and policies (e.g., the National Drainage Programme; agricultural policies which promote the production of mono-cultural export crops).*
- Action 21.5 Review the National Environmental Quality Standards (NEQS) with due consideration to potential impacts on specific ecosystems (e.g., the effects of sewage discharge and industrial effluents on aquatic ecosystems).*

4.11 ACCESS ISSUES

Identifying the Issues

The CBD is the first international convention which acknowledges a state's sovereign rights over the genetic resources within its jurisdiction and the resulting authority to regulate and control access to these resources (Article 15). However, the degree and extent to which the state could exercise this right has to be determined by national law. Parties to the Convention are also required to: promote the fair and equitable sharing of benefits arising from the use of genetic resources and the development of biotechnologies (Articles 15 and 19); and to facilitate access to, and transfer of,

technology, including biotechnology (Article 16).

Genetic resources have been developed and used since the dawn of civilization in Pakistan. Although the use of some traditional genetic materials has declined over time as new, high-yielding varieties have been introduced, there is still considerable potential for further development of native genetic resources. For example, there are hundreds of species of wild plants found in different parts of Pakistan which can be used for medicinal purposes. At present, their use is limited to local remedies and homeopathic medicines. Some genetic resources from Pakistan have been characterized and parented in developed countries. Access to these resources for use and research in the country of origin is essential.

There are several research institutions in Pakistan that focus on genetic resources and biotechnology, including the Genetic Research Institute at the Pakistan Agriculture Research Council (PARC), the Agriculture Biotechnology Institute at NARC, the Nuclear Institute for Agriculture and Biology in Faisalabad, and the National Institute for Biotechnology and Genetic Engineering (NIBGE), also in Faisalabad. However, these institutions operate in a policy vacuum in relation to the conservation and use of genetic resources. There is also limited scope for focusing on biological resources that are not of commercial value.

OBJECTIVES AND RECOMMENDED ACTIONS

Objective 22: Develop Policies and Laws to Regulate Access to Genetic Resources and Promote the Equitable Sharing of Benefits between Resource Owners and Users.

Action 22.1 Collate baseline data relating to genetic resources and on current practices of access to such resources for academic and commercial purposes.

Action 22.2 Prepare an existing legal and institutional profile relating to the import, export, and use of genetic resources and traditional knowledge.

Action 22.3 Formulate a national policy and strategy on genetic resources and access issues through the participation of stakeholders (government agencies, industry, scientific community, ex-situ conservation facilities, relevant NGOs, CBOs and private individuals).

Action 22.4 Develop an action plan for implementation of priority actions through assigning responsibilities and identifying institutional development needs and designate and appropriate authority to oversee and implement the policy and relevant laws.

Action 22.5 Develop legislation in support of the national policy.

22.5.1 This revised legal framework should:

- provide explicit recognition of Pakistan's sovereign right over its biological resources, including genetic resources;
- effectively control and regulate access to genetic resources, including bioprospecting, the import and export of all genetic resources (including micro-organisms and living modified organisms), and the use of biotechnology in developing genetically engineered organisms;

- provide for the recognition and protection of indigenous knowledge (through the use of petty patents or similar mechanisms), irrespective of time limitations;
- establish a clear system for the fair and equitable distribution of benefits derived from the use of genetic resources;
- formulate legislation for release of Living Modified Organisms (LMOs) into the environment which includes, proper Environment Impact Assessment for biosafety of LMOs and living organisms imported from other ecological zones;

Action 22.6 In developing the legal framework described above, assess the desirability of harmonizing new access legislation with similar legislation being developed in other countries in south and south-east Asia (e.g., Malaysia), in order to create a common, regional approach to these issues.

Action 22.7 Countries having similar ecological zones e.g., South Asian Association for Regional Cooperation (SAARC countries) should harmonize policy for import, export, and use of genetic resources from the region as a whole.

4.12 EXCHANGE OF INFORMATION

Identifying the Issues

The knowledge and experience about environmental problems and their solutions are unequally and poorly distributed around the globe. In particular, there is an information gap between developed and developing countries which must be bridged. A provision on exchanging information has now become a standard addition to international environmental and conservation agreements. Article 17 of CBD urges Parties to take into account the special needs of developing countries and include repatriation of information, where feasible.

Much original and unique information about species and ecosystems in developing countries is held by museums and other research institutions in developed countries, yet this information is often very difficult to access by the country where those specimens were collected. The Convention encourages the holders of such information, largely in the developed countries, to take measures to ensure that the information held is shared with the countries where it originated (Glowka *et al.* 1994).

Pakistan is data-deficient in many respects. As previously noted under Section 4.3, information about the biodiversity of Pakistan is presently scattered among a wide range of institutions, and current capacity to collect, store, analyse, and disseminate information is limited. A considerable number of actions will need to be undertaken, therefore, if Pakistan is to fulfill its commitments under this article of the Convention.

OBJECTIVES AND RECOMMENDED ACTIONS

Objective 23: Strengthen Information Management Systems on the Biodiversity of Pakistan

Action 23.1 Establish a national information clearinghouse on biodiversity.

23.1.1

The national clearinghouse could:

- create and manage meta-databases on biodiversity information in Pakistan and abroad;
- promote standardization of data formats;
- develop guidelines to assist custodial institutions to formulate individual information access policies for in-country and external users;
- improve collaboration and information exchange among agencies that collect information relevant to conservation of biodiversity (e.g., sectoral agencies, Bureau of Statistics);
- maintain information on all projects promoting conservation and sustainable use of biodiversity in Pakistan; and
- assist in matching information users with sources of biodiversity information.

These functions could be fulfilled by the national centre recommended in Action 5.1.

Action 23.2 Establish contact with institutions outside Pakistan (e.g., the British Museum of Natural History) to obtain information about those collections of Pakistani origin which are currently being held abroad.

Action 23.3 Enhance the capacity of relevant national and provincial institutions to collect, store, analyse, and supply information on biodiversity, through the provision of funding, equipment, staff, and training.

4.13 FINANCIAL RESOURCES

Identifying the Issues

Article 20 of the CBD requires each Party to provide financial support, in accordance with its capabilities, for the national activities which will be undertaken to implement the Convention. Article 20 also commits the developed nations to provide “new and additional financial resources” to assist developing countries with their biodiversity conservation and management programmes. These funds are currently being channelled through the GEF.

The successful implementation of Pakistan's *Biodiversity Action Plan* will require a significant financial investment. It is important to emphasise, however, that many of the recommendations contained within the Plan can be implemented through policy and legal changes (e.g., the use of incentives and the removal of “perverse” incentives”, as discussed in Section 4.7), and do not require large expenditures. Similarly, ongoing development activities and existing government programmes can be made more sensitive to biodiversity concerns, often at relatively little cost (e.g., through better use of EIA procedures). It is not necessary, therefore, to await the arrival of new funding before commencing implementation of the Plan.

For those measures which do require new funding, possible sources could include: the development of innovative funding mechanisms; bilateral/multi-lateral aid for stand-

alone, biodiversity projects; debt-for-nature swaps; partnerships with the private sector; and the GEF itself. In fact, GEF needs to recognize and financially support the needs of developing countries to implement their national biodiversity action plans.

Finally, it should be emphasised that funds spent on biodiversity conservation and management are not unrecoverable expenditures; rather, they are investments in Pakistan's future ecological, economic, and social security - investments which will yield substantial benefits at virtually all levels and sectors of society. Present economic tools and measurements, such as the national income accounts, fail to recognise or accord a value to these benefits.

OBJECTIVES AND RECOMMENDED ACTIONS

Objective 24: Develop National Funding Mechanisms to Support Priority Biodiversity Conservation and Management Programmes

Action 24.1 Re-assess national spending priorities, and consider financial re-allocations from those sectors which currently receive a disproportionate share of the national budget.

Action 24.2 Re-assess existing expenditure on biodiversity-related activities against the priorities identified in this Biodiversity Action Plan; re-align expenditure to address the most urgent and important priorities, as required.

Action 24.3 Establish a task force to look into possible avenues of developing sustainable revenues to support biodiversity.

24.3.1 Possible mechanisms might include:

- the establishment of endowment funds to cover recurring costs in long term conservation projects;
- royalties from the wildlife, forestry, and fisheries industries;
- the return of revenues generated in parks and reserves (e.g., from tourism) to the protected area system and custodian communities;
- "Adopt a Park" schemes, in which organisations agree to support an individual reserve, often under the banner of a flagship species (e.g., Marco Polo Sheep in Khunjerab);
- partnerships with the private sector, in particular, those companies that benefit from the exploitation of genetic resources;
- debt-for-nature swaps;
- bi-lateral debt relief (in which loans are reduced, re-structured or forgiven outright in return for agreements to put resources into conservation programmes);
- charging for ecosystem services provided by protected areas; and

-- special issues of postage stamps and coins.

Objective 25: Seek Increased Bi-lateral and Multi-lateral Funding for Biodiversity Programmes.

- Action 25.1 Create an informal working group of aid agencies and donors on biodiversity conservation and management in Pakistan.*
- Action 25.2 Establish a database of agency/donor development activities and locations to identify areas of possible donor interest.*
- Action 25.3 Coordinate donor activities to maximize conservation efforts and resources. Invite donor agencies to assist with priority conservation activities in regions where they already have development programmes.*
- Action 25.4 Strengthen national capacity to submit successful proposals to the GEF, through training in project development and proposal preparation (using the GEF format).*
- Action 25.5 Take steps to strengthen Pakistan's "voice" at the CBD Conferences of Parties.*

Chapter 5

COORDINATING BIODIVERSITY CONSERVATION EFFORTS

There are many stakeholders in the biodiversity of Pakistan and to be effective, conservation efforts must be coordinated across many sectors of society.

The **Federal and Provincial Governments** are the most important stakeholders with overall responsibility for providing an adequate policy and legal framework, enforcing regulations, building capacity and providing incentives and funds for the conservation of biodiversity. The policies and programs of key Federal Ministries (Ministry of Environment, Local Government and Rural Development; Food and Agriculture; Finance and, Science and Technology) and Provincial Departments (Agriculture, Livestock, Forestry, Wildlife, and Fisheries) are crucial to the conservation and sustainable use of biological diversity. To help ensure commitment and compliance to implementation of the *Biodiversity Action Plan* across Ministries and Departments with different (and often divergent) priorities, the strong support of the Planning and Development Divisions is also essential. Implementation of the *Biodiversity Action Plan* will need to be carried out at both the Federal and Provincial levels by establishing linkages with the Annual and Five-Year Planning cycles, and by establishing Steering Committees at both levels (see Implementation Measures, Chapter 6).

Research Institutions are responsible for documenting elements of biodiversity in Pakistan and for monitoring the health of ecosystems. **Training Institutions** play an important role in building professional capacity in the fields of conservation and sustainable use.

As direct users of biological diversity, **local communities** have an important role in resource conservation and use. The active involvement of communities in the management of wild species and ecosystems, where communities become the custodians and beneficiaries of biodiversity, may be the most promising approach to halt further loss of biodiversity in Pakistan.

Non-governmental Organizations can help bridge the existing gap between government and local communities to enhance conservation efforts. NGOs can be particularly valuable in providing technical tools and building capacity and awareness for the environment both locally and with government. NGOs are often well informed and can assist in monitoring implementation of the CBD both locally and nationally.

The **private sector** should be made aware of the importance, and value, associated with the conservation and sustainable use of biodiversity. The private sector has a strong influence in developing and maintaining markets for natural resources. It is also an important stakeholder in ensuring the equitable sharing of benefits from the use of natural resources.

Finally, the **general public** (both nationally and globally) has a stake in the natural heritage of Pakistan and can influence policy and decision making affecting biodiversity. To gather sufficient funds and support, the general public must be better sensitized to the rapid loss of biodiversity and the need for its conservation.

Chapter 6

IMPLEMENTATION MEASURES

Overall responsibility for implementation of the *Biodiversity Action Plan* will fall on the Ministry of Environment, Local Government and Rural Development, which is also the national focal point for the *Convention on Biological Diversity*. Within MELGRD, it is envisioned that a Biodiversity Secretariat (see below) will have particular responsibility for the Plan.

To oversee the implementation process, it is recommended that a Biodiversity Steering Committee be established at the Federal level. The proposed composition of the Committee is as follows:

Federal Biodiversity Steering Committee

Chair: Minister, (MELGRD)

Members

Secretary, (MELGRD)
Inspector General of Forests, (MELGRD)
Director General - Environment, (MELGRD)
Representative, Kashmir Affairs and Northern Areas Division
Representatives of Provincial Biodiversity Steering Committees (Punjab, Sindh, NWFP, Balochistan, Northern Areas and AJK)
Representative, Ministry of Food, Agriculture, and Livestock
Representative, Pakistan Agricultural Research Council (PARC)
Representative, Marine Pollution Control Board (MPCB)
Representative, Ministry of Finance
Representative, National Biosafety Committee
Representatives (2), Biodiversity Working Group
Member, Planning Commission
Director General, PEPA
Director General, PMNH
Country Representative, IUCN-P
Director General, WWF-P
Chief Executive Officer, SDPI
Representatives (2), private sector

Most implementation measures, however, will take place at the provincial level. It will, therefore, be important to establish Provincial Steering Committees and, if possible, to merge these with the committees which have already been established for the Provincial Conservation Strategies (SPCS, BCS, and NACS). The suggested structure of the Provincial Steering Committees is as follows:

Provincial Steering Committees

Chair: Minister (Forest, Fisheries and Wildlife Department)

Members

Additional Chief Secretary, Planning & Development Department (as Secretary)
Secretary, Forest & Wildlife Department
Secretary, Fisheries
Secretary, Agriculture
Secretary, Livestock
Secretary, Education

Secretary, Local Government and Rural Development
Member, Planning & Development Department
Representative, Biodiversity Working Group (from province)
NGO Representatives (2)
Community Representatives (2)

A national level, multi-disciplinary, working group should also be established to act as a technical body in support of the National and Provincial Steering Committees, to provide technical guidance for implementation of the Plan, and to review progress at periodic intervals. It is suggested that this function be performed by the Biodiversity Working Group, and that the membership of the group be re-notified to adequately reflect the relevant stakeholders (see Chapter 5) and also to include women. The following structure is proposed:

Biodiversity Working Group

Chair: Elected by Biodiversity Working Group (BWG)

Members

Representative, Biodiversity Secretariat (as Secretary)
Technical Experts (6), Provincial/state governments
Technical Expert, Pakistan Museum of Natural History
Technical Expert, National Agricultural Research Centre
Technical Expert, National Institute of Oceanography
Technical Expert, National Institute for Biotechnology and Genetic Engineering
Technical Expert, Pakistan Forest Institute
Technical Expert, National Council for Conservation of Wildlife
Technical Expert, Zoological Survey Department
Technical Expert, WWF-P
Technical Expert, IUCN-P
Research Scientist (2-4) from academia

In addition, it is suggested that a **Biodiversity Secretariat** be established in MELGRD to coordinate the implementation of all programmes under the BAP.

Biodiversity Secretariat

As the focal point within MELGRD for implementation of the CBD on behalf of the Government of Pakistan, a Biodiversity Secretariat will be established to take on the added responsibilities of implementing the BAP. It is important that all individuals assigned to this Secretariat have relevant technical experience. The Secretariat should be placed under a Director General/Joint Secretary (Biodiversity) level position and supported by: (i) a Biodiversity Programme Officer in charge of developing a central Clearinghouse Mechanism (CHM) for the CBD; (ii) a Biodiversity Planning Officer to assist other government agencies, NGOs, and private sector groups in preparing project proposals under BAP; and (iii) two Scientific Officers (Biodiversity) to provide technical support for BAP implementation. The Programme and Planning Officers would be Grade 19 officers while the Scientific Officers would be Grade 17/18. Given current restraints on new government hiring, it is proposed that the Secretariat positions be filled from existing, qualified government staff either through deputation or transfers between ministries.

An organizational chart for the proposed administrative structures is provided in Figure 3. Of these, the Biodiversity Secretariat must become fully operational within 6 months of the adoption of BAP by the government. The secretariat should then facilitate the establishment of the Federal and Provincial Steering Committees, and re-notify the Biodiversity Working Group which should commence working within the following 6 months.

The primary focus of the Biodiversity Secretariat is coordination to facilitate the timely implementation of the BAP. The secretariat will foster scientific and technical cooperation by promoting linkages between, and within, different sectors affecting biodiversity. The Secretariat

will also be responsible for developing work plans to implement BAP priority actions.

While some of the recommended actions in Chapter 4 will take considerable time and funding to address, others can be implemented immediately and at little cost. To guide the phasing of activities, an implementation schedule has been developed (Table 5) where recommended actions for each BAP component are listed by the anticipated length of time required for implementation. The phasing is described as:

immediate	-	within 1 year (at low cost)
short term	-	within 5 years
long term	-	within 10 years

During its first year of operation, the secretariat will begin to address the “immediate” priorities in cooperation with the Biodiversity Working Group and the Federal/Provincial Steering Committees.

Finally, the *Biodiversity Action Plan* should not be a “once off” document but, rather, an ongoing process that is periodically monitored and updated much like the *National Conservation Strategy*. The Plan should change as scientific knowledge increases, as the intellectual debate continues on various issues related to conservation of biodiversity, and new lessons are learned.

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Table 5. BAP Implementation Schedule.
Numbers refer to specific actions as described in Section 4.

BAP Component	Immediate (within 1 year)	Short term (within 5 years)	Long term (within 10 years)
Policy/Planning	<ul style="list-style-type: none"> • Adopt BAP (1.1) • Adopt Biodiversity Policy (1.2) 	<ul style="list-style-type: none"> • Promote coordination between institutions (1.3) • Integrate biodiversity into sectoral plans (1.4) and conservation strategies (1.5) 	
Legislation	<ul style="list-style-type: none"> • Enact Model Wildlife Law (2.3) • Finalize rules for PEPA '97 (2.6) • Protect species presently subject to illegal trade (3.3) 	<ul style="list-style-type: none"> • Review existing legislation (2.2; 2.4) • Develop access legislation (2.7) • Develop biosafety regulations (2.8) • Enhance enforcement capacity (3.1) 	<ul style="list-style-type: none"> • Amend Constitution (2.1) • Comply with International Conventions (3.4)
Identification/ Monitoring	<p>Appoint biodiversity centre(s) (4.1) Identify conservation priorities (4.2) Foster information sharing (4.6)</p>	<p>Create National Red Lists (4.3) Establish computerized databases (4.5) Produce "State of the Environment" report (5.2)</p>	<p>Institutionalize resource monitoring (5.1)</p>
<i>In-Situ</i> Conservation	<ul style="list-style-type: none"> • Prepare PA system review (6.2) • Identify priority areas for international designation (6.3.4) • Explore potential for transboundary Peace Parks (6.3.5) 	<ul style="list-style-type: none"> • Develop comprehensive PA legislation (6.1) • Prepare PA system plan (6.2) • Enhance PA management (6.4) • Develop regional conservation programs (7.1) • Enhance CBO/NGO capacity for conservation (7.3) • Promote buffer zone management (7.4; 7.5) • Share biodiversity information with planners (7.6) and defence agencies (7.7) 	<ul style="list-style-type: none"> • Expand PA system (6.3) • Restore degraded ecosystems (6.5) • Control exotic invasive (6.6) • Modify destructive resource practices (7.2)
<i>Ex-Situ</i> Conservation	<ul style="list-style-type: none"> • Compile directory of conservation initiatives (8.2) • Evaluate existing programs (8.3) • Identify priority species and genetic resources (8.4) 	<ul style="list-style-type: none"> • Develop national policy (8.1) • Strengthen capacity and scope (8.5) • Promote integration among institutions (8.6) 	
Sustainable Use	<ul style="list-style-type: none"> • Develop criteria for SU (10.2) • Promote community- 	<ul style="list-style-type: none"> • Formulate policies (9.1) • Review existing laws (9.2; 9.3; 11.1) 	<ul style="list-style-type: none"> • Enhance capacity for monitoring (10.1) • Require management

BAP Component	Immediate (within 1 year)	Short term (within 5 years)	Long term (within 10 years)
	<ul style="list-style-type: none"> based conservation projects (11.4) Strengthen sectoral coordination (13.1) 	<ul style="list-style-type: none"> Reduce incidental take (10.4) Evaluate traditional management systems (11.2; 11.3) 	<ul style="list-style-type: none"> plans as a basis for SU (10.3) Develop methodologies for valuation (12.1) Initiate “green” accounting (12.2)
Incentive Measures	<ul style="list-style-type: none"> Identify “perverse” incentives (14.4) 	<ul style="list-style-type: none"> Introduce direct/indirect incentives (14.1; 14.2) Introduce disincentives (14.3) 	
Research and Training	<ul style="list-style-type: none"> Identify gaps and priorities for new research (16.2) Assess biodiversity-related training needs (17.1) Create diploma course for PA Managers (17.5) 	<ul style="list-style-type: none"> Strengthen current biodiversity research (16.1) Design and implement in-service training (17.2) Design opportunities for international linkages (17.3) Develop degree programs in biodiversity and conservation biology (17.4) Initiate training programs with “umbrella” NGOs (17.7) 	<ul style="list-style-type: none"> Legislate Pakistani involvement in research (16.3) Promote post-graduate specialization (17.6) Integrate biodiversity concerns in other curricula (17.8)
Education/Awareness	<ul style="list-style-type: none"> Develop public education/ awareness strategy (18.1) Encourage the role of media (20.3) 	<ul style="list-style-type: none"> Develop relevant course material (19.3) Promote informal education programs (20.1), including focused campaigns (20.2) and traditional channels (20.4) Develop interpretive facilities (20.8) Develop locally relevant resource materials (20.9), including field guides (20.10) 	<ul style="list-style-type: none"> Incorporate biodiversity emphasis in national and local curricula (19.1; 19.2) Encourage partnerships in curricula development (19.4) Document local knowledge (20.5) Encourage growth of membership groups in biodiversity conservation (20.8)
Environmental Impact Assessment	<ul style="list-style-type: none"> Finalize rules and guidelines for PEPA 1997 (21.1) 	<ul style="list-style-type: none"> Strengthen capacity of EPA staff (21.2) Encourage effective public participation in EIA process (21.3) Expand the SEA concept (21.4) Review NEQS for specific ecosystems (21.5) 	
Access Issues	<ul style="list-style-type: none"> Collect baseline data (22.1) Prepare existing legal/institutional profile (22.2) Develop action plan 	<ul style="list-style-type: none"> Formulate a national policy (22.3) Develop legislation (22.5) based on a regional approach (22.6) 	

BAP Component	Immediate (within 1 year)	Short term (within 5 years)	Long term (within 10 years)
	(22.4)	<ul style="list-style-type: none"> Harmonize regional policies (22.7) 	
Exchange of Information	<ul style="list-style-type: none"> Establish a national clearinghouse on biodiversity information (23.1) 	<ul style="list-style-type: none"> Exchange information with outside institutions (23.2) Enhance institutional capacity to manage information (23.3) 	
Financial Resources	<ul style="list-style-type: none"> Establish task force to generate funding (24.3) Strengthen capacity to develop GEF proposals (25.4) Strengthen Pakistan's "voice" at CBD-COP (25.5) 	<ul style="list-style-type: none"> Re-align expenditures with BAP priorities (24.2) Enhance donor interest (25.2) and participation (25.1; 25.3) 	<ul style="list-style-type: none"> Re-assess national spending priorities (24.1)

Annex 1: Report on Stakeholder Participation

(prepared by Saleem Ahmed Qazi)

1. Introduction

This report gives a brief account of the process followed during the preparation of a Biodiversity Action Plan (BAP) for Pakistan. An attempt has been made to briefly describe the various stages during BAP preparation, to list the opportunities provided by the Project Management Team (PMT) for participation of the public and stakeholders, and to identify the factors which have served as constraints to participation.

The BAP Project was initiated in July 1996 as part of a PDF Block B funding grant from the GEF/World Bank. The focus of the funding was to prepare an investment proposal to GEF for a Protected Area Management Project (PAMP). An additional activity was also to prepare a national BAP for Pakistan, a schedule of activities is shown in Table 1.

Table 1: A chronology of activities during BAP preparation

Time	Activity
July '96	Project Start-up (PDF Block B Funding) - IUCN-P selected as lead agency in collaboration with WWF-P. - simultaneous work on PAMP
Sep. '96	First Consultative Workshop - 87 people attended two-day workshop - sectoral working groups identifies issues and made recommendations for BAP drafting
Winter '96	Based on the workshop feedback, background papers were prepared by national experts on: - cross-sectoral issues (legislation, education/awareness, economic policies) - data deficient subjects (vertebrates/invertebrates, microbiology, genetics and biosafety, coastal zones and marine fisheries, forests and rangelands)

Spring/ Summer '97	BAP Draft Preparation - compilation of background papers - preparation of initial draft (300 pages +) - revision and reduction of Draft (100 pages +)
Oct. '97	BAP Draft #1 distributed (200+ copies)
Nov. '97	Regional Review Workshops - 5 locations with 175+ participants - spirited debates - verbal and written feedback
Dec. '97	-filling additional gaps - preparation of consultation report
Next steps	- review, revise and prepare BAP Draft #2 - review by BWG - revise and prepare Final BAP - seek GoP endorsement - submit to CBD secretariat

2. Steps involved in BAP Preparation

The following activities, which specifically involved various stakeholders, were carried out during BAP preparation.

2.1. Literature Review

Like all projects involving planning, the Biodiversity Action Plan project started with a review of literature relevant to the Project and the concepts of biodiversity conservation and sustainable use. Reviews were made of similar efforts undertaken elsewhere in the world and relevance of these efforts to Pakistan was also explored.

2.2. Development of the Framework

To develop an outline of the BAP in a participatory fashion, a two day consultative workshop was organized in Islamabad on September 15-16, 1996. More than 160 individuals were invited to attend the workshop. The main objectives of the workshop were:

- *to agree on the contents of the BAP and to develop a framework;*
- *to identify and prioritize issues of concerns within specific areas of interest;*
- *to identify current and planned biodiversity conservation efforts (in Pakistan);*
and
- *to identify sources of information and expertise within each area of interest.*

Thus the workshop was organized not only to develop a framework of BAP but also to establish a contact database for increased stakeholder involvement in the project.

In total, 87 individuals from various regions of Pakistan attended the workshop. Recognizing the fact that biodiversity is an all-encompassing concept and it is difficult to create meaningful partitions of the participants for discussion purposes, group discussion areas were identified based on land-use practices and resource management. With this background, the participants were divided into discussions/work groups covering biodiversity areas such as:

- *Agriculture and Animal Husbandry,*
- *Coastal Zones and Marine Fisheries,*

-
- *Forest Trees and Economically Important Plants,*
 - *Invertebrates and Vertebrates,*
 - *Microbiology, Genetics, and Biosafety,*
 - *Wetlands, Fresh Water and Inland Fisheries, and*
 - *Wildlife and Protected Areas.*

The groups formed evaluated each of these areas on the basis of a common checklist.

The seven groups worked for more than six hours and shared their respective findings in a plenary. Feedback in the form of group presentations was supplemented with individual observations which were received in verbal as well as in written form.

2.3. Commissioning of Background Papers

On the basis of the findings of the consultative workshop, review of BAP-related activities elsewhere in the world, and information regarding the Pakistan situation gathered from other sources, 13 national experts were contracted to write background papers. These sectoral papers covered topics such as vertebrates and invertebrates, microbiology and genetics, marine biodiversity, legislation, education, public awareness and education, economic policy, etc.

2.4. Production of the First Draft

Following a succession of BAP Coordinators, information from the sectoral background papers and other sources were compiled into a first draft BAP. The initial draft was in excess of 300 pages and considered too lengthy to stimulate a consultative review.

Efforts were made in the fall of 1997 to condense the draft into a more manageable format and to focus the document on key issues and proposed actions while reducing details on the current status of biodiversity in Pakistan. A revised and reduced first draft BAP was distributed to over 230 individuals on 10 October 1997.

2.5. Review at Regional Workshops

To accommodate wide participation of stakeholders in the review of the draft BAP, one day workshops were held in 5 locations (Lahore, Quetta, Karachi, Peshawar and Islamabad) following distribution of the draft document. The time available for review of the nearly 100 page draft varied between two and five weeks depending on the date of the regional workshops.

Invitations to the regional workshops were prepared from a Contact Database created after the first workshop in Islamabad. Additional invitations were also issued after participant lists had been reviewed by GoP and regional IUCN/WWF offices.

The regional workshops followed the same general agenda in each location starting with an introduction to CBD and BAP followed by group discussions and presentations on the proposed actions identified in the draft. The intent of the workshops was to reach some level of national "consensus" on priority action and strategies for the future.

2.6. Follow-up to Regional Workshops

Based on some of the concerns and issues raised at the regional workshops a 6 member committee from Islamabad was asked to review and quickly revise portions of the draft BAP to fill some of the gaps identified.

Briefing of the Biodiversity Working Group (BWG) were held on 18 November and 15 December 1997 to provide updates on BAP preparation. All BWG members were invited

to the regional workshops and most members were able to attend.

3. Opportunities for Participation

Following is a brief account of the various fora for stakeholder participation, established during the project.

3.1. Biodiversity Working Group

The idea of creating a forum under the auspices of the Biodiversity Unit of the Ministry of Environment had been under consideration before the launch of the BAP/PAMP, however it got impetus after the Project launch. Basically the idea was to have a number of national level experts from different areas of specialization to provide advice to various biodiversity initiatives of GoP. Initial consultations between the Project Management Team (PMT) and the focal point of the biodiversity-related GoP-sponsored initiatives in the MELGRD concluded that a Biodiversity coordinating Committee, which existed only on paper could be improved by adding more appropriate experts to it and constituting the BWG. About one month after the launch of the Project, the group was formally constituted and an announcement to this effect was made by the focal point on August 22, 1996. As many as 22 individuals were taken on board. They included environmentalists, foresters, specialists from wildlife, livestock, agriculture, natural history, taxonomy, fisheries, tourism, marine sciences, zoology, biotechnology, protected area management, and development in general. The terms of reference of the Group included the following tasks:

1. *Formally review and approve the selection criteria for the selection of ten protected areas (PA's).*
2. *Review the results of the socio-ecological survey conducted on the eleven sites by the PMT of PAMP.*
3. *Review and approve 3-5 priority PAs.*
4. *Review the detailed needs assessment survey of the 3-5 priority PAs undertaken by the Team Leader and his team.*
5. *Review the working of the stakeholder groups for each priority area.*
6. *Review and approve the draft investment plans for each priority area.*
7. *Review and approve the BAP.*
8. *Review the status of the Convention on Biological Diversity for recommending action(s) on the obligations and incorporating them in the BAP.*

3.2. The Project Management Team

PMT is a tripartite body including representatives of the MELGRD, IUCN-P, and WWF-P. The PMT provided guidance to the PAMP/BAP Project staff. The Team Leader and the BAP Coordinator provided the link between the PMT and the Project staff. The PMT met once a month during the first few months of the Project and since then has been meeting only on significant stages of Project development. The following individuals met during PMT meetings to review the BAP.

Mr. Kalimullah Shirazi, Deputy Secretary and Biodiversity Focal Point, MoE
Dr. Javed Ahmed, Head Natural Resources Group, IUCN-P
Dr. Ejaz Ahmed, Deputy Director General, WWF-P
Mr. Ali Hassan Habib, Director General, WWF-P
Dr. Scott Perkin, Head Programme Support Unit, IUCN-P
Dr. A. Aleem Chaudhry/ Mr. Guy Duke, BAP Coordinator
Mr. Richard Garstang/ Mr. Kent Jingfors, Project Team Leaders, IUCN-P
Mr. Saleem Ahmad Qazi, Project Social Scientist
Mr. Usman Iftikhar, Project Economist
Ms. Khalida Haye, Project PRA Specialist

Mr. Ashiq Ahmed, Conservation Director, WWF-P
Mr. Najam Khursheed, Wetlands Specialist, WWF-P

4. Constraints to Participation

While the project explored different opportunities for participation of key stakeholders in preparing a national strategy document, such as BAP, there were 3 main constraints to ensure effective participation. These were:

a) Lack of information

When BAP started in 1996, there was no central registry or database listing departments, institutions or individuals involved in biodiversity related programs. There was lack of information sharing, or even understanding of who the primary stakeholders would be in preparing a national strategy document on biodiversity such as BAP.

b) Lack of interest (or incentives)

Several of the sectoral background papers were not adequately prepared. As a result, the draft BAP focused on elements of biodiversity that had been covered well and for which there was background information (e.g., vertebrates, plants).

During the regional workshops, it was clear that several individuals/institutions feel that voluntary contributions of information is difficult without some form of compensation. However, it was also pointed out that it was in the interest of every individual/institution to ensure their particular focus of biodiversity was well represented in a document such as BAP that could help identify future funding priorities.

c) BWG Composition and Funding

The composition of BWG needs to be reviewed was mainly comprised of representatives from federal and provincial government agencies. There is was currently no representation by NGOs or women on the committee. Moreover, The government membership does did not adequately incorporated participation by all line departments that are involved in biodiversity issues. Participation in BWG meeting is was also made difficult by the lack of funding to encourage participants from out of Islamabad to attend.

5. Individual Contributors and Members of the Biodiversity Planners Committee marked with *)

1. Mr. Z.B. Mirza, CERC, Islamabad*
2. Dr. Anwar Naseem, COMSTECH, Islamabad*
3. Dr. Syed Azhar Hasan, Pakistan Museum of Natural History, Islamabad *
4. Dr. Shahzad A. Mufti, Pakistan Museum of Natural History, Islamabad*
5. Dr. Ashiq Hussain Cheema, NARC, Islamabad*
6. Mr. Rashid Anwar, NARC, Islamabad*
7. Dr. Kausar Abdullah Malik, NIBGE, Faisalabad
8. Mr. Tanveer Arif, Society for Conservation & Protection of Environment, Karachi
9. Dr. Syed Irtifaq Ali, Former Vice Chancellor, University of Karachi
10. Dr. Mohammad Nazir Bhatti, DG Fisheries, Punjab
11. Dr. Manzoor H. Soomro, PSO, Pakistan Science Foundation, Islamabad
12. Dr. Surayya Khatoon, Department of Botany, University of Karachi
13. Dr. Naseem Ghani, Karachi
14. Mr. Qadeer Mohammad Ali, Marine Reference Collection and Resource Center, University of Karachi
15. David E. Steane, CTA, FAO Bangkok
16. Dr. Sarwat N. Mirza, AZRC, Quetta

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17. Dr. A. Hameed, Biological Sciences Dept., Quaid-iAzam University, Islamabad
 18. Syed Mahmood Nasir, DFO, Dera Ghazi Khan
 19. Prof. S. M. Saifullah, Botany Department, University of Karachi
 20. Ms. Naila Hussain, Shirkat Gah, Lahore
 21. Dr. Shahid Amjad, National Institute of Oceanography, Karachi
 22. Mr. Leslie Wijesinghe, CRO, IUCN-Sri Lanka
 23. Mr. Abeed Ullah Jan, Former Inspector General Forest, Islamabad

Annex 2: Other International Biodiversity-related Conventions to which Pakistan is a Party

Pakistan is a Party to two international conventions dealing with species: the Convention on the Conservation of Migratory Species of Wild Animals (adopted in Bonn, Germany in 1979 and to which Pakistan has been a Party since 1987); and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (signed in Washington in 1973, to which Pakistan has been a Party since 1976). Pakistan is also a party to two area-based treaties: the Convention on Wetlands of International importance especially as Waterfowl Habitat (signed in Ramsar, Iran in 1971, and to which Pakistan has been a Party since 1978); the Convention concerning the Protection of the World Cultural and Natural Heritage (signed at UNESCO, Paris in 1972). In addition to these treaties, Pakistan is a Party to the United Nations Convention on the Law of the Sea (signed at Montego Bay in 1982), supports the UNESCO Man and Biosphere (MAB) programme (initiated in Paris in 1968) and has signed (but not yet ratified) the Convention for Combatting Desertification.

Under the **Bonn convention**, Pakistan's principal obligations are 'to protect certain endangered species listed in Appendix I of the Convention and to endeavour to conclude agreements for the protection of migratory species whose conservation status is unfavourable and of those whose conservation status would substantially benefit from the international cooperation deriving from an agreement (De Klemm and Shine 1993).

Under **CITES**, Pakistan's principal obligations are to restrict the import and export of listed species. Appendix I lists endangered species of flora and fauna in immediate danger of extinction. Appendix II lists species not in immediate danger of extinction, but which may become so if trade restrictions are not applied. Appendix III lists species for which cooperation between Parties is desirable for their protection. A range of legislative measures are commended by the CITES Secretariat and IUCN for the adequate implementation of CITES (de Klemm 1993).

The **Ramsar Convention** is primarily concerned with the conservation and management of wetlands included in the 'List of Wetlands of International Importance' (Davis 1994; de Klemm and Shine 1993). Parties are also required to promote the 'wise use' of wetlands on their territory and to take measures for the conservation of wetlands and waterfowl by establishing nature reserves on wetlands, whether they are included in the list or not. A Wetland Fund was set up in 1990 to assist Parties to discharge their obligations under this Convention. A range of legislative measures is required to implement the Ramsar and the specific wetlands in particular, and for the division of jurisdiction among government agencies for the catchment-side management of wetlands. To date, Pakistan has designated 9 wetlands as Ramsar sites under the Ramsar Convention (NCCW data).

Under the **World Heritage Convention**, Pakistan's principal obligation is to conserve and transmit to further generations the natural and cultural heritage situated on its territory (de Klemm and Shine 1993). The inclusion of a site on the World heritage List requires the approval of the World Heritage Committee. A special financial mechanism, the World Heritage Fund, has been established to assist Parties to discharge their obligation in respect of sites, with great success.

Although a number of Pakistan's cultural sites have been inscribed on the World Heritage List, none of Pakistan's natural sites have yet been included. However, an application in respect of the Central Karakorum National Park has been prepared and is under consideration of the UNESCO.

The only worldwide programme for the establishment and conservation of protected areas is the Biosphere Reserve network which was developed under **UNESCO's Man and Biosphere Programme** (de Klemm and Shine 1993). As there are no treaties or legally binding obligations governing this network, designations of Biosphere Reserves are made on a purely voluntary basis. Proposed designations by individuals states must, however, be approved by the MAB Coordination Committee. To date, Pakistan has designated only one Biosphere Reserve (Lal Suhanra National Park), although a number of other areas (e.g., the Indus Delta) would appear to be particularly well suited to this

management approach.

Under those provisions of the **UN Convention on the Law of the Sea** (UNCLOS) relating to Biodiversity, Pakistan's principal obligations relate to the conservation and exploitation of marine species, the establishment of marine protected areas, and the prevention of marine pollution (which includes the introduction of alien or exotic species).

Pakistan has recently signed and ratified the **UN Convention to Combat Desertification** (UNCCD). Though this Convention does not directly address Biodiversity, it addresses the degradation of arid and semi-arid rangelands. There are potential synergies between UNCCD and CBD that need to be further explored.

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