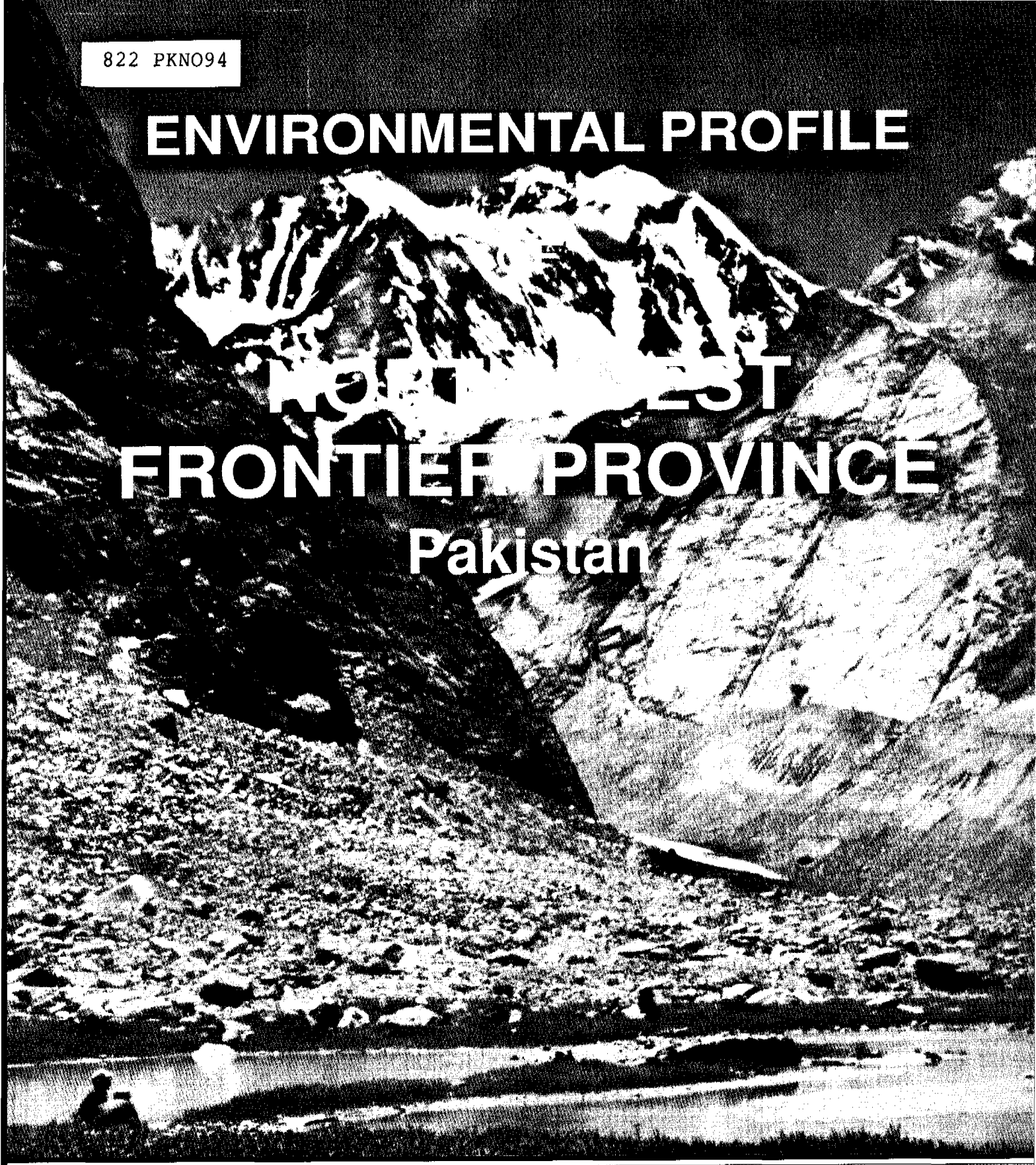


# ENVIRONMENTAL PROFILE

# NORTH WEST FRONTIER PROVINCE Pakistan



# ENVIRONMENTAL PROFILE OF NORTH-WEST FRONTIER PROVINCE Pakistan

editors:

Dr. Ir. Albert van Dijk  
Ms Maliha H. Hussein

LIBRARY, INTERNATIONAL REFERENCE  
CENTRE FOR COMMUNITY WATER SUPPLY  
AND SANITATION (IPO)  
P.O. Box 53198, 2509 AD The Hague  
Tel. (070) 534911 ext. 141/142

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*DHV Consultants BV*

Amersfoort, P.O. Box 1399, The Netherlands

*EDC (Pvt.) Limited*, Enterprise & Development Consulting  
Islamabad, P.O. Box 2389, Pakistan

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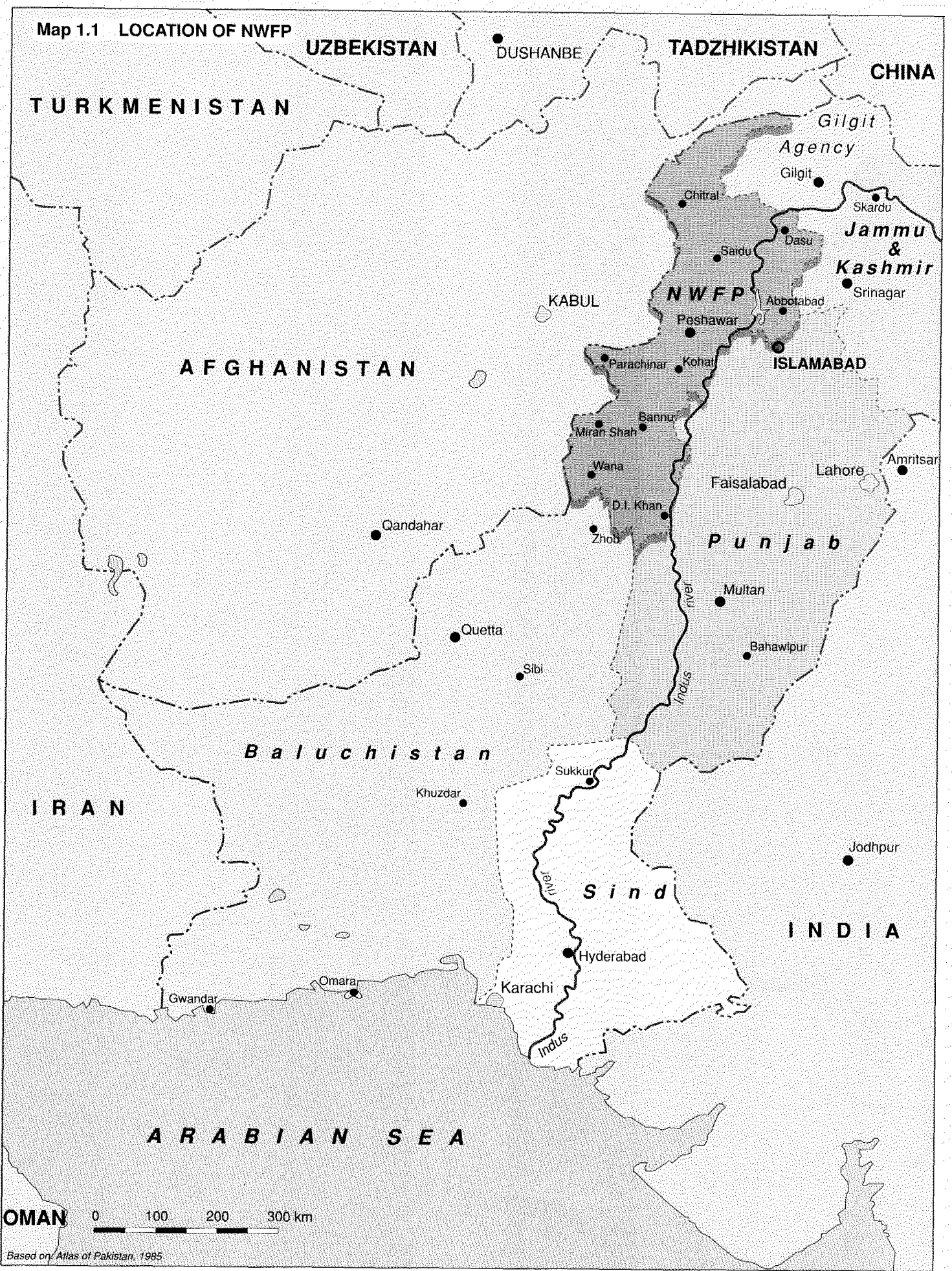
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Map 1.1 LOCATION OF NWFP



## EXECUTIVE SUMMARY

The principal environmental issues in North West Frontier Province (NWFP) are population pressure, poverty, poor quality of the natural-resource base, breakdown in social institutions and the common property regimes vested with collective management, the lack of land use plans, narrow resource base and lack of enforcement of existing legislation. A World Bank Appraisal report (May 1992) on environmental protection and resource conservation reported that "policy makers and farmers have focused almost exclusively on questions related to agricultural production and have given insufficient consideration to developing sustainable resource use systems." This has led to the indiscriminate deforestation of mountains and hill sides, overgrazing of rangelands and overwatering of crops on the irrigated plains (Mardan, Peshawar) over tapping of groundwater (Kohat, Bannu) and inadequate drainage with the resulting problems of severe soil erosion, silting of reservoirs, degradation of natural pastures, lowering groundwater table, waterlogging and soil salinity.

The population increase is due mainly to natural growth rate and the large influx of Afghan refugees. Rural to urban migration is not a serious issue in NWFP. The population increase has exerted enormous pressure on the natural resource base of NWFP. Population increase has led to overcrowding not only in the villages but within each household as well, placed an added burden on civic amenities, led to an overuse of natural resources and to epidemics of various diseases.

Income levels in NWFP are low. Figures which allow a comparison of provincial and national averages are not available. However, it is generally believed that income levels in NWFP are below the national average. In real terms, wage rates have declined over the last ten years. The lack of access to basic social services, low coverage of water supply facilities, poor sanitation and overuse of natural resources is due primarily to the low economic development in the Province, high unemployment and low wage rates. The low economic level forces people to seek cheaper alternatives and overuse natural resources for which

they have use rights. In the absence of commercial fuels, people use local resources like wood, shrubs, grasses, crop residue and cow dung. Studies have determined that the current growth in demand for domestic energy use is unsustainable. The increased pressure on the natural resource base as a result of poverty and a greater population has placed tremendous stress on the social traditions that play a key role in environmental conservation and management. The problem for NWFP is compounded by the fact that more than 60 per cent of the land in NWFP is under some form of common property ownership or use. The breakdown of traditional institutions which enforced a system of use rights, the increased population pressure and poverty have led to a lack of enforcement at village level. There is also a lack of political will to formulate and enforce the existing legislation on natural resource management, air pollution and industrial pollution. This leads to deforestation, inadequate waste management and disposal. Weak environmental protection institutions, inadequate legislation, a low level of public awareness, policy distortions and insufficient short-term incentives to encourage poor farmers and stock owners to adopt activities with long-term benefits all contribute to natural resource mismanagement.

Among the elements causing the poor quality of natural resource base are factors like waterlogging and salinity, lowering of groundwater level, soil quality, the state of urban pollution. As the land use is unsustainable and grazing of livestock uncontrolled, the regeneration of natural vegetation is prevented. The denuded mountain slopes are the cause of massive soil erosion and siltation of dams, reservoirs and river beds. Over 60 per cent of the Province's land area is mountainous and therefore highly susceptible to soil erosion.

Among the urban environmental problems are the lack of effluent and waste management. Most industries in NWFP dump their untreated effluent either in the rivers or on open land, NWFP has virtually no sewage treatment facilities. There is no effective mechanism for collection, sorting or disposal of solid waste. The drinking water and air are badly polluted. There is ample evidence that the urban pollution has had a detri-

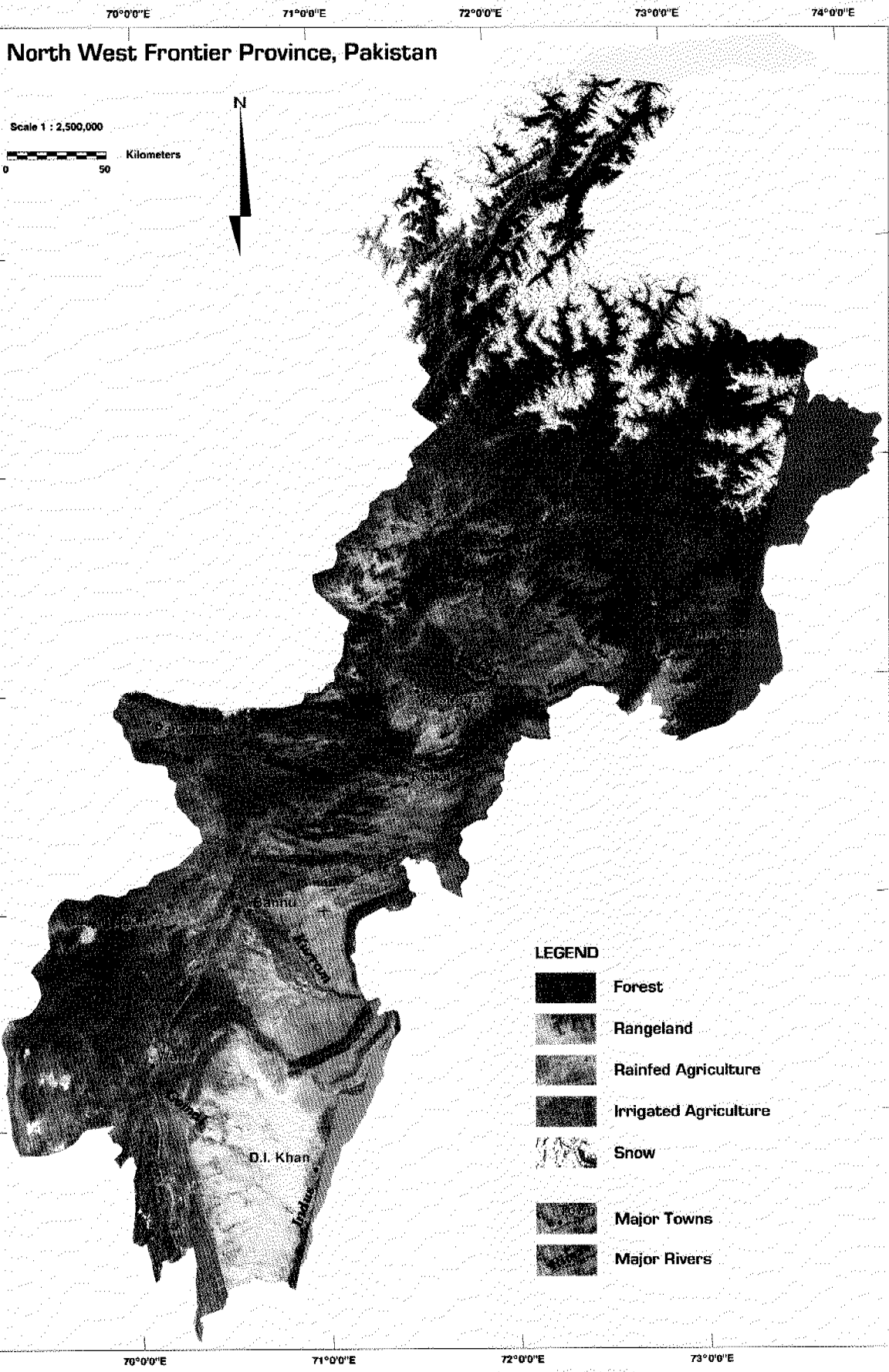
mental effect upon both human and animal health in the Province.

### **Recommended actions:**

NWFP has one of the most beautiful landscapes on Earth. To preserve NWFP, the environmental degradation should be reduced or preferably stopped. Through the adoption of the National Conservation Strategy (NCS), the Government of Pakistan has committed itself to reorienting its development efforts towards sustainable development. The Government of NWFP (GoNWFP) has made a start with the formulation of the Sarhad Provincial Conservation Strategy (SPCS). The SPCS is the response of the GoNWFP to the need to implement the NCS. The SPCS should result in a comprehensive policy for management of the environment in NWFP. Organizations responsible for initiating environmental management have been created and are being strengthened. Besides existing projects, donor organizations are actively involved in the formulation of environmental studies and the identification of projects that contribute to the improvement of the environment.

Both the NCS and the SPCS are action oriented and their policy formulation is linked to the implementation of pilot projects. Twelve priority areas of action have been identified under the SPCS: environmental legislation; business-government round table; Kabul River clean up; urban waste; cleaner air programme; sustainable agriculture; community development; cultural heritage; forests, watersheds, grazing lands, fisheries and wildlife; population; clean drinking water; and education and communication. Sustainable development is a long-term process, which will require a fundamental reorientation in attitudes, institutional structures and policies of many actors. The recommended direction of the SPCS, and other environment management oriented policies can be summarized in a series of long-term (over 5 years) and short-term (3-5 years) goals. The long-term goals are:

- **Sound and effective environmental management** depends on the availability of a strong environmental institutional capacity. Therefore the GoNWFP should continue, to assist donor organizations, to strengthen the Environment Section of Planning, En-



Environment and Development Department (PE&D) and the Environmental Protection Agencies (EPA).

- **Successful environmental management** relies on the appropriate distribution of environmental management functions over different types of non-governmental organizations. (NGOs) and the private sector should play a significant and permanent role in environmental management in NWFP.

- **Appropriate and effective management of natural resources** needs a strong partnership at the different levels. From the divisional, district and council level down to the level where the problems are situated: the village or watershed. Attempts should be made to broaden the capacity through the establishment of Village Development Committees (VDCs) or other forms of community-based initiatives. These groups play an important role in environmental awareness raising at the village level.

The short-term goals can be divided into five categories: research; training; policy formulation; policies; and policy instruments:

1) To establish a network of environmental research organizations in NWFP to generate reliable discriminative information for policy makers.

2) To train environmental professionals.

3) To formulate environmental policies and management procedures through process approach involving a wide audience of experts.

4) To develop and implement comprehensive environmental management strategy, sectorial and regional policies. It is important to define the fields where immediate action is needed and to assign capacity that can act effectively. For instance, the following issues should be addressed:

- **forestry and watershed management**  
Methods are developed. But how can local NWFP (governmental and non-governmental) organizations take over the developed approaches so that full regional coverage is achieved and the quality maintained?

- **agriculture**  
More research projects in the barani (rainfed) areas to solve the problems

of declining soil fertility and erosion are required.

- **industry**

Review and enforcement of environmental standards are needed so that the industrial pollution will be reduced to acceptable limits.

- **job opportunities**

Economic growth and environmental protection are two processes that are strongly related. A lack of economic growth in NWFP will make it difficult to finance environmental protection activities. People living at the subsistence level are not inclined to bother with environmental issues. One way to achieve economic growth is to create jobs. Most promising are the small-scale industries. The Government should stimulate small-scale industry but also control the pollution of these industries.

- **air pollution**

A major part of air pollution in urban centres in NWFP is caused by traffic. Implementation of already developed traffic circulation plans and enforcement of car gas exhaust standards should reduce the air pollution.

- **urban development**

Priorities in urban development should be: low-cost housing projects; increase of sewerage systems; treatment of sewerage; improvement in solid waste collection; clean drinking water for everybody. Technologies in this field are well-developed and proven. Financing the improved services is a problem due to the limited revenue generation.

- **population**

Environmental degradation is closely related to population pressure. The population pressure in NWFP is high and increasing. There is a demand for fertility control: a third of Pakistani women want no more children and a large additional number want the means to space the birth of children. The level of modern contraceptive use is very low (only 5 % of couples). Requirements to reduce population growth are: consistent political support for family planning (rural health network), to augment the low status of the women, to reduce poverty and increase the literacy rate.

- **biodiversity**

Protection of the biodiversity in NWFP will depend on a more stringent adherence to Environmental Impact Assessment (EIA) procedures. Considering the weak capacity that exists, it is recommended that the GoNWFP select a few priority areas, both in terms of areas and types of ecosystems and species. In addition, awareness raising activities need to be intensified to convince the (local) population of the economic and cultural importance of biodiversity. The pilot projects of the World Wildlife Fund (WWF), in which tourism, hunting and a sustained use of fragile ecosystems are combined need to be continued and expanded.

5) Environmental policy instruments that are effective in NWFP

The success and effectiveness of environmental management policies will depend on the availability of effective policy instruments, e.g. EIA procedures, environmental legislation. Effective enforcement will depend on a well-defined system of penalties and fines, and on economic policy instruments to regulate environmental behaviour of the main economic actors.

## 1. INTRODUCTION

### 1.1 Background

This environmental profile of the North-West Frontier Province (NWFP) was prepared for the Government of NWFP at the request of the Planning, Environment & Development Department. The purpose of the profile is to evaluate the current state of natural resources and environmental management in the Province, to identify the overall trends in resource use and development and to assess the impact of the trends on the future environmental status. This document highlights the critical environmental issues for the Province and is designed to assist as a reference and planning guide. This profile is not intended to specify an action plan or give a list of recommendations to counter the environmental problems of the Province. It is designed to give an analytical assessment which points to the current situation so that policy makers can infer

their own action plan and recommendations.

The environmental profile was prepared in July-September 1993 by a combined DHV and EDC team. The profile is based on secondary data sources. The only primary data collected was to determine the air pollution levels in selected cities of NWFP. During the data-collection process, the team assessed that a large number of data was available in the Province regarding different aspects of the environment and natural resources. However, this data was not present in a consolidated manner and it was therefore difficult to form an overall impression of the environmental situation. The first task in the preparation of this profile was to collect the data and collate it to provide a comprehensive view of the state of the environment in the Province. The reference section provides details of all resource materials used in preparing the profile.

The profile is organized in five main components. The first component describes the natural resource base, the second component analyses the interaction between the environment and the human factor, the third component contains an analysis of the main environmental issues, the fourth component provides an institutional overview and the fifth component proposes a means towards a more effective environmental management. This report structure was chosen because it provides a good descriptive and analytical basis on which NWFP government can conduct its task of formulating recommendations and policy analysis.

NWFP government has taken the lead in studying its environmental problems and preparing a comprehensive action plan for dealing with its environmental concerns. This initiative has led to the formulation of the Sarhad Provincial Conservation Strategy (SPCS) in collaboration with IUCN. This report provides the starting point for an environmental benchmark for the Province and gives a working first draft on which the SPCS can be developed over time. It is expected that this report will assist in building a solid database for helping to protect and develop the natural resource base of the Province. The report also identifies the gaps in existing environmental data.

## 1.2 Introduction to NWFP

The North-West Frontier Province is the smallest province in terms of area of the four provinces of Pakistan and the third largest in terms of population. The area is very diverse, comprising the high mountains of the Hindu Kush in the north and the Indus plain in the south (Maps 1.1, 1.2 and 2.5). NWFP covers richly diverse ecological systems. From snowy, forest-covered mountains to arid rangelands. From the barren hills of the tribal areas to the fertile agricultural Peshawar valley.

NWFP is regarded as the western border of the subcontinent and was the traditional trade route from Asia to India. Through its passes have travelled many conquerors and explorers like Mahmud of Ghazni, Cyrus, Alexander the Great, Tamburlane, Emperor Babur, Nadir Shah and Ahmad Shah Abdali. It has been the cradle of the Buddhist Gandhara civilization (sixth century BC). Afghanistan forms the western boundary of NWFP. In the east it borders with the Punjab Province and in the far south it has a short border with Baluchistan. In the north, only a narrow corridor separates it from Central Asia and China.

The province of NWFP was created as an administrative entity in 1901. It comprises administrative units called divisions, districts and Provincially Administered Tribal Areas (PATA). NWFP occupies approximately 100 200 km<sup>2</sup>, of which 74 521 km<sup>2</sup> are under provincial administration. The remainder is covered by the Federally Administered Tribal Areas (FATA), which are under the political control of the Federal Government<sup>1</sup>. NWFP currently comprises seven divisions and 22 districts. The number of districts has gradually increased and the size of each district has consequently decreased.

## 2. THE NATURAL ENVIRONMENT

### 2.1 Climate

The diversity in geographical conditions cause likewise climatic conditions in NWFP (see Diagram 2.1 and Table 2.1). The Division of Dera Ismail Khan in the south is one of the hottest in Pakistan, with maximum temperatures of

between 46 °C and 50 °C, while summers are temperate and winters often extremely cold in the mountainous region of the north. The air is generally dry, therefore daily and annual temperatures may differ considerably.

There is wide variation in precipitation, both in amounts and in distribution over the year. Rainfall over NWFP mainly occurs in two distinct crop-growing seasons, viz: Rabi (winter, December to March) and Kharif (summer, June to September). Almost no rainfall occurs in lower NWFP and relatively very little in the hills of upper NWFP in the intermediate periods, i.e. April to May and October to November.

In Rabi, frontal systems from the west cause widespread rains over NWFP (see Map 2.1). The main Rabi precipitation ranges from 1100 mm in the north-western part of the Province to below 100 mm in the southern tip. In Kharif, the southeast Monsoon is primarily responsible for rainfall activity over the Province (see Map 2.2). Monsoon onset takes place over the subcontinent in the first or second week of June. The main Kharif precipitation ranges from 900 mm in the area around Mansehra to around 100 mm in the southern and northern part of the Province.

### 2.2 Geography and topography

Land-forms in the northern parts of NWFP reach their greatest altitude with elevations averaging 3000 metres above sea level and peaks of more than 7000 metres, including the mighty Tirich Mir (7750 metres) near Chitral City (see Map 2.5). Dividing Chitral from the Wakhan corridor of Afghanistan is the Hindu Kush range with its equally impressive southern extension, the Hindu Raj or Shandur Range.

Coming down from the hills are a series of very productive agricultural basins; Peshawar, Kohat-Bannu and the Derajat. Most are fringed by hills which are steep on the northern sides and with gentle slopes towards the southern side. Basins and plains comprise roughly one quarter of the Frontier's total surface area.

All the dense forests are located in the moist north and northwestern mountainous regions. They accommodate a



great deal of biodiversity. The major perennial rivers of Pakistan also originate and pass through these areas. The mountains would have been impenetrable without the gateways gorged out by the streams. The Province's western and southwestern mountain ranges are dry and have scanty vegetation. Agricultural activities are found more in the rainfed and irrigated plains and valleys of the Province.

### 2.3 Geology

The North-West Frontier Province can be subdivided into four broad geological units (see Map 2.3):

#### *The metamorphic and igneous rocks of the northern mountains:*

The area north and west of the Peshawar valley consists of metamorphic rocks associated with intrusions of igneous rock. It consists mainly of black amphibolites of the Upper Swat Hornblende group. The dioritic rocks are widespread in Bajaur Agency, and in the southwest of the Dir District. Further north, Tertiary volcanic rocks are present in the form of a very thick series of andesite and dacite tuffs interbedded with fossiliferous metasedimentary rocks.

#### *The Mesozoic rocks of the southern and southwestern part of NWFP*

Mesozoic sediments occur in the western part of the Khyber Agency, the Orakzai area, the Kurram Agency, North Waziristan, and South Waziristan. They also extend into the Kohat range. The east-west Safed Koh range also comprises Jurassic and cretaceous limestones.

#### *The Tertiary rocks of the central and southeastern part of NWFP*

The rocks of Tertiary era are mainly found in the centre and south of the Province. Dark grey Palaeocene shale and limestone are found along the crest of the Kohat range and between the Peshawar valley and the Kohat plain and in the adjacent part of Orakzai Agency. A broad belt of Eocene and Miocene formations is found south of the Kohat range, between Kohat town and Banda Daud Shah.

#### *The Upper Tertiary and Quaternary sediments*

These sediments occur in the Peshawar valley, D.I. Khan, Bannu and the intermontane basins. The basins are filled with deposits, mainly alluvium, consisting of sand, gravel, boulders, silt and clay. These are the erosion products of the surrounding mountains and have been transported by the streams and rivers both from the hills and from more distant source areas. Not only river water but also wind is an active transport medium and has deposited thick layers of loess, which is well-sorted, fine windblown silt.

### 2.4 Hydrology

Both surface water and groundwater are important for the natural environment, drinking and irrigation in NWFP. Most of the surface and groundwater available in the Province is classified as

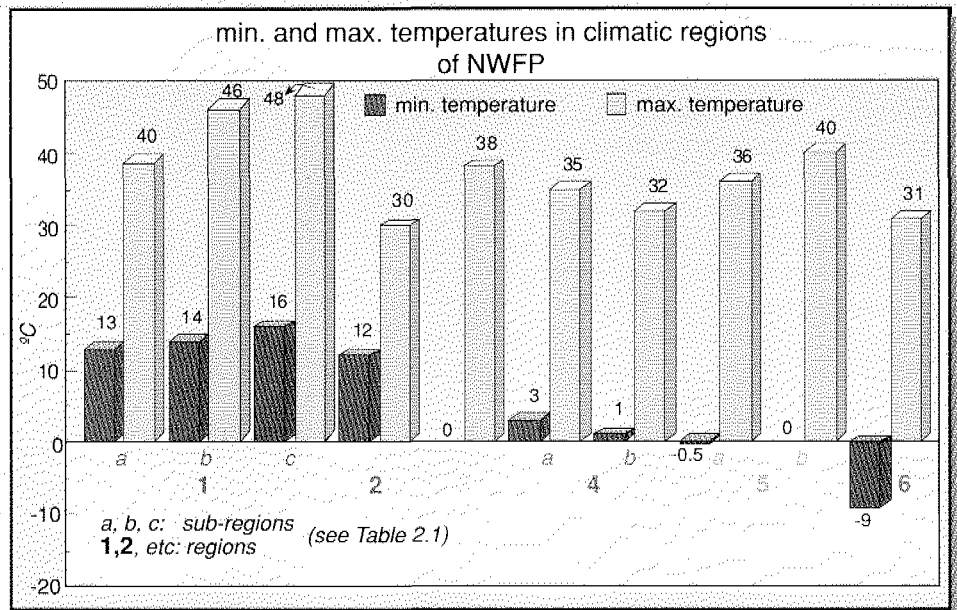


Diagram 2.1

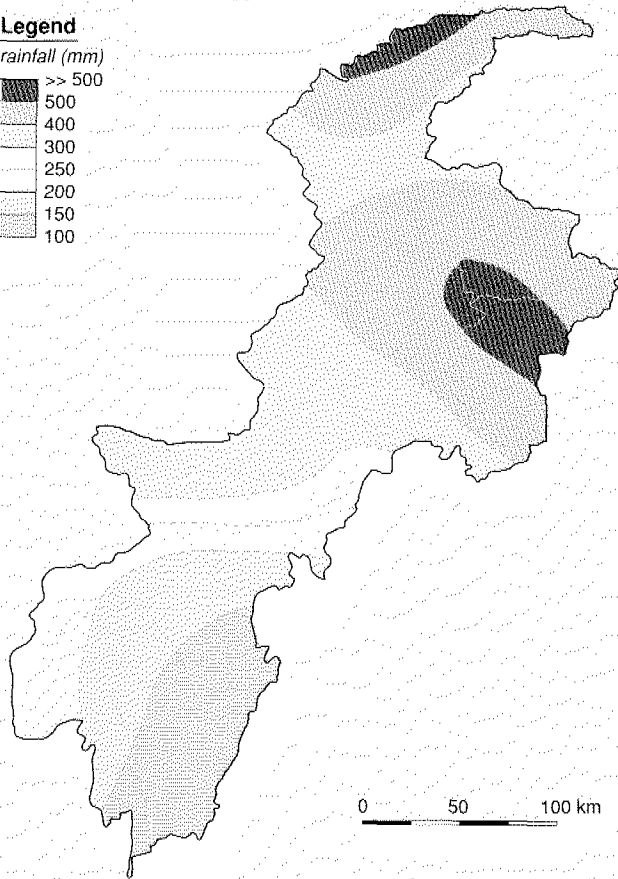
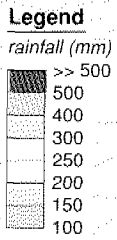
Region	Sub-region	Location
1	a	Peshawar vale west
	b	Bannu Basin
	c	Dera Ismail Khan
2	-	Parts of Swat, Dir, Abbotabad & Peshawar vale
3	-	Spur of outer Himalayas
4	a	Hills of Swat, Dir and Kohistan
	b	Hills of Kohat and Karak
5	a	Northern Swat, Southern Chitral, Bajour & Khyber agencies
	b	Waziristan and southern parts of Kohat and Karak districts
6	-	Northern part of Chitral district

Table 2.1: Climatic zoning in NWFP

Remains of the buddhist monastery Takht-i-Bahi (3<sup>rd</sup> century A.D)



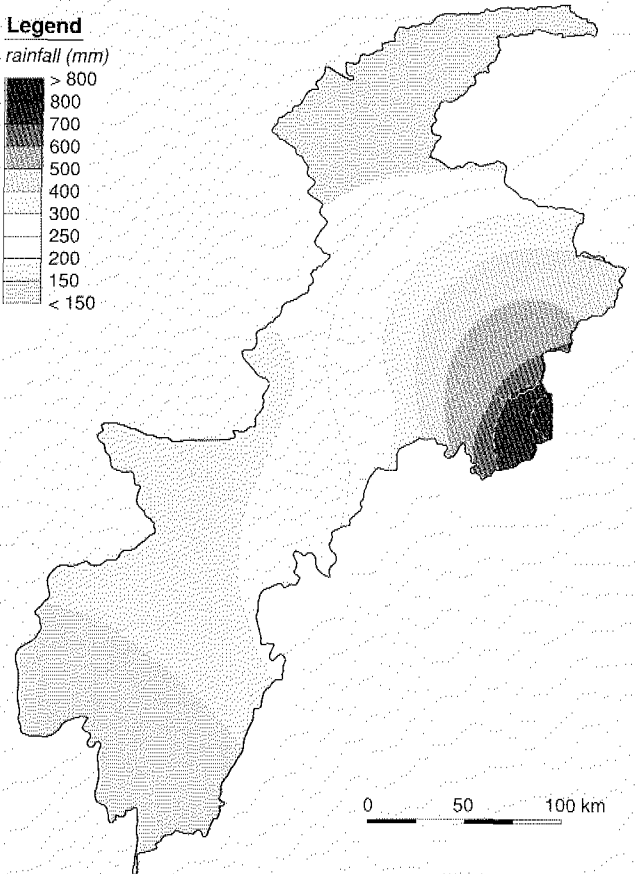
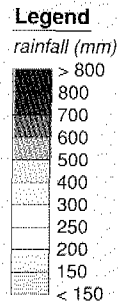
**Map 2.1 MEAN SEASONAL RAINFALL (mm) FOR RABI**



0 50 100 km

Source: PARC, WRI, NARC, 1993

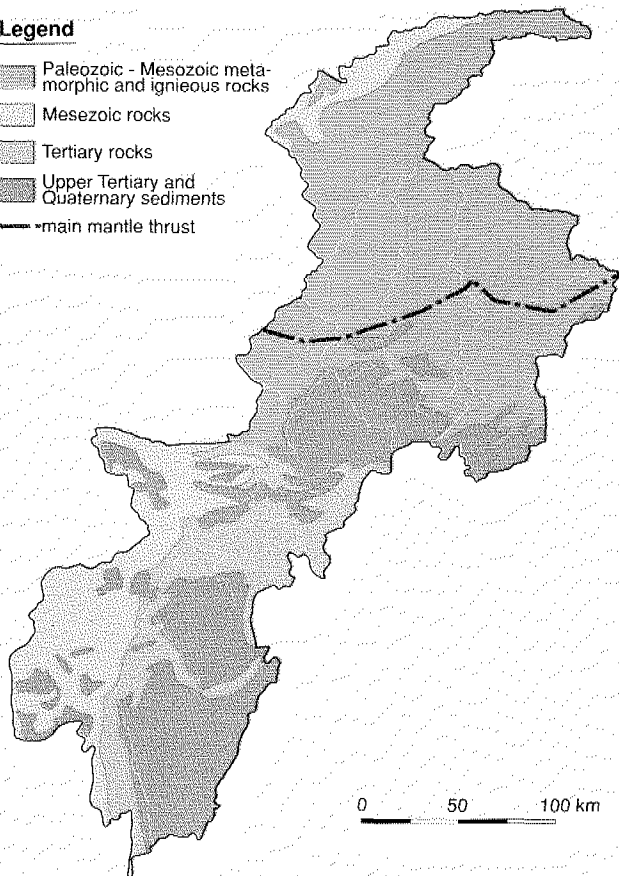
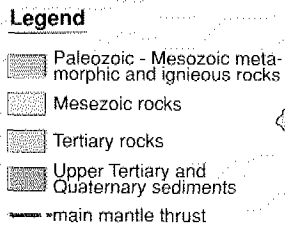
**Map 2.2 MEAN SEASONAL RAINFALL (mm) FOR KHARIF**



0 50 100 km

Source: PARC, WRI, NARC, 1993

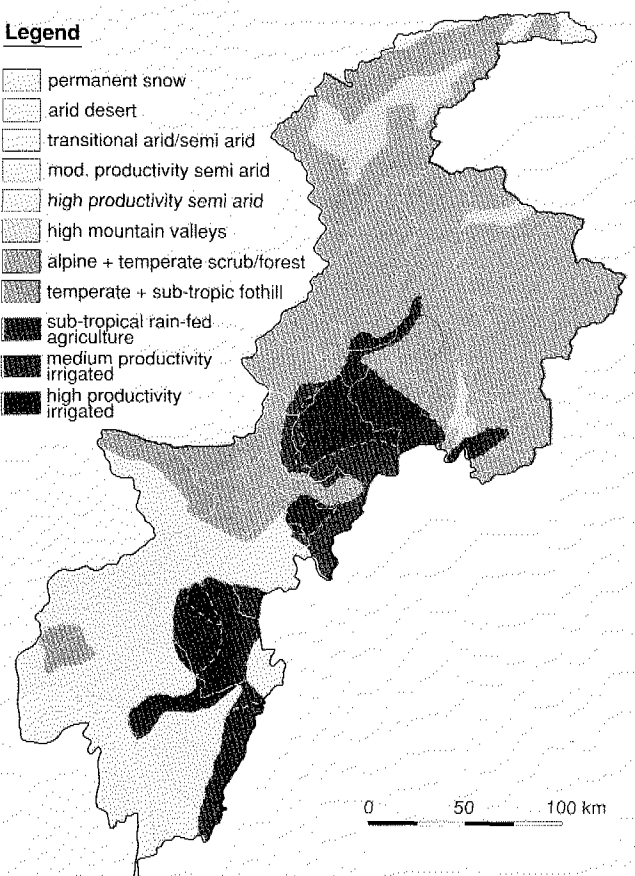
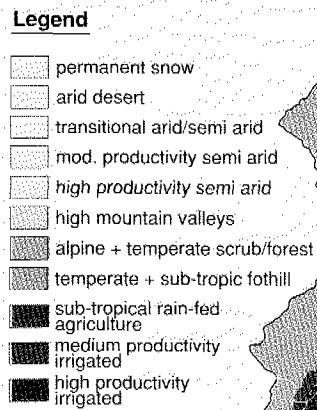
**Map 2.3 GEOLOGICAL MAP OF NWFP**



0 50 100 km

Based on: Geology map of Pakistan, in Atlas of Pakistan, 1985

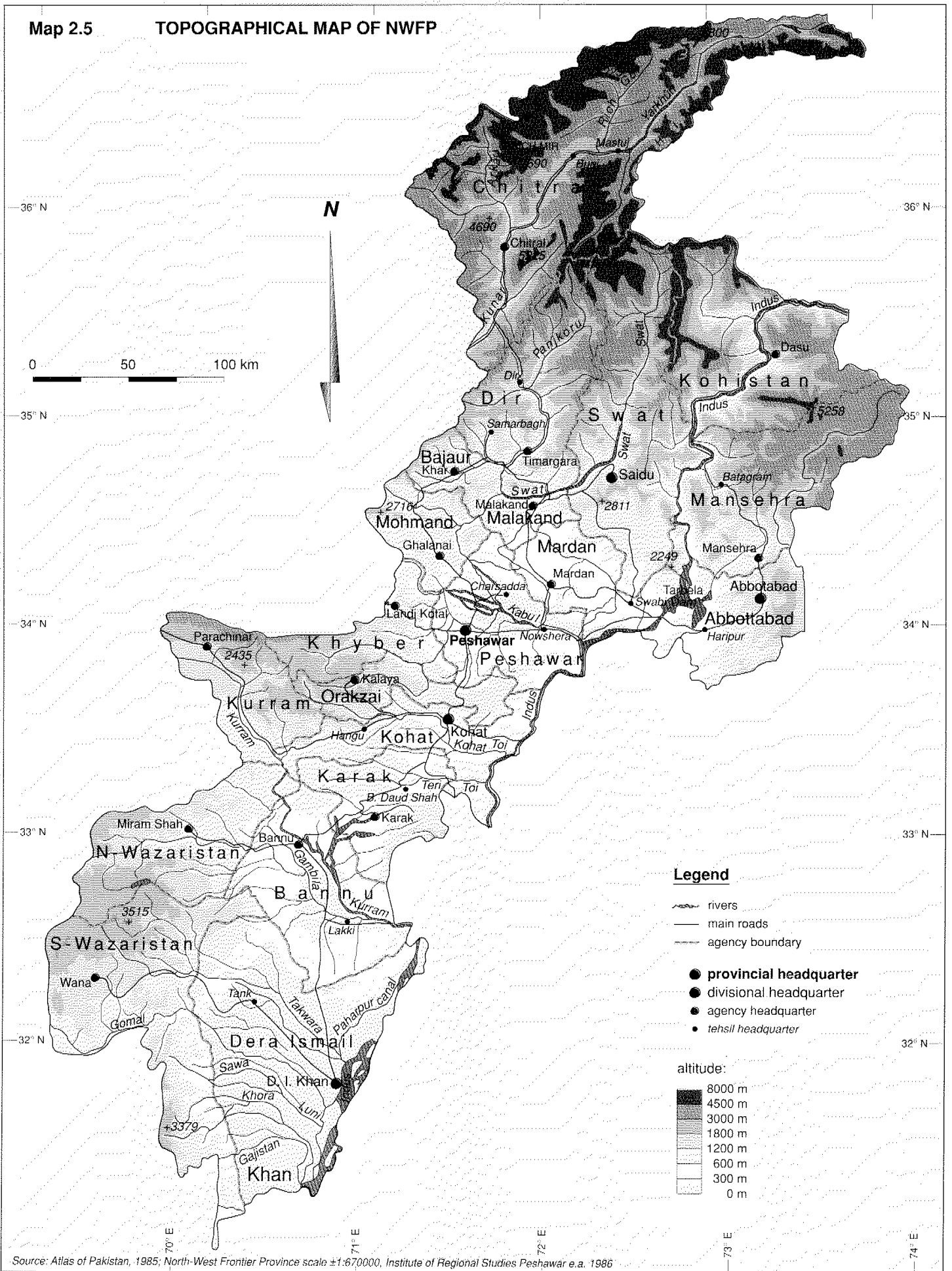
**Map 2.4 NWFP AGRO-ECOLOGICAL ZONATION**



0 50 100 km

Source: HESS

Map 2.5 TOPOGRAPHICAL MAP OF NWFP



Source: Atlas of Pakistan, 1985; North-West Frontier Province scale  $\pm 1:670000$ , Institute of Regional Studies Peshawar e.a. 1986



Summer landscape

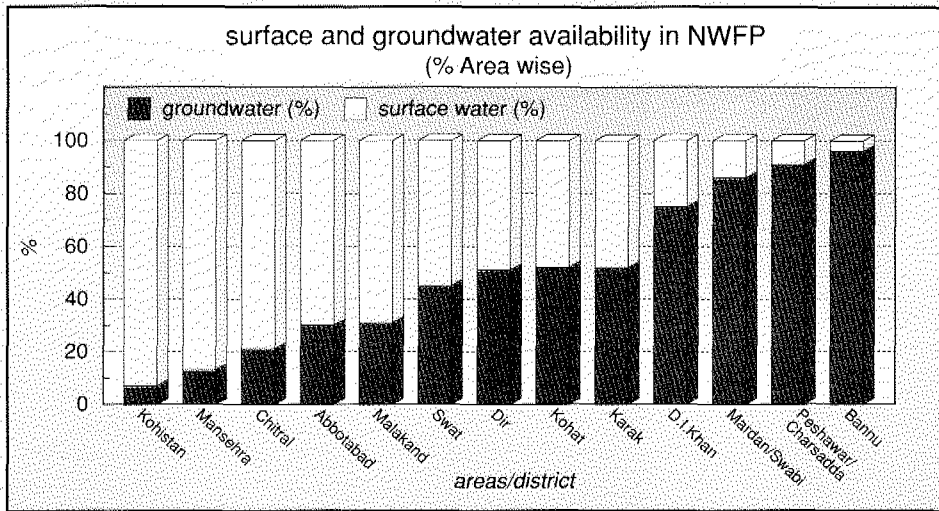


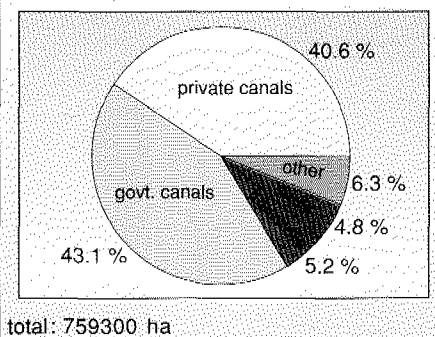
Diagram 2.2<sup>1</sup>

Kathas, the traditional gravity irrigation system



Diagram 2.3<sup>2</sup>

mean area irrigated by different sources in NWFP in settled areas, between 1987-90 in ha



sweet with the exception of brackish water zones in D.I. Khan, Bannu and Karak districts. Surface and groundwater availability in NWFP Province are presented in Diagram 2.2.

In NWFP, surface water is generally in abundance in the form of springs, rivers and khwars (water from melted snow). Most of Pakistan's groundwater resources exist in the Indus Plain extending from the Himalayan foothills to the Arabian Sea and are stored in alluvial deposits. The areas of significance for groundwater exploration and development in NWFP are the valleys of Peshawar, Mardan, Kohat, Bannu and some areas of D.I. Khan.

The use of river water for crop irrigation is an ancient practice. The oldest method is the construction of small diversions called kathas that carry water when the river is high. Canal irrigation started during the Moghul rule (16<sup>th</sup> and 17<sup>th</sup> centuries) and increased considerably after Pakistan's independence. In addition to the use of canal water for irrigation, tubewells, wells and tanks are also sources of irrigation water in the Province (see Diagram 2.3).

The development of groundwater through tubewells has been the most significant factor in increasing water supplies during the last 28 years. The area irrigated by tubewells in NWFP is 47,700 ha and the reported irrigation efficiency is better due to negligible conveyance losses through the canals and better control to match the crop water requirements.

## 2.5 Soils

The soils of NWFP may be divided according to their physiography into the following groups<sup>3</sup>.

### Residual-colluvial soil of mountain slopes, fans and terraces

These soils are shallow to moderately deep, gravely loams formed on slopes ranging between four and 80 per cent. More than 40 per cent of the soils on steep slopes are shallow due to extensive water erosion. Organic matter in the soil is around one per cent. In most places, the soil is not deep enough to cultivate crops.

### Alluvial plains

Alluvial deposits occur extensively in Peshawar, Bannu Valleys, Dera Ismail Khan District and in the intermontane valleys in the form of narrow elongated strips along the major streams. The alluvial soils are generally deep, have a sandy to clayey texture and are moderately alkaline and calcareous. In most regions however the soils are low in organic matter. The alluvial soils have a high agri-



culture potential. In many regions they are exposed to frequent floods due to the proximity of rivers, resulting in waterlogging and a decline in agricultural productivity.

#### Loess plains

Loess deposits are found extensively in the Peshawar Valley, the Haripur plain and in the intermontane valleys in northwestern parts of Province. They comprise thick deposits of calcareous silt sediments. In some areas very severe truncation and dissection have resulted in gullied land or badlands. These soils are deep and moderately alkaline and calcareous with a very high agriculture potential. Water shortage, steep slopes and water erosion are the main limitations.

## 2.6 Vegetation, (plant geography, vegetation structure)

Vegetation zones of NWFP according Roberts (1977) can be briefly described as follows:

#### 1. Permanent snowfield and cold desert.

The highest parts, mainly above 4000 m, of the Himalaya and Hindu Kush Ranges in Hazara, Swat and Chitral Divisions. Consists of glaciers, permanent snowfields, high-altitude cold desert with low vegetation cover including species such as dwarf *Salix* spp., and forbs *Mertensia tibetica*, *Potentilla desertorum*.

#### 2. Alpine zone.

Areas above the tree-line in Hazara, Swat and Chitral Divisions.

a) *Alpine meadows*; Occur below glaciers and areas where snowmelt provides more mesic conditions. Often good growth of grasses and sedges, with forbs such as *Saxifrage sibirice*, *Potentilla* spp., *Primula* spp., *Polygonum* spp.

b) *Sub-alpine scrub and birch forest*; Consists of narrow belts at the lower edge of the alpine zone (c.3000 m - 3500 m), descending to lower altitudes in ravines. Characteristic tree species are *Betula utilis*, *Salix* spp., *Myricaria germanica*, *Rhododendron anthropogon*, *Junipers communis* and *Hippophae rhamnoides*, with a ground layer of grasses and herbaceous plants.

#### 3. Dry temperate coniferous forest.

Found on the drier inner ranges of the Himalaya with less monsoon influence, in Hazara (upper Kaghan valley, Siran and Alai valleys, and District Kohistan), upper Swat (Dir and Swat Kohistan) and Chitral. Main tree species are *Picea smithiana*, *Pinus wallichiana* and *Cedrus deodara*, with an understorey of *Indigofera gerardiana*, *Sambucus ebulus*, *Sorbaria tomentosa* and *Plectantrus rugosus*.

#### 4. Himalayan moist temperate forest.

Found on slopes receiving high monsoon rainfall in Hazara (notably in the Galis, lower Kaghan valley, and southern parts of the Palas valley, District Kohistan). There is a mixture of deciduous and coniferous tree species including *Pinus wallichiana*, *Abies pindrow*, *Quercus dilatata*, *Acer caesium*, *Populus ciliata*, *Prunus padus*, *Taxus baccata*, *Aesculus indica*, with a dense understorey of *Berberis* spp., *Lonicera* spp., *Viburnum* spp., and *Skimmia anquetilia*.

#### 5. Subtropical pine forest.

A fairly narrow zone between 900 m to 2000 m

along the southern flank of the Himalaya in Hazara (lower Galis, Mansehra) and the lower Swat valley. The trees *Pinus roxburqi* and *Quercus incana* dominate, with an understorey of *Berberis* spp., *Clematis qouriana*, *Carrisa* spp., *Cotoneasters* spp., and clumps of grasses.

#### 6. Tropical deciduous forest.

Restricted in NWFP to the Margalla Hills bordering the federal capital territory. In the shadier ravines there is an association of tropical Indo-Malayan tree species, including *Bauhinia variegata*, *Shorea robusta*, *Ficus caria*, *Cassia fistula*, *Salmalia malabarica*, and *Lannia coromandelica*, with an understorey of *Dodonaea viscosa*, *Woodfordia fruticosa* and *Carissa spinarum*. A number of Indo-Malayan bird and mammal species are associated with this zone.

#### 7. Alpine dry steppe.

a) *Steppe forest in northern latitudes*; Typified by valleys of lower Chitral, Dir and northern District Kohistan. Vegetation consists of scattered trees of *Junipers macropoda*, *J. polycarpus*, *Pistacia integrimma*, *Quercus ilex*, and *Pinus wallichiana*, with a ground layer of woody shrubs *Artemisia maritima*, *Ephedra intermedia*, and *Berberis* spp.

b) *Steppe forest of intermediate latitudes*; Found in the far south of NWFP around the Takht-i-Sulaiman and the western border of Waziristan, and further north in parts of Safed Koh (Kurram Agency), Malakand and Swat. These areas are sparsely covered with trees *Juniperus macropoda*, *Fraxinus xanthoxyloides*, *Pinus gerardiana* and *Pistacia mutica*, with shrubs such as *Artemisia maritima*, *Ephedra nebrodensis* and *Rosa webbiana*.

#### 8. Arid subtropical habitat.

Rocky and hilly areas from sea level to around 900 m.

a) *Slight monsoon influence*; Regular winter frosts and dry, hot summers. Hill areas of eastern Waziristan. The area is overgrazed with a degraded vegetation of trees *Acacia modesta*, *Olea cuspidata*, and shrubs *Dodonaea viscosa* and *Monothea buxifolia*.

b) *Baluchistan desert scrub*; Very cold winters and no monsoon influence. Extends throughout most of Waziristan and the lower areas of NWFP. Degraded scrub vegetation: *Reptonia buxifolia*, *Olea cuspidata*, *Pistacia integerrima*, *Nannorhops Ritchiana* and *Bromus* spp.

#### 9. Riverine tract.

Restricted in NWFP to the immediate vicinity of the River Indus south of Tarbela. Characteristic plants are *Tamarix dioica*, *T. aphylla*, *Populus euphratica* and *Acacia arabica* and reed grass *Sacharum spontaneum*.

The major forest zones are indicated in Map 2.6.

## 2.7 Land use zoning: Relief, climate and vegetation integrated

In areas like NWFP there is a strong effect of relief on climate, vegetation and soils. Cross section 2.1 shows this integration schematically. This cross section forms the basis for agro-ecological zoning. Several different agro-

ecological zone maps of NWFP exist. All maps are made by different agencies for different purposes. Table 2.2 compares the agro-ecological zonings of the Province. The large number of zones reflects the great diversity of this province.

This profile has adopted the agro-ecological zoning of SSOP, PARC (WRRI, NARC) and of HESS. The Soil Survey of Pakistan (SSOP) classifies the country's agro-ecological zones according to variations in topography, climate, water availability and soils. Given the variations in soil type and water availability, the SSOP has computed the average yields of food staples at the current levels of agriculture inputs. From these yields, 1981 population-support capacities have been computed. The population-support capacities for NWFP are analyzed in Section 9.1.

The agro-ecological zones of the PARC (1980) and the Agricultural University of Peshawar (1993) indicate suitability of the different zones for crops. They are based on annual data. However, NWFP has two distinct agricultural seasons, namely Kharif (Summer) and Rabi (Winter), and the suitability of a crop to grow should be classified according to these two seasons. Therefore, a fifth agro-ecological zoning was developed by PARC (WRRI, NARC) especially for this profile. This zoning will evaluate crop suitability in Section 6.7.

HESS developed agro-ecological zones for purposes of sampling fuelwood biomass throughout the country<sup>4</sup>. This demarcation of zones is based on vegetation types and cycles, interpreted from satellite imagery for each month of the year, which is a good indicator of land productivity. HESS's agro-ecological zones are shown in Map 2.4 and are described as follows:

#### Zone 1: Permanent snow

This zone lies above 4800 m elevation, well above the tree line and alpine pastures, and supports no plant growth.

#### Zones 2 and 3: Arid desert and transitional arid/semi-arid

The climate is continental with high annual and diurnal temperature ranges. Mean annual rainfall is around 250 mm. Summer temperatures are 30 °C to 40 °C, but winter temperatures can drop to below zero. Vegetation is closely related to soil moisture: open woodlands, grass along stream beds and on piedmont slopes. Livestock production is one of the main land uses, along with some cultivation.

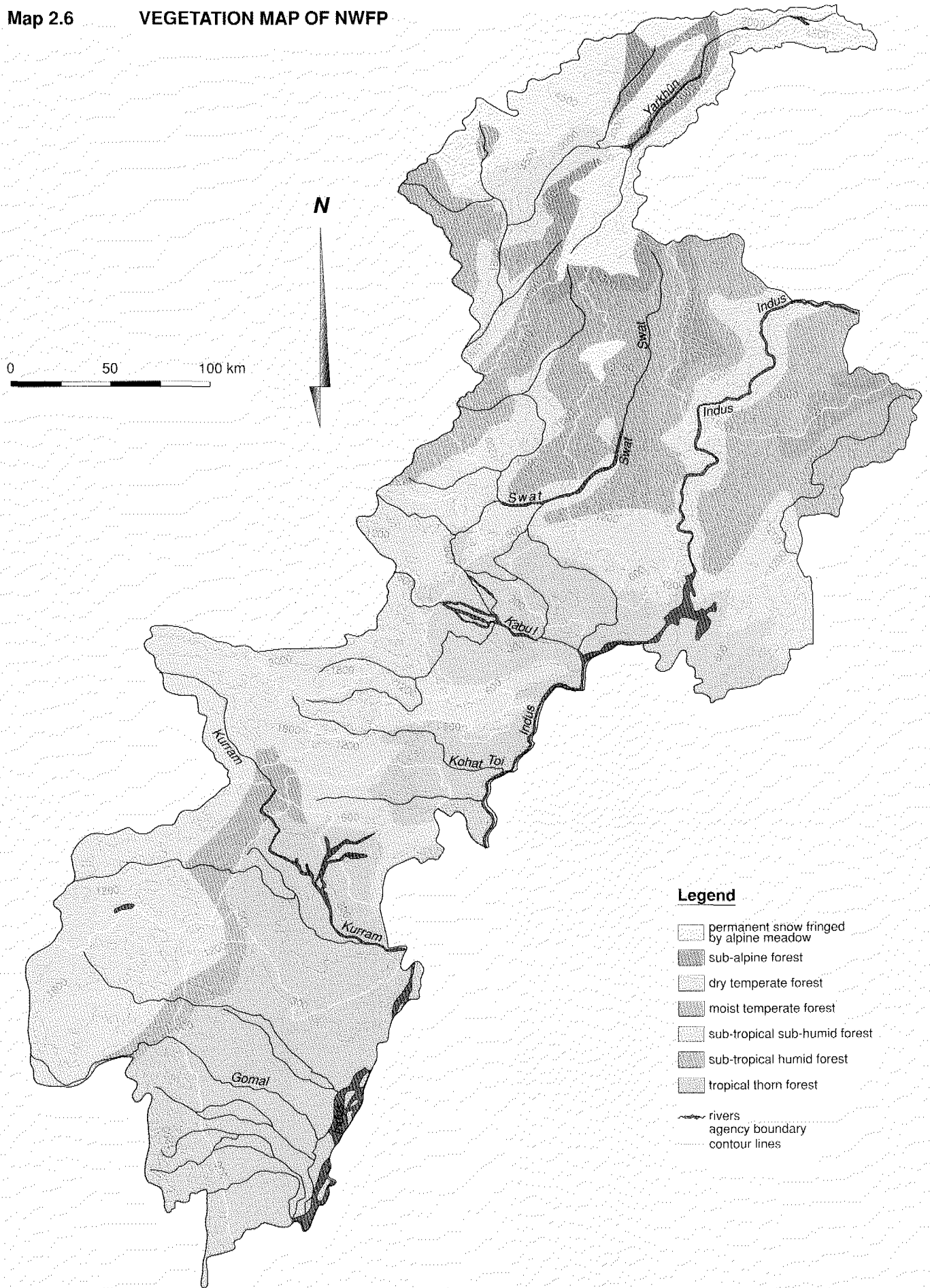
#### Zone 4: Moderate productivity semi-arid

The main difference between this zone and its



Map 2.6

VEGETATION MAP OF NWFP



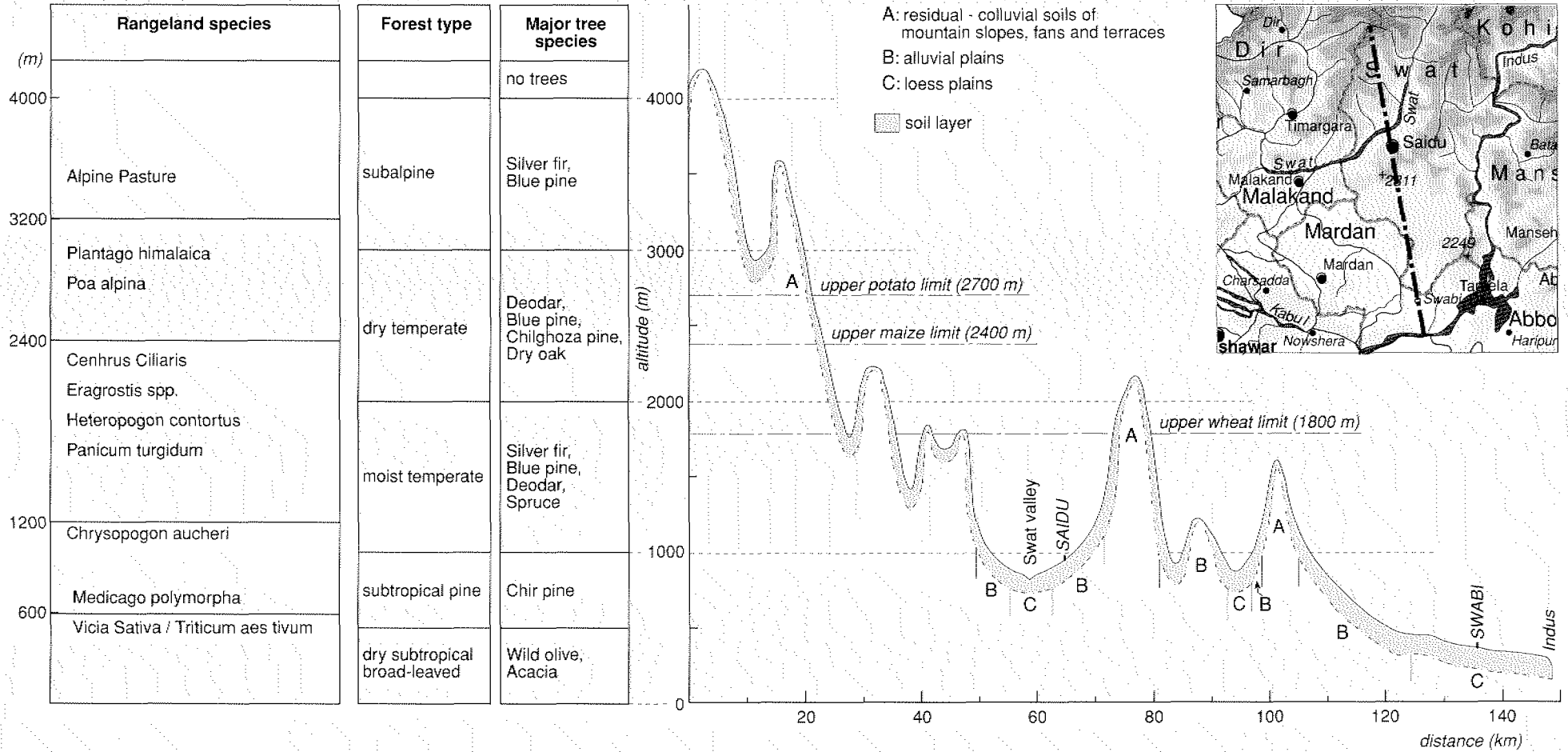
**Legend**

- permanent snow fringed by alpine meadow
- sub-alpine forest
- dry temperate forest
- moist temperate forest
- sub-tropical sub-humid forest
- sub-tropical humid forest
- tropical thorn forest
- rivers
- agency boundary
- contour lines

Source: Forest department Peshawar; Atlas of Pakistan, 1985

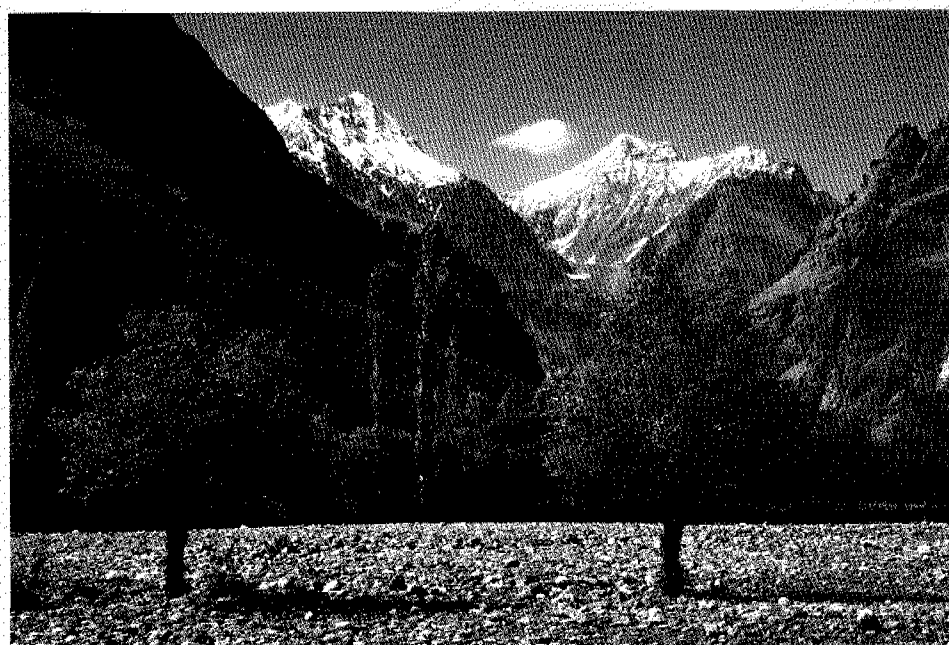
Cross-section 2.1

CROSS SECTION NWFP ALONG THE LINE SAIDU - SWABI, indicating main soil types and characteristic vegetation types





Winter landscape in the north



The shallow colluvial soils of fans and mountain slopes

adjacent Zone 3 is an increase in moisture and vegetation. The main land uses are livestock and agriculture.

**Zone 5: High productivity semi-arid**

This zone is more productive as it falls in the well-watered valleys. Forests in this zone are the main utilization of land.

**Zone 6: High mountain valleys**

Upper mountain slopes have poor soils, but valleys have rich, deep soils overlying colluvium. The climate is cold and dry and winters are severe. Mean daily temperatures are often less than 0 °C, with daily minimums down to -13 °C. The region receives only 125 to 500 mm precipitation, most as snow. Energy demands are high due to the cold winters. Villagers cut their fuelwood from nearby forests or rely on wood imports if there are none.

**Zone 7: Alpine and temperate scrub/forest**

Climate is dry, cool-temperate with mainly winter rainfall. Snowfall can range from two to six metres. Summer temperatures are usually below 15 °C and mean monthly temperatures are below 0 °C for more than half the year. The vegetation is strongly determined by altitude. High alpine scrub is important for grazing. Cultivation is being extended further up the steep slopes as good land becomes scarce below. This zone still has large supplies of wood, but the rate of exploitation makes their future uncertain.

**Zone 8: Temperate and subtropical Himalayan foothills**

The annual precipitation reaches 1400 mm at higher altitudes, 1000 to 1400 mm at middle elevations, and is less than 1000 mm at lower elevations. The landscape at high altitude is rugged. Valleys at lower altitudes have deep alluvial deposits. Slopes once covered by dense forest are now patchy due to clearing for timber, fuelwood and agriculture. HESS's prognosis for these forests is poor.

**Zone 9: Subtropical rainfed agriculture**

This zone is an undulating plain at altitudes between 700 and 1000 m. The area is hot and semi-arid with mainly summer monsoonal rainfall. Summer mean maximum temperatures are around 38 °C and winter temperatures range from 4 °C to 7 °C. The area has little natural vegetation and is intensively farmed, mainly for rainfed cereals. Many trees are planted on farm boundaries. HESS estimates a decline in wood stocks due to a high demand from Peshawar and other large towns. However, social forestry programmes have been

Table 2.2: Agro-ecological zoning of NWFP

S. No	Agency	Year	No. of Zones	Purpose
1	Pakistan Agricultural Research Council (PARC)	1980	6	To divide the Province into various zones as to their suitability for raising various agricultural crops. Basis of classification is physiography
2	Soil Survey of Pakistan	1985	9	To classify the area as to suitability of its various zones for different types of vegetation. This zoning is based on climate and type of native vegetation
3	Agricultural University, Peshawar	1993	5	To divide the Province into various zones based on their suitability for following various cropping patterns. It is mainly based on rainfall, temperature and presence or absence of irrigation
4	Household Energy Strategy Study (HESS)	1992	11	To sample fuelwood biomass. It is based on vegetation changes and cycles interpreted from satellite imagery for each month of the year as indicator of land productivity
5	PARC (WRII, NARC)	1993	40	To divide the Province into zones based on crop suitability. Basis of the classification is seasonal rainfall, aridity index and growing degree days.

initiated and are expected to have a positive impact.

#### **Zones 10 and 11: Medium and high productivity irrigated land**

As with Zone 9, social forestry programmes have encouraged tree planting on these highly productive sites. Nevertheless, demand in Peshawar is so high that wood is imported from northern NWFP and the Northern Areas.

## **2.8 Species diversity in NWFP**

### **Mammals**

No definitive checklist of the mammals of NWFP has been prepared. However, Roberts (1977) provides a detailed description of the mammals of Pakistan and their distribution from which such a list might be compiled. For all Pakistan, Roberts lists 158 species of mammal in ten out of the eighteen known orders: *Insectivora*, 11 species; *Chiroptera*, 36; *Pholidota*, 1; *Lagomorpha*, 6; *Rodentia*, 43; *Primates*, 2; *Carnivora*, 31; *Perissodactyla*, 1; *Artiodactyla*, 18; *Cetacea*, 9. Of these orders, *Cetacea* and *Perissodactyla* are absent from NWFP.

Palaearctic mammal species probably reached NWFP from Central Asia through the Himalaya and Hindu Kush (Mallon 1991). They include brown bear, stoat, greater white-grey long-eared bat and ibex. Indo-Malayan mammal species probably reached NWFP along the Himalayan foothills. These include leopard cat and goral. The mingling of these two species in NWFP has produced some distinctive mammal communities. The far north of Chitral and Kohistan have characteristic high Himalayan fauna such as snow leopard, brown

bear, alтай weasel, and long-tailed marmot.

The Himalayan moist and semi-moist temperate forests of NWFP have perhaps the richest mammalian communities of any ecosystem in Pakistan, with species including Kashmir grey langur, rhesus macaque, grey wolf, Kashmir red fox, Himalayan black bear, stone marten, yellow-throated marten, leopard, leopard cat, musk deer, grey goral, Royle's pika, Indian giant flying squirrel, small Kashmir flying squirrel and Indian crested porcupine.

*Endemic mammals:* Of the 6 mammal species endemic to Pakistan, two may occur in NWFP:

- Woolly flying squirrel: a little-known and extremely rare and local species of steppic mountain areas. May occur in northeast Chitral, northern Swat Kohistan and northern District Kohistan (Kandia and Jalkot valleys).

- Murree vole: abundant in the Himalayan moist temperate forests zone in the Murree Hills, Hazara and Swat.

No endemic subspecies of mammal are noted for NWFP (Mallon 1991).

*Threatened mammals:* The Moghul Emperor Babar gives accounts (c.1526) of hunting rhinoceros in the vale of Peshawar. This must have been the Indian one-horned rhinoceros, now extinct throughout Pakistan (Roberts 1977).

Internationally threatened mammals occurring in NWFP are: grey-wolf (V), European otter (V), smooth-coated otter (K), leopard (T), snow leopard (E) and markhor (V) (E = endangered, V = vulnerable, T = threatened, K = insufficiently known: see IUCN [1990a] for definitions of categories of threat). Of these, NWFP is perhaps most important for its population of markhor. The best known population is protected in the Chitral Gol National Park.

No objective checklist of nationally or provincially threatened mammal species has been prepared. However, in addition to the above-listed species, a list of such species for NWFP would probably include the following: Kashmir grey langur, brown bear, Himalayan black bear, leopard cat, Palas's cat, lynx, caracal, Himalayan ibex, and Himalayan musk deer.

### **Birds**

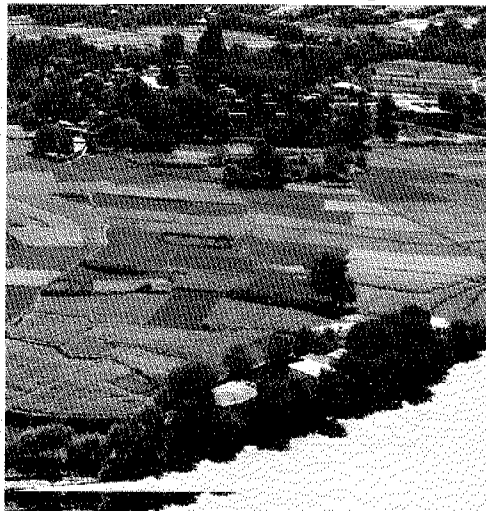
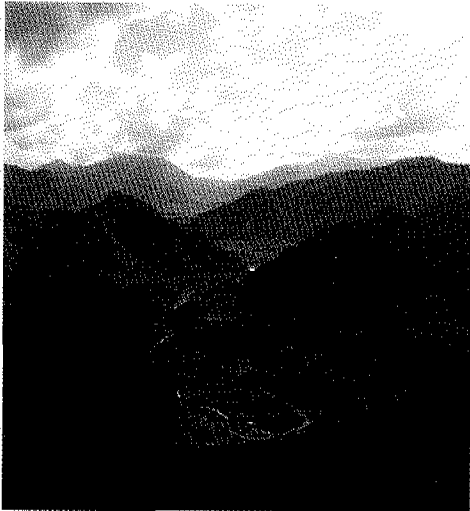
No definitive checklist of the birds of NWFP exists. However, Roberts (1991, 1992) provides a detailed description of the birds of Pakistan and their distributions from which such a list might be compiled. Roberts lists 666 species of birds for all Pakistan. Breeding birds are a mixture of Palaearctic and Indo-Malayan forms, and the occurrence of many species at one or other geographical limits of their range is illustrative of the diverse origins of the avifauna (Mallon 1991). A number of important migration routes, particularly of cranes, ducks, raptors and passerines, pass through NWFP.

*Endemic birds.* ICBP (1992) identify two areas in Pakistan - the Indus valley wetlands, and the Western Himalayan forests - as Endemic Bird Areas (EBAs). EBAs are areas with a concentration bird species having restricted ranges. EBAs are good indicators of overall biodiversity, and they can be regarded as biodiversity 'hotspots' NWFP contains a large part of the Western Himalayan EBA. A small part of the Indus valley wetlands occur in NWFP.

Seven of the eight bird species endemic to the Western Himalaya occur in NWFP, namely: western tragopan, cheer pheasant, Tytler's leaf warbler, Brook's leaf warbler, white-cheeked tit, white-throated tit, orange bullfinch, and red-browed finch.

*Threatened birds.* 12 internationally threatened bird species occur in NWFP (Collar and Andrew 1988; Roberts 1991, 1992), namely: Dalmatian pelican (migrant, V), lesser white-fronted goose (rare vagrant, K), white-headed duck (wintering, K), Palas's fish eagle (K), black vulture (K) western tragopan (E), cheer pheasant (E, extinct in NWFP?), houbara bustard (migrant, K), sociable plover (migrant and occasional wintering, K), wood snipe (single record, K), large-billed bush warbler (K), long-tailed prinia (K) (see under mammals for categories of threat). Of these species, NWFP is probably most important for the western tragopan. The world's largest

*Diversity in geography: the mountains of the Hindu Kush, the river banks along the Chitral river, alluvial plain of the Swat river*

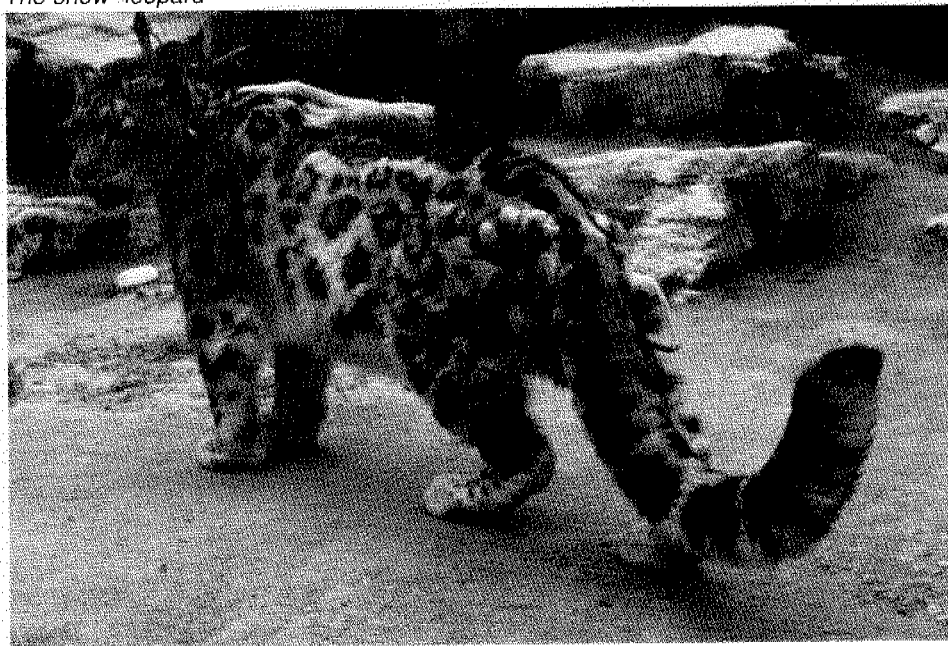






*The western Tragopan, never photographed*

*The snow leopard*



known population of this species occurs in the Palas valley, District Kohistan. This beautiful bird is used as a 'flagship species' for the Himalayan Jungle Project in Palas.

The threatened western population of the Siberian crane, a part of which winters in Rajasthan, India, may migrate through NWFP. However, this population has declined and no birds arrived at the usual wintering site at Keoladeo in 1993.

#### **Reptiles and amphibians**

One hundred and seventy-four species of reptile have been recorded in all Pakistan and checklists are probably available for NWFP. As with other groups, these species are also a blend of Palaearctic and Indo-Malayan forms.

Mallon (1991) does not list any reptile species endemic to NWFP, but states that current research on the herpetofauna of Pakistan may identify new endemics. Of the seven internationally threatened reptiles of Pakistan, only one, the central Asian cobra, occurs in NWFP. Its status is poorly known.

No information was immediately available on the amphibians of NWFP.

#### **Fish**

Mallon (1991) reviewed the fish diversity of Pakistan and information relevant to NWFP is reproduced here. Pakistan has 156 native freshwater species (plus several species introduced for sport fishing). The fish fauna is predominantly south Asian, with some west Asian and high Asian elements. There are seventeen endemic species (11% of the total) and five endemic subspecies. Also noteworthy are the nine species of snow trout of mountain barbels (subfamily Schizothoracinae) which occur in the rivers of the northern mountains. They are representative of an ecologically interesting group of fish endemic to snow-fed rivers and lakes of the high Asian sub-region.

The Indus river system contains a mainly south and southeast Asian fish fauna, while NWFP has mainly central and west Asian fish species. The mountain ranges along the Afghan-Pakistan border form a contact zone between these two faunas. Fish species diversity is high in the Himalayan foothills in Hazara, Malakand, Swat and around Peshawar. Diversity is lowest in the montane zone of the northern mountains.

#### **Invertebrates**

Mallon (1991) reviewed the invertebrate diversity of NWFP. There has been little research on the invertebrates of Paki-



stan. A number of butterfly species are endemic to the northwest Himalaya and Hindu Kush mountains and several occur in Chitral, namely: *Aporia nabellica hesba*, *Colias alpherakyi chitralica*, *Maniola davendra chitralica*, *Hipparchia boloricus chitralica*, and *Erebia kalinda chitralica*. At least four species of Apollo butterfly occur in Chitral: *Parnassius tianshanica baroghila*, *P. actius sulla*, *P. delphius chitralica*, and *P. charltonius ducalis*.

#### Flora

Mallon (1991) reviewed floral diversity in Pakistan and information relevant to NWFP is reproduced here. 5,500-6,000 species of vascular plant have been recorded in Pakistan to date. Around 300 species are endemic to Pakistan, 90% of which occur in the northern and western mountains at altitudes over 1200 m. Chitral has 39 endemic species. Recent collections from the Palas valley, District Kohistan (Rafiq, in pre.), have identified about 100 species as being endemic to the northwest Himalaya (not necessarily to Pakistan) out of some 500 species collected. Plants in Palas show affinities to no fewer than four floral regions, the Irano-Turianian, central Asian, Sino-Himalayan and Indo-Malayan. The Palas checklist is still far from complete. Much more intensive historical and contemporary collecting in Swat and Kaghan yielded around 1500 species from each valley.

The only plant in Pakistan to be listed in the red data book is the west Himalayan elm. A large reproducing population of this species, probably the world's largest, was recently discovered in the Palas valley, District Kohistan.

There are an estimated 2000 medicinal plant species in Pakistan though few are exploited, and 90% of the country's medicinal herb requirement is imported. Many of these medicinal plants occur in the northern montane areas.

#### Genetic resources

Northern Pakistan is a Vavilov centre of crop genetic diversity. Mallon (1991) reviews the crop and livestock diversity of Pakistan, but gives no specific information on NWFP.

<sup>2</sup>Source: Director of Agriculture statistics NWFP, Peshawar.

<sup>3</sup>Source: Mr. Ourangzeb Khan, Deputy Director, Soil Survey of Pakistan.

<sup>4</sup>Source: Forestry Sector Master Plan, North West Frontier Province 1992.

### 3. THE HUMAN FACTOR

#### 3.1 Race, language and religion

Pukhtoon designates a person who speaks Pukhtu. Pathan is a Hindi term adopted for them by the British. The racial composition of the Pukhtoons is less than clear. The tribes who dwelled in the area in the days of the Greek historians are believed to be part of the great Aryan horde which had moved down from Central Asia a millennium earlier. Over the course of centuries, the Greek, Persian, Turk, and Mongol invaders who passed through the Frontier have added their blood.

According to Pukhtoon legend, the race was founded by Qais in the seventh century, and the three main branches trace their origin to his three sons. The Sarbani Pukhtoons claim descent from Sarban, the Ghilzai Pukhtoons are the descendants of Baitan and the Ghurghusht Pukhtoons are the descendants of Ghurghusht.

Nearly one-third of the population of NWFP is non-Pukhtoon. The non-Pukhtoon population consists largely of landless artisans and peasants who are mainly *Gujars* and *Awan* by caste. In the tribal areas, they are called *Hamsaya* or *Kadwal*. In the border areas of Hazara and Derajat, social norms more closely resembling those in Punjab and Kashmir may be discerned. *Biradiris* or clan groups remain important, but mainly as social networks, particularly for marriages. Chitral has a separate language and culture of its own; a visible difference crossing over from Dir is that the carrying of arms is uncommon. Most distinct are the indigenous Kalash, people now confined to three small valleys in Chitral. Their way of life is rooted in the worship of ancestral spirits and trees. Their unique customs attract a lot of attention from visitors. However, due to the conversions of the Kalash to Islam, their age old traditions are rapidly becoming extinct.

Around 68 per cent of the households in NWFP are Pukhtu speaking, eighteen per cent are Hindko speaking, while Seraiki is the mother tongue of four per cent. Around eight per cent of households speak local languages, such as Kohwar in Chitral district, while Urdu and Punjabi speaking migrants account for only two per cent of the households.

With the exception of Sindh, Islam came to NWFP earlier than to any other part of South Asia. Since the Pukhtoons received their religious instructions from Sunni Turk dynasties, the majority are Sunni of the Hanafi school. Non-muslim minorities form less than 0.5 per cent of the population.

#### 3.2 Pukhtoon society

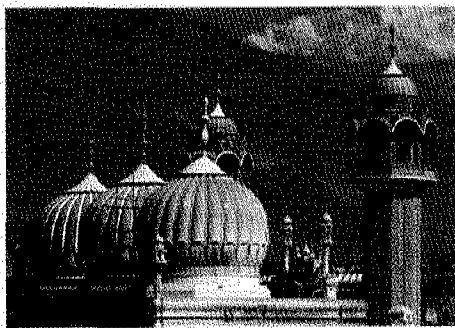
The Pukhtoon society comprises both the people of the tribal areas and the settled districts of NWFP. The tribal society has been the focus of many studies as it has kept alive the true Pukhtoon ethos. The Pukhtoons of the settled districts have however been subject to external influence and have moderated some of the more traditional aspects of their culture and customs. The Yusufzai, Muhammadzai and Khailil tribes belong to the settled districts and have limited links in the tribal areas. All other Pukhtoon tribes of the settled districts have extensive affinal and consanguinal ties with the tribal Pukhtoons (see Map 3.1).

The Pukhtoon society is individualistic despite the rigid behaviour prescribed by clan membership. While Pukhtu speaking people constitute one cultural and social entity, Pukhtoon society is divided into tribes, based on genealogies. The tribes are sub-divided into Khels, which may be equated with clans. Within the Khels, the basic division is the expanded family group. The leader of each family group is called a Malik, and the most important of a group of Maliks is designated as the leading Malik of the Khel. The usual object of allegiance is the Malik, and in settled districts, a Khan. They gain their title by their ability to lead followers in public affairs. A Pukhtoon Malik is however no more than a first among equals, and acquires the status through personal merit and the ability to inspire fellow tribesmen. Primogeniture is not recog-

<sup>1</sup>Source: Contribution of Primary Tubewells in the Development of Water Potentials (1991). Ministry of Planning and Development — Government of Pakistan



The daredevil horsemanship and the roaring spectators during a polo game



Islam came to the NWFP earlier than to any other part of South Asia



A pukhtoon

Weapons play an important role in the lives of pukhtoons



nized, and leadership is accorded to the most capable.

The social structure in the settled districts has altered a great deal from the tribal order. The Khans have lost much of their original leadership role in the settled districts. Agriculture is a notable characteristic of the culture of both the settled and tribal areas. In the former, it is however more developed in terms of irrigation, cultivation of cash crops and utilization of modern technology. The literacy rate is higher in the settled districts, especially for women. The trend towards having nuclear rather than extended families is also more pronounced in the settled districts.

The *jirga* is the Pukhtoon assembly in which all public and private affairs are settled. The *jirga*, of which the Khan is the head, now contends with the state judiciary in the settled districts. Rules of the federal and provincial governments are enforced through state intervention. The decisions of the village *jirga* in the districts have to be reinforced by the court of law if the case has also been registered by the law enforcement authorities. Unlike in the tribal areas, a legal permit is required for the manufacture and possession of arms and ammunition. The *hujra* is traditionally a male club and social centre, which exists in every village of the tribal as well as settled areas. It is the focus of community opinions and actions. While *Hujras* exist in the villages of the settled districts as well, they have lost much of their functional importance.

Traditionally, the conduct of Pukhtoons was guided by a code of honour called the *Pakhtunwali*. The foremost commandment of the *Pakhtunwali* is *Badal* or revenge (revenge is a dish which tastes better cold, Pukhtoon proverb). The obligations to take revenge for a wrong falls not only upon the man who has suffered it, but also upon his family and tribe. Insults and retaliation hence involve clans and perpetuate blood feuds. The most frequent causes of trouble are money, women and land (*zar, zan, zamin*). In rare instance, feuds are terminated when the weaker party throws itself on the mercy of its enemy, called *Nanawati* or acceptance of a bonafide truce, when blood money may be accepted in lieu of revenge. The third component of *Pakhtunwali* is *Melmastia*,

or hospitality towards a guest, stranger, or an enemy if he seeks it. A formal escort or assurance of safety to a guest or enemy is called *Badragga*. The *Pakhtunwali* provides for law and order in a harsh environment, and is still a strong force in the tribal areas.

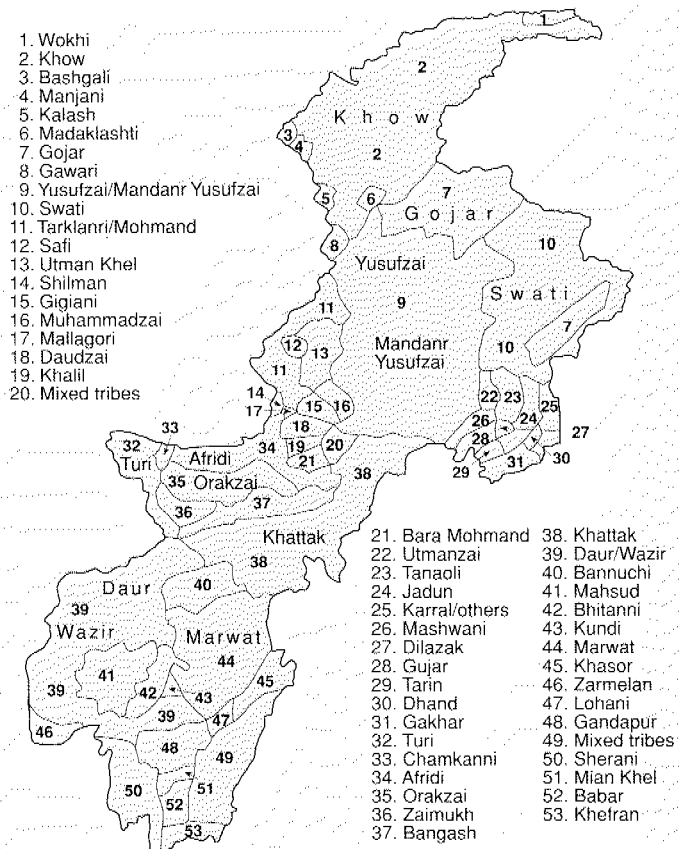
Pukhtoon women take little part public affairs, and usually observe strict *Purdah*. *Purdah* is a complex system of rules, requirement and prohibitions, which excludes women from public life and confines them to the house<sup>1</sup> (a woman's place in the home or in the grave, Pukhtoon proverb). Women are intelligent and aggressive within the limits prescribed by custom. They play an important role in arranging marriages and alliances between families. Women also provide the practical means of implementing *Melmastia*. Women of the working classes are responsible for domestic work, some outdoors. They do not observe *Purdah* in the same way as the affluent classes. Female visibility in both the settled and tribal areas is hence an indicator of poverty. At marriage, a brideprice is paid by the groom's family to the bride's father either in cash or kind.

### 3.3 Population growth

NWFP has experienced rapid population growth, specially since the 1960's. According to the 1981 census, the population of the Province was eleven million. It was estimated to have grown to 16.7 million by 1993, excluding refugees. Map 3.2 displays the population increase per district from 1951 to 1981. During 1951-1961, the Province had a relatively modest growth rate (2.3 per cent per annum). After 1961, mortality rates, especially of infants and children, declined, primarily as a result of the wider availability of modern medicines. However, fertility did not decline, owing to low levels of birth control, associated with widespread illiteracy, specially of females, persistence of the extended family norm, and religious interpretation. The average family size is still six children. From 1961 to 1981, population has grown at 3.3 per cent, which is slightly higher than the national average. The population growth after 1981 is estimated at three per cent.

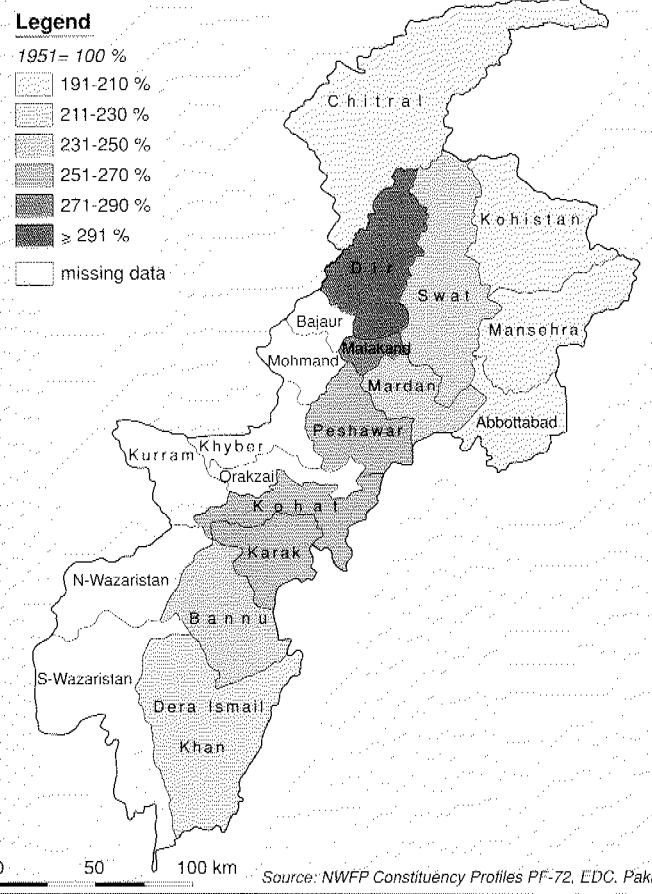
However, the population pressure is high (see Map 3.3 and 3.4). Due to its

**Map 3.1 NWFP TRIBES**



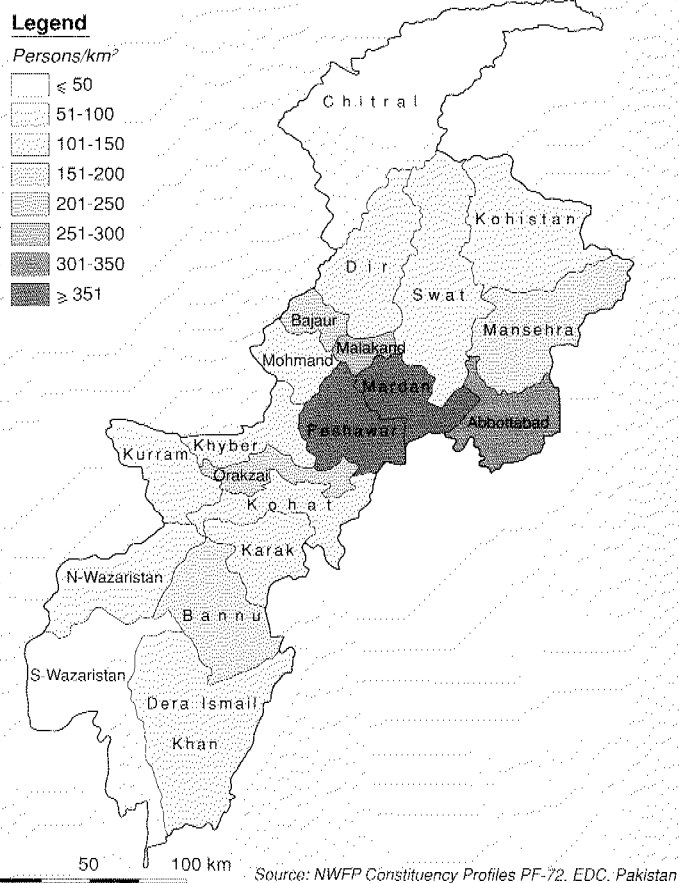
0 50 100 km Source: North-West Frontier Province: scale 1:670000, Institute of Regional Studies Peshawar e.a, 1986

**Map 3.2 POPULATION INCREASE NWFP 1951-81**



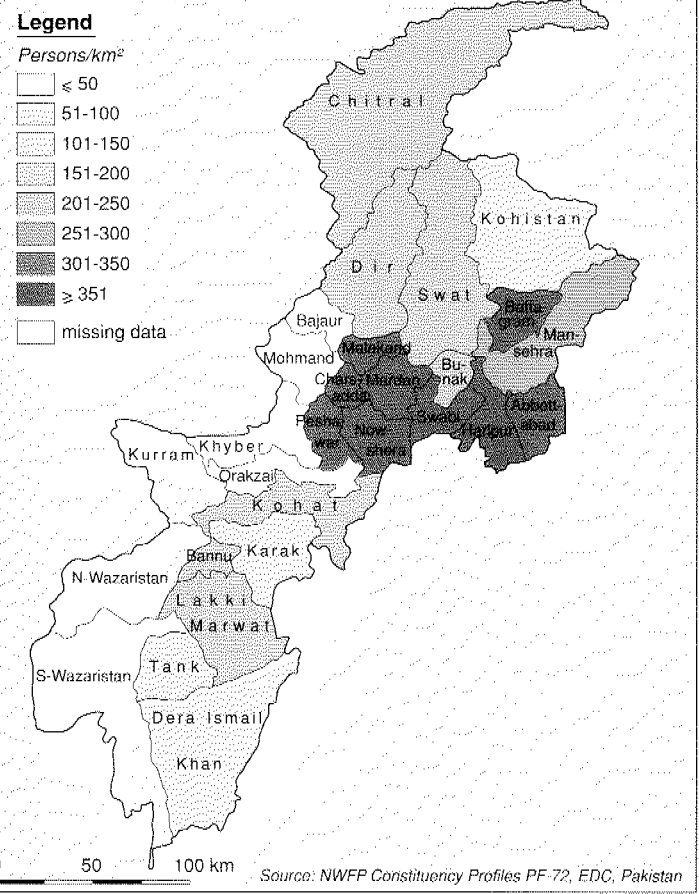
0 50 100 km Source: NWFP Constituency Profiles PF-72, EDC, Pakistan

**Map 3.3 POPULATION DENSITY NWFP 1981**



0 50 100 km Source: NWFP Constituency Profiles PF-72, EDC, Pakistan

**Map 3.4 POPULATION DENSITY NWFP 1993**



0 50 100 km Source: NWFP Constituency Profiles PF-72, EDC, Pakistan

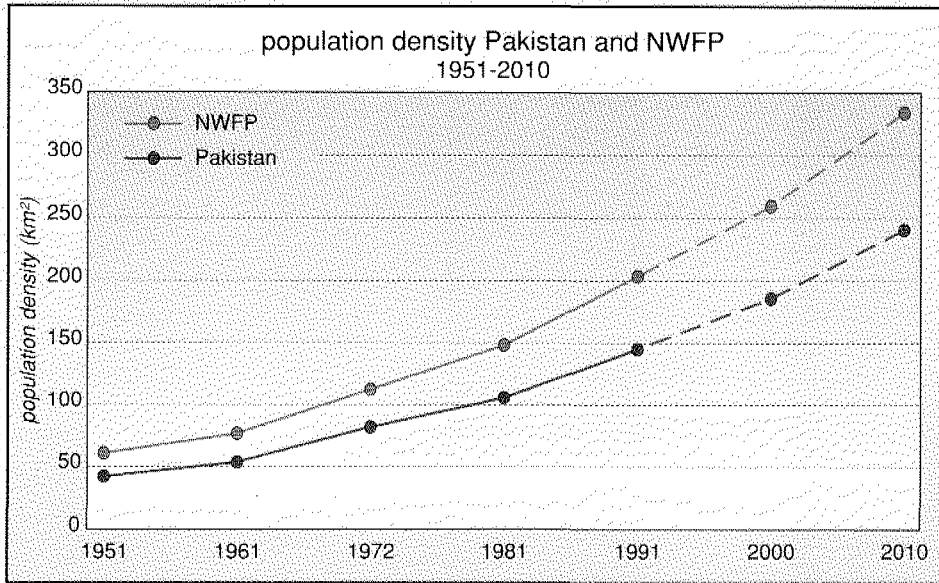


Diagram 3.1

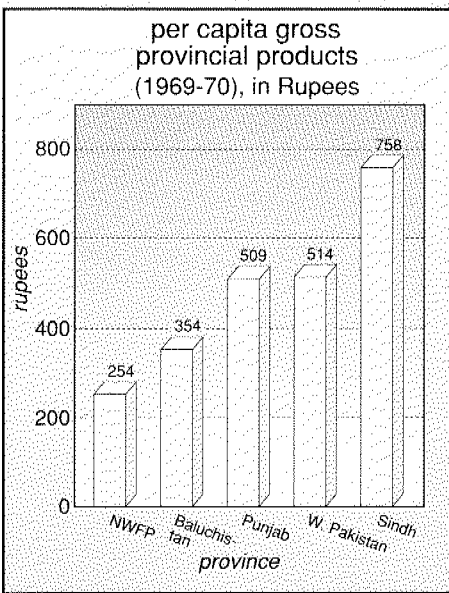


Diagram 3.2

*Pukhtoon women in burqa take little part in public affairs*

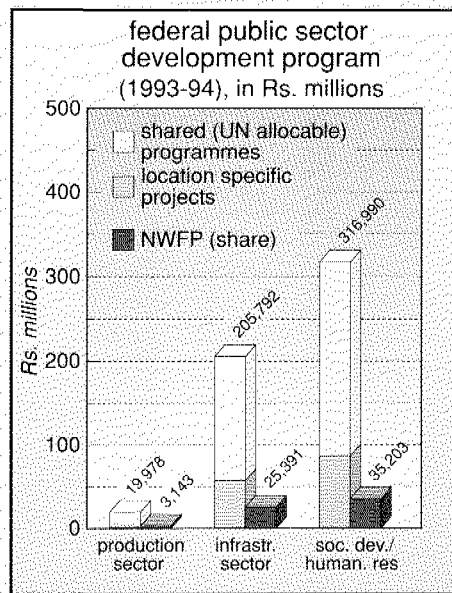


Diagram 3.3

*A girl representing one of the 3000 Kalash people*



hilly terrain, NWFP's cultivated area is only nineteen per cent. Most of the people live in the cultivated areas. The population pressure in the Province on cultivated land is 910 persons per square km and on irrigated land 2080 persons per square km.

The Eighth Five Year Plan projects the population of NWFP to be nineteen million by the year 2000 and 25 million by 2010. The population density in NWFP is projected considerably higher than elsewhere in Pakistan (see Diagram 3.1). It assumes that the annual growth rate will fall to 2.7 per cent and drop further to 2.5 per cent after 2000. These targets will require a concerted effort. In 1981, 47 per cent of the population was below fifteen years of age. It is estimated that this had fallen to 42 per cent by 1990. However, this is still a high dependency ratio and implies a huge demographic momentum with a very large number of people entering reproductive age.

In 1981, the gender ratio was 109 males to 100 females. The surplus males could be due to high maternal mortality, higher mortality of infant girls (owing to poorer feeding and health care than for boys), and under-enumeration of females. Census under-reporting (probably four per cent in the 1981 census) results in a larger present and future population than projected on the basis of the last census.

Afghan war refugees have become a significant component of NWFP population. Around 2.5 million Afghans migrated to NWFP during the period from 1979 to 1992. It is estimated that about one million have returned to Afghanistan since 1992. But peace has still not come to Afghanistan. Refugees continue to arrive. In 1992, NWFP accommodated 160 000 new refugees from its war-torn western neighbour<sup>2</sup>.

### Effect of modern influences on society

Better communications such as radio, TV, construction of asphalt roads will influence the way of life. In the NWFP, agriculture has changed from subsistence to market production, workers have migrated to the Gulf states and a tourist industry is emerging. This has resulted in change of values. The old wooden mosques with carved pillars and houses are replaced by new concrete structures in a standard Pakistan style. The traditional silver jewellery in the women's dowry has been replaced by coarse mass-produced gold jewellery. Ethnologists often speak of a collapse of culture. In the NWFP the outer appearance of the culture changes without fundamental change in the minds of the people, in their values and norms.

### 3.4 Urbanization

NWFP is predominantly rural. Only fifteen per cent of the population lived in urban areas in 1981, and at the start of this decade, the share is estimated to be just above sixteen per cent. The low pace of urbanization may be attributed to limited intra-provincial, rural-urban migration. During the 1970s, only 64 000 persons moved from the rural areas of the Province to its cities and towns. In contrast, 614 000 migrated to other provinces. This implies that urban growth in NWFP is mainly due to natural increase rather than rural-urban migration. The 8<sup>th</sup> Five Year Plan projects that NWFP will remain predominantly rural until 2010 (77 per cent) and beyond.

The urban population is concentrated in eight cities. Peshawar, the provincial capital, (0.9 million; 1991 estimate) accounts for nearly 37 per cent of the urban population. Seven other major settlements of the Province: Mardan, Mingora, Kohat, Nowshera, Abbottabad, D.I. Khan and Charsada, accommodate another 33 per cent. Many environmental problems have been exacerbated by the concentration of urban population.

### 3.5 Refugees

Most Afghan war refugees settled in NWFP despite its small size and limited resources. They selected NWFP owing to physical and social proximity. At their peak, the refugees represented around one in six of the resident population. At the moment, around 1.4 million remain in the Province, forming around seven per cent of the resident population. It is estimated that at least 0.3 million settled in NWFP's towns and villages. Peshawar city was considered a unique magnet of economic opportunities for Afghan refugees, and the city and camps close to it saw a massive influx.

The refugee population was overwhelmingly a dependent one; 24 per cent were men, 48 per cent children under fifteen years of age, while 28 per cent were women. Owing to the custom of Purdah, women were largely prohibited from participating in the labour force. However, most refugees, including their children, worked in the transport sector, providing cheap labour in the brick kilns and on the farms. They were given food

rations and access to basic social services. Nevertheless, the pressure caused by the high number of refugees had an enormous impact: e.g., increase of vehicular pollution, degeneration of road infrastructure, increased deforestation, accelerated collapse of the sewage and solid waste systems.

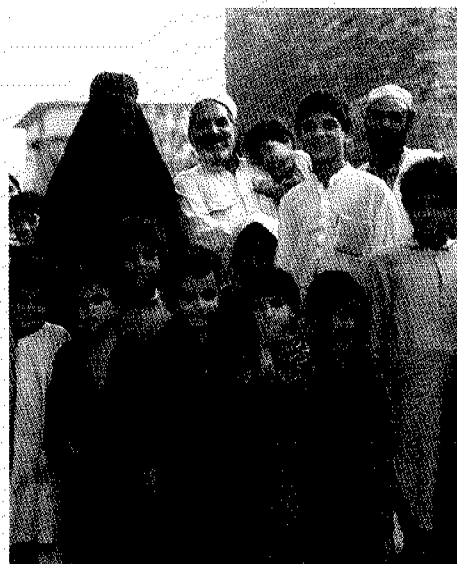
### 3.6 Economic situation

It is difficult to obtain figures on the Gross Regional Product for NWFP. The last estimates of GRP for provinces were prepared by the 1969-70 panel of economists. [Note: After the separation from Bangladesh, GOP has a policy not to estimate GRPs]. These estimates suggested that in the nineteen-sixties, NWFP had the lowest per capita income among the four provinces, half the national average and about one third the level in Sindh (see Diagram 3.2). However, the methodology did not fully cater for inter-provincial remittances and the informal economy.

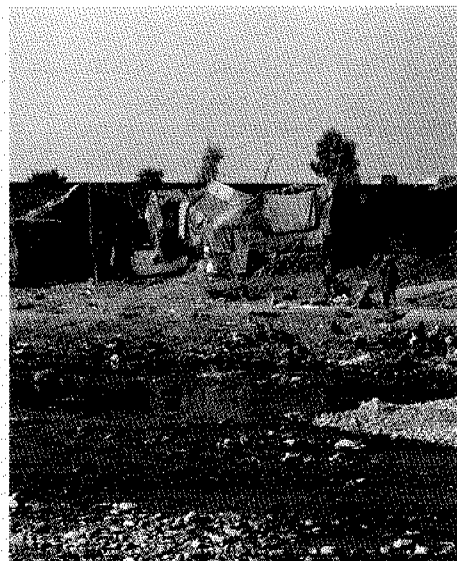
Remittances from Pakistanis abroad especially the Middle East may also have markedly changed the regional income distribution. No other occurrence had such a pervasive impact on so many areas of Pakistan's economy and society. Changed social relationships, increased expectations, new vocational opportunities, faster information flows, all arose largely due to the remittances from the Middle East. NWFP had the highest propensity to migrate, according to some estimates at two or three times their share of the country's population. About 27 per cent of the migrants were from NWFP.

The Province has a very low industrial base and the economy has remained predominantly rural. According to rough estimates, NWFP contributes 8.4 per cent of the total national GDP. The value of industrial production is nine per cent of the national total. NWFP has seven per cent of the total large-scale manufacturing industry in Pakistan and employs only 8.2 per cent of the labour force.

The National Finance Commission Award of 1991 made the provinces financially more autonomous and responsible for their economic performance. Allocations in the residual Federal Government Development Programme are made by selecting projects with high

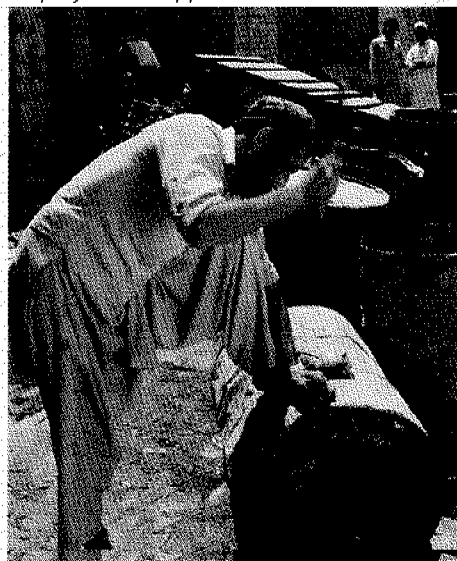


*One man, two wives (one has died), 18 children, 36 grandchildren in 1993*

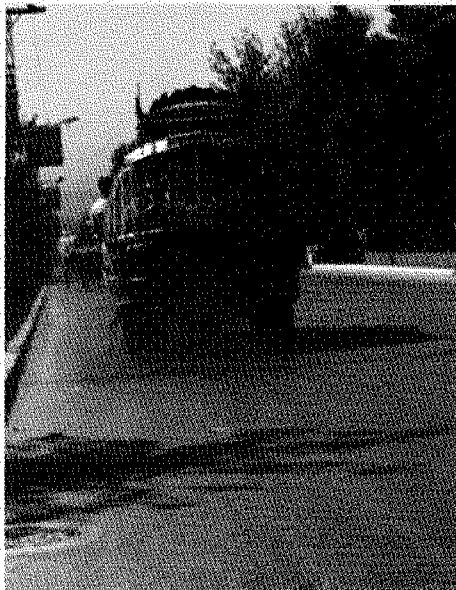


*Some of the 427,000 inhabitants of the Katchi abadis (squatter settlements)*

*Off-farm activities have to be stimulated in order to increase the employment opportunities*







An air polluter in Peshawar

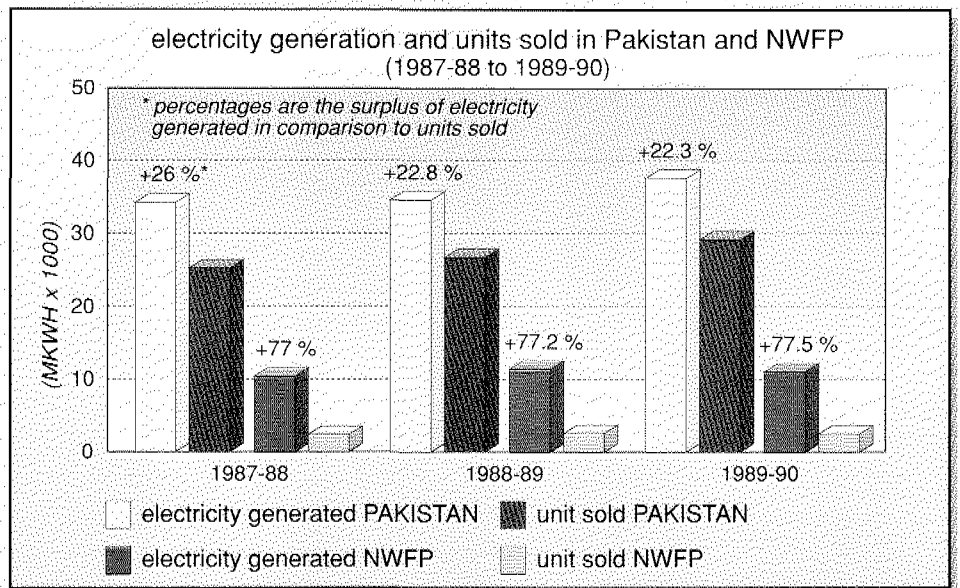


Diagram 3.4



Sixty per cent of the rural population has access to piped water supply

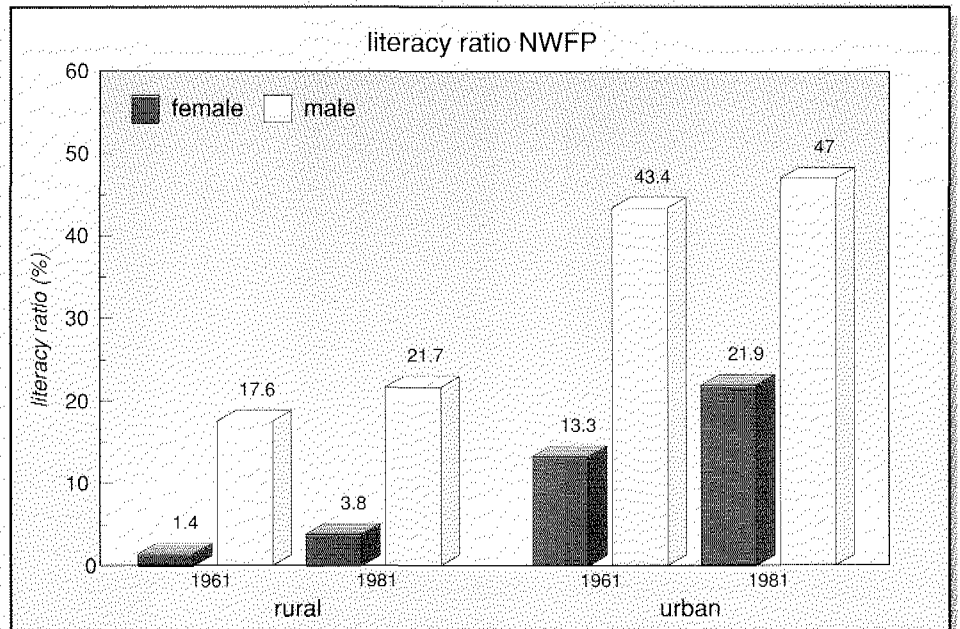


Diagram 3.5

The top 2 energy sources in rural NWFP: wood and cow dung



economic and social returns (see Diagram 3.3), but the portfolios are implicitly adjusted to reflect population shares.

In the 1990s, with privatization and deregulation of the economy, the public sector is no longer the dominant investor. The government has withdrawn from the production sector. Several industrial estates have been created to attract investment by giving tax holidays and other concessions. There are clear lobbies and vested interests that agitate against the granting of such concessions to any single province.

Various attempts have been made to rank districts across the country by levels of development. In all studies, most districts of NWFP fall in the second and third quartiles. Though there have been considerable shifts in the fortunes of certain districts, those in the Peshawar valley are consistently near the top of the second quartile, while those in the former PATA are near the bottom of the third quartile.

### 3.7 Energy

#### *Hydel and fossil fuel*

Presently NWFP generates about 30 per cent of the country's electricity, whereas it consumes about nine per cent of the total electricity produced in the country (see Diagram 3.4). It can therefore be considered as having a surplus in the electrical energy sector with hydel power being the principal source. Hydel power stations are located at Tarbela, Warsak, Dargai and Malakand. According to the 1980 census, 352 500 (or 20 per cent) housing units use electricity for lighting in rural NWFP. Only a negligible number of housing units in the rural part of the Province use electricity for cooking.

The number of agricultural electricity consumers has increased almost three-fold from 6140 in 1970 to 18 050 in 1991. However, agricultural electricity consumption is very small (four per cent of the total electricity used in NWFP). The main electricity consumers are tubewells.

Sales of petroleum in the Province increased to 819 200 tons in 1990-91, representing an annual increase of nine per cent over the last six years. Data for rural sector consumption of petroleum products cannot be isolated

from the total figures for the Province. NWFP has no significant oil fields and imports almost all its gasoline.

The number of consumers using natural gas for various purposes in the Province increased to 66 700 in 1990-91, indicating an increase of over 50 per cent over the last six years. Despite this increase, only four per cent of the households use gas. The number of consumers in the rural areas using gas for cooking is low (only 2400 in 1980). Most of the gas consumed there is sold in cylinders. It is uneconomical at present to build transmission lines for gas distribution in the rural areas.

There are hardly any coal reserves in NWFP. A few small mines have reserves of 26.97 million metric tonnes of coal. Only 42.227 metric tonnes of coal were produced in the Province in 1990-91, showing a small annual increase. The consumption of coal in the rural sector is mainly for cooking. It was used by only 3048 (0.2 per cent) of rural households in 1980.

#### *Non-fossil fuel (wood, animal and crop waste)*

Wood and agricultural wastes accounted for over 98 per cent of the cooking and heating fuel used in rural NWFP according to the 1980 census. Wood contributed about 76 per cent, while cow dung, crop residues etc. accounted for about 22 per cent of the source of cooking fuel at that time. The annual consumption of fuelwood for each household in NWFP is 5.6 cubic metres per annum<sup>3</sup>. The gender division of labour in the lower economic groups leaves the collection of fuelwood to women. Since fuelwood is free, women are reluctant to purchase wood or switch to alternative fuels that have to be purchased. Deforestation and the use of fossil fuel increase the greenhouse effect.

### 3.8 Social indicators: education, water sanitation, health and nutrition

#### *Education*

The education system in South Asia is a legacy of colonial rule. Being at the frontier of the British Empire, NWFP received little investment in education, and, despite substantial current provin-

cial allocations, has not caught up in the four decades since independence. NWFP has the second lowest rate of literacy among the provinces of Pakistan. In 1981 the literacy rate was only seventeen per cent, compared to 31 and 27 per cent for Sindh and Punjab respectively. The literacy rate has improved by only three per cent in the 20 year period between 1961 and 1981. Within the Province, there are wide variations between males and females, and between urban and rural areas. In 1981, only 6.5 per cent of all females and only four per cent of rural females were literate (see Diagram 3.5). The literacy rate in urban areas is nearly three times that in rural NWFP (36 versus 13 per cent).

#### *Water and sanitation*

The water supply coverage for the Province is relatively good. The proportion of rural population in NWFP with piped water supply is 60 per cent, well above the national average of 44 per cent. However, the proportion of rural population with sanitation facilities is a mere two per cent, compared to a national average of twelve per cent. The men and the children use open fields during the day, the women need to wait until dark.

#### *Health*

Health indicators for NWFP are close to the national average. The Infant Mortality Rate (IMR) of 90 per 1000 births is close to the national average of 88; similarly, the Child Mortality Rate (CMR) of 133 per 1000 births is close to the national average of 130. However, both sets of rates for infant and child mortality compare unfavourably with those of countries at a similar level of economic development.

Most urban and industrial waste water is discharged untreated in open drains. Rain storms cause overflow of the drains. The contaminated water runs in the streets and causes health hazards, especially for children. Washing of dishes and cups in open drains is common. Diarrhoea is the main reason for the high infant mortality. Other causes are the lack of immunization against communicable diseases like TB, polio, tetanus, measles and diphtheria. The fatal effect of these diseases are also caused by malnutrition.

There is a difference in health between man and women. Due to the Purdah women are living in confined spaces year in year out without much exercise or light and are naturally prone to illness. This is intensified by continual pregnancies and inadequate nutrition. The average life expectancy of a women is 50 years, 10 years shorter than for a man.

### Nutrition

The scope and severity of nutritional problems in NWFP have remained unchanged over the last decade. Protein and vitamin A deficiencies are common both among boys and girls; anaemia is widespread among pregnant and lactating women, and increases with age. Anaemia also occurs in 25 per cent of children under five. Locally, goitre (iodine deficiency) is a problem in most of the northern parts of the country. The government is trying to address this

problem through the distribution of iodized salts.

According to the National Nutrition Survey (1985-87), 57 per cent of children in NWFP are stunted (low height for age), about six per cent are wasted (low weight for age), and 4.5 per cent are both stunted and wasted. More girls are stunted and wasted than boys. This indicates that girls are more effected by malnutrition than boys. Inappropriate weaning practices are becoming widespread. Whereas 98 per cent of infants are breast-fed in the first five months, this declines to 66 per cent at twelve months. Unsterilized bottles are a source of acute infections, specially diarrhoea, which is an important cause of child mortality and malnutrition. The pattern of diet between adult males and females does not differ throughout the Province, but the amounts may vary. For protein malnutrition, little difference

exists between urban and rural, and between poor and middle socioeconomic status areas. This suggests bad food habits are a major part of the problem.

<sup>1</sup>Reference J. Kalter, *The arts and crafts of the Swat valley*, 1991.

<sup>2</sup>Reference: *News international*, 6/2/1994

<sup>3</sup>Forestry sector master plan NWFP, ADB and UNDB, 1992.

## 4. INTERACTIONS BETWEEN THE PEOPLE AND THE ENVIRONMENT

### 4.1 Land use

Along with an extreme diversity in physiography, NWFP is characterized by an uneven distribution of resources and land use. The three main land uses in

*Girls belonging to the 6.5 % literate females in NWFP*



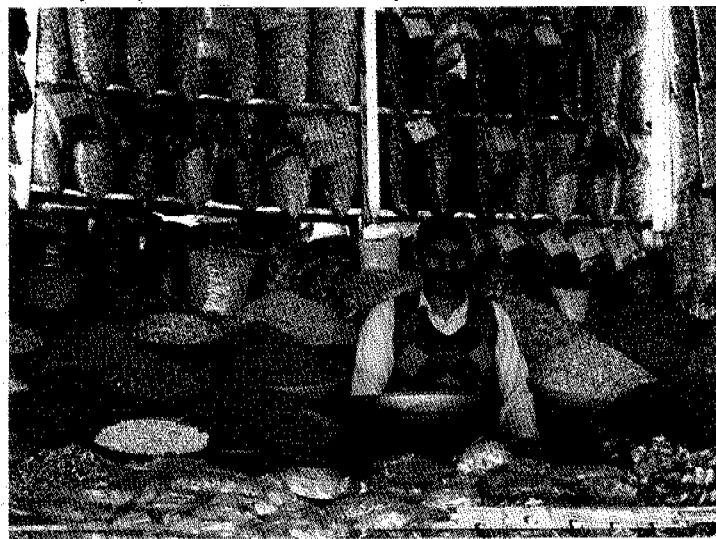
*Two per cent of the rural population has sanitation facilities*



*Open-air restaurant*



*Grocery shop in NWFP with a variety of dried fruit and nuts*



NWFP are crop cultivation, grazing and forestry. Diagram 4.1 gives the current (1990-91) land-use pattern in NWFP. Only nineteen per cent of the area is currently cultivated and thirteen per cent is forested. Compared with the other provinces of Pakistan, NWFP has the largest share of culturable waste (lands), only Baluchistan has a lower share of its area under cultivation (five per cent) and Sindh a larger share of land not available for cultivation (47 per cent).

Diagram 4.1 also gives a comparison between 1982-83 and 1990-91 figures. Agriculture in NWFP has changed only slightly during the last decade. According to these figures, the total forest area has increased. This is due to afforestation programmes undertaken by the Government of NWFP, donor projects in the forestry programme and a change in the demarcation of forest areas. Some would argue that this figure overesti-

mates the actual change in forest area. However, these figures are generally accepted by the Forest Department.

Diagram 4.2 divides the cultivated area into fallow, area sown once and area sown more than once a year. The area sown more than once is small but it appears to increase over the recent years.

## 4.2 Agriculture

Agriculture in NWFP is mainly subsistence agriculture which is characterized by low agricultural inputs. Tractors are used only for ploughing the fields close to the roads. The use of fertilizers is very low. Pesticide use is also limited. The area under irrigation is 824,000 ha or about 23 per cent of the total cultivated area.

### Cropping pattern

The most important of NWFP's **Rabi** crops is wheat. Wheat is grown in the barani as well as

irrigated areas. The increase in area under wheat (44 per cent) over the last fifteen years is largely the result of incentives provided by the government. About 60 per cent of the wheat in NWFP is grown in the barani tracts, contributing about 40 per cent to total wheat production. Other important Rabi crops grown in the province are chick peas, barley, rapeseed and mustard.

The major **Kharif** crop is maize. The area under maize has increased by 27 per cent over the last fifteen years. NWFP produces 55 per cent of all the maize grown in Pakistan. Maize is used as food for human consumption in food deficit areas. It is also grown for green fodder and to make products like starch, vegetable oil, glucose, etc. Most of the maize crop is grown in high-precipitation barani areas of Malakand and Hazara. Groundnut, sorghum and millet are the other important Kharif crops of NWFP. They are mostly cultivated in rainfed areas. Diagram 4.3 compares the land use by crops in NWFP in 1975 and 1991. Sugar cane is an important crop in the irrigated areas.

### Vegetable crops

Total area of vegetables (both Kharif and Rabi) in NWFP has increased by 23 per cent over the last fifteen years. Most vegetables show a gradual increase from one year to the next. Okra and cauliflower displayed a strong increase in cultivation at the beginning of the nineteen-eighties. This

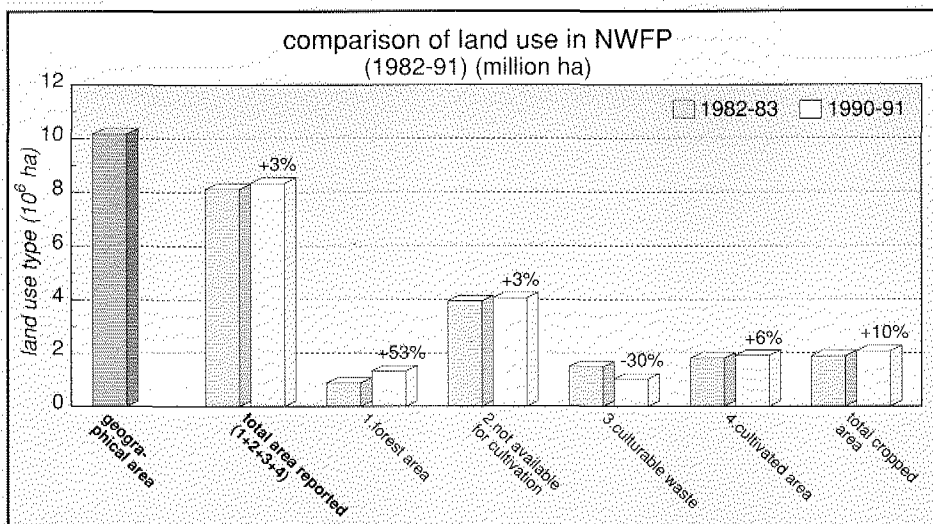


Diagram 4.1<sup>1</sup>

Diagram 4.3<sup>2</sup>

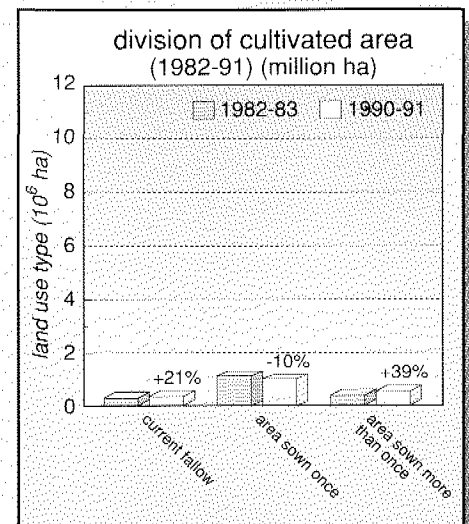
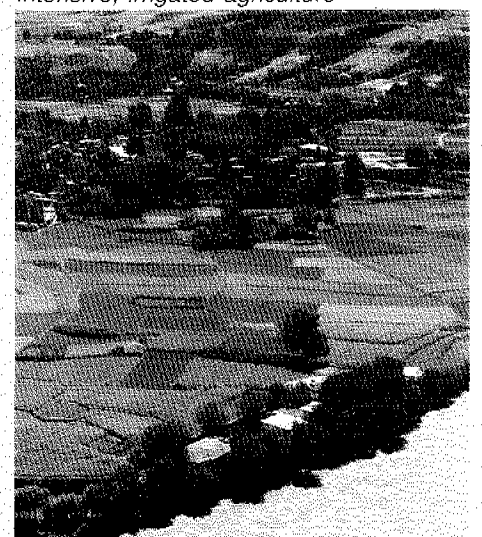
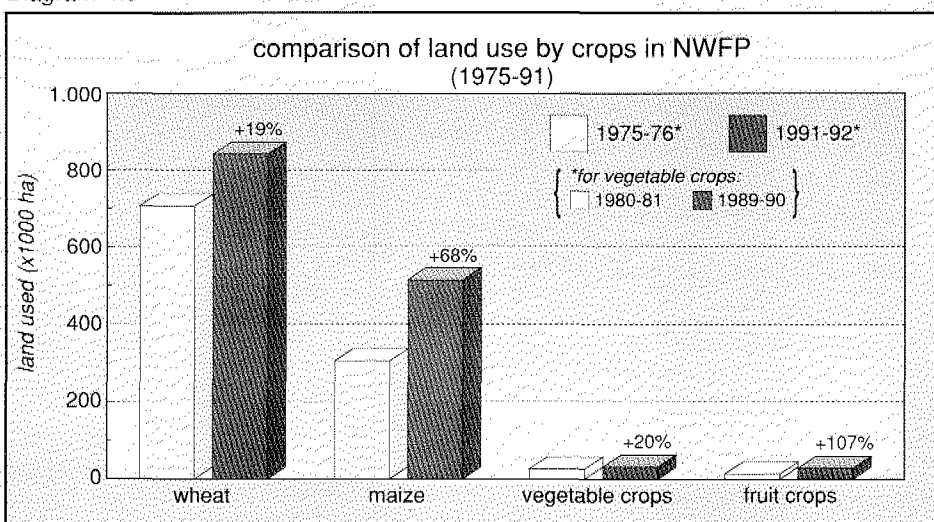


Diagram 4.2<sup>2</sup>

Intensive, irrigated agriculture





increase was due to the influx of Afghan refugees who prefer these vegetables. Recently onions are becoming a popular crop. Because of its diverse physiography, NWFP can grow vegetables that are out-of-season in other areas. This is especially the case for tomatoes. The area around Dargai has the ideal (frost-free) climate for tomato production in winter. It is the only place in Pakistan where tomatoes are grown during that part of the season. As a result, the farmers fetch a high price and have doubled the area under tomato production during the Rabi season. Unfortunately, crop diseases tend to reduce the yields.

The cultivation of potato has expanded strongly in the hilly areas where maize was a predominant crop. The reason for expansion is the high prices for quality potatoes. However, the increase in potato cultivation in hilly areas has increased soil erosion as farmers plant potatoes across the contour lines. There is a need for an effective demonstration programme to encourage the planting of potatoes along the contour lines to reduce soil erosion. Moreover it is a capital-intensive crop, feasible only for "large" farmers.

#### **Fruit crops**

The total area under fruits has increased by 107 per cent in the last fifteen years. The cultivation of apples has tripled since 1989-90. This is due to the long shelf life of apples and the cultivation of high-yield dwarf varieties. In the early sixties, the Peshawar valley used to be famous for its high-quality peaches. However, the roots of the peach are very sensitive to wetness and peach production has declined drastically as a result of the rise in the water table caused by the Warsak Dam. With

the decline in peach cultivation, the area under apricot, plum, persimmon and pear has increased in the Peshawar valley. Peach cultivation is now mainly confined to the Malakand Division.

The area under watermelon has declined due to tough competition from Punjab. Muskmelon was a major Kharif crop of the Bannu, D.I. Khan and Peshawar areas. Its area declined drastically in 1984-86 due to severe fruit fly and powdery mildew problems. However, it increased again in 1986-87. It now fluctuates around 11 000 ha.

#### **Farming systems**

Farmers in low rainfall areas follow their land to keep the productivity at a certain level and to conserve water. Even in high rainfall districts, the land reserved for wheat cultivation may be left fallow in the Kharif season to conserve moisture for Rabi. The cropland is grazed during the fallow period. Crop rotation is widespread. The crop varieties used in the rotation depends on physiography and water availability. For instance, the Peshawar plain largely irrigated. Typically, a crop rotation here can be sugarcane, wheat, maize and berseem. In the arid plains of D.I. Khan, the crop rotation can be millet, fallow, wheat. The combination of crop rotation and fallow have a very positive effect on the sustainable use of the farmland. It reduces crop diseases, erosion, nutrient depletion of the soil and allows moisture to accumulate.

#### **Crop-livestock interaction**

Livestock has a strong influence on the cropping pattern and the farming practices in NWFP. Intercropping, an important feature of barani agriculture, allows farmers to increase fodder production. Maize grain intercropped with maize fodder

occurs widely. Fodder is also grown in Kharif season. It covered a total area of 115 550 ha (six per cent of the cultivated area) in 1987-88. Fodder is so important that it is also a high-priority crop in the area under irrigation. Peshawar and Swat have a larger share and together account for nearly 40 per cent of the provincial fodder acreage.

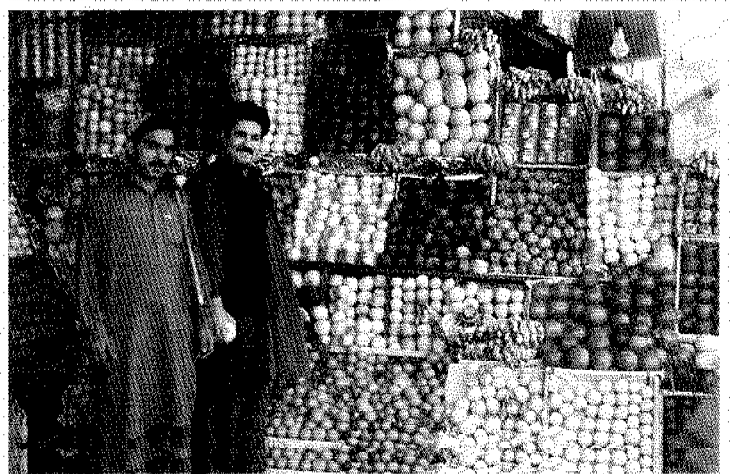
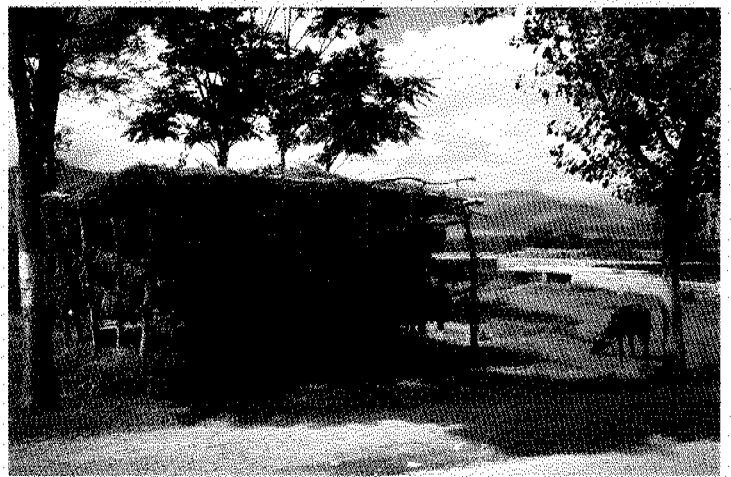
#### **Pesticide use**

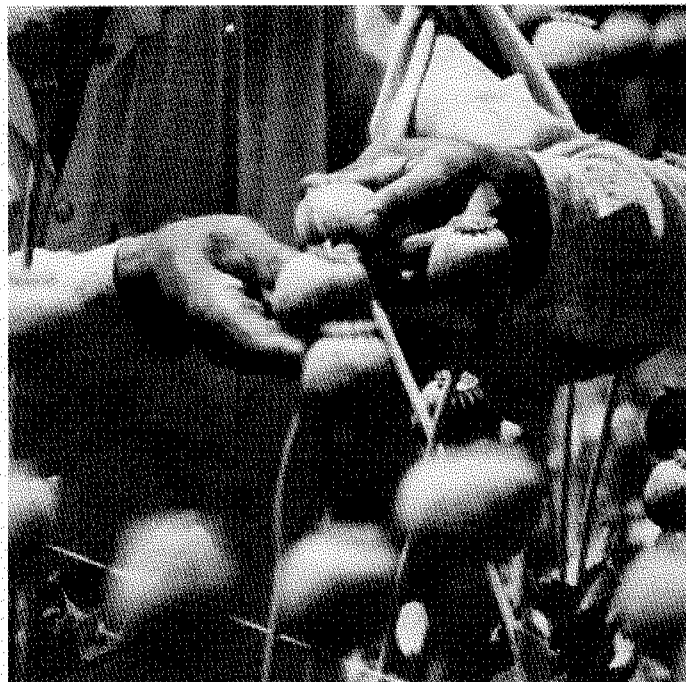
Pesticides are used intensively to cultivate vegetables and fruit crops. Apple trees suffer from diseases such as apple scab and insects such as stem borer, mites and codling moth and aphid and are heavily sprayed. Young fruit orchards are intensively cultivated with vegetables. The result is that the vegetables receive more pesticides than required for the control of vegetable pests. Farmers have been able to control fruit fly and mildew with the application of increasing pesticide amounts. Biological control of fruit fly with pheromone traps containing Methyl Eugenol along with a minimum pesticide spray would reduce environmental and health hazards. However, this requires an active promotion campaign by the government. Pesticides are not generally used for staple crops. The price of pesticides is high in NWFP and the government has terminated the subsidies on pesticides. This also tends to discourage the use of pesticides. Currently, there is little monitoring of pesticide residues on fruits and vegetables by the Government.

### **4.3 Livestock**

Livestock in the North-West Frontier Province is an important part of the

#### **Agricultural products**





*Poppy, a controversial cash crop*

### Poppy in Dir district of NWFP

Small-scale Opium poppy (*Papaver somniferum*) cultivation started before the turn of the century. Production became more widespread after the partition of the Indian Sub-continent and with the growth of the illicit international trade, the cultivation of poppy recently became the major cash crop in the area. Originally, barring a small fraction of the total production for use as local traditional medicine, the harvested opium resin was exported and processed into heroin elsewhere, but more recently Pakistan has become a major processing and marketing centre for both opium and heroin.

Data produced by the Pakistan Narcotic Control Board (PBNCB) show that opium production in Pakistan reached a peak of 800 tonnes in the 1978-79 growing season. It then dropped to less than 100 tonnes in 1980-81 but began rising again in 1985-86. Approximately 9,500 ha of opium poppy were reported estimated grown in the 1991-92 season for a production of 181 tonnes of opium. Of this, almost 50% came from the Dir district of NWFP.

Poppy growing started in the Dir District during the time of the last Nawab (local prince) when he gave permission to two predominant and fiercely independent clans living in the district, the Painsa Khel and the Sultan Khel, to do so. As the power of the Nawab declined, poppy growing spread throughout the district, but remained more concentrated in the main valleys dominated by the two clans. The official estimate for the district was 3,654 ha for 1991-92, 39% of the total area estimated under poppy in Pakistan.

However, the share of opium-gum in Dir is greater due to higher yields than in the climatically less favourable tribal agencies of the south. The average yield in the district is officially estimated at 30 kg/ha dry gum on irrigated

land and 25 kg/ha on non-irrigated land, compared to the average national yield of about 20 kg/ha. Depending on the yield estimates used, the total annual production of dry opium gum in Dir district is likely to be between 70 and 90 tonnes.

Meanwhile, drug use (mainly heroin) has become more common in Pakistan, increasing from zero in 1980 to an estimated one to two million heroin users in 1991. The one million estimate is based on a PNCB survey carried out in 1988, while the two million figure has been reported in the press but has no official basis. In addition to the heroin users, Pakistan is believed to have some 260,000 opium addicts. The total consumption of opium equivalent either as heroin or opium in Pakistan has been estimated at 480 tonnes based on the 1988 study. Based on these figures: *Pakistan has become a net importer of opium products.*

It is believed that most opium harvested in Afghanistan (more than 2,000 tonnes) reaches Pakistan through the Tribal Agencies, where it is processed into heroin and then conveyed to local and international markets. However in the poppy game there are more players than the farmers alone, each with their own interests. In Europe and North America there are the users who need it, the governments who can only ban it, the factories that produce the chemicals (Acetic Anhydride) and the equipment to convert poppy into heroin, the banks who provide loans, smugglers who transport it and dealers who sell it.

Pakistan is engaged in the programme to eliminate opium poppy cultivation nationally. Since 1973, the Government has taken a number of steps to halt opium production, but efforts have been accelerated and concentrated in the NWFP. The government recognized at the outset that enforcement of the poppy growing ban could cause financial hardship to many poppy growers, and that the ban was thus not likely to succeed in the long run unless alternative ways were found for farmers to make a living.

Therefore the government is using a "carrot & stick" approach to eliminate poppy cultivation. Although poppy cultivation has been officially banned in Pakistan, the government is implementing the ban gradually, and with as little use of force as possible. The government uses development activity in a poppy growing area as the "carrot", seeking to persuade the growers to stop production in response to the implementation of certain economic development activities. However the "stick" of enforcement remains an essential element of the strategy, to be used where needed.

The assistance provided by the UNDCP for the Dir District Development Project is intended to support government efforts. During the first phase of the project many problems have been encountered in implementing some of the proposed activities and in attaining the desired objectives. Although the project started to operate in 1987, it is only since 1989 that full access was granted to the valley of poppy concentration. With few exceptions, the targeted farmers, whose cooperation was essential for the proposed development to succeed, proved to be suspicious of the project aims. They felt that the suggested project interventions were an undesired threat to their independence in decision making for their livelihood and also an interference in their private life. Access of project officers to some of the core poppy valleys was often barred by local armed farmers.

The project has achieved the targets set for almost all the infrastructure work (roads, drinking water supply, irrigation, land terracing, bridges, electrification). The "green" and the "social" sectors have not been properly dealt with, mainly because the government side "decided" that any attempt to involve the community in decision making would only be a waste of time and money in a society where even small conflicting interests may end up in endless disputes or even armed confrontations.

*Good agricultural land is scarce*



*Yak*





Gujars still trekking



Natural forest



Denuded watersheds

Controlled grazing

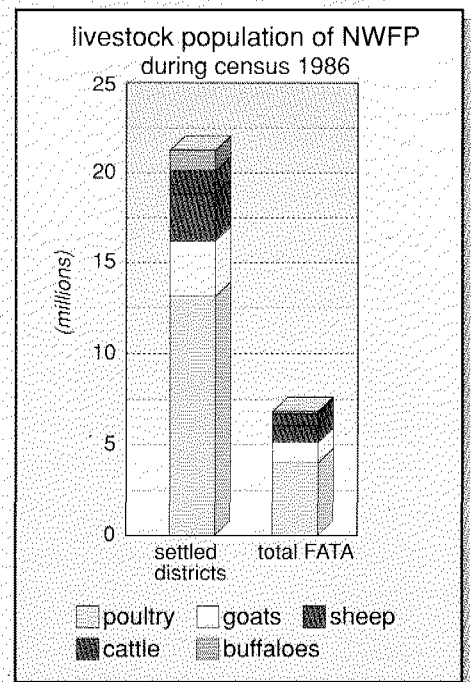


Diagram 4.4

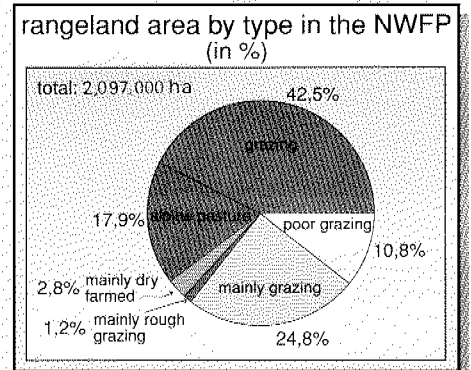


Diagram 4.5<sup>1</sup>

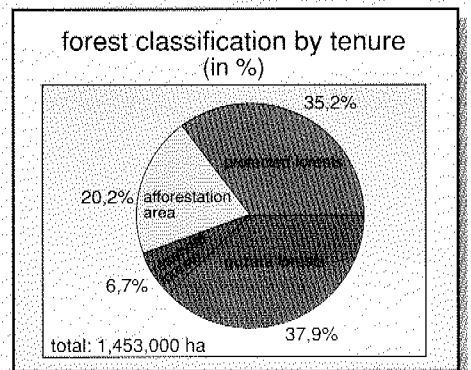


Diagram 4.6

Cutting of forage





overall farming system. Throughout NWFP, livestock numbers have increased for all species between the 1976 census and the 1986 census (see Diagram 4.4). In cattle, the male to female ratio decreased by sixteen per cent, the percentage of lactating females increased by 20 per cent and the percentage of males used for work decreased by 26 per cent. This shows a clear trend away from draught power toward milk production. The population increases in buffaloes and goats reinforce the picture of a steadily increasing demand for milk<sup>5</sup>.

#### **Breeds of cattle and buffaloes**

Buffaloes in NWFP are of the nili-rivi breed. The cattle in the plains and foothills are mostly zebu animals of dhani, lohani, and nondescript breeds. In the northern mountains, the Achai/Gabrali breed predominates, especially in Swat, Dir, Kohistan and Bajaur Agency. Due to the artificial insemination programme implemented since 1982, perhaps 100,000 crossbreed (local breed with Friesian) cattle may also be encountered throughout the Province.

#### **Production system of cattle and buffaloes**

Rural agricultural as well as non-agricultural households maintain small herds, generally between two and six cattle and buffaloes each as part of the subsistence farming system. Urban commercial herds maintained principally for the sale of milk may range from one or two animals, mainly buffaloes, to as many as 50. Transhumance and semi-transhumance households in the mountains may keep up to 20 cattle each.

#### **Livestock feed**

Understandably, only cattle and buffaloes in milk and draft-bullocks are fed fodder crops and concentrates. The remaining livestock subsists on agricultural roughage and natural vegetation on grazing lands. Both are nutritionally inadequate. In wetter regions, livestock is dependent on crop residues, especially wheat chaff and maize stover, for most of their energy. Some forage is produced by intercropping summer fields and cultivating small plots of winter clover, but forage cultivation is poorly developed in NWFP and forage currently contributes a minor amount to livestock nutrition. There is an acute shortage of fodder in winter and its quality is poor. Most of the range resources have become degraded and produce far less than their potential. The trucking of animals from one region to another also affects the distribution of grazing pressure in different zones.

## **4.4 Rangelands**

The estimated total grazing land covers nearly 2.1 million ha scattered over the Province (see Diagram 4.5). Rangeland includes areas used for grazing, grass and wood cutting. These areas have a very low cultivation potential and produce sparse shrubs and grass. A large portion of land in the south of the Province is grazed. Extensive areas of poor pasture land are used for grazing on the

slopes of low mountains and in the arid areas. Peshawar valley has most of the irrigated land in the region and a small area of rangeland. An active transhumance livestock system has also traditionally operated between Afghanistan and NWFP. Three systems of grazing are practised in the area: sedentary, transhumance, and semi-transhumance.

#### **Sedentary**

This system is practised in areas where winters are not too severe to pose serious problems of feed scarcity. Throughout the year, livestock is grazed on fallow land, fields after harvest, privately or communally owned grazing and forest lands and even State-owned forests. Shepherds graze small herds of sheep, goats and cattle in the morning and return in the evening. Part of the grazing land is closed to grazing after the monsoon rains and the forage is cut as hay in September-October. Loose herding is also practised on grazing land after the forage has been harvested for hay, and in forest areas (Anwar Khan, 1971).

#### **Transhumance**

This system is practised by migratory tribes, mainly the Gujars. They feed their livestock in the dry subtropical broad-leaved forest zone of the Pothwar plateau at the foothills of the Himalayas. The upward migration starts along the Kaghan, Indus Kohistan, and Neelam valleys in March. They spend April and part of May in the subtropical and temperate forests, and start to reach the subalpine and alpine pastures in May. Summer is spent in these pastures and the downward trek starts in October. The summer pastures are about 2000-3000 m elevation (Noor Mohammad, 1989). Yet the Gujars are no longer as welcome as in the past. Many villages now demand a price for grazing the animals. The contraction and deterioration of the communal grazing and forest land have restricted the herd migrations.

#### **Semi-transhumance**

Communities residing in the temperate zone must move their livestock with the seasons over several levels during the year to make the most efficient use of available forage. The Kohistanis of Kalam, for example, use four levels for this purpose: plains, winter; 1800-2500 m autumn and early spring; 2500-3000 m, late spring and early autumn; 2700-4200 m, summer (Anon, 1984).

The Kohistanis reside on valley-bottom land at 1800-2500 m where they maintain individually owned pastures. These pastures are irrigated when water is available and sometimes even manured. The pastures are grazed in early winter, before snowfall, and in spring, before the livestock leaves for forest grazing grounds. After the livestock leaves in spring, the pastures are protected from grazing and the forage cut in September and made into hay. Fodder scarcity in winter is a major concern for the over-wintering population. Therefore, the core livestock needed by the over-wintering population are retained and the remainder sent down to spend the winter at lower elevations.

Seasonal grazing lands are located on mountain slopes higher than 3300 m in Dir and Swat districts. These areas remain under the snow during the winter months and are grazed in summer. During winter, migratory herds move down into the valleys or travel further south to grazing areas in Peshawar,

Kohat, Dera Ismail Khan or to the Pothwar region and the irrigated Punjab.

Dry oak is so important to the local economy that trees near habitations are parcelled out among households and carefully protected. In the long bleak winters when the ground is covered with snow and the roads are impassable, it is the only green forage available to feed the few head of livestock that the over-wintering households must keep to survive.

## **4.5 Forests**

Using satellite imagery, the Forestry Sector Master Plan (1992) estimates the wooded area of NWFP as 1.490 million ha. The forest area under the control of NWFP Forest Department is about 1.450 million ha (NWFP Forest Department, 1993). Of this, about half is managed by the Forest Department under forest management plans. The remainder either has sparse vegetation<sup>6</sup>, or is barren.

Forests can be classified in various ways: by tenure, forest type, and whether or not they produce commercial timber. Diagram 4.6 gives forest classification by tenure<sup>7</sup>.

**Reserved forests** are owned by the government and the people living nearby have few legal rights to them. However, grazing is permitted as a concession.

**Protected forests** are owned by government but local people have substantial rights to use them - timber for personal use, firewood for domestic needs, grazing, and a 60 per cent share in the proceeds from the sale of produce. Declaring them to be "Protected forests" is an interim device for extending immediate legal cover to forests until the process of "settlement" can occur. In this process, the rights claimed by local people to the forests are examined through a lengthy judicial process, and either accepted, rejected or commuted on suitable payment.

**Guzara forests** are private forests owned by families, or groups of families. Under the authority of the Hazara Forest Act 1936, the Forest Department can regulate cutting in these areas. They are either managed by the Forest Department or, since 1981, by forest co-operatives.

**Afforestation** areas are privately owned lands, being planted by the Forest Department under various projects, predominantly for watershed management.

The forests of NWFP are almost evenly distributed over the Himalayas in the Hazara Civil Division, and the Hindu Kush in the Malakand Civil Division. Champion, Seth and Khattak (1965) categorized the forests by altitude. The forest types are indicated on Cross section 2.1. The forest trees can be divided into two groups: coniferous and broad-leaved.

#### **Coniferous.**

The main forests of NWFP contain conifers like



deodar, blue pine, fir, spruce, chir pine and chilgoza pine. Collectively, they are known as "softwoods" by the timber trade. About 85 per cent of softwood timber is used in construction, while the remainder is used in manufacturing (crates, boxes). NWFP is the main supplier (65 per cent) of coniferous timber to the whole of Pakistan (Anon 1992). Deodar is the prime softwood of Pakistan, prized mainly for its higher resistance to insects and decay organisms. Blue pine is almost as good as deodar with the exception of durability. However, it grows faster. Fir and spruce are used where strength and durability are not major considerations. Chiz pine is used for construction where tangential strength is required. It is also the conifer capped heavily for natural resin. Chilgoza pine yields edible nuts and timber of low quality.

For a few years, a little used conifer, *Taxus bacata*, formerly considered a weed tree, has gained considerable prominence since its bark contains taxol, which is used in the treatment of certain forms of cancer. In the past, a forester would automatically have removed a *Taxus bacata* competing adversely with deodar.

#### **Broad-leaved.**

Scattered among the conifers of the moist, temperate forests are broad-leaved species such as oaks, walnut, maple, elm, bird cherry, ash mould, horse chestnut. They favour moist, shady locations, and survive only where biotic pressures are light. Foresters do not normally harvest them because of their benign influence on soil and their value for wildlife. However, they are the prime target of villagers hunting for firewood.

Wild olive and acacia grown on the Himalayan foothills are important for protecting watersheds and providing small timber, firewood, and forage. The ash mould is valued to produce high quality white cabinets. The dry oak is a comparable species on the Hindu Kush foothills.

#### **Trees grown on farmland**

For about two decades, fast-growing exotic poplars are the major trees grown on borders of the irrigated farmlands of NWFP and along the roads, comprising about 24 per cent of the total trees on such farms. The other major trees are: bakain (eighteen per cent), shisham (fifteen per cent), Ailanthus (thirteen per cent), and mulberry (ten per cent). On rainfed farms, the main trees are ber (23 per cent), and Ailanthus (fourteen per cent) (Amjad 1991). Recently eucalyptus is gaining popularity.

Poplars are used in the match industry. Shisham is the prime cabinet wood of Pakistan. Bakain and mulberry are used in the sports-goods industry. Ailanthus is good for making tool handles. Ber yields an edible and very healthy fruit. All these trees also yield firewood.

## **4.6 Watersheds**

NWFP's watersheds cover about three million hectares in the moist mountains. Of this, about 1.3 million ha are under forest, and about 0.6 million ha under agriculture. Almost the entire watershed area is used for grazing. The condition of NWFP's watersheds is crucial to the economy of the whole of Pakistan because of its heavy reliance on irrigation and hydroelectricity. Both require large

and extremely expensive storage reservoirs. But water reservoirs in NWFP have a short life because of the depleted state of the watersheds.

Besides yielding water, NWFP's watersheds comprise a variety of micro-climates that can grow high-value crops such as off-season vegetables, seed potatoes, fruit and nuts and other agricultural crops and forage.

## **4.7 Fisheries**

NWFP's fisheries are confined to the northern districts and are dominated by trout rearing. Brown trout, *Salmo trutta* was brought to NWFP in 1928 from Kashmir, where it had been introduced from the UK. Rainbow trout was introduced from the USA in 1980. The indigenous cool-water fish comprise the snow carp, *Schizothorax sp.* and other smaller cichlid fish occurring in the southern parts of the cold-water region. Mahashar is also included in this category.

Raising and stocking trout in the cold-water lakes and streams has been a major task of the Fisheries Department. It maintains seven hatcheries to this end in Dir, Swat, Chitral, and Mansehra Districts, with an annual production of about 850,000 fries. Trout fisheries are a major attraction for tourists to the northern districts. Today, about 1100 km of streams and about 1500 ha of lakes are being stocked with trout. The potential is much higher. To prepare for an increase in the scale of trout stocking, a training centre and a new hatchery for trout are being constructed at Madyan, and the reconstruction of the Shinu hatchery that was washed away in 1992 is being contemplated under the Second Aquaculture Development Project. Trout are caught annually by anglers in sports fishing and about 20 tonnes are produced by private fish farms.

#### **Warm-water fisheries.**

Warm waters comprise reservoirs, rivers and streams, and fish farms. Warm-water fish species of commercial importance are the indigenous carp such as rohu, margala, and catla; and the exotic carp such as the Chinese, common, silver, and glass carp. Reservoirs covering about 1500 ha are being stocked with carp. They produce about seventeen tonnes of fish annually. Warm-water rivers and streams extend over about 12 500 km. They are stocked with indigenous as well as exotic carp. Specific stretches of these water bodies are leased out to contractors for fishing. Individual licenses are also issued to commercial fishermen, as well as sport anglers. The Fisheries Department is constructing fish culture demonstration farms, ex-

panding its hatcheries and establishing a carp culture training centre. The current annual production from these waters is about 294 tonnes, fetching a revenue of about Rs. 9.5 million for the Department.

## **4.8 Land tenure**

Land tenure determines the relationship between the resource (land) and the user (the farmer). Tenurial arrangements are particularly important for the sustainability of agriculture and the productivity of the land. Long-term investments in tree planting, land improvement and water management require long-term interests in the land holdings. Most tenants in NWFP are share croppers. The owner can terminate the lease arrangement at any moment. In a share-crop arrangement, the production of a field is divided over the tenant and the landowner. A common division in the rainfed agriculture is an equal share for owner and tenant. In the irrigated areas, the division is usually 60 per cent for the landowner and 40 per cent for the tenant, depending on the inputs (water) by the landlord. A tenant needs two bullocks for his field activities. If the tenant has to borrow one bullock from the landlord, the tenant's share decreases to 25 per cent of the production.

Diagrams 4.7 and 4.8 compare the incidence of farms and farm area under the three distinct categories of tenurial arrangements (owner, owner-cum-tenant and tenant) in NWFP with Pakistan as a whole in 1980. NWFP has about thirteen per cent of all farms and nine per cent of all the farmland in Pakistan. The diagrams also show that NWFP has a high percentage (16 %) of owner-operated farms and a high percentage (34 %) of small farms. However, average holdings in NWFP were only 2.5 ha compared to 4.5 ha in the country as a whole.

Purely tenant-operated farms in NWFP were eighteen per cent compared to 26 per cent in Pakistan. In terms of area, pure tenancy existed over only fifteen per cent of farmland in NWFP compared to 22 per cent in Pakistan. The average farm size was 2.6 ha compared to 3.9 ha for the entire country.

Owners-cum-tenants are farmers who own part and rent the rest of the land they cultivate. Owners-cum-tenants comprised nineteen per cent of all farmers in Pakistan, but only fourteen per

cent of farmers in NWFP. The average size of farms (6.1 ha) was close to the national average (6.3 ha). The owner-cum-tenancy arrangements prevailed over 28 per cent of the farm area in NWFP, compared to 26 per cent nationally. Diagram 4.8 also indicates that the owner-cum-tenancy system covers a high percentage of small farms in NWFP.

The conclusions drawn from this analysis are: there are proportionately more owner-operated farms in NWFP than in the country as a whole, but still the land-tenure arrangements in NWFP do not encourage the share cropper to invest in the land, resulting in unsustainable agriculture. However, the average size of owner-operated farm in NWFP is less than the national average.

#### 4.9 Water accords; usage rights and distribution

Within NWFP in common with the rest of the subcontinent, water is distributed on the basis of a traditional system called "*warabandi*". In *warabandi*, water is allocated to each farmer on the basis of his acreage. Since water is crucial for the productivity of land, its usage rights are well defined, but subject to variation at district level.

Customary water rights in the Province fall under three broad categories. In the first category, water and land are inseparable. Each landholder has a right to water according to the size of his holding and the extent of canal labour he undertakes. This system is normally found in the areas where water is not scarce.

In the second category, water is considered a property and is bought and sold separately from land. This water-distribution system is found mainly in the dry areas. Those who do not have any control over this resource, whether inherited or acquired, receive water from other shareholders in lieu of canal labour along with nominal money payments. They may also enter into "*khost*", a treaty acknowledging the dependent status of the users entailing some small personal services by them to the owner.

The third category is a mixture of the first two. Water and land are treated theoretically as separate entities. But for many years, no distinction has been

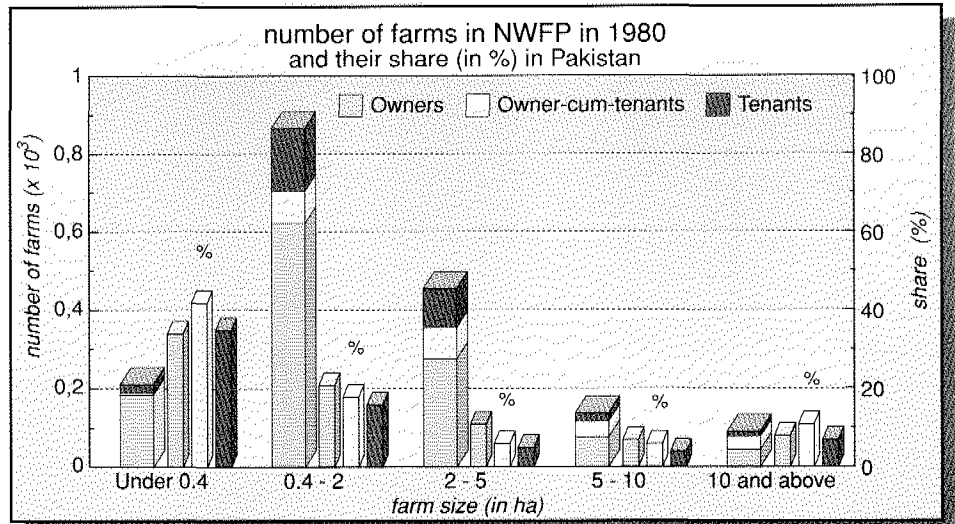


Diagram 4.7

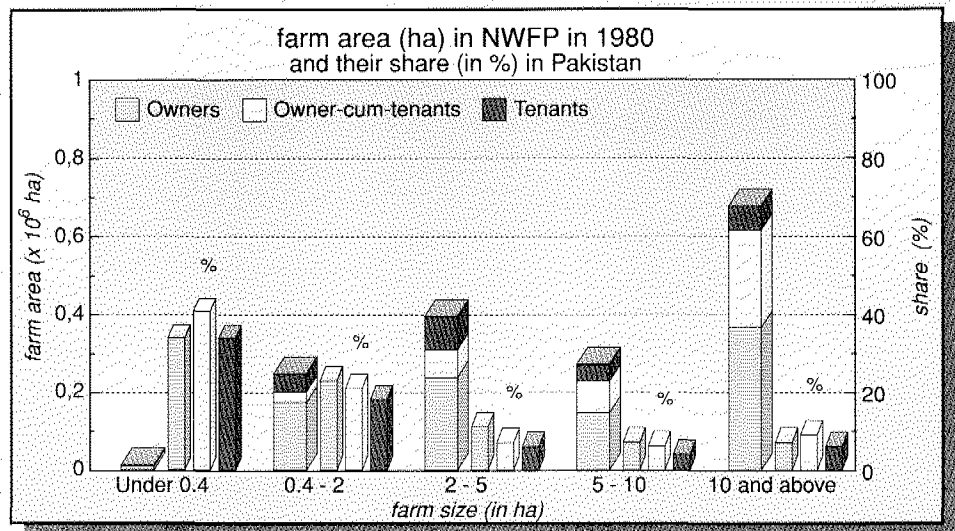
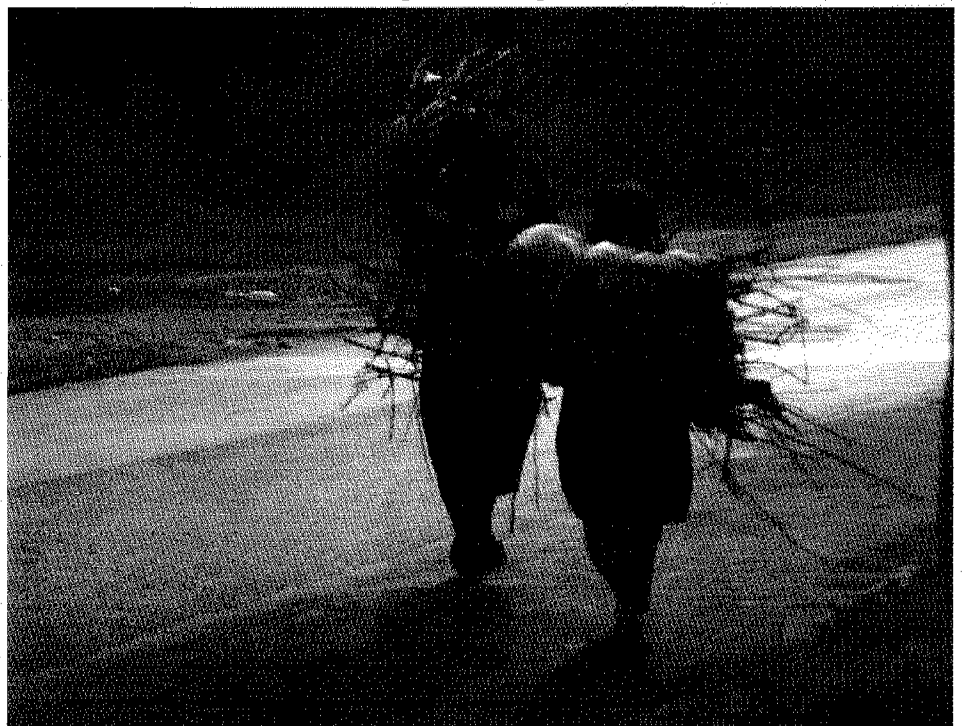


Diagram 4.8

Women carrying fuelwood for cooking and heating



drawn between the two. Nevertheless, waterlords and landlords still exist as distinct classes.

A wide variety of customary water-distribution systems exists within these three categories. For instance, in the Peshawar area, the land holdings are usually divided into four "brakha" (shares) or sectors. The watering periods (waqats) are fixed and are either from sunrise to sunset or from sunset to sunrise. The allocation of turns is managed by the people themselves. Another type of water share called "sawa" is given as a special privilege to the clans on the basis of their being the original settlers.

Water is not a scarce resource in Swat. There the water is a communal resource and its usage is linked with land ownership. Under the supervision of the local and traditional rulers, the amount of water available is shared amongst the irrigators on the basis of their land holdings and the location of their lands. Water is distributed among the shareholders in terms of minutes. Since the area covered by the channels varies, the time or "warabandi" is also different for each channel. Lands located in the far reaches of the channels are allocated greater time shares owing to a decrease in water quantity.

In practice, problems arise when water becomes scarce. The regulated water-distribution system is departed from and the "large" and influential farmers will get their share first.

#### 4.10 Women and land

Official estimates of the female labour force in the Province amount to only 1.81 per cent of the total female population<sup>8</sup> and six per cent of the total labour force in agriculture, animal husbandry, forestry, hunting and fishing<sup>9</sup>. These official figures grossly underestimate the participation of women. The critical factor determining land use by women is the economic status of the family (owner or tenant) to which she belongs.

In the irrigated and rainfed areas, the role of women in agriculture for the rich landowning households of NWFP is negligible. The women of poor landowning household also have limited participation in agriculture, but they do perform outdoor activities such as collect-

ing fuelwood, fodder and livestock grazing. One indicator of poverty is therefore female visibility and participation in outdoor economic activities.

In the tenancy households and the small and marginal farms, female labour requirements are high because of the desire to maximize the productivity of rented resources. This is particularly so in the tenure system where the tenant can keep the surplus after paying the rent. The purdah influences the work of the women. The participation of the women from tenant households in the rainfed regions is the highest as the house is situated within the landholding and affords women easy access to the fields. The houses in the irrigated areas are usually outside the landholding. There, the old women or young female children work in the fields. Normally, there is a division of labour between men and women. Men do jobs like field preparation and irrigation. Women do the harvesting, cleaning, weeding, storing and applying manure. Female labour is used extensively in tobacco production. Commercial fruit production excludes women without exception.<sup>10</sup>

Usually, male out-migration does not increase the agricultural workload of women. The land is either leased out to tenants or a male relative is assigned the responsibility of irrigation and care. Seasonal male out-migration takes place after the crop is sown until harvest time.

Women (except those of the landowning class) make dung cakes, which are used as fuel. Most dung comes from the stables near the houses. Dung is also collected from common land and fields even by the women of families that do not own livestock.

<sup>1</sup> Source: *Agricultural statistics of Pakistan, 1983-84 and 1991-92*.

<sup>2</sup> Source: *Agricultural statistics of Pakistan, 1983-84 and 1991-92*.

<sup>3</sup> Source: *Agricultural statistics of Pakistan, 1991-92*.

<sup>4</sup> Source: *Soil survey of Pakistan. Reconnaissance soil survey: 1967-1977*.

<sup>5</sup> Source: *Livestock population census, 1986*.

<sup>6</sup> Except for about 85 000 ha of plantations raised largely under the watershed rehabilitation programme (FSMP 1992).

<sup>7</sup> NWFP Forest Department, 1993.

<sup>8</sup> *Women and Men in Pakistan (A statistical profile)*, Federal Bureau of Statistics, 1992.

<sup>9</sup> *Women and Men in Pakistan (A statistical profile)*, Federal Bureau of Statistics, 1992.

<sup>10</sup> *The Fruit and Vegetable Boards Women's Project, Impact and needs assessment survey, 1990*

## 5. CONSERVATION OF BIOLOGICAL DIVERSITY

### 5.1 Introduction

NWFP has a rich biological diversity at the ecosystem, species and genetic level. These biological resources provide essential ecological services and a wide range of social, cultural and economic benefits to the people of NWFP. However, these resources have suffered serious decline due to a rapidly growing human population and demands for higher standards of living. Biological resources in NWFP continue to be seriously threatened by deforestation, overgrazing, water pollution, hunting and new agricultural practices. The legislative and institutional provisions for the conservation of biological resources in NWFP are inadequate. The current protected area system (excluding game reserves) provides a reasonable level of protection to a meagre 0.6% of the land area, and covers just three of NWFP's twelve main ecosystem types.

Future priorities for conservation of biodiversity are suggested, including: legislative reform; policy development; institutional strengthening and reorientation; the preparation of an NWFP biodiversity study, strategy and action plan; protected area planning and development; recovery plans for threatened species; provision for community participation; and the integration of conservation and development.

#### *Definition of biological diversity*

Biological diversity (or biodiversity) encompasses all species of plants, animals, microorganisms and the ecosystems and ecological processes to which they belong. It is usually considered at three different levels: genetic diversity, species diversity and ecosystem diversity. Genetic diversity is the sum total of genetic information contained in the genes of all living organisms. Species diversity refers to the variety of living organisms on earth. Ecosystem diversity relates to the variety of habitats, biotic communities and ecological processes in the biosphere, as well as the tremendous diversity within ecosystems. (McNeely et al., 1990).

The value of biological diversity:

-Biological resources provide the basis for life on earth, including that of humans. The fundamental social, ethical, cultural and economic values of these resources have been recognised in religion, art and literature

from the earliest days of recorded history.

-Biological resources contribute to social and economic development, through 1) products consumed directly - such as firewood, fodder and game meat, 2) products for commercial harvest - such as timber, fish, and medicinal plants, 3) various ecosystem services and functions - including watershed protection, photosynthesis, regulation of climate, and production of soil, 4) the intangible values of keeping options open for the future, and simply knowing that certain species exist. (McNeely et al., 1990)

#### **Biogeographical location of NWFP**

The map of the world can be divided into distinct natural realms, the widely accepted model being that of Udvardy (1975). NWFP, lying at the north-western corner of the South Asian (Indian) subcontinent, has a flora and fauna composed of a blend of elements from the Palaearctic and Indo-Malayan realms. The flora of NWFP can more specifically be described as having affinities to the Irano-Turanian, Indo-Malayan, Sino-Himalayan and Central Asian phytogeographic (floral) regions.

The level of endemism (the number of restricted range species) is often taken as an indicator of overall biodiversity. Though no figures are available for NWFP, Pakistan as a whole has a relatively low rate of endemism (species with a restricted range). However, the blending of species from different regions has ensured a diverse and interesting flora and fauna (Mallon, 1991).

## **5.2 Ecosystem diversity in NWFP**

Compared with other provinces of Pakistan, NWFP has a rich diversity at the ecosystem level. Roberts (1977) divides Pakistan into nine major ecological or vegetative zones which he further subdivides into eighteen habitat types. Of these, no fewer than twelve occur in NWFP (see section 2.6).

#### **A critical ecosystem of NWFP**

The ecological zones of highest global importance in NWFP are probably the moist and dry Himalayan temperate forest zones. The temperate forest of the Western Himalaya have been identified by ICBP (1992) as a global 'hotspot' for biodiversity (see under *birds* in 2.8). Studies in the Palas valley, District Kohistan (Duke 1994) show that these forests have a remarkable avian, mammalian and floral diversity, with a large number of endemics. These forests are probably the most species rich ecosystem in Pakistan. The forests of the Palas valley are recognised by the Forestry sector master plan (Government of Pakistan, 1992) as the most outstanding example of this ecosystem in Pakistan.

## **5.3 Threats to biodiversity in NWFP**

The principle threat to biodiversity in Pakistan - and in NWFP - comes from the increased pressure on natural resources produced by rapid population growth and demands for increased standards of living. Together, these account for a doubling of the demand for natural resources every 12 years. More specific threats to biodiversity in NWFP are posed by deforestation, overgrazing, soil erosion, water pollution, hunting, fishing and agricultural practices.

#### **Deforestation**

Studies using satellite imagery show annual rates of decline in forest area for various parts of Hazara Division, NWFP of between 1.4% and 8.8%. If these rates continue, the forests of these areas would completely disappear within 10-50 years. Khattak (1993) attributes continuing deforestation throughout NWFP to heavy uncontrolled grazing, commercial felling, local use of trees for fuelwood, clearance for cultivation, and defective road construction. More fundamental causes seem to underlay these more obvious problems. They include the breakdown of customary ownership and resource management systems, the political economy of NWFP (which has favoured the concentration of control over forest resources into a few hands), and population growth (including the influx of some 3 million Afghan refugees).

Deforestation implies the wholesale loss of tree and shrub species, together with the associated ground flora and the vertebrate and invertebrate faunas they normally shelter (Mallon, 1991). In NWFP this is particularly serious for the Himalayan temperate forests.

Rates of plantation for Pakistan in the 1980s were half the estimated rate of forest loss. Though significant progress is being made in tree-planting, particularly on farm lands, monotypic plantations of exotic species are no substitute for the loss of diverse native forests. Plantations generally support common and cosmopolitan species and are of low overall value for biodiversity compared with native forests.

#### **Overgrazing and soil erosion**

Livestock numbers in Pakistan are increasing by 20% every seven years. Some ranges support livestock at three times their carrying capacity, and there is serious overgrazing with ranges producing 50% or less of their capacity. Serious degradation of rangelands reduces the diversity of flora, and changes the vegetative composition. Competition for grazing affects wild herbivore species, and the reduced prey base can then support smaller populations of raptors and mammalian predators. Overgrazing leaves the soil vulnerable to wind and water erosion. It is estimated that siltation due to soil erosion will reduce the storage capacity of the Tarbela Dam by one third by the year 2000, 26 years after commissioning. (Mallon, 1991)

#### **Dams and irrigation**

The construction of the Tarbela and other smaller dams has increased wetland habitat, which has been of benefit to birds, especially wintering water-

fowl. However, subsequent conversion to agriculture has led to the loss of riverine and thorn forests and their associated fauna. (Mallon, 1991)

#### **Water pollution**

The causes of water pollution are the discharge of untreated sewage, agricultural and industrial wastes into water courses. The Kabul River in NWFP is particularly badly affected by untreated municipal wastes - no treatment facilities exist in any town or city of NWFP (IUCN, 1993).

#### **Hunting and collection of plants**

Hunting is a serious threat to many species in NWFP. Though hunting is controlled, its in the practice difficult to police. Firearms are widely carried in NWFP, particularly in the tribal areas. Much of the territory is beyond the practical reach of the law enforcement agencies, let alone of the few, unarmed wildlife guards. Policing alone cannot resolve this problem. A wide range of gamebirds, waterfowl and mammals are shot for meat, while all the ungulate species have been shot for trophies. Khan (1991) reports that some 100,000 waterfowl are shot annually on migration in Chitral alone. Though most waterfowl are offered some protection by law, almost all species - regardless of status - may be hunted under licence. In practice, hunters rarely differentiate between common and rare species, and bags often exceed the generous legal limits. Moreover, though Chitral is a major flyway, there is no protected area for waterfowl. Of the ungulates, hunting threatens musk deer (hunted for musk), markhor, ibex and goral in NWFP. Black bear cubs are caught to be sold for bear bating and as dancing bears. Adult bears are persecuted for raiding crops and attacking livestock. Rhesus monkeys are captured for sale as laboratory animals or persecuted for feeding on crops, and are not rare. Most cat species have valuable fur, and pheasants and herons are hunted for their feathers. Falcons are sold for the falconry trade - a particularly acute problem in NWFP. Cranes are captured in large numbers to be kept as garden pets. Large birds such as storks or migrating birds of prey may be shot at for target practice. Snakes are hunted for their skins. Virtually all the larger mammals have declined in number and had their range reduced as a result of hunting. (Mallon, 1991).

Some plant species may be threatened by their collection or use. These may include *Ulmus wallichiana* (lopped for fodder), *Taxus baccata* (extraction of taxoil) and *Fraxinus xanthoxyloides* (fodder). The and fungus *Morchella* spp. may be threatened by intensive collection for sale.

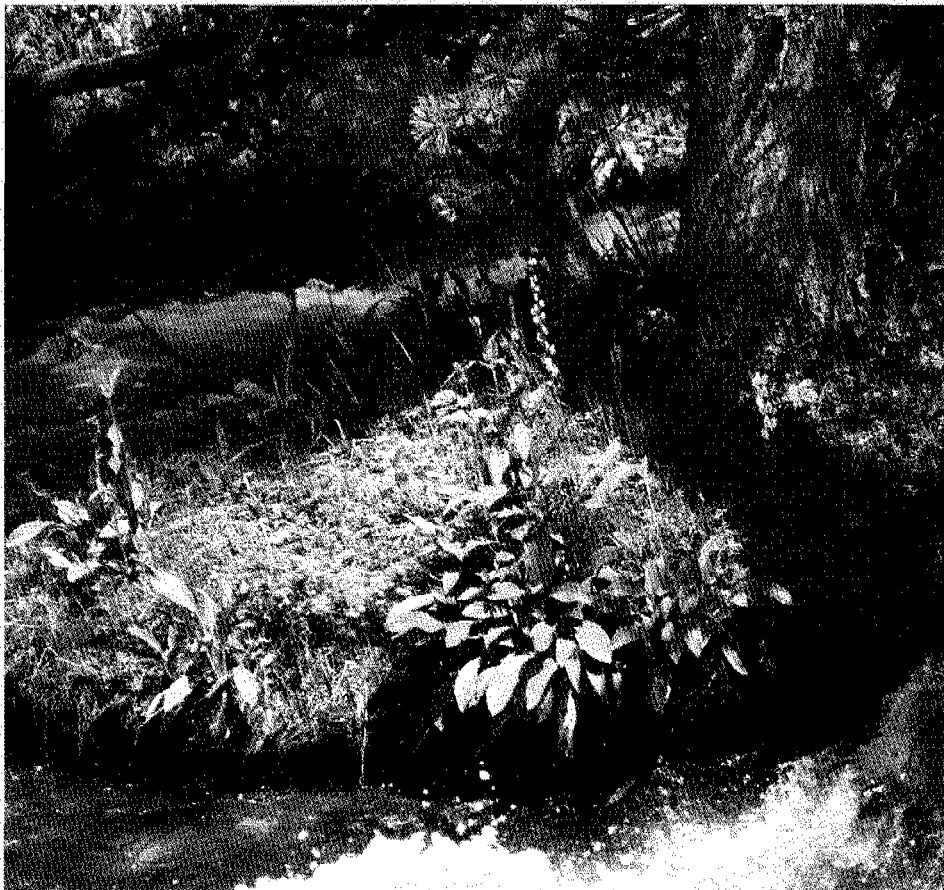
#### **Fishing**

No data are available on freshwater stock levels, but the introduction of exotic fish species for sport fishing poses a threat to indigenous species (Mallon, 1991).

#### **Agricultural practices**

The increasing use of new varieties of seed reduces the amount of local land races planted, some of which may be lost altogether. It is obviously important that agricultural research establishments should endeavour to preserve samples of all local strains. Indiscriminate use of biochemicals directly affects non-target species and may allow the emergence of resistant strains of agricultural pests. The introduction of improved livestock strains to improve the quality of herds threatens the survival of indigenous breeds. (Mallon, 1991).





NWFP is rich in biodiversity

## 5.4 Conservation of biodiversity in NWFP

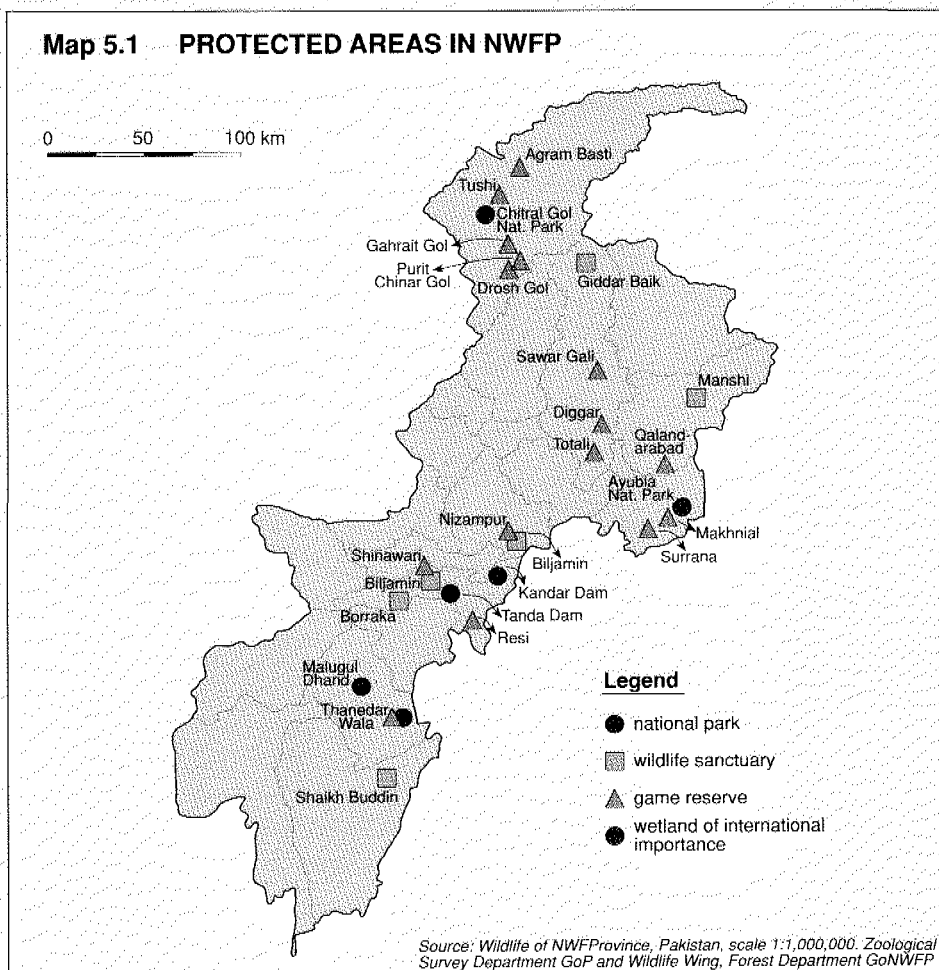
### Protected areas

Protected areas (see Map 5.1) form a central element of any strategy to conserve biodiversity (IUCN, 1993). Well known as national parks and nature reserves, they also encompass more recent concepts such as sustainable use reserves, wilderness areas and heritage sites. A good network of protected areas forms perhaps the pinnacle of a nation's effort to protect biodiversity, ensuring that the most valuable sites and representative populations of important species are conserved in a variety of ways. The network complements the less intensive measures that can be taken for conservation outside protected areas.

Countries need a mixture of the different types of protected areas. Similarly, countries need a mixture of large and small areas: a few large areas are easier to protect and have greater ecological integrity, but many smaller areas may often contain a greater number of species and ecosystems, and may be better able to meet the needs of local communities. Few protected areas worldwide have so far been declared to protect genetic resources. Genetic resource reserves may often be quite small.

IUCN (1993) list six categories of protected areas according to their management objectives and degree of protection (Appendix 7). Of NWFP's three categories of protected area - national park, wildlife sanctuary, and game reserve - only national parks and wildlife sanctuaries meet IUCN criteria as protected areas. NWFP's national parks approximate to IUCN's Category II (National park). NWFP's wildlife sanctuaries approximate to IUCN's Category I (Strict Nature Reserve/Wilderness Area).

IUCN (1990b) lists for NWFP 2 national parks, 5 wildlife sanctuaries and 27 game reserves. These protected areas and their superficies are listed in Appendix 7. The total area protected within national parks in NWFP is 9,434 ha (0,1% of total land area of NWFP) and the total area protected within wildlife sanctuaries, 50,467 ha (0,5%). Thus the total protected area warranting IUCN categorization in NWFP is less than 0,6% of the total land area. This com-



## Tourism

The NWFP has much to offer to tourists. Snow-capped peaks; lush green valleys of unusual beauty; excellent cuisine; marketable crafts such as copper and silverware, carpets, furniture; fine arts and architecture, representing civilizations in the very dawn (40,000 years ago) to the present day; people with an interesting social and cultural background; people who are service-oriented: the Pakistanis are among the most hospitable and courteous people in the world; pleasant climate: cold and snow in the winter, pleasant warm autumns and springs; low rate of criminality. The NWFP is a sportsman's paradise offering a range of popular sports such as: cricket, polo, tracking and fly fishing. All this suggests that the NWFP has the potential to become a major tourist resort. However, there are also limitations to the development of tourism: the comfort is very limited: most places in the NWFP are only for the adventurous; the driving is very



*Buddhist (3<sup>rd</sup> century A.D.) sculpture in the Swat museum, Mingora*

impulsive and driving yourself is for the fatalistic; most scenic places are only reached by a uncomfortable short-wheel based 4WD jeep; fewer than 3 % of the population speaks English; female tourists are stared at; prohibition prevails in NWFP, even for foreign visitors; many hotels are expensive compared with the standards provided; the lack of sanitation and sewage, tourists are often sick due to limited cleanliness. The preservation of the rich cultural heritage of archeological remains is largely neglected. The natural deterioration of these aspects is being accelerated by vandalism. Sri Lanka and Nepal could serve as a model to develop tourism under comparable conditions.

compares with a general figure of 3.7% of the land area of the earth which is protected. (An additional 3.1% [312,314 ha] of NWFP is protected within game reserves in NWFP, but these do not warrant any IUCN category). The protected areas as indicated by the Wildlife Wing are displayed in Map 5.1.

The effective protected area coverage in NWFP is clearly inadequate; excluding game reserves, only three of the twelve main ecosystem types of NWFP receive any protected coverage, and the extent of coverage of even these three ecosystems is poor. The three ecosystems represented are: moist temperate forest (Ayubia, Manshi, total 4,005 ha); dry temperate forest (Chitral Gol, Agram Basti, total 37,616 ha); dry subtropical broadleaf forest (Borraka, Manglot, Sheikh Buddin, total 18,280 ha).

Further shortcomings in Pakistan's protected area system pointed out by IUCN (1990b) and Rao (1986) are applicable to NWFP. The size and distribution on protected areas do not meet the needs of the ecosystems or plant and animal communities; the creation of most has been haphazard, with their boundaries

not drawn according to ecological criteria; many are too small, and wide dispersion makes them isolated 'islands'; weak law enforcement is a problem; there are inadequate safeguards against habitat degradation within protected areas. There is also a lack of comprehensive management plans for most protected areas, a lack of trained personnel to manage them scientifically, and insufficient legal provision and personnel to enforce the laws. There is also a need for public education programmes, and the involvement of the local population by ensuring that financial rewards and other benefits reach them.

**Wetlands;** Pakistan ratified the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention) in 1976. Two Ramsar sites remain listed in NWFP, namely Thanadarwala Game Reserve (Bannu) and Tanda Dam (Kohat). Several sites have been delisted as not being of international importance. Cases for Ramsar listing of Tarbela Dam and D.I. Khan Waterfowl Refuge are under preparation. It is possible that changes in NWFP's Ramsar sites have since been indicated to the

Ramsar Bureau. Neither Kandar Dam nor Kheski Reservoir are considered to be of international importance (Ramsar Convention Bureau, 1990).

### 5.5 Future priorities

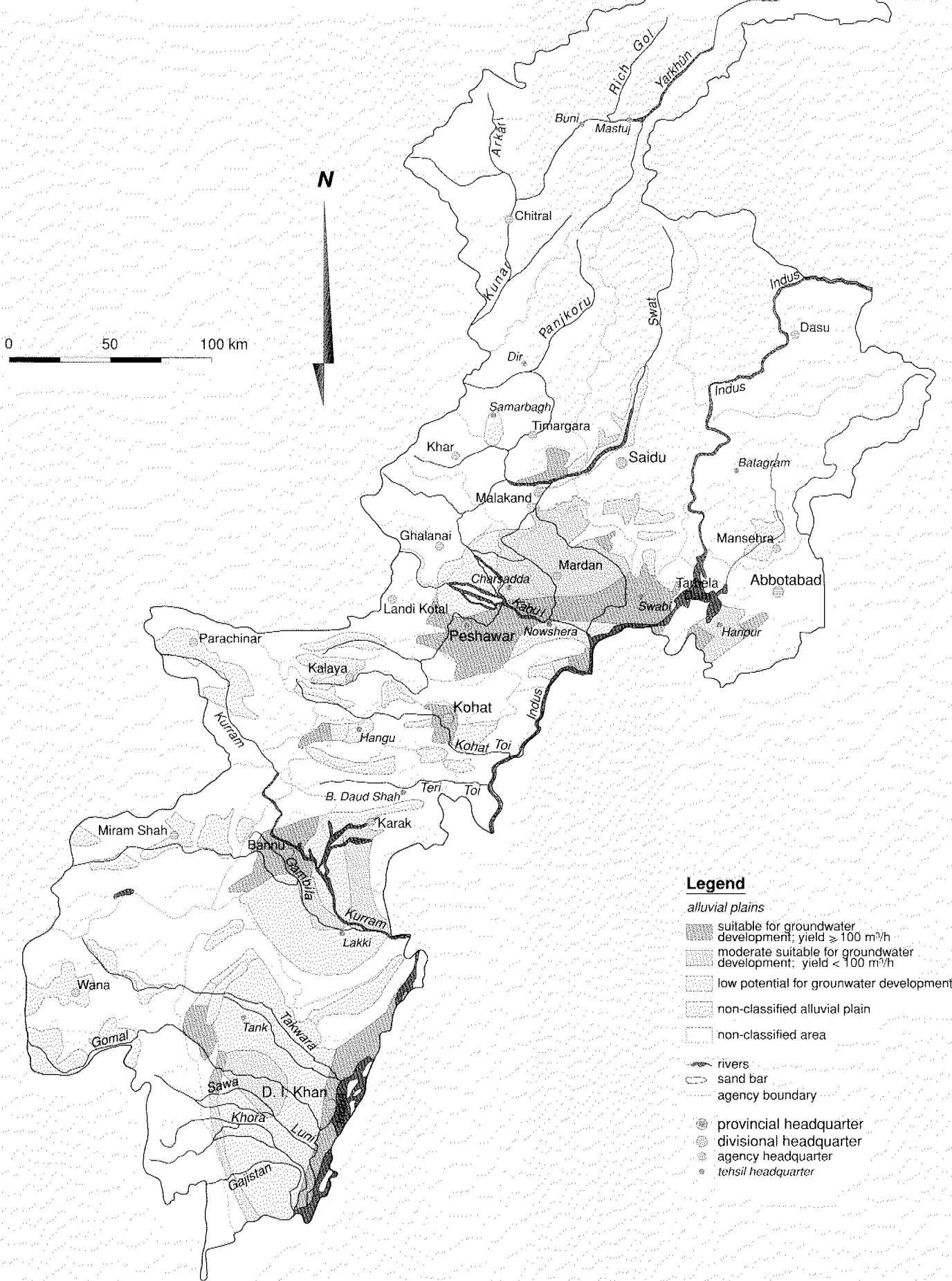
Priorities for the conservation of biodiversity have been set at the national level by the National Conservation Strategy (GOP/JRC-IUCN, 1992), and progress has already been made in formulating the Sarhad Provincial Conservation Strategy (IUCN, 1993). Pakistan is expected to ratify the Biodiversity Convention in 1994, and this will have legislative, policy and programme implications for the conservation of biodiversity in the country.

## 6. MAJOR PROBLEMS ASSOCIATED WITH NATURAL RESOURCES

### 6.1 Groundwater depletion

Groundwater reserves depend on an equilibrium between outflow (discharge)

**Map 6.1 GROUNDWATER RESOURCES OF NWFP**



Based on: Hydrogeology and Groundwater Resources of the NWFP, by WAPDA Hydrogeology Directorate, Peshawar, Pakistan and Institute of Applied Geoscience, Delft, The Netherlands, 1988

and inflow (recharge). Diagram 6.1 shows that the rate of depletion is higher than recharge only in two districts (Kohat, Bannu), resulting in a decline in reserves. However, the balance is positive in the remaining districts. The overall recharge of groundwater is 3.85 million ha.m against a pumpage from aquifer of 0.95 million ha.m per year for the Province resulting in a net positive balance of 2.90 million ha.m annually. Therefore today, there is still a tremendous potential of groundwater development in nine of the Province's eleven districts. Groundwater use is estimated at 25 per cent which gives a vast groundwater development potential of 75 per cent<sup>1</sup> (See Map 6.1).

Diagram 6.2 shows the groundwater balance according the different components of inflow and outflow. Precipitation is the largest contributor to the inflow. In NWFP the total precipitation inflow is larger than the total outflow. But the other sources of inflow are very important. Five districts will have a negative water balance when precipitation is the only source of inflow (Peshawar/Charsadda: -0.09, Mardan/Swabi: -0.05, Kohat: -0.04, D.I. Khan: -0.17, Bannu: -0.02 mha-m).

The groundwater discharge through private tubewells has been the most significant factor in increasing water supplies during the last 28 years. The three main factors responsible for the increased use of tubewells are:

- *Simple technology.* Technological improvements for digging borewells and pumping water have made wells increasingly attractive.
- *Economy.* Pump users in the rural areas pay a flat, low rate for electricity, encouraging profligate groundwater use. A drawback of the use of electricity is the frequent power cut. This is especially serious when the crop is in a critical stage.
- *Higher crop yields.* The farmers can exercise better water control for crops and make their decisions without relying wholly on the canal-irrigation system.

A better control of the water is especially important because the shortage of water for irrigation is a common phenomenon in NWFP, even in the surface-water command areas. Groundwater may be very beneficial, especially dur-

ing Kharif, when tubewells may provide the required supplemental supply if the surface-water system carries insufficient water. Moreover, pumping groundwater in areas irrigated with surface water combats waterlogging by lowering the water table. However, groundwater quality plays an important role. In areas with saline groundwater, pumping causes a recycling of the salt and salinity.

Yet the increase in discharge can also have an adverse impact on groundwater resources. Intensive pumping by a vast majority of farmers has caused the water table to drop 1.5-4.5 m before and after the installation of tubewell. Decline in groundwater reserves is especially serious where the water tables are low (19.6 metres in Warsak). In some arid areas pumping out groundwater entails the risk of mobilizing the surface soils and polluting the groundwater by recharging with salt water. Despite the picture favouring surface-water availability presented in the table above, additional surface-water sources are becoming increasingly difficult to secure while the use of groundwater is increasing.

## 6.2 Deforestation

Forests are a renewable resource. When a tree has reached a certain age it can be harvested. However, the natural vegetation of NWFP has been immensely degraded over time. Potentially, the whole of NWFP should be under tropical thorn forest (Champion, Seth, and Khattak, 1965) in the plains, dry subtropical broad-leaved forest on the drier foothills, moist and dry temperate forests on the mid-mountains, and subalpine forest, at the highest elevations at which trees can survive. The tropical thorn forests have been exterminated mainly due to the conversion of land for agriculture combined with grazing and cutting of woody vegetation for fuel. The remaining forest types have fallen to a fraction of their potential extent, mainly due to heavy uncontrolled grazing, tree felling, and cultivation of mountain slopes.

Such denuding has been occurring since the Aryans first invaded this area around 500 B.C., but it has greatly intensified during the past century due to a rapid increase in human and livestock populations. According to an estimate

(WRI and IIED, 1988), the forest area of Pakistan decreased from 141 530 km<sup>2</sup> in 1880, to 67 310 in 1980; a decrease of 52 per cent in one hundred years. During the nineteen-seventies, the above-mentioned study estimates an annual decrease of 1.5 per cent per year for the whole of Pakistan. Its 1992 edition indicates the annual decline of 0.4 per cent. However, these data are based on country reports which, until recently, were mere guesstimates.

The data on forest and deforestation in NWFP are contentious. Agricultural statistics for Pakistan indicate that the forest area was 1.33 million ha in 1992 and shows a 53 per cent forest increase during the period from 1982 to 1991 (see Diagram 4.1). This increase should be the result of the reforestation programmes. The Forestry Sector Master Plan estimates the total area under forest and trees to be 1.68 million ha. While preparing for the Forest Development Project Siran valley, GTZ (1990) compared the LANDSAT MSS<sup>2</sup> for 1979 and 1985, and LANDSAT TM<sup>3</sup> for 1988 of Siran and Agror-Tanawal Forest Divisions. The comparison revealed that the forest area declined annually by 1.8 per cent from 1979 to 1985, but the annual decline was 12.8 per cent from 1985 to 1988. It is unclear what caused the acceleration of annual depletion rate from 1.8 per cent during 1979-85 to 12.8 per cent during 1985-88.

The rates of decline varied within the project area according to the population of the surrounding area and the accessibility of forests (see Diagram 6.3). Of special interest in the above-mentioned study is the rate of decline under various tenure classes of the dense forests (more than 60 per cent canopy closure)<sup>4</sup> (see Diagram 6.4.).

The study imputes the lower rate of decline in Guzara Forests under the forest co-operative societies to their refusal to allow the non-right holders to collect firewood from their forests. In this manner, the entire burden for the supply of firewood to non-right holders shifts to the reserved and protected forests and those Guzara forests managed by the Forest Department. An other reason was a deliberate overestimation of yield from the coops-managed Guzara forests which, for a major



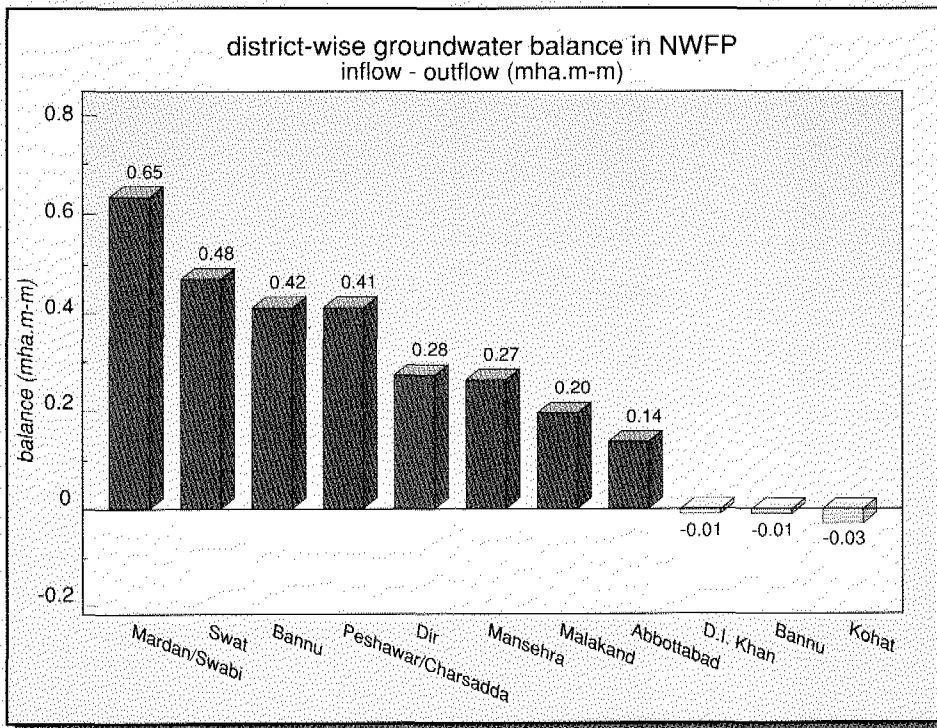
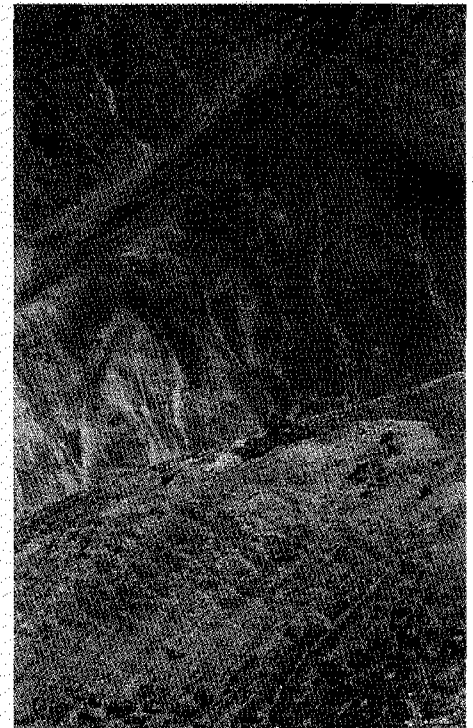
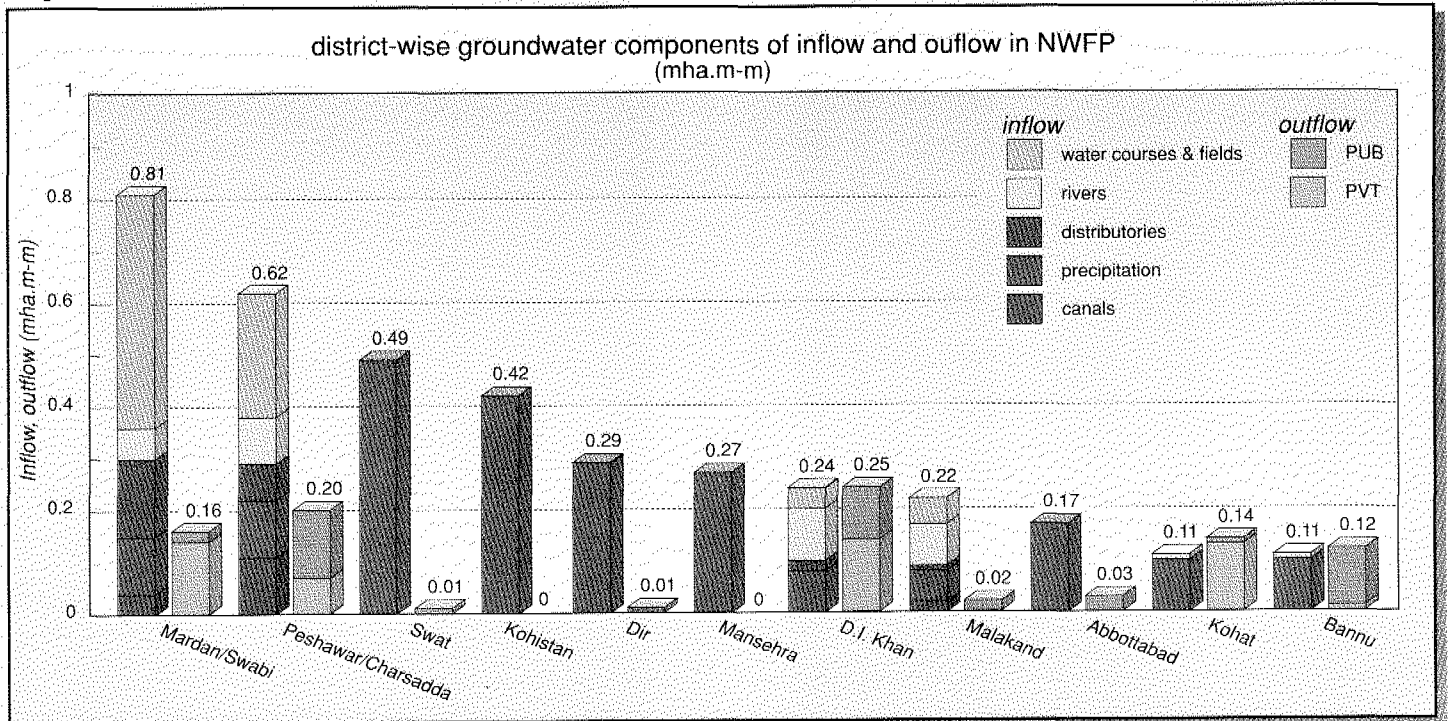


Diagram 6.1



Deforestation has stopped!

Diagram 6.2



Deforestation of Deodar



Timber transport



part came from illegal cutting from reserved and protected forests.

The Malakand Social Forestry project has investigated the deforestation in Dir and Malakand Agencies using satellite data of 1972, 1978 and 1993. The interpretation was followed by intensive fieldwork. The results are displayed in Map 12.1 at the end of the profile. The results are not representative for the NWFP but are indicative of the deforestation.

Forest management is a complex affair. The Forest Department has been managing the Guzara forests (550 000 ha) since 1936. Between 1981 and 1992, some were transferred to the management of their owners' co-operatives. In 1992, the Prime Minister of Pakistan suspended the operation of the co-operatives, charging them with unsustainable high rates of felling, unaccompanied by adequate regeneration. Since

then, co-operatives of Kohistan District have been revived due to the violent protests of the local people against their suspension. The current situation is in a state of flux: management by the Forest Department is criticized by the Guzara owners for their indifference to the protection and regeneration of the Guzara Forests, and their insensitivity to the needs of the owners. Management under the co-operatives is faulted for overfelling, inattention to regeneration, and a disregard of the needs of the small Guzara owner and the non-right-holder. Management under both systems is unsustainable and deforestation continues in the meantime.

The management of protected forests is also very unsustainable: Local people contest the forest ownership. In some areas, they are preventing the Forest Department from planting areas where

mature trees have been removed. The Forest Department does not permit grazing in the protected forest, but natural regeneration fails to establish itself due to ubiquitous grazing. The forests are not demarcated and the local people promptly appropriate any sizeable opening in the forests for cultivation. These forests have only been under the management of the Forest Department for the past two decades (as against about a century for reserved forests, and about half a century for the Guzara forests). The law-and-order situation in many of the forests is tenuous. The forest-operation contractors engaged by the Forest Development Corporation for felling and transportation have purchased the people's 60 per cent share in the sale proceeds by making advance payments to them, and have therefore regained an interest in illicit felling, thus undermining the *raison d'être* for the establishment of the Corporation.

The Forest Department gives high priority to forest conservation, but despite all efforts, the tremendous pressure on the forest caused by high prices for timber and demand for fuelwood and money makes it extremely difficult to save the forest. It is generally perceived that Forest Department staff is also a threat to the forest.

### 6.3 Soil erosion

Erosion is a natural process, especially prevalent in geologically young mountainous areas as NWFP. However, when the land surface on slopes is bared of protective vegetation due to cultivation, overgrazing, tree removal, construction and mining activities, the soil erosion accelerates at alarming rates and the soil forming processes are too slow to compete with soil erosion. This results in the loss of the all-important top layer and plant nutrients. In the end, this affects the farmer as the productivity of his fields declines<sup>5</sup>.

The Forestry Sector Master Plan has estimated annual soil loss based on measurements by WAPDA. The extent of transported sediments present in the water was measured in some watersheds between 1960 and 1982. The highest rates of erosion are in the Indus catchment between Tarbela reservoir and 90 km upstream where estimated soil loss is 150 to 165 tonnes of soil per

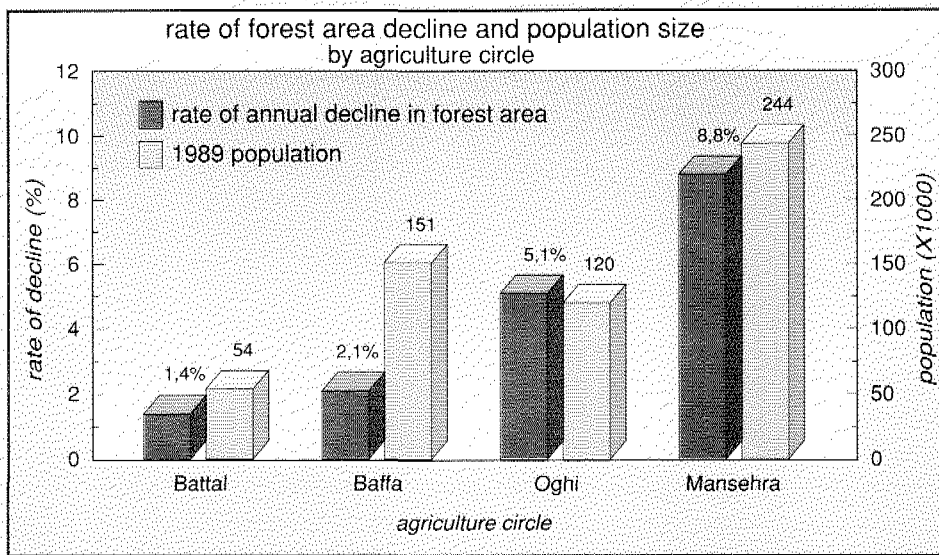
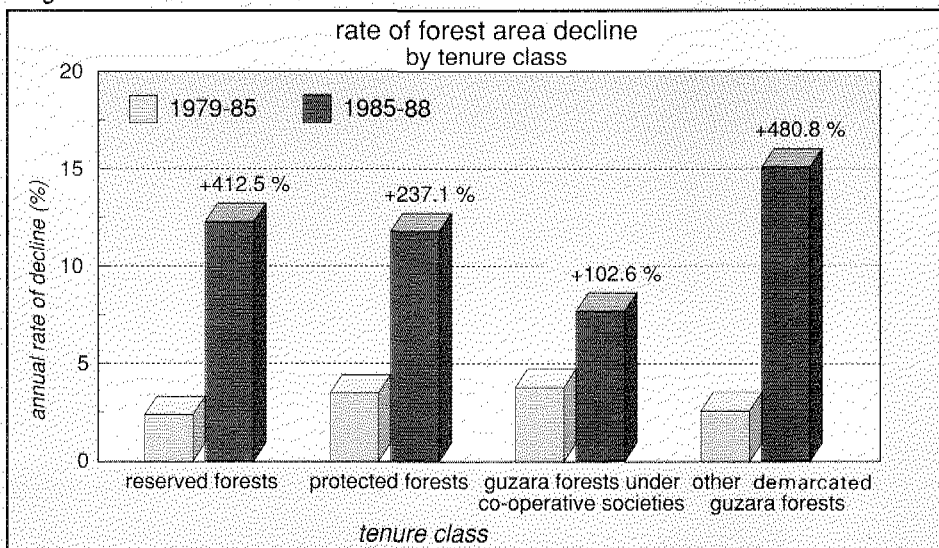


Diagram 6.3

Diagram 6.4



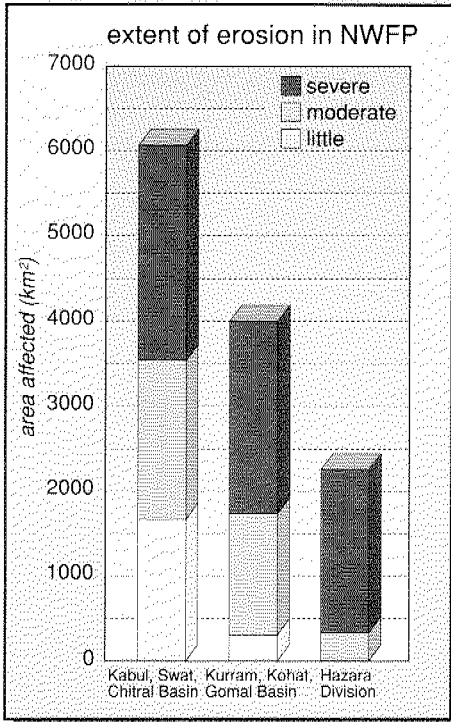
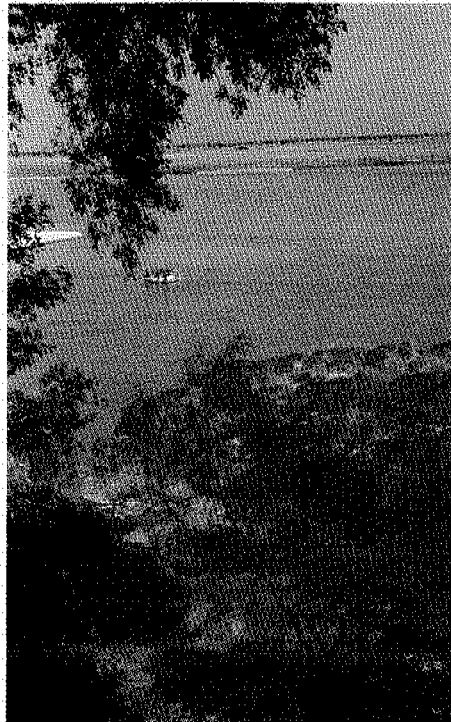
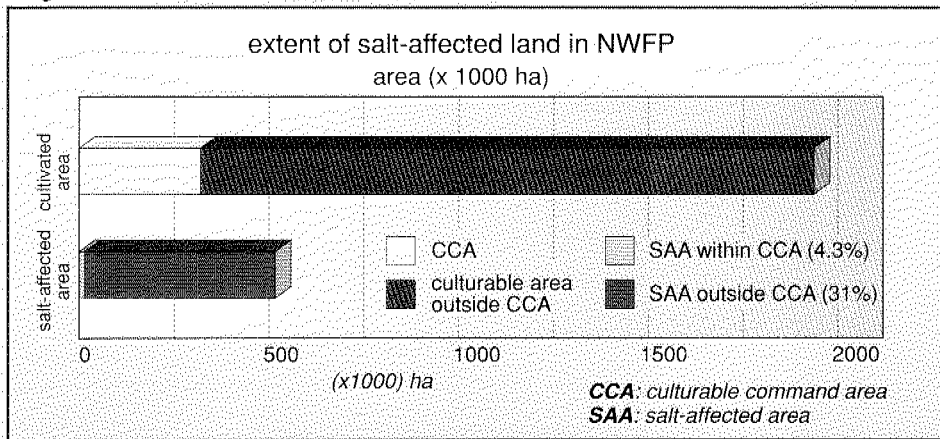


Diagram 6.5



Confluence of the sediment rich Kabul river (brown) and the clear Indus river (blue)

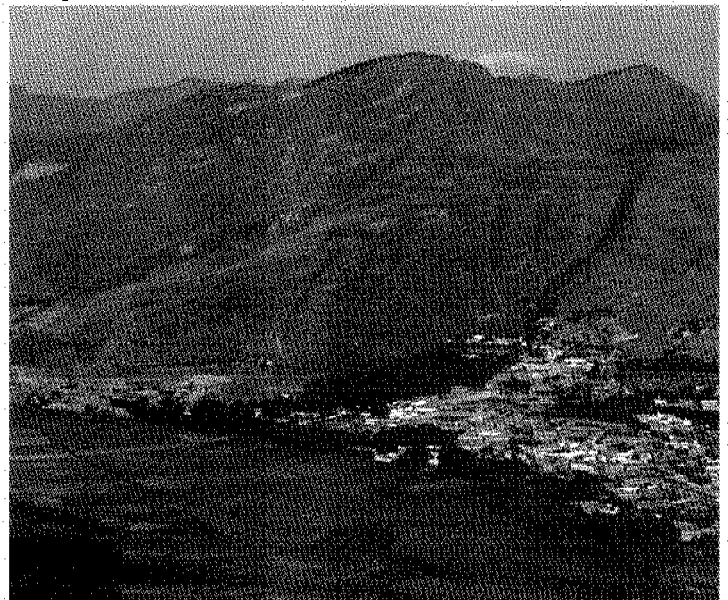
Diagram 6.6<sup>a</sup>



Terraces are one way to stop erosion, but frequently the terrace erodes away



Overgrazed hills in Swat



hectare per year. Erosion rates in other catchment areas are much lower, approximately 20 tonnes of soil per hectare per year. Most of the load is carried by rivers during the monsoon period (June - September), when rainfall is high resulting in flash floods.

In NWFP, wind erosion is generally active in drier areas with light soils. Diagram 6.5 shows the extent of erosion in various areas of the Province up to 1990-91.

The process of erosion can only be stopped by expensive projects such as integrated watershed conservation and social forestry. Reduction of erosion by preventing cultivation on steep mountain slopes and conservation of the watersheds are much better alternatives.

#### 6.4 Rangeland degradation

Grazing land depletion in NWFP has been caused by excessive grazing over a long period. It is estimated (Anwar Khan, 1971) that the grazing lands of Hazara Civil Division could support 548 000 animal units<sup>6</sup>. These grazing lands now support about 1 672 000 animal units<sup>7</sup> - almost three times their capacity. Of the five million ha of NWFP grazing lands, 4.3 million ha are so depleted that 'there are no or few signs of evergreen vegetation or dry vegetation. Bare soil seems to dominate the surface during the dry season.' (FSMP 1992).



Rotational grazing techniques have been well known and proven in rangelands for many years. Unfortunately, with the demise of the traditional social structure, free grazing has become widespread. In free grazing, the stocking densities and the carrying capacities are no longer in balance. This leads to overgrazing and overrest. Overgrazing first exterminates the most palatable species. The vegetation has no chance to restore and ultimately even the roots die out. However, persistent, heavy grazing ultimately destroys even the least palatable, leaving bare soil unprotected to wind and water erosion. During overrest the dead standing grass will obstruct the growth of new shoots and ultimately the grass will die.

The area under rangelands and the common lands has declined in favour of agriculture. This severely restricts the migration of the herds of the Gujars. Persistent, heavy grazing is one of the most important causes of forest depletion, the possibilities for regeneration are destroyed and a decrease in the biodiversity in NWFP results. The most damaging impact of overgrazing is in the watersheds. When the vegetation cover is depleted, excessive grazing on steep slopes causes accelerated soil erosion. In the semi-arid plains, overgrazing leads to desertification.

Despite the serious environmental problems caused by excessive grazing, little has been done to date to rehabilitate the more than 4.3 million ha of depleted

grazing lands. The main reason is low returns compared to the high cost of rehabilitation. The introduction of "exotic" forage species has not met the expectations by improving the range productivity. Even with fertilization and the creation of trenches, the exotic species have shown limited ability to propagate into the surrounding rangelands<sup>9</sup>.

Also, rangeland rehabilitation is complex. It not only involves technical aspects of range management, but also institutional aspects with participation of the local people, the complex and varying local land tenures, and agricultural and livestock husbandry practices.

### 6.5 Waterlogging and salinity

Conventionally, waterlogging and salinity have been viewed as occurring together. As the water table rises due to poor internal drainage, seepage from canals and distributories, discharge from the side hills or over-irrigation, salts are pushed up to the surface through capillary action.

#### Waterlogging

Waterlogging refers to a condition in which the soil is saturated to the extent that common plants fail to grow or their growth and yields are adversely affected due to the poor aeration of the root zone. According to a recent estimate by WAPDA, severely waterlogged areas (with a water table of 0-5 feet depth) occupy 0.04 million ha in NWFP which

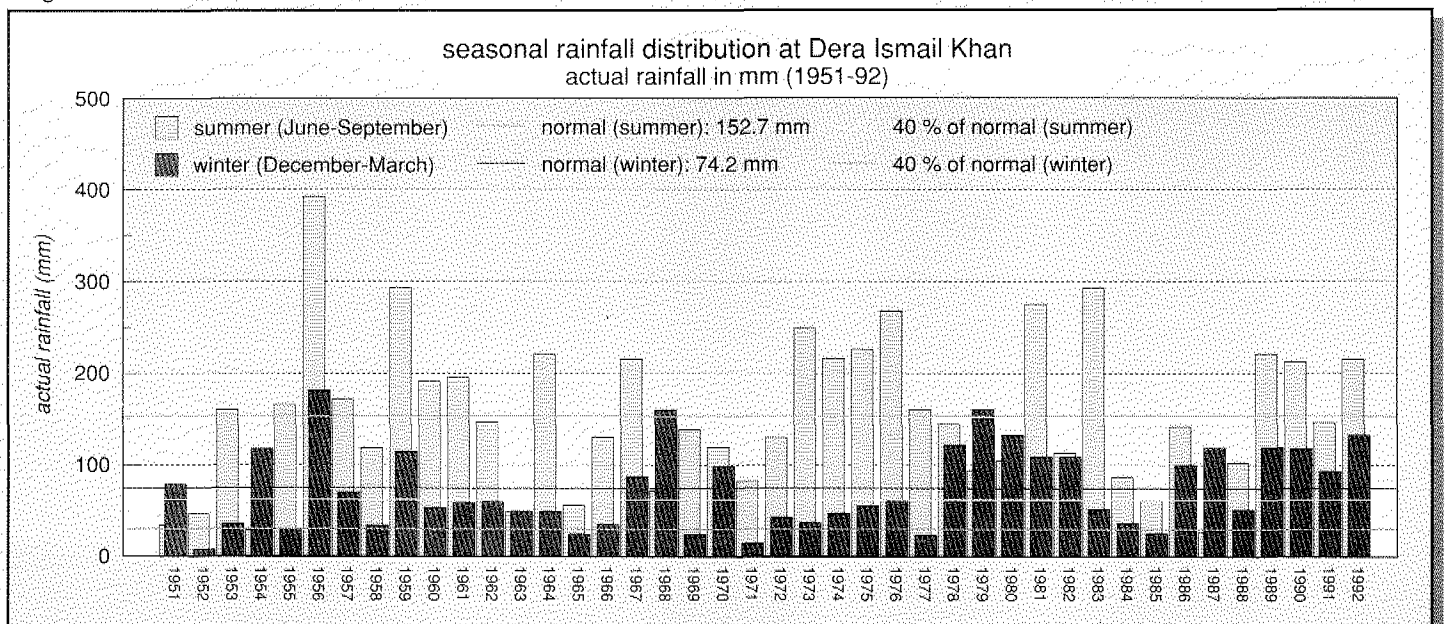
is 0.4 per cent of the gross area. This figure may almost double after the monsoon rains. The areas with high water table also vary from year to year in relation to precipitation and other factors.

The drainage of land underlain by fresh groundwater does not pose a serious problem. Tubewells offer a satisfactory solution for draining this land and, at the same time, enhance the irrigation water supplies. In fact, this has been a major component of WAPDA's Salinity Control and Reclamation Project (SCARP). Many private tubewells have been installed whose rate of return is much higher than the publicly owned systems (WAPDA). WAPDA's revised action programme not only recommends exclusive jurisdiction of the private sector in groundwater development and drainage, but also incorporates a SCARP transition programme under which the present SCARP tubewells will be gradually phased out of the public sector and replaced by small, privately owned and operated tubewells. Their operation and maintenance remain a matter for concern. Drainage in the saline groundwater areas of NWFP is of real concern for the public sector.

#### Salinity

The salt-affected soils occur in specific physiographic locations and are formed as the result of the redistribution of salts in the soil profile taking several thousand of years. The process has been precipitated by a rise in the underground

Diagram 6.7





water table following the establishment of extensive irrigation systems and the emergence of barriers to natural drainage from the railway and road network. The extent of salt-affected land in NWFP is presented in Diagram 6.6. This indicates that most (26 per cent of the total cultivable area) salt-affected areas lie outside the canal command area (CCA), which, mainly due to recharge at higher ground, has resulted in the movement of water through the underground medium, dissolving and carrying salts and discharging on side slopes or lower ground, causing salinity problems (e.g., impairing crop growth).

An evaluation of the SCARP programme shows that the water table in the project areas has generally been lowered but only a small proportion of saline soils has been reclaimed. The problem has been secondary salinization (sodicity) with poor-quality tubewell water. Sodicity could lead to such progressive soil dete-

rioration that yields of even the most common crops could be reduced up to 50 per cent and sensitive crops would fail to grow. This can be overcome by adding gypsum or pyrite to soils with good quality. The use of gypsum in the high-sodium, low-salinity soils can be encouraged through proper extension and efficient marketing of gypsum in the affected areas of the Province.

## 6.6 Droughts and floods

Periods with less than 40 per cent normal rainfall have been identified as drought periods<sup>10</sup>. Diagram 6.7 give seasonal rainfall distribution for D.I. Khan. There were two severe drought periods in the southern NWFP. In 1952 and 1965, rainfall was less than 40 per cent of the normal levels during both summer and winter. Droughts also occurred in the region during the summers of 1950, 1951, 1963 and 1986 and the winters of

1955, 1977 and 1986. In general, NWFP has not experienced any severe drought conditions except in the extreme south (D.I. Khan area). This is due to the two rainy seasons. Even if the rains fail during Kharif, as they occasionally do, there are always the Rabi rains and the Province does not find itself in severe drought conditions.

Flood problems in NWFP are related to its peculiar topographic and climatological factors. Due to large-scale deforestation in the upper catchments, retention of precipitation by trees and grass has decreased. So the rain water flows down with an unabated fury and even medium-intensity rainfall generates flash floods streaming down the watershed mountains causing heavy erosion in the upper regions and deposits in the deltas. The capacity of streams has, therefore, reduced and cannot accommodate even medium flooding, causing over-bank flooding and inundation of

### Flooding



### Area surrounding the Warsak dam

The area surrounding Warsak dam has severe environmental problems. The towns of Khalil and Dawaudzai have been badly affected by waterlogging caused by the Warsak dam. An area of approximately 100 sq. miles, once fertile, has been transformed into wetland where only sugar cane can be grown.

The Municipal Corporation of Peshawar uses the nearby Dawaudzai area to dispose of the city's waste. A total 125 000 kg<sup>11</sup> of solid waste is dumped on a daily basis, largely consisting of human faeces and industrial waste.

The scavengers are looking for useful items and children are playing in the waste. The place is infested with flies and cockroaches. The area is prone to various diseases including stomach and skin complaints.

The Peshawar Municipal Authorities have burned the waste to dispose of these dumps. The resulting smoke created more problems for the residents. Methane gas is generated by anaerobic decomposition within the waste. The decomposition of urban solid waste releases chemical compounds. These compounds seep into the ground and surface water. Groundwater pollution in the Warsak area is very serious as the water table is only a few feet deep.

It was not until a year ago that the residents met to persuade the Peshawar Municipal Corporation to dump the waste elsewhere. Even today, large piles of waste can be seen lying around in this area, waiting to be taken away by some local government agency....

adjoining areas and villages. Floods in Peshawar valley generally result from heavy precipitation in such catchments. Flash floods cause heavy damage to lands, crops, communication infrastructure and human lives.

There are three major right-bank tributaries of the Indus river in NWFP, viz.: the Kabul, Kurram and Gomal rivers. These join the Indus between Tarbela and Kalabagh. The overflow of the catchments and the right-bank tributaries will intensify flooding in the Indus basin.

## 6.7 Rainfed agriculture: deteriorating production

About 59 per cent of the cultivated area is rainfed in NWFP. Diagram 6.8 presents the average yields of Barani (rainfed) and irrigated crops. Diagram 6.9 gives the area under Barani and

irrigated crops. The analysis of these diagrams shows that:

- the area under rainfed agriculture is very large compared to the area under irrigation
- agricultural yields of rainfed areas in NWFP are low
- by applying irrigation and fertilizers, the yield can be increased by at least 25 per cent for the drought-resistant crops and 80 per cent for the drought-sensitive crops<sup>12</sup>.

Diagram 6.10 compares agricultural statistics of Kharif and Rabi crops of 1980-81 with those of 1989-90. The area under cultivation has increased, but the yields over the nine years remain nearly the same or are reduced.

The major reasons for low agricultural production in the rainfed areas may be summarized as follows:

- Poor soil conditions due to centuries of unabated cultivation and erosion;

non-fulfilment of the nutritional requirement of the plants

- Moisture stress, particularly at the critical stage of crop growth
- Frequent seasons without crops due to inadequate rainfall<sup>13</sup>
- Non-adoption of modern knowledge and techniques; inadequate agricultural inputs such as improved seeds, chemical fertilizers and pesticides; limited extension services
- Small land holdings and scarcity of labour and capital (and credit)
- Large off-farm losses due to under-developed infrastructure, transportation constraints and inadequate storage facilities.

Taking into account the large area under rainfed agriculture, it is very worthwhile to study these under-exploited resources to increase the agricultural production in NWFP. The Government

Diagram 6.8

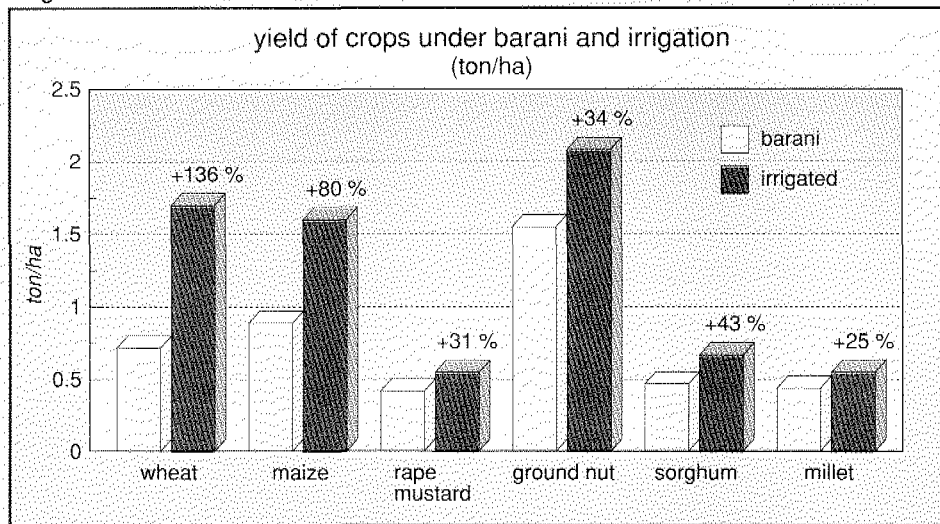


Diagram 6.10

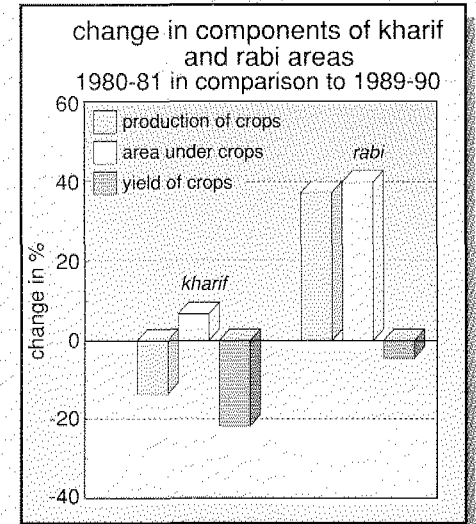
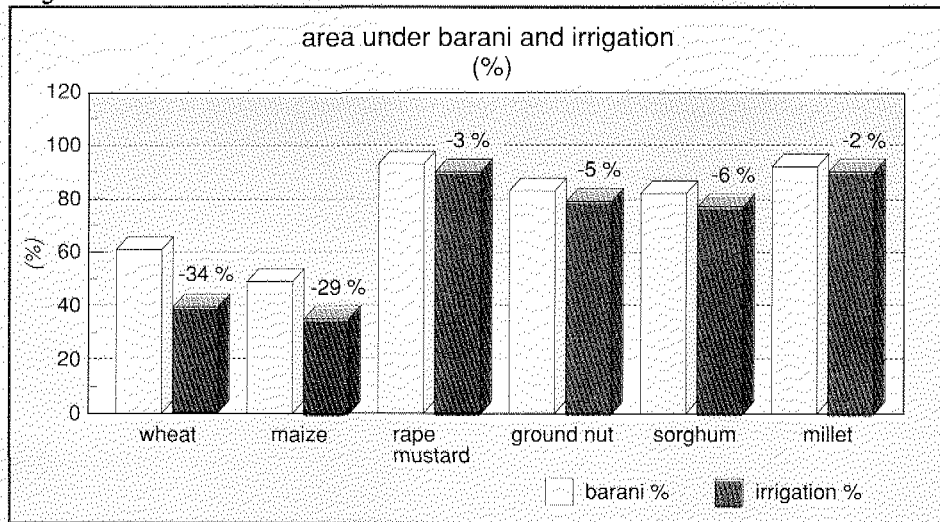
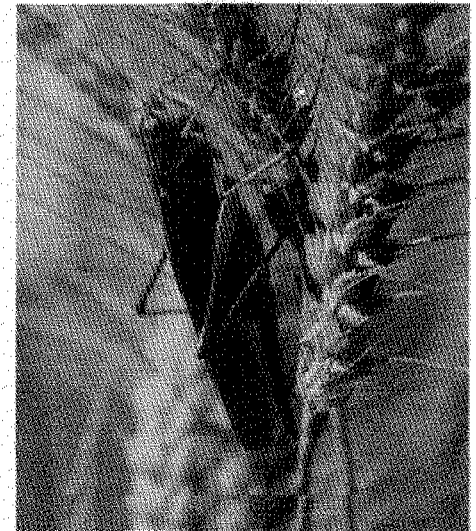


Diagram 6.9



Crop losses



### Thirty-six fatal hours....<sup>14</sup>

September 8 and 9, 1992 will not be forgotten easily by the people of Hazara Division. In these two days the sky unburdened itself of 390 mm of relentless rain for 36 hours. During this period, Hazara Division, normally a moderate precipitation zone, received about half the average annual supply of rain. What followed was of catastrophic proportions. Rivers rose rapidly in mountainous regions (by more than six metres in some narrow gorges). Large chunks of mountainsides denuded of protective cover 'slipped' into rivers. Bridges - solid structures of concrete and steel - struck by a battery of boulders, cut timber (logs) and swept away by uprooted trees almost without a trace. While landslides caused massive infrastructure damage (destroying buildings and roads), riverine towns and villages such as Garhi Habibullah, Kohala, Mahandri and Jabori sustained maximum damage from the raging flood waters. Hazara Division was the worst hit. According to Rauf Khattak, the Commissioner of Abbotabad, "263 people were killed" as a result of the rains: 5337 houses, 825 shops and standing crops on 11 485 acres were damaged. The loss to forest property, irrigation channels and communications amounted to Rs. 900 million. Rs. 9 680 000 were reportedly disbursed as compensation among the population. Many affected people complained they did not receive the compensation.

Further downstream from the watersheds, the rains and swollen rivers had other effects. Two massive flood peaks in the watershed feeding the Jhelum river hit the Mangla dam. Unprepared and panic-stricken, the engineers at the dam site released 900 000 cusecs of water on an unsuspecting populace, when the dam reservoir rose beyond its limits. Jhelum and its surrounding towns and villages were submerged in 2.5-3 m of water, while a settlement of 400 people on an island in the middle of the River Jhelum a few miles from the dam disappeared under the 20 foot high tidal surge of water.

In the middle of October, a group of six journalists, a soil scientist and representatives of two environmental and development NGOs met to find answers to the questions: What, "were the root causes of the floods"? Were environmental factors responsible for the damage or were other factors than the environment the cause?

The answer pointed clearly in the environmental direction as the group discovered after four days of extensive travel in Hazara. It was also clear that there were socio-economic, political, administrative and natural forces that helped to accelerate the environmental problems of the upland watershed regions.

There were four primary causes of floods. First, the natural causes. The rain, without doubt, played a major role in the devastation that led to the eventual flooding. Late monsoon rains in September are not a rare occurrence for the sub-continent. However, the intensity of the storm and the amount of precipitation recorded this time were unusual. Soil quality is also a factor that contributes to erosion, particularly in hilly terrain where physical conditions do not allow for vegetative growth. Heavy rains on a mixture of rock and loess soils resulted in landslides.

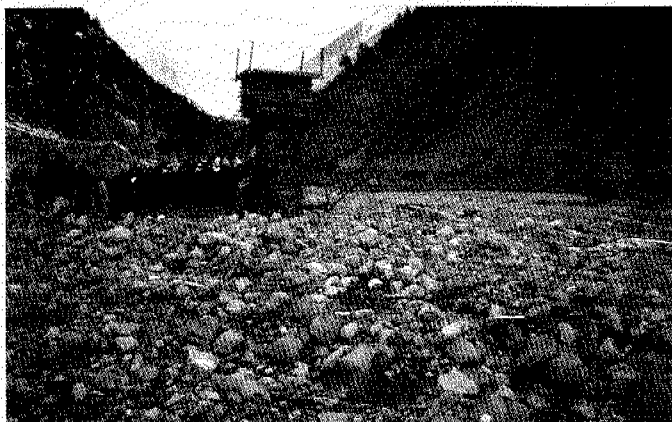
Deforestation, overgrazing and over-population were the three main reasons.

Deforestation: 85 per cent of forests in Hazara Division are privately owned, while fifteen per cent are under state control. Extensive illegal logging, little attempt at large-scale reforestation, outdated forestry laws and their ineffective implementation all exacerbated rather than slowed down the rate of deforestation.

Over-population: in the temperate zone where most of Pakistan's forests are located, the growth in population has put tremendous pressure on the forest resources. In the absence of provision of income to alternate energy source, as well as alternate source of income for those dependent on forests and forest lands for their subsistence needs, growing numbers of people in the years to come, will continue to use forests and forest lands for their food, fuelwood and fodder requirements.

Over-grazing: one of the most obvious problems witnessed by the group was not so much the sight of wood being chopped but of livestock grazing on the mountainsides of Gujars (nomadic herdsmen) and their cattle convoys making their way across roads where landslides have occurred, and of locals cutting fodder grass and fuelwood on hillsides. It was instructive to find practical examples of hillsides denuded not only of trees but of shrubs and grasses - vegetative cover essential for protecting the soil against water and wind erosion.

The floods did much to raise the public awareness of the problem of degradation of the Himalayan forests in the NWFP and resulted in policy changes. However, a ban on logging in Kohistan has thrown the Kohistanis into the hands of the big logging contractors. In March 1993, the result was a violent two-week blockade of the Karakorum Highway, and a retraction of the ban<sup>15</sup>.



*The only remnant of a village after the thirty-six fatal hours*



*Where is the village?*

### Sedimentation of the Tarbela reservoir

Siltation in the Tarbela reservoir has reduced its holding and power-generation capacity along with its working life.

At its construction in 1974, Tarbela had a storage capacity of 1.43 million hectare metres (MHM). By 1984, this was reduced to 1.24 MHM due to sedimentation caused by water erosion from the denuded hills in the catchment areas. If sedimentation continues at this rate, the reservoir will be completely filled within 73 years, and rendered inoperable even before this time. The result is an economic life of 50 to 60 years instead of the estimated economic working life of 170 years.

of Pakistan has set up various agencies and projects to investigate some of these issues and to evolve appropriate technologies. One such project is the Barani Agricultural Development Project and is run by the Agriculture Department.

<sup>1</sup> *Groundwater development potential (canal-command area), Water Resources Planning Division, WAPDA 1988*

<sup>2</sup> *MSS Multi-sector scanner; resolution 80 m*

<sup>3</sup> *TM Thematic mapper; resolution 30 m*

<sup>4</sup> *Tree canopy is more than 60 per cent closed. Canopy closure is an indication of the stock of forest trees in a forest.*

<sup>5</sup> *Sources: Forestry Sector Master Plan North-West Frontier Province. Reid, Collins and Associates, Canada and Silviconsult Ltd., Sweden.*

<sup>6</sup> *An animal unit (AU) is method for transforming the number of various types of livestock to a common standard so that they can be added together. For this purpose, a cow, a horse, and a donkey are considered to be one animal unit each; a buffalo and a bullock, 1.5 and 1.3 AU respectively; and a goat and a sheep, 0.3 and 0.2 AU respectively.*

<sup>7</sup> *1986 livestock census data projected to 1993, using the 1980-86 inter-census growth rates of various kinds of livestock; and their number converted to animal units.*

<sup>8</sup> *Source: Soil Survey of Pakistan (various reports)*

<sup>9</sup> *Malakand Range-Management Programme. Technical report N° 5, 1993.*

<sup>10</sup> *Source: The rainfall data for Dera Ismail Khan were obtained from the Meteorological Department, Islamabad. Drought analysis is confined to the yearly records for 1951-1992. Seasonal rainfall has been deduced from monthly rainfall records for these areas from which generalizations for the entire Province have been drawn.*

<sup>11</sup> *Solid Waste Disposal practices in NWFP, Environmental Protection Agency, NWFP, p.24.*

<sup>12</sup> *Source: Agriculture statistics of NWFP and agricultural statistics of Pakistan, 1989-90*

<sup>13</sup> *Source: Problems and Prospects of Rainfed Agriculture in NWFP (An Overview) Evaluation of Phase II and Future Requirements. Pakistan Academy for Rural Development, Peshawar, December, 1988.*

<sup>14</sup> *Reference Sanneya Hussain, NCS Bulletin, Vol. 4, Issue 12, September 1992, pp 3-5.*

<sup>15</sup> *Reference Himalayan Jungle Project. Year 2 Report. 1993.*

## 7. RURAL POLLUTION

### 7.1 Overview

The National Sector Policy Conference held in Islamabad in April 1988 acknowledged that rural pollution is an area of concern for the government of NWFP. With an agriculture-based economy, supplemented by the industrial sector, pollution in the rural areas of the Province mainly relates to ground and surface-water contamination caused by

fertilizers, pesticides, and industrial discharges into the main water bodies. But today, the use of fertilizers and pesticides in NWFP is minimal due to their high cost and frequent unavailability. The use of fertilizers and pesticides may be high in the intensive irrigated agriculture, but data on their contribution to rural pollution are lacking.

There is no system of human and animal waste disposal at the village level. In the southern region, Kohat, Karak, Bannu and D.I. Khan, population density is low and clustered, demand for municipal waste disposal is low. In the central parts of the Province such as Peshawar and Mardan Districts, population densities are high and consequently municipal waste disposal is a significant problem. Rural areas are also the dumpsites for municipal wastes from the cities. The contaminants leach from open refuse dumping through the soil into the water. The problem is exacerbated in rainy seasons as primarily due to inadequate drainage in an almost flat landscape. The sanitation facilities in rural areas are inadequate (only two per cent of the rural population had access to sanitation facilities in 1989). The use of the contaminated water leads to ill health.

### 7.2 Groundwater pollution

There is a large variation in regional groundwater quality distribution in Pakistan. However, on the basis of province-wise groundwater quality distribution<sup>1</sup>, the quality of groundwater in NWFP is the best in the country with 82 per cent fresh, twelve per cent marginal, and six per cent poor<sup>2</sup>.

The introduction of a vast canal system for irrigation has affected the chemical quality of the shallow groundwater. The seepage of good-quality surface water through the major canals and channels will improve the chemical quality of the

shallow groundwater. However, due to the continuing disposal of untreated industrial and municipal sewage effluent, the groundwater aquifer will be contaminated locally. Where water-table depth approaches land surface, under conditions of excessive recharge, evaporation from the capillary fringes has led to concentration of salts in the uppermost layers of the system.

In their hydrochemical survey of groundwater in the Peshawar valley, Bundschuh and Balke (1991) showed that almost all samples had a very good water quality (see Table 7.1).

There were three human-polluted wells with high nitrate concentrations. Some of the highly mineralized groundwater samples from the central part of the Peshawar valley had high contents of calcium (up to 260 ppm), magnesium (up to 240 ppm), sodium (up to 850 ppm) and chloride (up to 1240 ppm).

### 7.3 Surface-water pollution

Surface-water resources in NWFP are highly vulnerable to pollution. The main population centres are located along the rivers and dump their sewage into them. Since the Kabul river is no longer fit for drinking, its major tasks today are as a carrier of domestic and industrial waste, and to provide water for irrigation. Fish still survive in the river but the future of the river's fisheries is bleak if surface-water pollution continues unabated. Details from a study on water quality of Kabul river are presented as a case study on the next page.

Sporadic information is available on the quality of effluents from industry in Peshawar and Nowshera. High levels of Biological Oxygen Demand (BOD), pH, and heavy metals are present in these effluents. The polluted waters gather in nearby ponds and threaten the groundwater resources.

Table 7.1: Quality of the groundwater in the Peshawar valley

minerals	% of samples	concentration in samples (ppm)	acceptable limits (ppm)
Nitrates	80	< 20	45
Calcium, together with magnesium	85	30-100	60
Magnesium, together with calcium	94	15-50	60
Sodium	most	50-100	120
Potassium	most	1-6	25
Chloride	most	< 50	250



## Water quality of the Kabul river

The major source of pollution in the Kabul river and its tributaries is untreated sewage from cities, towns and villages of Afghanistan and the NWFP. The entire stretch of the Kabul river is heavily infested with faecal coliform - an indication of sewage pollution. In addition, about 40 industrial units discharge their untreated effluent into the Kabul river or its tributaries. A recent survey report (February 1993) on water quality, use and discharge into the Kabul river has revealed the following conditions:

The Biological Oxygen Demand (BOD) indicates pollution and relates to the amount of oxidizable organic matter present in water. Excessively high BOD values (above 3.0 mg/l) were observed at several sites.

The Chemical Oxygen Demand (COD) indicates the intensity of pollution due to sewage and industrial effluent. COD values were excessively high at many locations throughout the Kabul river from Warsak to Khairabad. Pakistan has recently announced a limit for municipal and industrial effluent streams of 150 mg/l and follows WHO standards for COD limit of 10 mg/l on drinking-water. The COD values measured at more than 20 locations along the Kabul river range from 13 to 744 mg/l, on which basis the water is unsafe for drinking and is also a threat to aquatic life.

Nitrates and nitrites are known toxins to human and aquatic life. Nitrate levels along the entire course of Kabul river in the NWFP were safe for human consumption. The nitrite levels were unsafe for aquatic life at several sites.

The presence of ammonia-nitrogen (NH<sub>3</sub>-N) in river water indicates fertilizer residues, municipal and/or industrial sewage. NH<sub>3</sub>-N was excessively high after mixing effluent from Akbar Tannery and the Khazana Sugar Mills.

Sulphates and sulphides present in industrial and municipal effluent are also toxic to human and aquatic life, and the resulting acid can corrode concrete sewage lines. Ingestion of water containing more than 500 mg/l of sulphates can cause diarrhoea and dehydration. Sulphates were below limits although sulphides were excessive at several entry points into the Kabul river.

The phosphate is within the 5 mg/l (EC) limit for drinking-water purposes. The measured phosphate levels were in the 0 to 0.65 range. But phosphate levels along Kabul river exceed the critical limit of 0.1 necessary to protect water bodies from eutrophication.

Faecal coliform bacteria concentrations in the Kabul river were well above the limit of 3 faecal coliform/100 ml (WHO) which renders the water totally unsafe for drinking. The faecal coliform ranged from 1600/100 ml to 1800/100 ml at 20 out of 33 locations. The others were also around 250 coliforms/100 ml.

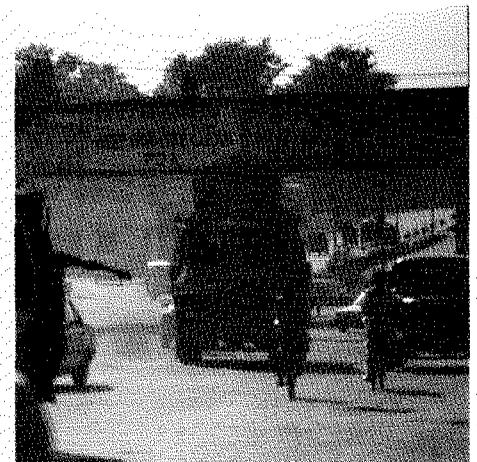
Table 7.2 Impacts of mining activities

activities	impacts
<b>I. Surface Mining</b>	
1. Limestone quarrying	Deforestation, deterioration of slopes; disruption of drainage
Limestone blasting	Noise; wildlife disturbance
2. Gravel/coarse sand quarrying for construction	Deterioration of stream recharge
3. Clay pits for brick kilns	Visual degradation of landscape
4. Stone quarrying for crush	Deterioration of watershed; flash floods and silting of downstream reservoirs
5. Silica-sand extraction for glass	Deforestation, removal of top soil; permanent loss to agriculture
<b>II. Ancillary Activities</b>	
1. Coal	
1.1 Destructive use of pitprops (1 million kikar trees / annum consumed in collieries)	Excessive demand on Sindh hurrie/bela plantations
1.2 Pumping acidic water from collieries; high in turbidity	Water unpotable for considerable distance downstream Noxious gases; health hazard; depressant effect on agriculture yields; toxic to animals, specially birds
1.3 Large volumes of compustable wastes: self-igniting	Loss of infrastructure; property values
1.4 Ground subsidence	Major aquifer/freshwater pollution; irreversible soil damage
<b>III. Ancillary Activities</b>	
1. Solid wastes; marl, rock salt wastes, mineral line dusts; pyritic shales and radioactive mineral tailings	Pollution of freshwater sources and degradation of topsoil
2. Crushing, grinding and processing of fine grained minerals; preperation of feed for dry process cement plants	Dust pollution
3. Transport of run-of-mine material (up to 40% wastes) in open trucks	Unnecessary haulage; risk of accidents; dust pollution on transport routs

*The application of pesticides is low, but harmful pesticides such as DDT are still used in NWFP*



*Smoke exceeds 10 times the limit value*



## 7.4 Fertilizer and pesticide pollution

Excessive use of pesticides, herbicides and fertilizers to increase the crop yields can be a significant source of surface and groundwater pollution. The use of agrochemicals in NWFP is much below the application levels practised in developed countries. However, a major concern is the uncontrolled application of these chemicals. Very often, expired chemicals are used to spray crops and fumigate green imports. It is difficult to make quantitative statements on pollution due to agrochemicals as no reliable analytical information is available for NWFP.

The pesticides locally formulated are Furadan, Sevin, DDT-SP, BHC, Sevidol, Thiodan, Diazinon, Malathion, Zolondt, Methyl-parathion. The general trend is to shift from cheaper organochlorides to costly organophosphates, carbamates and pyrethroids.

Studies on the pesticide and fertilizer residues in the soil and groundwater have always lagged behind due to financial constraints and lack of proper laboratory facilities. DDT is not of concern for groundwater contamination due to its relative insolubility in water, however, it can persist in soil and enter the food chain.

An FAO-funded study on food contamination and control was carried out in 1981-84 at the National Institute of Health, Islamabad. One of the major research areas was pesticide residues in food samples. The results of this study (NIH, 1984) reveal that of 25 different varieties of pesticides for which this study was conducted, 23 were present with varying intensity. The weakness of this study was that although the samples were collected from various local markets throughout the country, they were pooled together. The result was that it was impossible to specify where the contamination originated.

Herbicides are very expensive in NWFP and few farmers have ever applied them. The use of herbicides has gained momentum over recent years in NWFP due to the adoption of the zero-tillage technology in the wheat-cropping system. The herbicides are fairly water-soluble and their extensive and long-term use can pose problems where the water table is high.

The result of inappropriate or excessive application of fertilizers is residues in the soils. Most residues are retained in the soils, reducing the impact on groundwater.

## 7.5 Mining and its environmental impact

Most mining in NWFP is on a small-scale. As in other developing countries, it is inefficient, exploitive of human labour, and wasteful of natural resources. Most registered units employ fewer than 10 persons, while the number of unregistered small units is unknown. The rudimentary blasting techniques used in quarrying result in rubble that is susceptible to being washed away in subsequent flash-floods<sup>3</sup>. At present, chromite, china clay, clay shale, coal, dolomite, emerald, feldspar, gypsum, limestone, marble, ochre, rock phosphate, rock salt, salica sand, slate stone and soap stone are being mined in the Province<sup>4</sup>. Surface mining for most minerals involves human labour with pick and shovel. Mechanized transport and ventilation have been introduced in underground coal and salt mines.

Environmental impacts of mining activities in the province are summarized in Table 7.2.

<sup>1</sup> Government of Pakistan, Ministry of Planning and Development, Islamabad, by NESPAK and Specialists Group Ltd., April 1991.

<sup>2</sup> WAPDA groundwater quality standards for irrigation are: 1000 ppm total salts, usable for all types of soils and plants; 1000-3000 ppm total salts, marginal; above 3000 ppm, poor and unfit for irrigation. However, groundwater with salinity can be used for irrigation under controlled conditions (IACA).

<sup>3</sup> Source: Hydrogeology and Groundwater Resources of the North West Frontier Province, Pakistan by Wapda hydrogeology Directorate, Peshawar, Pakistan & Institute of Applied Geoscience, Delft, Netherlands. 1988  
National Conservation Strategy by the IUCN & the Ministry of Housing and Environment, Government of Pakistan.

Quarterly News Letter, No. DGM-1 (3)/91, Ministry of Petroleum and Natural Resources, Government of Pakistan January to March, 1993

<sup>4</sup> Source: Quarterly Newsletter No. DGM-1 (3)/91, Mineral Wing, Ministry of Petroleum and Natural Resources, Government of Pakistan

## 8. URBAN AND INDUSTRIAL POLLUTION

### 8.1 Air pollution

Urban air pollution in NWFP is attributable to many sources, the most prominent being vehicular pollution, dust particles, emissions from the large number

of small-scale brick kilns and stone crushers. Most trucks, buses and passenger cars have diesel-fuelled engines. Maintenance of the engines is poor. Diesel fuel is often mixed with kerosene causing incomplete burning and two-stroke engine fuel of the rickshaws is often mixed with poor-quality lubricating oil in unknown ratios. This causes emission of large amounts of black smoke and unburnt volatile hydrocarbons. Recent studies show a very high concentration of tetra-alkyl lead in Pakistani gasoline. A large amount of suspended dust is generated due to vehicles driving on unpaved road shoulders, poorly maintained and overcrowded roads. Tongas mostly cause traffic congestion resulting in a high concentration of vehicle smoke and noise in the area. The rickshaw, a traditional means of public transport, emits noise and smoke increasing pollution in the large cities. Improper disposal of cattle and horse excreta, etc. from the roadsides increases suspended particles in the air and thus pollution. The numerous outdoor food stalls and restaurants in city centres and bazaars also cause local air pollution due to frying meat in oil and roasting on charcoal fires.

For the purpose of this profile DHV Consultants conducted air-pollution measurements in May 1993 in three different cities in NWFP; Peshawar, Kohat and Mingora. These measurements were performed during a short period of about 48 hours at each measuring station with specific continuous measuring equipment. Dust samples were analysed for polycyclic aromatic hydrocarbons (PAH) for two cities. A review of the equipment used for this measurement is given in Appendix 12.

Table 8.1 gives the results of the air-quality measurements and an approximate image of the meteorological conditions. Comparing the results of the measurements with generally accepted air-quality standards, it can be concluded that the concentration of NO<sub>2</sub>, dust and benzo(a)pyrene seriously exceeds the limit values. The measured concentrations of dust, smoke and benzo(a)pyrene reach approximately ten times the limit value. These are alarmingly high concentrations. This is very serious, especially because benzo(a)pyrene is carcinogenic.

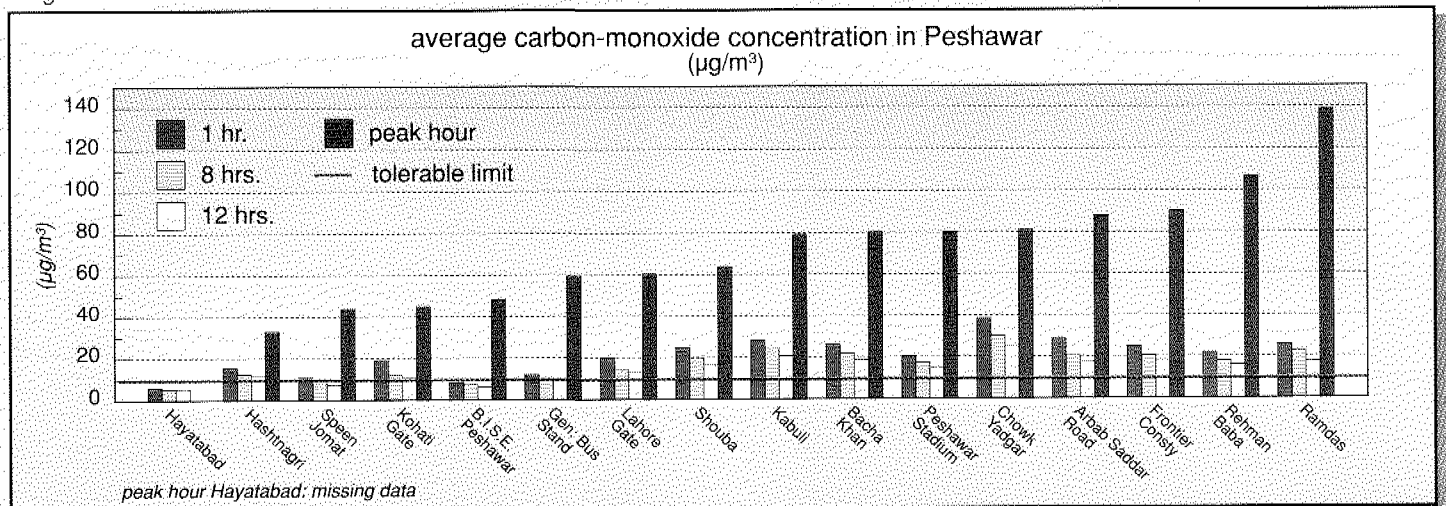
location	meteo information	pollutant	average value ( $\mu\text{g}/\text{m}^3$ )	maximum value ( $\mu\text{g}/\text{m}^3$ )	minimum value ( $\mu\text{g}/\text{m}^3$ )
Peshawar	sun/overcast wind NW, 4-6 m/s temp. 23-26 °C	SO <sub>2</sub>	1	72	0
		CO	834	9280	0
		O <sub>3</sub>	30	103	12
		NO	19	235	0
		NO <sub>2</sub>	53	363	0
		NO <sub>x</sub>	80	401	17
		dust	1290	1890	789
Kohat	sunny wind calm temp. 30-35 °C	SO <sub>2</sub>	3	48	0
		CO	975	7192	0
		O <sub>3</sub>	31	110	13
		NO	10	153	1
		NO <sub>2</sub>	156	659	29
		NO <sub>x</sub>	167	684	31
		dust	1640	2670	1150
Mingora Swat	sunny wind calm temp. 26-30 °C	SO <sub>2</sub>	5	226	0
		CO	3340	5800	0
		O <sub>3</sub>	15	100	3
		NO	10	199	0
		NO <sub>2</sub>	38	392	4
		NO <sub>x</sub>	66	401	15
		dust	1630	2720	1020

Table 8.1<sup>1</sup> Concentrations of polluting components in ambient air ( $\mu\text{g}/\text{m}^3$ )

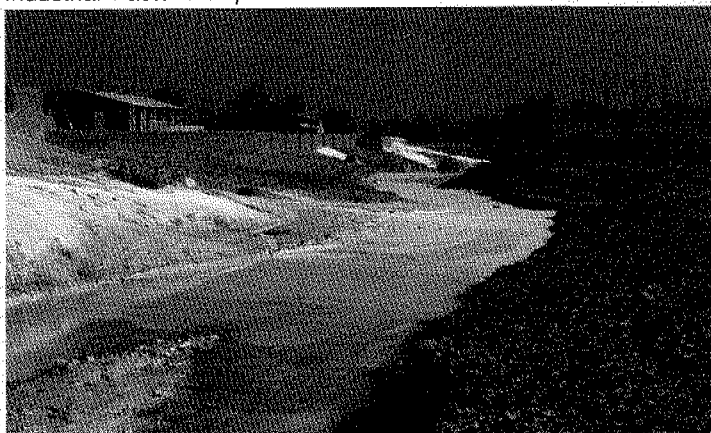
Diagram 8.1<sup>1</sup>

Although the ambient air measurements were conducted during a very short period, the results give a fairly general image of the ambient air quality for urban areas in NWFP. During daytime, the average NO<sub>2</sub> concentrations exceed the maximum permissible concentration in ambient air by approximately a factor of three. Short-time concentrations of approximately ten times the limit value were measured. In sunlight, these high NO<sub>x</sub> concentrations combined with unburned hydrocarbons generate oxidants and ozone. This phenomenon is easily observed by the dense photochemical fog that is generated during calm weather. Concentrations of O<sub>3</sub> and CO were also high, but did not reach dangerous levels. Concentrations of SO<sub>2</sub> were low. An exception may be made for areas adjacent to brick kilns in rural areas using wood, coal and even rubber tires for firing.

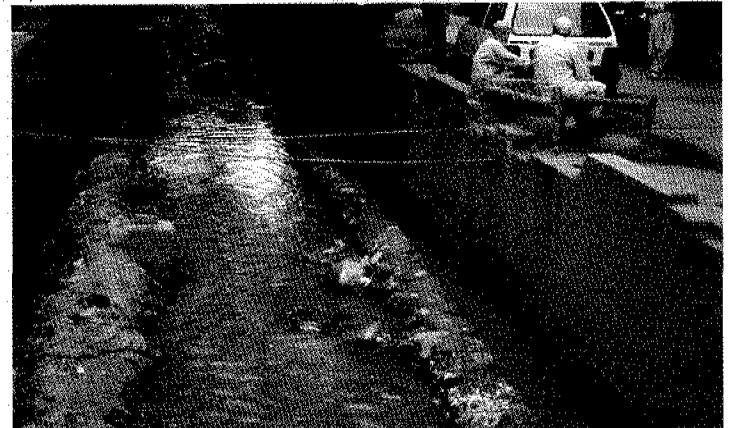
With the encouragement and financial support of the Pakistan Environmental Protection Foundation Peshawar, PCSIR monitored carbon-monoxide concentration in the air for a twelve-hour



Industrial waste is disposed in the rivers



Open sewer in Peshawar



period at sixteen points on the main roads of Peshawar. Whereas the tolerable limit of the gas is 9 ppm, its average ratio in the air for a twelve-hour period was between 11 and 17 ppm. At certain points, it rose to the level of 40 to 100 ppm at peak hours (see Diagram 8.1).

In the same study, PCSIR has proposed several practical solutions to reduce the vehicle air pollution through better traffic circulation. The solutions vary from proper bus stops to different lanes for slow and fast traffic. Up to now these are not implemented.

The total estimated number of vehicles on the road was 199,580 in 1992. However in Peshawar, the Motor Registration Authority estimated that there were only 120,560 vehicles on the road in 1992. Road space in and around Peshawar is severely limited and many roads operate above capacity. The number of registered vehicles in Peshawar District is currently rising by eleven per cent per annum. Severe

traffic congestion is experienced in the centre of Peshawar.

The horn is extremely important: the driver with the loudest horn has the right of way; drivers rather prefer to drive at night without lamps than without a horn. The large influx of Afghan transporters into Peshawar has greatly exacerbated the noise levels in Peshawar city.

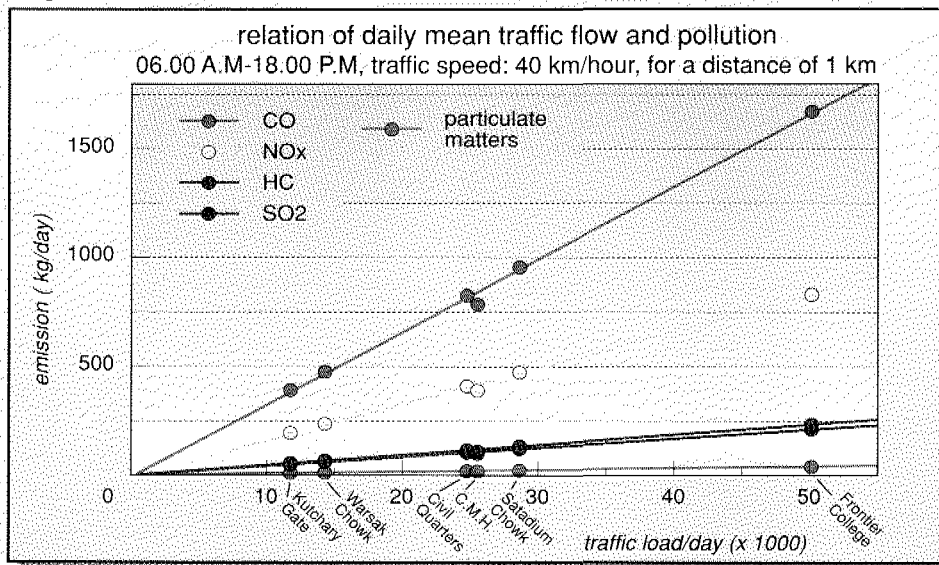
Road-traffic pollution loads are more frequently calculated on the basis of total gasoline and diesel-fuel consumption per year. Traffic loads at six selected junctions in Peshawar were estimated on the basis of a twelve-hour manually classified traffic census<sup>2</sup>. The emission loads were calculated and are shown in Diagram 8.2. These figures indicate that the pollution load is very high. Although important factors like temperature, wind direction, speed and rainfall intensity have not been taken into account, which may decrease the existing pollutant loads, current levels point to an immediate need for proper environmental protection. These esti-

mates were made by the Traffic Engineering Management Unit in 1988-89 and the traffic load has increased considerably since then.

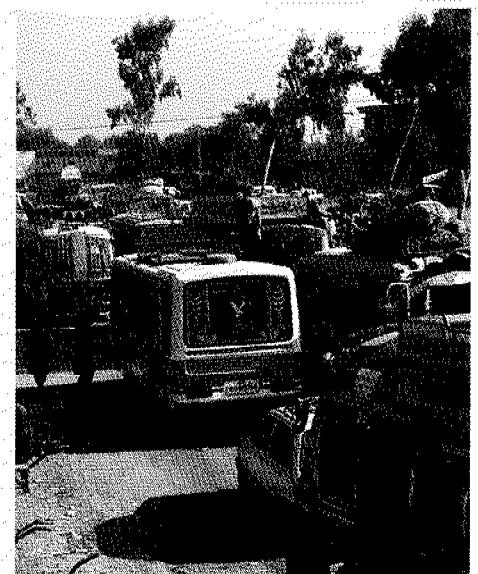
An air-quality campaign has been initiated in NWFP on a small scale. A committee headed by the Deputy Inspector General of police, Peshawar, is to check vehicular pollution, however no report exists as to the outcome of this work. To abate the air pollution caused by traffic emissions:

- (i) standards for vehicle-exhaust gases need to be formulated and the exhaust gases emitted by the cars must be checked regularly,
- (ii) the quality of engine fuel must be improved,
- (iii) general awareness must be stimulated about environmental pollution and the impact on health,
- (iv) ambient air must be monitored in urban areas, the most attention being given to monitoring dust or smoke,

Diagram 8.2<sup>3</sup>



An informal bus stop



Is anything useful?

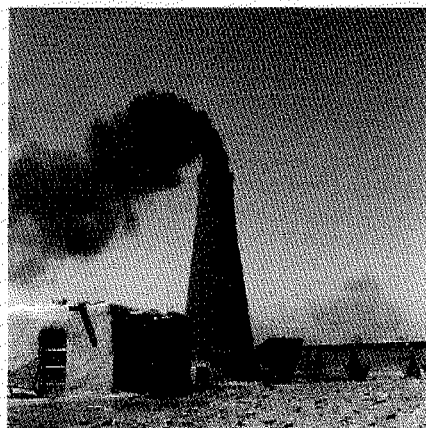


Oil spill pollutes groundwater





### Brick kilns in Peshawar



*Smoke contains high concentration of sulphur dioxide*

The approximately 350 brick-kiln factories situated in and around Peshawar have created a major environmental problem. There are eight brick kilns in Subhan Abad area within a radius of just three kilometres. These brick kilns cause serious respiratory problems among the local population. Some of the brick kilns have been there for more than fifteen years and their smoke has badly affected the crops in the locality.

On a monthly average, a brick-kiln factory producing 800 000 bricks uses large amounts of rubber to start the fire and burns a total of eight tons of firewood, 200 tons of low-quality coal, 20 drums of used mobile oil. One can imagine what amount of hazardous material the 350 brick-kiln factories situated around Peshawar would burn. The smoke emitted has high concentrations of sulphur dioxide. The combustion of rubber and used mobile oil emits hydrocarbons and carbon monoxide in large quantities. This regular emission into the atmosphere of hazardous waste has resulted in several diseases. There are reports of brick-kiln workers becoming unconscious after inhaling large quantities of smoke. The bonded labour system is still used in these brick kilns.

A GTZ-funded FECT project has introduced vertical shaft-kiln technology. This technology is considered to be more economical and environmentally friendlier.



*Even rubber tyres are fuel for the brick kilns*



*No stimulating working conditions*

### Second Bhopal?\*

In July 1976, Adamjee Chemical Works at Nowshera approached the PCSIR for assistance with an emergency that had developed at their plant. The emergency situation was created by a fatal explosion in which some workers died and grievously injured.

The Adamjee Chemical Works produces caustic soda and chlorine gas ( $\text{Cl}_2$ ) by electrolysis of brine solution obtained from rock salt. The chlorine gas was liquified and stored in a tank. At first it seemed the procedures were well applied; the valves of the chlorine tank were checked regularly for any leakage and chlorine cylinders were filled from this tank.

During the discussions however, the Mill management reluctantly gave information on minor, harmless explosions during last few months. Obviously these early alarms were ignored. When the chlorine supply line valve was closed by the plumber, the fatal explosion occurred and the pipeline shattered into pieces.

Investigation revealed that the factory had switched from Freon Compressor to Ammonia Compressor. Although the plant had well-qualified technical and chemical engineering staff, they failed to realize that in the new process **NITROGEN TRICHLORIDE** ( $\text{NCl}_3$ ) was produced instead of **AMMONIUM CHLORIDE**. Nitrogen trichloride is an exceedingly treacherous explosive material. This explained the explosion. When the valve was closed, the  $\text{Cl}_2$  pressure goes down, explosions and the  $\text{NCl}_3$  will decompose and exploded.

In the mean time, the pressure of  $\text{Cl}_2$  storage tank was exceeding the designed pressure due to excessive heat. The Management decided to release the pressure by discharging the  $\text{Cl}_2$  into a pond filled with lime slurry. But the excessive discharge of  $\text{Cl}_2$  resulted in ice formation, the valve choked and blocked the passage. Within a few minutes, the 30 ft of pipeline exploded and shattered into pieces.

After this explosion, the public panicked and started to evacuate their houses. Due to the public hue and cry, Government concern grew and the factory was visited by the Governor of the Province. The Governor ordered the management to implement a plan developed by PCSIR. The plan was to connect the 15 ton liquid chlorine storage tank with an air compressor, which would provide necessary pressure to open the choked valve and provide an envelope of air to the  $\text{NCl}_3$ . The envelope of air will not allow the  $\text{NCl}_3$  to become active.

It was estimated that 15 tons of chlorine could have endangered the life of human population within a 15 km radius. The factory is situated in Nowshera, a town with 600,000 inhabitants in 1976. If the explosion were to take place, the number of lives lost would have exceeded the Union Carbide accident in Bhopal, India.

But the story is not yet complete. The tank contained 1-2 tons of oleum, which was kept to dehydrate the Chlorine gas. The Management wanted to inspect the tank after the accident and decided to flush it with water. This decision was prevented; mixing water with oleum generates a tremendous amount of heat which can trigger an explosion of small quantities of  $\text{NCl}_3$  within the tank.

NO<sub>x</sub> and CO. PAH concentrations in dust samples should be analysed,

(v) small regional environmental laboratory must be established for analytical purposes.

## 8.2 Industrial pollution

It is estimated<sup>5</sup> that in 1989 NWFP had 1205 industrial units in NWFP, 305 chip and stone crushers and 427 brick kilns. The industrial units are scattered over a vast expanse of the Province with a greater concentration in and around the cities of Peshawar, Charsadda, Nowshera and Gadoon Amazai. Another major industrial area in the Province is Hattar between Taxila and Haripur in Hazara Division. Waste disposal by industry is totally unregulated and uncontrolled with the result that all kinds of toxic and hazardous wastes are being discharged indiscriminately into the water bodies (Kabul river) and soils. No zoning laws exist specific to industry. As such, fertilizer, cement, leather and other industries with hazardous wastes can be located at will. Data on emissions and discharges by different industries are not available.

## 8.3 Solid waste

The removal of solid waste from the main urban areas of NWFP is inadequate. It is estimated that only 40 per cent of the solid waste generated in Peshawar is collected and disposed of at one of the municipal dumps or directly onto agricultural fields. The remaining 60 per cent can be seen as heaps of garbage on roads, in drains or on open land<sup>6</sup>. Even where solid waste is collected, disposal is unsatisfactory and a health hazard.

Plastic bags decompose very slowly and form a serious source of pollution. Plastic bags in the sewage system often block the drainage. The seepage of waste water poses dangers for building foundations and the groundwater.

<sup>1</sup>Source: Pakistan Environmental Protection Foundation (PEPF) March 1993 News Letter

<sup>2</sup>Hazardous effects of traffic pollution in urban areas and their remedial/control measures. EPA, NWFP, April 1993.

<sup>3</sup>Source: Traffic Engineering and Management Unit (TEMU) Peshawar NWFP

<sup>4</sup>Reference: Khattak M.A., *Averting a major catastrophe by diffusion of incidentally formed explosive*

*material at Adamjee Chemical Works Nowshera. Engineering Horizons, August 1991*

<sup>5</sup>Survey report. Hazardous Industrial Units in NWFP. EPA, NWFP, 1989.

<sup>6</sup>PC-1. Peshawar roads and traffic management, Provincial Urban Development Board. Second Urban Development Project, PMU, NWFP.

# 9. ANALYSIS OF ENVIRONMENTAL AND SUSTAINABLE DEVELOPMENT ISSUES

## 9.1 Carrying capacity of the land

The Soil Survey of Pakistan (SSOP) has computed 1981 population support capacities for the following five major agro-ecological zones in NWFP (Section 2.7):

- Sulaiman Piedmont
- Wet Mountains
- Northern Dry Mountains
- Western Dry Mountains, and
- Northern Irrigated Plains.

As non-food crops are grown in arable lands, these capacities may be somewhat overestimated. But the trade in non-food crops would allow the resident population to purchase staple food needs. This will balance the overestimation.

The variation in soils and water availability results in wide differences in carrying capacities of land in NWFP. In the benchmark year of 1981 (Diagram 9.1), irrigated Malakand (in the northern irrigated plains) was estimated to be capable of supporting 850 persons per square kilometre, whereas Chitral (in the northern dry mountains), with little arable land, could support only ten persons per square kilometres. The arid hilly parts of Kohistan and Swat, with negligible arable land, have almost no capacity to sustain livelihoods through crop farming. But still people are living in that area and the population density is many times higher than the population supporting capacity.

The carrying capacities according to crop growth classes for Rabi and Kharif are presented in Map 9.1 to 9.6.

## 9.2 Incentives and disincentives for sustainable use

A rapidly increasing population is the greatest obstacle to sustainable land-use in NWFP. This can be seen by the attempts of land-hungry farmers to cultivate steep land. Once cleared of vegetation, the valuable topsoil erodes within a few years, leaving a barren tract prone to gullying, and resulting in erosion and boulder deposition on arable land downstream. There has also been rapid growth in the population of landless people and of members of households with forest rights exerting unsustainable demands on grasses, shrubs and trees.

Population pressure is paradoxically also one of the greatest catalysts to land improvement. As their landholdings have decreased in size, progressive farmers have turned to fruit trees, vegetable farming and aquaculture to maintain their incomes. Land under these high-value products is often the best maintained for erosion, water logging and salinity control, and for soil tillage.

An understanding of the positive and negative roles of population pressure leads to targeting the inheritance, tenure and common property management systems as the critical approximate determinants.

The traditional system of inheritance results in parcelling and fragmentation of land holdings, increasing the distances farmers have to travel to their fields. It is more costly to apply organic manure to fields at a distance from the homestead, and more difficult to maintain erosion-control structures.

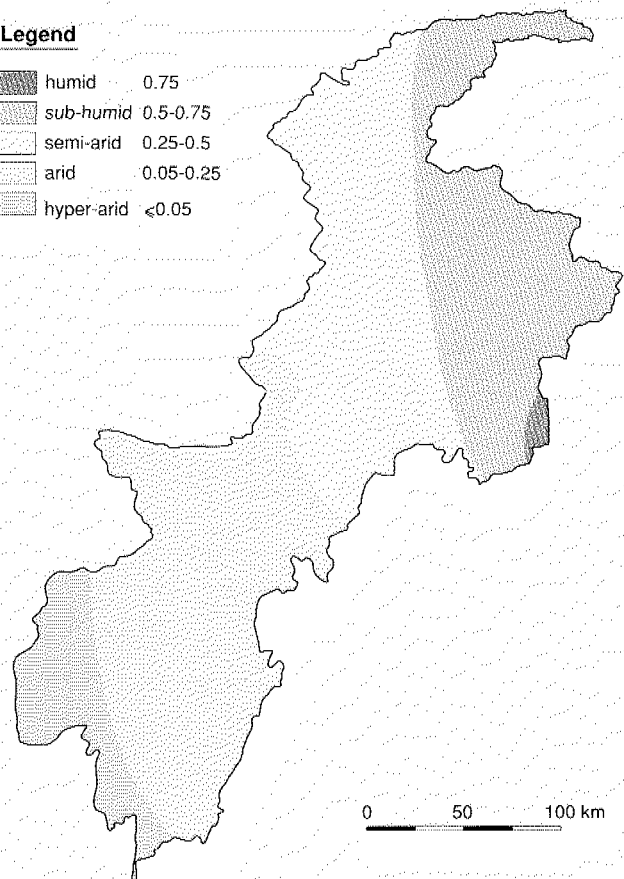
Although large land holdings in arable lands have become rarer, the absentee landlords of large pasture lands, mainly in Hazara but also in Malakand, have no incentives to improve them. Arriving once a year to collect the grazing fees based on animal heads, they have no interest in the state of the rangelands, and owing to lack of permanent grazing rights, neither has the transhumant (migratory) herdsman.

With social change and collapse of common property management regimes, Shamilaat forests and rangeland vegetation are also collapsing. The result is increased erosion and landslides, destroying valuable arable land and physical infrastructure lower down the slopes.

**Map 9.1 ARIDITY CLASSES FOR RABI**

**Legend**

- humid 0.75
- sub-humid 0.5-0.75
- semi-arid 0.25-0.5
- arid 0.05-0.25
- hyper-arid <0.05



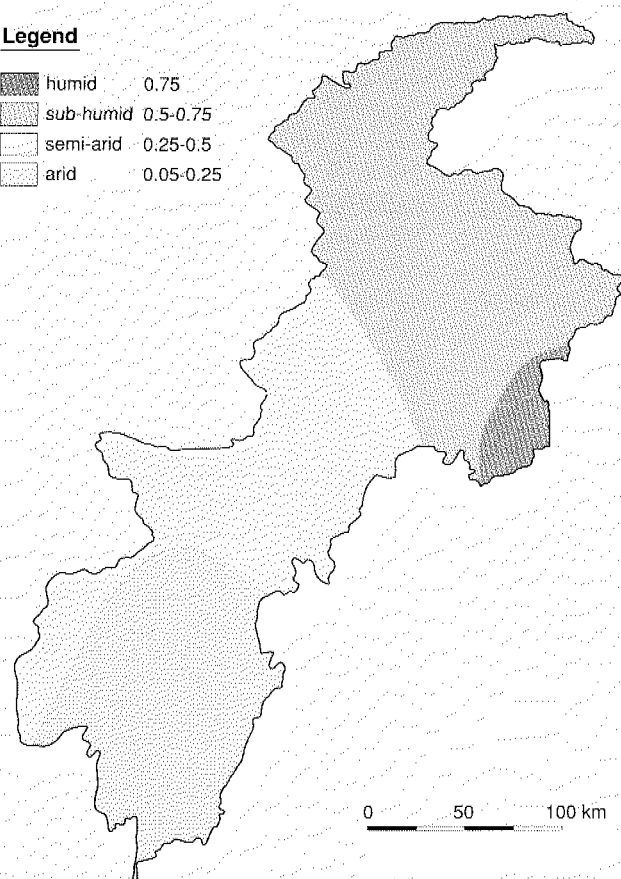
0 50 100 km

Source: PARC, WRI, NARC. 1993

**Map 9.2 ARIDITY CLASSES FOR KHARIF**

**Legend**

- humid 0.75
- sub-humid 0.5-0.75
- semi-arid 0.25-0.5
- arid 0.05-0.25



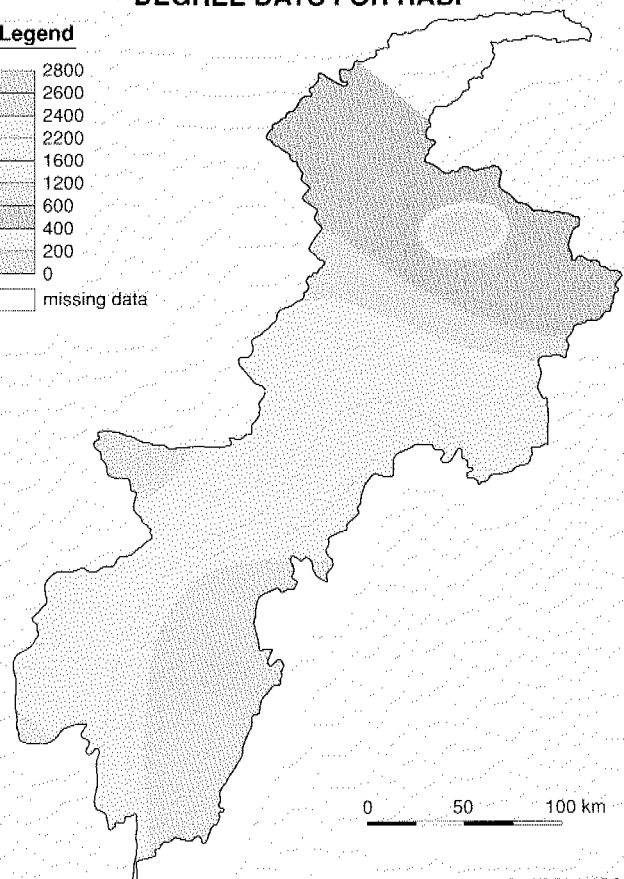
0 50 100 km

Source: PARC, WRI, NARC. 1993

**Map 9.3 MEAN SEASONAL GROWING DEGREE DAYS FOR RABI**

**Legend**

- 2800
- 2600
- 2400
- 2200
- 1600
- 1200
- 600
- 400
- 200
- 0
- missing data



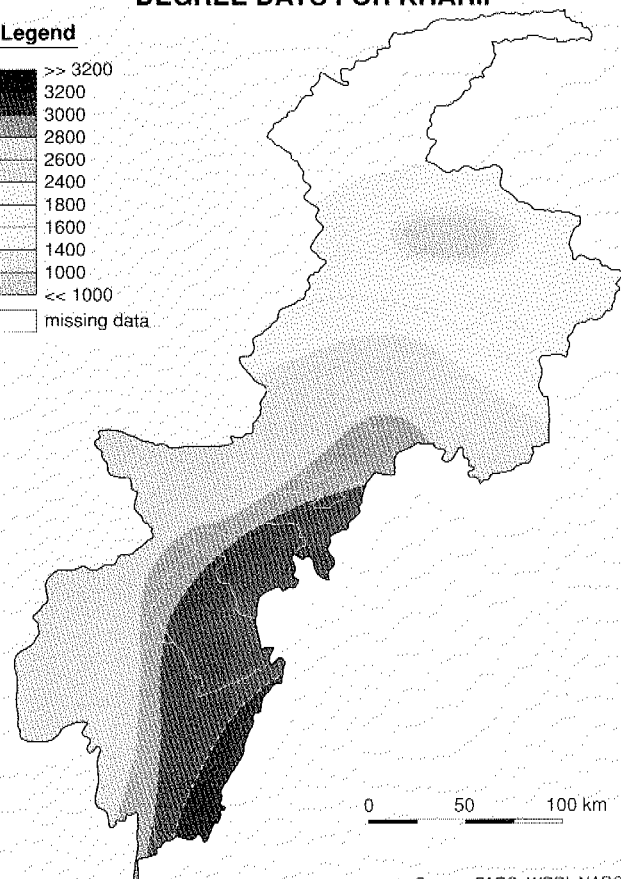
0 50 100 km

Source: PARC, WRI, NARC. 1993

**Map 9.4 MEAN SEASONAL GROWING DEGREE DAYS FOR KHARIF**

**Legend**

- >> 3200
- 3200
- 3000
- 2600
- 2400
- 1800
- 1600
- 1400
- 1000
- << 1000
- missing data







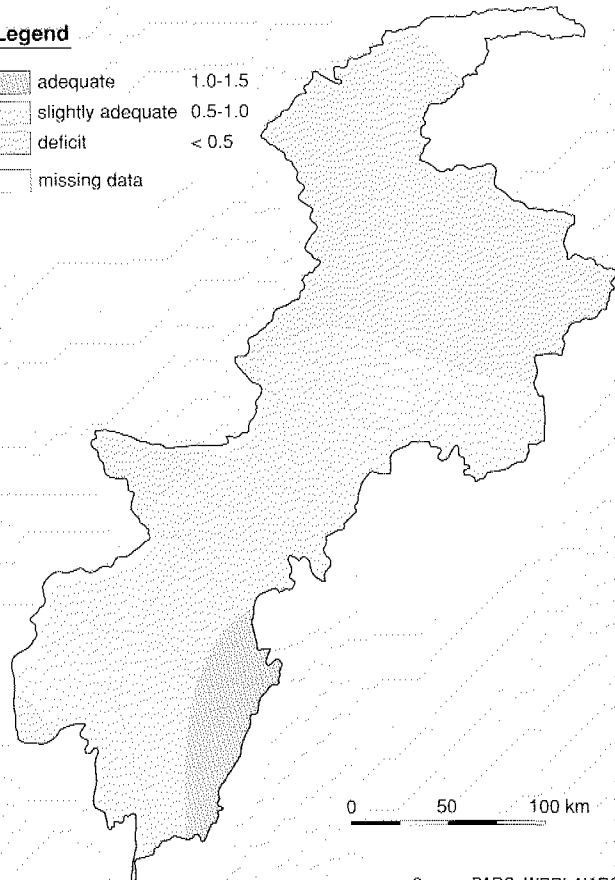
0 50 100 km

Source: PARC, WRI, NARC. 1993

**Map 9.5 CROP-GROWTH CLASSES FOR RABI**

**Legend**






-  adequate 1.0-1.5
-  slightly adequate 0.5-1.0
-  deficit < 0.5
-  missing data

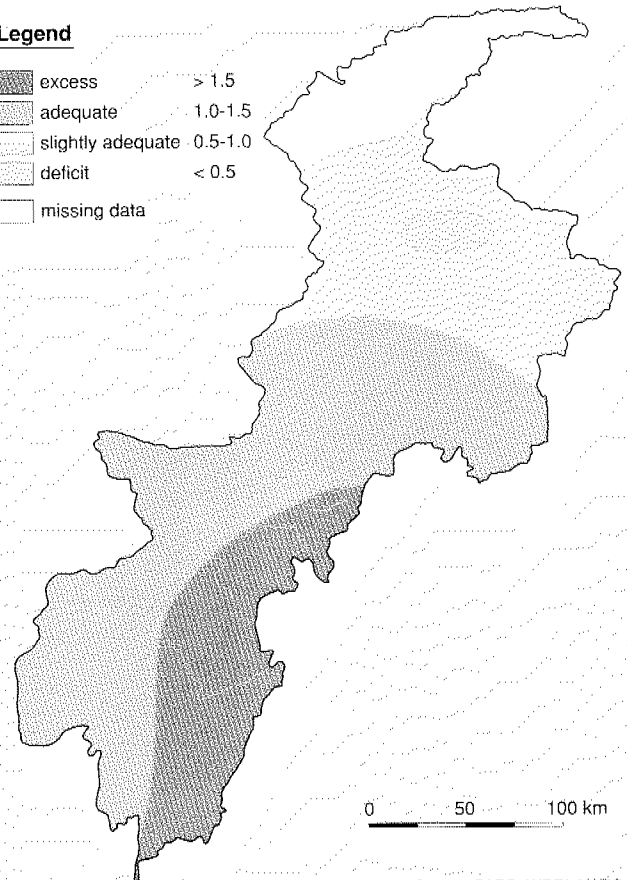


Source: PARC, WRI, NARC, 1993

**Map 9.6 CROP-GROWTH CLASSES FOR KHARIF**

**Legend**

-  excess > 1.5
-  adequate 1.0-1.5
-  slightly adequate 0.5-1.0
-  deficit < 0.5
-  missing data



Source: PARC, WRI, NARC, 1993

**AGRO-CLIMATIC ZONES**

A fifth agro-climatic zoning was developed by PARC (WRI, NARC) especially for this profile. The NWFP has two distinct agricultural seasons, namely Kharif (summer) and Rabi (winter). The fifth method classifies the NWFP into zones of crop suitability according to these two seasons. Maize and wheat were used as a representative crop for Kharif and Rabi seasons respectively.

To be crop-specific, the rainfall was converted into an aridity index (maps 9.1 and 9.2) and the temperature into a Crop-Growth Index ( $I_{cg}$ ). The aridity index is a ratio between 50 per cent probability of total seasonal rainfall and actual crop

evapotranspiration. The  $I_{cg}$  is based on the Growing Degree Days (GDD). The GDD shows the effect of temperature on crop-growth (maps 9.3 and 9.4). The Crop-Growth Index is the ratio between the GDD available and GDD required (maps 9.5 and 9.6).

The Seasonal Crop-Growth Index and Aridity Index were used to produce the agro-climatic zones. First the seasonal maps were superimposed to obtain the annual maps which then were superimposed to delineate the agro-climatic zones. There is much variability in agro-climate. The northern half of the province lies in the humid to sub-humid

Kharif season and humid to semi-arid Rabi season with a combination of  $I_{cg}$  ranging from adequate to deficit. The middle and a narrow western strip lies in a zone of semi-arid Kharif and semi-arid to arid Rabi season with a combination of  $I_{cg}$ -range excess to deficit. The southern part is quite dry having an arid Kharif season and arid to hyper-arid Rabi season. The temperature ( $I_{cg}$ ) availability in this zone ranges from excess to deficit.



### 9.3 Population pressure

Overall population density in NWFP is slightly higher than the average for the country as a whole, and is moderate compared to densely populated Punjab. In 1981, the population density in NWFP was 148 persons per square kilometre, which is projected to have risen to 248 persons per square kilometre by 1993. However, this average figure is misleading, both due to the limited amount of arable land in NWFP, which is already densely settled, and the ecological fragility of sparsely populated dry uplands.

Already in 1981, when the country as a whole was close to food self-sufficiency, NWFP was a deficit province having to

*Chitral valley with high carrying capacity, mountains with low carrying capacity*

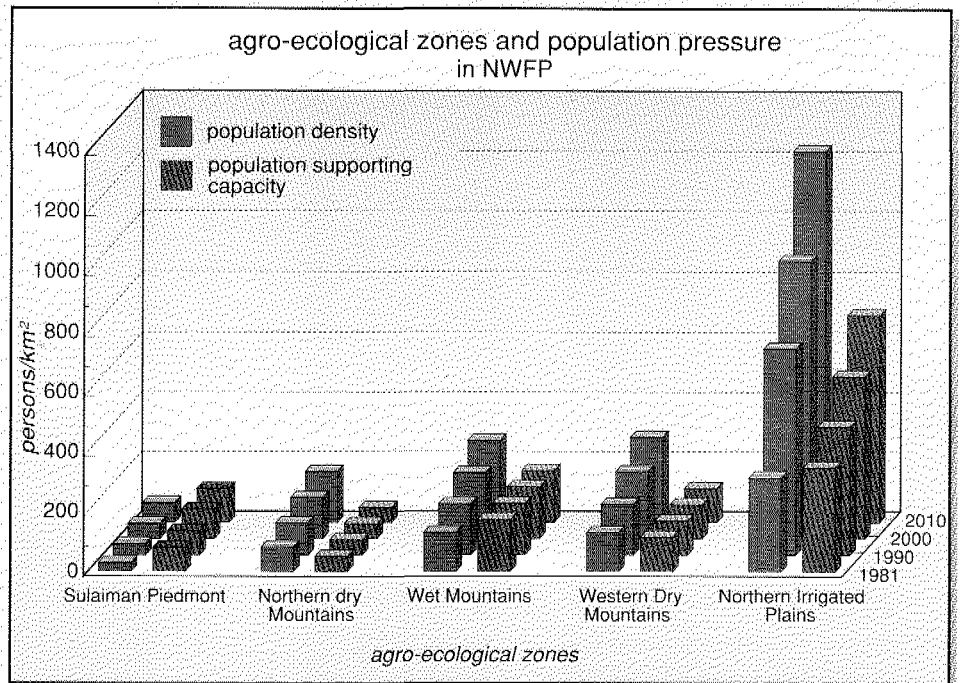


import around thirteen per cent of its staple food needs. Food deficits were most serious in dry mountainous Kohistan and Swat, whereas wet areas in Swat had the greatest potential to support more population. In absolute numbers, the largest populations exposed to food shortages were in the densely settled irrigated areas (Peshawar, Mardan and D.I. Khan), but their purchasing power from off-farm and urban economic activities protected them from severe hunger.

Despite yield increase due to higher input agriculture in irrigated areas, it is estimated that staple food deficit had risen to 29 per cent for NWFP as a whole by 1990 (see Diagram 9.1).

Diagram 9.1 projects population-supporting capacities assuming complete colonization of the gravity command of Chashma Right Bank Canal and a doubling of benchmark yields under high input agriculture by 2010 in the irrigated areas. This will close much of the current gap between local and international yields, and further increases will be gradually more difficult to obtain and sustain. The table also provides population densities for each jurisdiction under the 8th Five Year Plan population projections. The 8th FYP projects the population of NWFP to be 19 million by the year 2000 and 25 million by 2010. Due to a sharply increasing population, the Province will have a food deficit of 39 per cent by 2000 and 47 per cent by 2010.

Diagram 9.1



### Common property

The greater portion of the land is and has always been held by the Pukhtuns and the sovereignty over the large areas is claimed by descendant groups (*Khel*) of these Pukhtuns. Each member of the *Khel* has a share, a portion of the large estate. He did not own particular fields, but the right to a portion of the total land. Each field was allotted, but allotments were made for fixed periods (e.g., five years) so that after a long cycle, all members of the group had the right to use all fields for the same lengths of time. This system of periodic redistribution of land was called *Wesh* and ensured that ideally there were no landless Pukhtun. A certain amount of land was excluded from redistribution. Such land was e.g. dedicated to support the mosques, the saints and the meditators. The Pukhtuns do not usually work the land themselves. They lease it for a share of the harvest. Now the *Wesh* system has been abolished, the land can be sold and there are landless Pukhtuns. The boundaries of the old system became increasingly porous, they are replaced by the modern barriers of social status mainly based on income. The landless Pukhtun has to sell himself as a day-wage labourer.

The hill-sides are usually the undivided common property of land-owning *Khel*. Once trees covered the hills, now they are under grasses and shrubs and are used mainly for grazing. Tenants and Gujars were allowed access to the hill sides, though they do not have the rights. Most Pukhtun land-owners live in the larger villages situated in the irrigated lands. Control by the *Khel* over hills far from their homes is almost nil and the tenants and Gujars can use that land as they wish. Some Gujars and their herds visit the hills during certain months of the year, others settle permanently as squatters. Nothing is done about it because the traditional institutions which enforced a system of use rights is breaking down.

Problems arise with land improvement programs such as afforestation. The *Khel* often favours these programs because of prospects of additional income. But the tenants and the Gujars obstruct these programs as they will lose the use of the hill sides. The problem is compounded by the fact that more than 60 per cent of the land in NWFP is under some form of common property ownership or use.

The 8th FYP projections have an incorporated degree of implicit migration; it is estimated that urban population will increase to 23 per cent by 2010 from the 1981 benchmark of fifteen per cent. Yet intra-provincial migration will not be an adequate response to population pressure. All agro-ecological zones of NWFP except Sulaiman Piedmont will see a staple food deficit by 2000. At the level of administrative subdivisions within the deficit agro-ecological zones, only the wet areas of Swat and irrigated Malakand will maintain the capacity to feed more population. The most severe food shortages with more than 60 per cent of the population exposed to hunger will occur in dry Swat, Kohistan, Kohat, Karak, Mansehra and presently irrigated D.I.

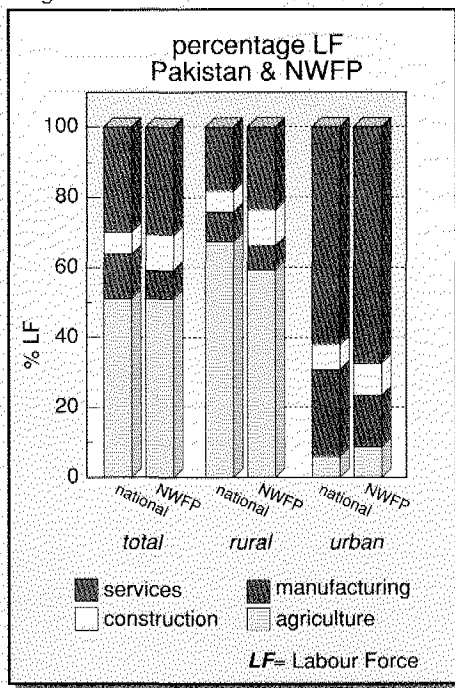
Khan. Large numbers of people residing in urban Peshawar and Abbottabad will also have to depend on inter-provincial and international imports to meet their food needs.

Food deficiency will be alleviated if the people have enough money for food. The purchasing power of the people will depend on their employment outside agriculture (e.g., industry, services), but this will require a major effort. A milder solution would be to reduce population growth by family planning. The average family size is still between five and six children. There is a demand for fertility control: a third of Pakistani women wants no more children and a large additional number wants the means

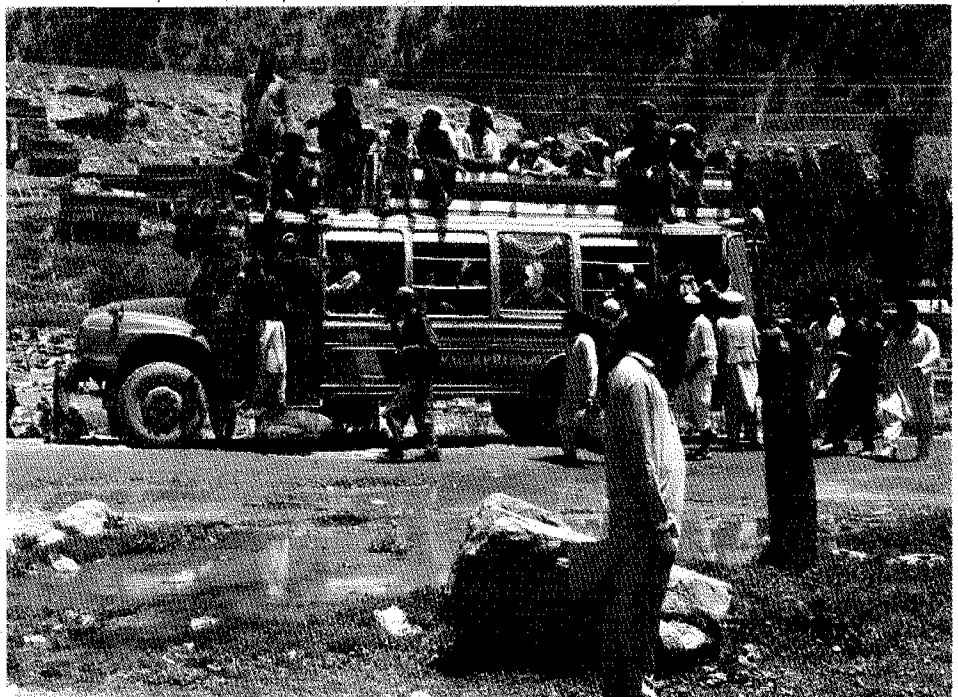
to space children. Only nine per cent of couples use modern contraceptives.

There is a lack of adequate health infrastructure. Pakistan has never made the kind of investments in the rural health networks that India and Bangladesh have made. As a percentage of total government expenditure, Pakistan's budget for health and education is among the lowest in South Asia, about half the level of neighbouring countries like Sri Lanka, India and Bangladesh. This results in 70 per cent of the rural population not having access to primary health facilities. Further, not all existing facilities offer family planning, partly because staff are not trained in contraceptive issues. It is estimated that as few as five

Diagram 9.2



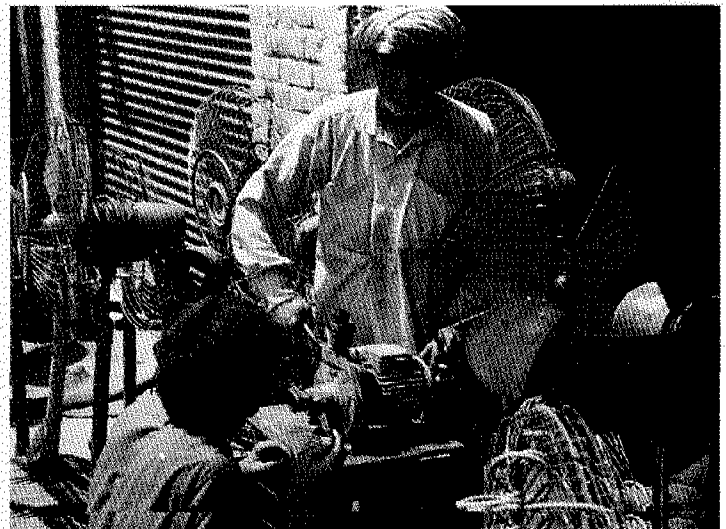
Overcrowded public transport



Not everybody can work in agriculture



Jobs should be created in the small-scale industries



per cent of couples can obtain these services in rural areas.

The requirements to reduce population growth are, among other things:

- establish a rural health network
- provide consistent political support for family planning
- improve the low status and the illiteracy rates of women
- reduce poverty<sup>1</sup>.

## 9.4 Lack of opportunities for non-agricultural development

Distribution by major industrial sectors (Diagram 9.2, Labour Force Survey, 1987-88) shows that agriculture in NWFP employs the same share of labour as the national average (51 per cent), but the Province lags behind by almost five per cent in the manufacturing sector. A higher share of NWFP's labour force is involved in construction in rural and urban areas, and in services in mostly urban areas. In the community

services sub-sector, most jobs are clerical, a result of the government response to unemployment pressures.

An analysis of Diagram 9.2 and the expected food shortages in the near future clarifies that NWFP needs to revise its policy for job creation. Too many people are already working in agriculture and the capacity of the agriculture sector cannot absorb the imminent labour surplus. Instead of creating low value-added clerical jobs in the public sector, a strategy to improve the distribution of private employment in favour of more productive small-scale manufacturing is warranted, both in urban and rural areas. Small-scale manufacturing can create items that may enhance economic activity. The costs of creating a job in small-scale manufacturing are considerably less than in large-scale manufacturing.

## 9.5 Labour migration

The decade preceding 1981 witnessed significant international and national migration out of NWFP. Most interna-

tional emigration was temporal male labour to the Middle East. Migration has changed in recent years. It has reduced to the Middle East, but increased to Malaysia. Of the 614 000 internal migrants during the 1970s, 60 per cent moved to Sindh, while three per cent moved to Islamabad. In recent years, Karachi has become one of the more important destinations.

The consequences of this labour migration on natural resource management are unclear. It appears that in areas

Table 9.1: Large farms in NWFP

year	owner	owner-cum-tender	Tender
percentage of large farms in NWFP			
1972	2.1	3.2	1.5
1980	2.5	1.9	0.7
percentage of land occupied by large farms			
1972	13	24	10
1980	23	16	4
average size of the large farm (ha)			
1972	23	28	24
1980	28	26	17



Afghan refugee camp in 1993

### Refugees<sup>2</sup>

One of the largest migrations in recent times has occurred in the North-West Frontier Province of Pakistan, when approximately 2.8 million Afghan refugees fled from Afghanistan.

Environmental problems in NWFP were compounded due to this massive influx of people. Peshawar city was considered as a unique magnet. The demand for municipal services for water supply and sanitation increased several-fold. Peshawar and its surrounding areas do not have adequate sewage and solid-waste-disposal systems. The pressure exerted by the refugees caused a total collapse in many areas, which resulted in overflowing dumps of garbage and sludge.

The removal of vegetation from watersheds and rangelands in NWFP was well advanced before the arrival of refugees, whose appearance accelerated the process of denuding the landscape. Some refugee camps were located in parts of NWFP with very little vegetation, such as western Bajaur District. As shelter (tents), food, and fuel (kerosene) are supplied by the refugee relief agencies, these camps have virtually no impact on the environment. However, refugee officials also placed camps in the prime forested areas. The devastation in these places was shocking.

The main causes of destruction have been felling of trees, deforestation to create agricultural land, lopping for fuelwood, and excessive tapping of the trees for resin. Many trees have also

been debarked to chest height to kill them and use them later for construction. The mazri palm was overexploited, and in places eliminated by Afghan women, who use its leaves to make baskets and mats and by extracting the entire plant for burning as fuel. Not all misuse can be attributed to the refugees and local inhabitants have taken advantage of existing conditions to exploit the forest resources.

Three million head of livestock accompanied the refugees. It appeared that the impact of the livestock on the environment was local. The impact depends, among other things, on the concentration of the livestock. The ratio of livestock to the population of the various camps is highly variable (Atkinson, 1979; Jones, 1985; Rahman, 1985). In Chitral District, for example, there are about three sheep and/or goats for every refugee. In the Eastern District of Mansehra there was one sheep or goat for eight refugees.

The Pakistan Government now realizes the folly of locating refugees in prime forest areas. Both NWFP and central government have embarked on extensive replanting programmes. Despite these efforts, it is unlikely that this deforested area will ever regain its former density and extent. The environmental damage caused to the biotic resources in NWFP is extensive and probably irreversible.

The influx of Afghan refugees has significantly increased the volume of heavy traffic especially in freight haulage and public transport. Canal patrol roads in NWFP connecting refugee camps to the trunk road system have deteriorated under the increased traffic densities.

However, the refugees have also played a positive role. They planted many trees in forestry and watershed management projects sponsored by UNHCR. The refugees can use the skills in tree planting in the rehabilitation of postwar Afghanistan. The brick-kiln industry has flourished due to availability of cheap labour. This however has significantly contributed to an increase in air pollution. The refugee scavengers collect valuable components from the garbage and sell them to the small industries. Recycling garbage has reduced the pressure on the rapidly deteriorating municipal services.

Peace has still not come to Afghanistan. Refugees continue to arrive.



where substitute labour is not readily available, a certain amount of degradation of the natural resource base occurs. For instance, it was reported that in some areas of NWFP, irrigation channels fall into disrepair, rangelands are used more intensively by the free grazers with traditional users rights, and the communities natural resources suffer from their inability to protect them. But as the entrepreneurs will leave first, labour migration will definitely result in a brain drain.

## 9.6 Land tenure

As seen in Section 4.8 land inheritance and tenurial systems are direct determinants of the degree to which sound environmental management and sustainable development are possible. The off-farm interests of owner-operators and the duration and sharing arrangements of tenancy are other critical variables. With this caveat, the broad categories of owners, owners-cum-tenants, and tenants may be used for an initial assessment.

The Agricultural Census of NWFP shows that 68 per cent of the 0.5 million farms in NWFP were owner operated, eighteen per cent purely tenants and fourteen per cent owner-cum-tenants in 1980. Diagram 9.3 shows that this pattern was largely the result of trends operating during the 1970s. Between 1972 and 1980, the number of farms increased by fourteen per cent, the owner-operated farms increased by 42 per cent, while the number of owner-cum-tenant farms and pure tenant farms decreased by 30 per cent and nine per cent respectively. Between 1972 and 1980, the total farmland decreased by four per cent, the farmland operated by owners increased by 42 per cent. The land operated by owner-cum-tenant and tenant farms decreased strongly by 36 per cent and 34 per cent (Diagram 9.4)

The increase in farmland operated by owner provides hope for sustainable development. But Diagram 9.5 shows that the major changes occur in the large farms. Detailed research on the

large farms is shown in Table 9.1. The analysis shows that:

- Some of the large farms under tenant and owner-cum-tenants are converted into large farms under owner.
- Total number of large farms decreases more (almost 2.5 times as much) than the area under large farms.
- The average size of the large farms is increasing (from 23 ha in 1972 to 28 ha in 1980).

This means there is a tendency to move towards smaller farms.

Diagram 9.6 shows the 1972-80 trends of the tenant farms separated into their lease components. The area under share cropping declined by 33 per cent, under contract lease by 25 per cent, while other forms of tenancy were virtually eliminated. Especially the large tenant-operated farm area declined very strongly. But the land under owner-cum-tenant also requires further analysis. Owner-operated area in Diagram 9.7 increased only by 20 per cent compared to 42 per cent of Diagram 9.3.

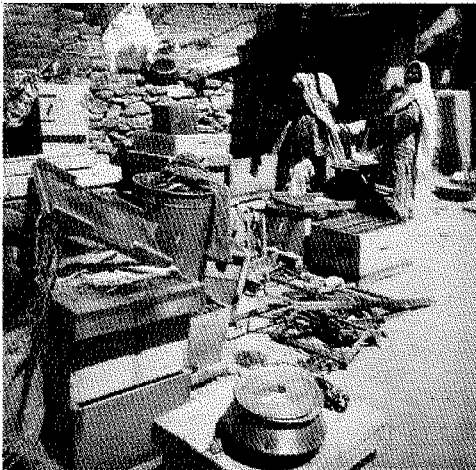
*Fuelwood for sale, but what is left?*



*Social forestry campaign*



*Women's project to reduce the fuel-inefficient stoves*





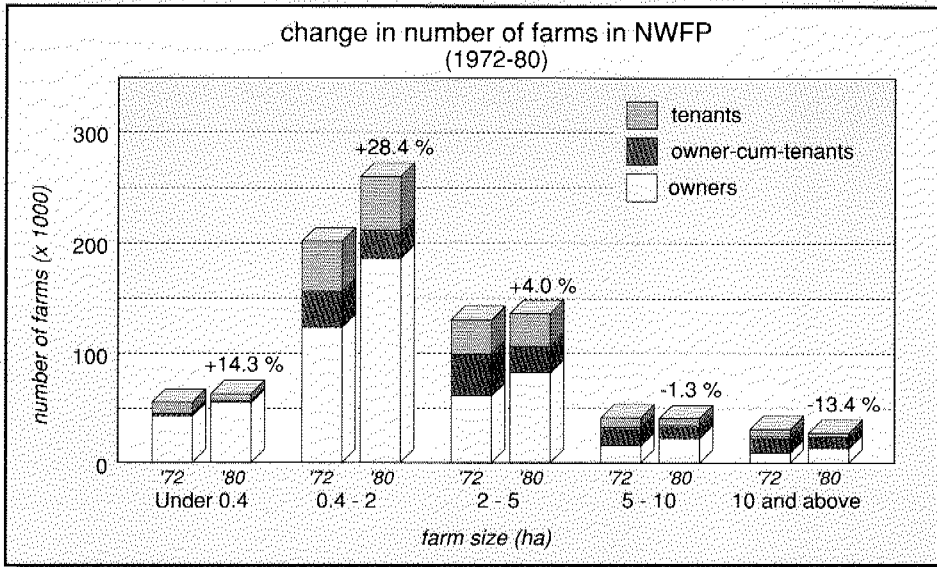


Diagram 9.3

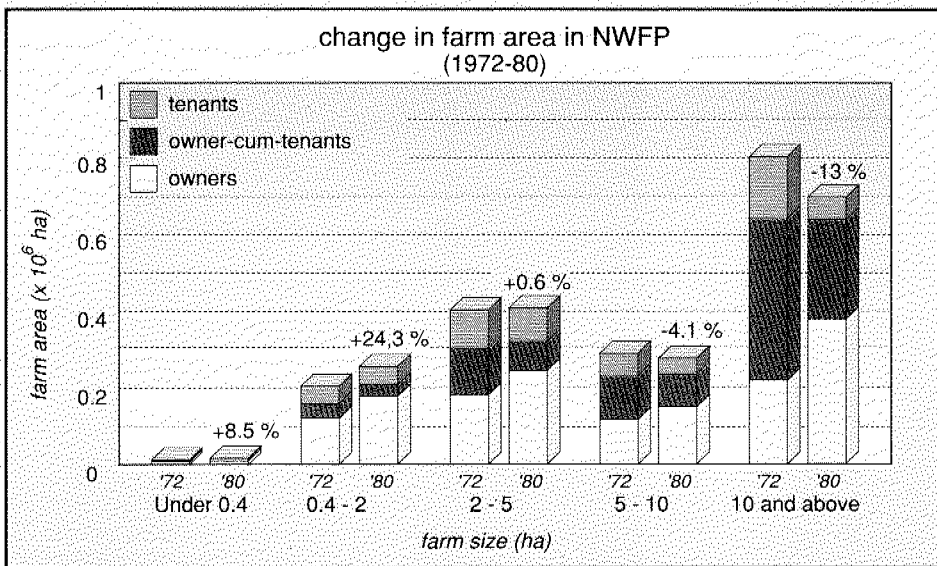
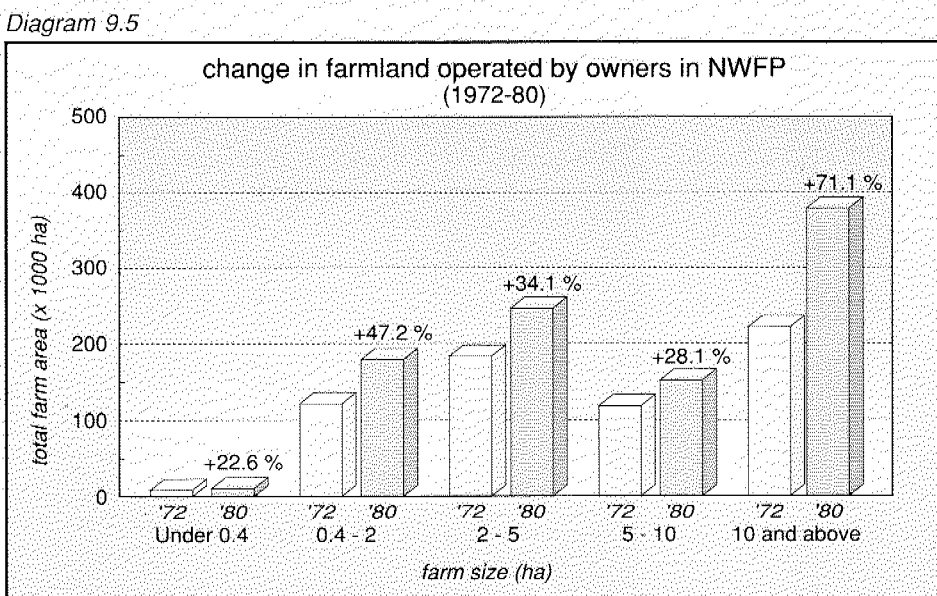


Diagram 9.4



The 20 per cent level corresponds more realistically because of the definition of owner-cum-tenant: the tenancy change of the owned land of the owner-cum-tenant to land operated by owner is not a physical change.

In NWFP, 76 per cent of owner-operated, 96 per cent of owner-cum-tenant, and eighteen per cent of tenant-operated farmholdings are fragmented and there is a trend towards smaller farms. This has adversely affected the possibilities for efficient water management and land improvement. The higher number of large farms with their modern agricultural techniques such as mechanization, high inputs of fertilizer and pesticides will also have a negative effect on the environment. On the other hand, the trend toward more owner-operated farms (20 per cent) since the 1970s provides hope for long-term investments in the land and sustainable agriculture.

### 9.7 Fuelwood substitution

Biomass consisting of roundwood, shrubs, dung, and crop residues is the main domestic fuel in NWFP. It is used by 90 per cent of rural and 60 per cent of urban households for cooking and heating. According to the Household Energy Strategy Study (HESS), fuelwood consumption comprises 56 per cent roundwood and 44 per cent low grade fuel (twigs and shrubs).

As in the rest of Pakistan, farmlands, not forests, are the predominant source of fuelwood in NWFP, except in areas surrounding the forests, where wood from the forest is the main source. Farmers have been encouraged to plant trees under social forestry programmes. The Forestry Master Plan (FSMP) survey estimated the number of trees growing on farmlands to be roughly 56 million, with a total standing volume of about 8.56 million m<sup>3</sup> which is nine per cent of the estimated standing volume of timber in the commercial and non-commercial forests.

Despite successful planting, fuelwood is a dwindling resource in NWFP. The average felling of roundwood over the 1984-88 five-year period was estimated at 4.9 million m<sup>3</sup> exceeding the 4.4 million m<sup>3</sup> annual growth on 1.7 million hectares of forests and farmlands by 0.5 million m<sup>3</sup>. While farmlands pro-

vide much of the roundwood, most unsustainable harvesting takes place in the forests. Total extraction by Forest Development Corporation, Forest Cooperatives, and thieves is estimated at 0.860 million m<sup>3</sup>, far exceeding the recorded output 0.263 million m<sup>3</sup> of timber and 0.014 million m<sup>3</sup> of fuelwood from managed public forests.

HESS estimates total fuelwood consumption at 7.4 million m<sup>3</sup>, (of which roundwood is 4.1 million m<sup>3</sup>) and the FSMP assumes that fuelwood demand will grow at two per cent per annum, less than the rate of population increase, owing to slower rural population growth and fuelwood substitution. Nevertheless, the demand for roundwood as domestic fuelwood, will grow to 5.9 million m<sup>3</sup> by 2010. Clearly, both additional plantation and fuelwood substitution are needed.

The *conventional* commercial alternatives to fuelwood such as kerosene, gas, coal, and electricity from large hydropower stations are limited, expensive, and an expansion in their domestic use could lead to other problems. Kerosene price subsidies could aggravate the problem of diesel adulteration. NWFP has only 67 000 gas connections. More gas connections should be provided, but gas is a limited resource, with other potentially higher value-added uses. While coal is an under-used, relatively abundant fuel, its extensive domestic use could aggravate indoor and urban air pollution. Electricity from the national grid is needed for industry, already subject to load shedding, and should not be used for domestic heating and cooking.

*New and renewable* sources of energy - biogas plants, small hydroelectric, passive solar heaters, and solar cookers - are potential future replacements for fuelwood. But elsewhere in the world (e.g., China, India) it has been demonstrated, that it is not so easy to implement these replacements and that investment costs are high. The biogas plants require much maintenance and there is an ethical resistance to using it for cooking. Cooking on a solar cooker takes too long. Current programmes have run into problems, especially due to high maintenance costs. Most problems result from a departmental approach to extension. An approach based on community participation in project development and technical training for

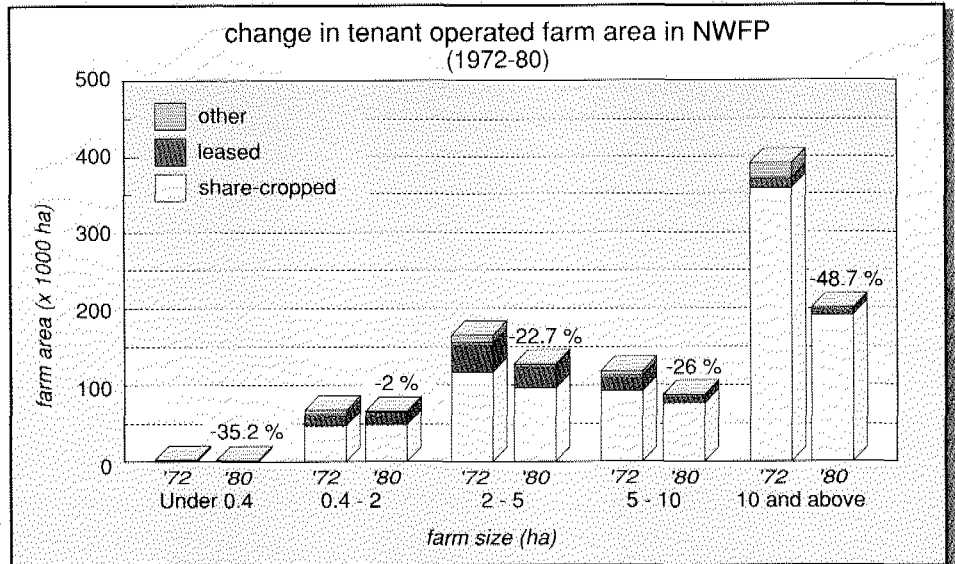


Diagram 9.6

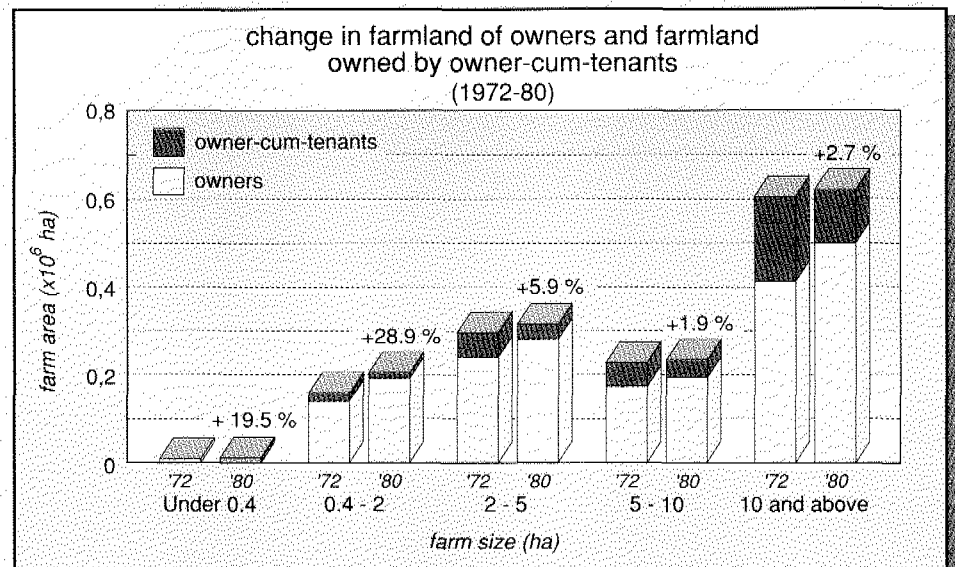
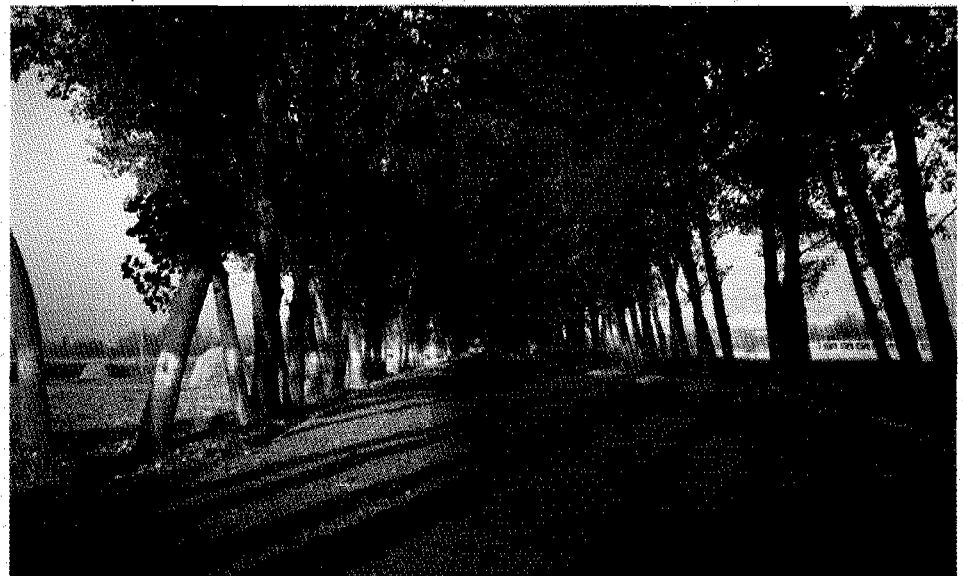


Diagram 9.7

Trees also provide shade



maintenance could transform these technologies from marginal to mainstream sources of energy supply in NWFP.

Energy conservation - through fuel-efficient stoves, tandoors (commercial stoves), heaters - may be considered another form of substitution, with small initial investment and reduced running costs. The widespread adoption of fuel-efficient tandoors and metal stoves with 25 to 40 per cent efficiency of energy conversion, compared to four to eleven per cent for traditional ones, may halve the fuelwood demand in NWFP. A well-considered communication and extension programme will be required.

## 9.8 Participation of the local population

The prospects for food security and forest conservation appear grim. A massive awareness campaign is needed to alert the people in NWFP about the deplorable future of their Province. Trees are worth much more standing than as lumber. Goods and services from forests provide more money and jobs than tree felling. Services fail to appear in conventional accounting systems, and the benefits like prescription drugs with active ingredients derived from forests remain undervalued. No one knows how many new medicines may be developed from forest products. Flood prevention, watershed stabilization and fisheries, scenic and recreational benefits of the forests can earn large amounts of money. The greatest value of the forest is the diversity of life within them. Internalising ecological values in prices is a prerequisite to arrive at a sustainable forest economy. Political change will be required to achieve an ecological forest economy. Unless the strong grip of large timber interests can be broken, forest conservation will be difficult if not impossible. Officials distribute concessions to those who fell the trees for quick profits. The ultimate challenge is to make the ecological services sufficiently remunerative for all groups involved—government agencies, residents—so that they act as defenders, not destroyers of the forests. Joint management are required systems, in which residents benefit from the forest use and protection. The need to invite local participation in a sustainable strategy for managing and

developing the Province's natural resources is well-recognized. Its importance is emphasized by the fact that the people are the principal users of the natural resources in NWFP, and today they have no alternative. The importance of the people's participation has been accepted in the National Conservation Strategy and in the Sarhad Provincial Conservation Strategy. One of the major challenges to environmental conservation and management is to develop a strategy that will effectively involve communities. There are several successful models of community participation in the social forestry sector, irrigation, agriculture, water supply and sanitation. Some of these models could be improved upon to develop sustainable strategies for conserving the environment.

<sup>1</sup> *Pakistan Medical Journal*, April 1993

<sup>2</sup> *Condensed from Impact of Afghan refugees on the vegetation resources of Pakistan's Hindukush-Himalaya*, Nigel J. R. Allan, 1987.

## 10. IMPACT OF THE ENVIRONMENTAL PROBLEMS ON THE POPULATION

The population has an impact on the environment, but also the population is influenced by environmental impacts. The men will be more directly affected than women. The women's role in NWFP has traditionally been dominated by segregation from men, except for the immediate family. As a result the women are excluded from production processes. However, this has not been the case for the lower social groups, such as tanners, scavengers and entertainers. Their women are participating in agricultural and pastoral activities.

### 10.1 Agriculturists

The environmental problems relate to:

- reduction of the agricultural land due to urban and industrial expansion, desertification and soil erosion;
- reduction in crop yields and change in land use;
- fragmentation of the land and reduction of smallholdings as a result of

land-tenure arrangements,

- increased use and uncontrolled application of agrochemicals with their impact on agricultural growth, human health, and wildlife.

### **Reduction of agricultural land.**

Over recent decades, the urban and industrial expansion in NWFP has continued on valuable and productive agricultural lands. For example, agricultural land in the metropolitan territory of Peshawar has declined from 68 per cent to 55 per cent during 1965-85 with a corresponding increase in residential area from 9.5 per cent to 19.4 per cent during the same period; and in Saidu Sharif (Mingora), productive agricultural land decreased from twelve per cent to 2.5 per cent during 1971-81.<sup>1</sup>

In the semi-arid areas, especially west of Bannu and D.I. Khan, agricultural land is giving way to desertification, largely due to limited water resources. In the northern areas of the Province, deforestation is occurring in the watershed areas. Deforestation is a major cause of soil erosion. When deforestation occurs, women have to travel longer distances to obtain fuelwood that is collected not only for household use but also for sale.

Soil erosion is seriously affecting the terrace cultivation in the Province's hilly areas. The continuing loss in cultivation is also due to overuse and poor land-management practise, especially in the rainfed areas of Hazara and Malakand Divisions that receive high precipitation. Soil erosion has three major undesirable impacts; it removes the fertile topsoil from the agricultural land, it raises the level of stream and river beds, and thus increases flood hazards for adjacent cultivation and habitations; and it greatly reduces the functional life of water reservoirs.

The key to watershed rehabilitation is the sustainable development of mountain land. This requires the use of mountain land according to its capability for sustained productivity. Thus steep mountain slopes would be planted with trees, moderate slopes with perennial forage crops, gentle slopes with fruit and nut trees, and level land with off-season vegetables and other high-value crops. But changing existing land-use in the mountains is extremely difficult because it involves land tenure, and local customs and traditions. Any programme for the sustainable development of mountain land must therefore seek the active participation of the local communities in both planning and implementation.

### **Watershed rehabilitation**

To date, watershed rehabilitation in NWFP has been attempted in a sporadic manner. The bulk of the work has been addressed by the Forest Department under its watershed management programme

since the nineteen-sixties. Its main activity has been planting trees. For a few years, several foreign donor projects have been active in social forestry (Kalam Integrated Rural Development Project, Malakand Social Forestry Project, etc.). These projects have successfully pioneered the development of mountain lands with the participation of local communities. Their success has prompted the European Commission to support two similar projects in NWFP, for Dir Kohistan, and the Galiyat. Watershed rehabilitation can only yield its full productive and protective dividends if it covers a significant area of all the watersheds. Kalam and Malakand-type projects must therefore eventually cover all important watersheds in NWFP. Since the Forest Department has successfully pioneered this approach and would be responsible for implementing it in the two EC projects as well, it would be the best agency for implementing all such projects that may be launched in the future. It must therefore review its current structure and make the necessary adjustments to perform this massive task effectively and efficiently.

**Reduction of crop yields and change in land use**

Animal dung and agricultural residues can provide an important soil additive for maintaining organic matter and plant-nutrient levels. But animal dung and other agricultural wastes are used as fuel. This is a serious problem as most of the soils in NWFP are deficient in organic matter and plant nutrients. This will reduce yields.

In response to an enlarging commercial market system, a striking feature of agrarian change in recent decades is the shift in cropping patterns toward cereals and cash crops, away from pulses and oil seeds, which have provided proteins and a low-cholesterol cooking medium. This may have negative consequences for nutritional levels and balance, specially for the subsistence poor with no access to the market. Often these crops require higher capital investment. The "smaller" farmer has insufficient capital to invest and he will not take advantage of the prospects.

**Fragmentation**

Remnants of the 'green revolution' of the late 1950s have had wide-ranging social and economic repercussions across the broad spectrum of society, leading primarily to changes in landownership patterns. Optimum use of the 'green revolution' technologies suggested land holdings of minimum 40 ha with substantial financial inputs. As an outcome and as shown in the section on land tenure, the smaller agriculturists have been losing their lands to influential farmers and other more economically beneficial land uses.

Land inheritance and tenurial systems in NWFP have resulted in 76 per cent of tenant-operated farm holdings in the Province becoming fragmented. For the small farmer using low technical inputs, land fragmentation is not a serious problem provided the fields are not too far from his farm. But fragmented farm holdings contribute negatively to efficient agricultural practices, land improvements and watershed management.

**Uncontrolled use of agrochemicals**

The irrigated Kabul river valley is an example of the effect of uncontrolled use of agrochemicals. There is economic pressure to intensify cultivation and increase yields of cereals, fruits and other cash crops. Yields can be increased by the excessive use of chemical fertilizers and pesticides in a complex cropping pattern. Presently, no governmental monitoring of pesticide residues on fruits and veg-



*Shortage of land; with land improvement (terracing) any piece of suitable land is used*

**Fodder collection**





etables in the market occurs. The use of pesticides will become a major health hazard for humans as well as livestock as farmers are ignorant of residual effects of pesticides like DDT. More research is required to identify the increased levels of toxins and other contaminants in ground and surface water. Integrated pest management approach is a way to reduce the high levels of toxins.

Agricultural land adjacent to the river also suffers from waterlogging, hypersalinity and sodicity of soils. However, attempts are underway to reclaim these areas by improving the drainage and treating the soils. But the operation and maintenance will remain a major obstacle.

Today, the future for the agriculturists appears grim, with a reduction of agricultural land and reduction of crop yield.

## 10.2 Fishermen

At present, the aquatic resources of NWFP are in deep crisis. The basic reasons are the degradation of the natural fish habitat due to population pressure, intensive agriculture, environmental degradation, and the implementation of large infrastructure projects.

### Population pressure

Sewage and industrial effluent discharging into rivers and streams kill fish or degrade their natural habitat. Encroachment by land and industrial developers along the river banks causes a significant loss of spawning habitat. Over-exploitation of fish stock occurs through illegal fishing during the closed seasons, and use of dynamite, electric shocks, and insecticides for fishing.

### Intensive agriculture

The use of insecticides, pesticides, fertilizers is low in NWFP. But the application of these agrochemicals is higher in intensive agriculture (irrigation, cash crops). In some areas, the seepage of these inorganic elements into the streams and water reservoirs causes environmental degradation of the natural habitat of fish.

### Environmental degradation.

Soil erosion in the watershed areas has disturbed the natural nutrient cycle of the fish and has caused silting of several breeding lakes. The removal of top soil in the watershed areas has also increased the frequency of heavy flooding in the fish breeding areas. Several fish species such as Mahasher have nearly become extinct.

### Large infrastructure projects

The construction of large hydroelectric power projects such as Tarbela restricts the migratory movement of the fish species to their traditional breeding grounds. Also the super-saturation of gases caused by water control structures is harmful to fish.

However, fish cultivation has great potential, it is profitable, there are many rivers and lakes in NWFP, and investment costs are low. Fish ponds can be part of the irrigation systems. The needs of the fish population must be incorporated into the design of these projects so that they become environmentally friendly. Other obstacles standing in the way of sustainable fisheries development are:

- Inadequate technical data about the water bodies as fish habitat
- Inadequate marketing
- Inadequate funds to realize the full potential of fisheries

The future of the fisherman also looks grim, however there is an opportunity: tourism. The mountains have great scenic beauty and their cold-water lakes and streams are stocked with trout. Some of these areas are already major tourist attractions. Fish can form a basis for ecotourism designed specifically to improve the quality of life of the local people. With deforestation, these attractions will disappear dramatically and result in missed opportunities.

## 10.3 Pastoralists

Pastoralists in NWFP are caught between the rapidly increasing livestock populations and reduction of range resources.

### Increasing livestock population

The population increase has resulted in an increased demand for livestock products and productivity. Moreover, most agriculturists in mountain areas are also engaged in pastoral pursuits in order to increase the livestock population. In winter, the animals are kept at home and inadequately stall-fed. In summer, they are moved to the highland pastures resulting in uncontrolled grazing.

### Reduction of range resources

Changing patterns of economic interaction over recent decades, development of the irrigation system in the plains, urbanization and industrialization have led to a situation where the traditional balance and interdependence between pastoral and agricultural activities, and the link between the rainfed (barani) areas and irrigated plains has been disrupted.

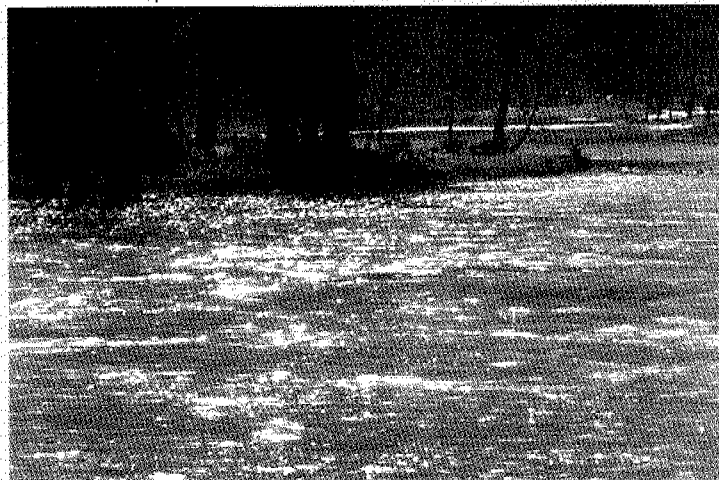
The environmental repercussions of development are most evident in the rainfed (barani) areas of NWFP where major parts of the traditional seasonal pastures have disappeared. This is manifested in the cultivation of steep lands for food and fodder. As a result of deforestation, large areas of traditional community owned grazing lands have been brought under cultivation.

Most rangelands are of poor quality. Uncontrolled grazing and excessive cutting have depleted the vegetation off the grazing areas. This has resulted in the replacement of palatable grasses by poor-quality vegetation that is less nourishing for livestock. Combined with high stocking rates, the result is that the livestock population of the area is undernourished for at least part of the year.

While the quantity of feed is adequate for animal maintenance, its low quality results in poor milk production and limits the potential gains of genetic improvement programmes. The provincial artificial insemination programme for cattle and buffaloes cannot achieve its potential in the face of inadequate nutrition.

As the rangeland resources are in decline, farmers meet the shortage in animal feed by expanding

*Fisherman's paradise*



*The herdsman, his flock and the traveller (always collecting wood)*



fodder acreage. This fact underlies the increasing competition of fodder and grain for a share in cropped area in NWFP. Fodder production in the Province is insufficient to feed the livestock population and additional amounts must be imported from Punjab to meet the shortage.

Ranging has potential in NWFP. There are several constraints to the rehabilitation and sustainable development of livestock:

- *Support.* The livestock sector is a neglected adjunct of the Department of Agriculture of the Government of NWFP. It is not a department at Secretariat level, and therefore does not have its own full-time Secretary with a mandate to upgrade the sector. It does not have any arrangements for extension, which are urgently needed. Its arrangements for research are rudimentary.

- *Economy.* Limited attention is paid to improving the productivity of the grazing lands because the artificially depressed prices of livestock products do not justify the required investment in rangeland research, extension and development. Since profitability in livestock management is low, it has generally remained a subsistence activity, with no major investment in the removal of its major constraints.

- *Diseases.* The livestock of NWFP suffer widely from debilitating diseases and are generally riddled with ectoparasites and endoparasites. The owners have neither the knowledge of the effect of these parasites on productivity, nor the means for the curative action needed.

In general, the efficiency of operation of the animal health service is hindered by:

- a restricted operating budget (compared with its personnel and capital development budgets),
- limited access to service areas, vaccines and medication,
- difficulty in obtaining timely laboratory backup,
- lack of quantitative knowledge of the patterns of occurrence of diseases and their economic importance, and
- lack of appropriate animal health delivery models specifically tailored to the existing farming and grazing system.

So the future also appears grim for the pastoralists: deterioration and reduction of rangelands, prices of livestock products which are artificially kept low, low-quality livestock problems and little hope for incentives from government.

### 10.4 Town dwellers

Town dwellers in NWFP are faced with a complex set of socioeconomic and environmental problems. In terms of human exposure to environmental impacts, town dwellers are probably rated the highest and have to bear the brunt of the environmental repercussions of overpopulation and urbanization. In addition to these, inadequate supply of drinking water, lack of housing and services, environmental problems such as air and water pollution, food contamination, and garbage disposal, all have a severe impact on town dwellers.

#### *Overpopulation and urbanization*

A major pressure on urban environment is the lack of housing for low-income groups. In NWFP alone, over 40 000 units are required every year to house

the increase in urban population. The state and the formal sector combined are unable to provide the land and the services to more than 20 per cent of the units annually, and this at a price that the poor cannot afford. The rest of the population, including part of the refugees are absorbed by the informal sector that is resulting in increased densities in and around the already environmentally degraded city centres. For example, in and around Peshawar, the Katchi abadis of Islamabad Colony, Tahkal Payan, Akhundabad, and Shah Bund housed 427 000 people or 55 per cent of the total 776 500 people housed in Peshawar (1986). Throughout the country, these informal settlements and Katchi abadis house more than 50 per cent of the population and nearly 22 per cent of urban households.<sup>2</sup>

Major urban settlements of the Province are Peshawar, Mardan, Mansehra, Mingora, Kohat, Nowshera, Abbotabad, D.I. Khan, Bannu and Charsadda where the population density averages 195 persons per square kilometre. High population growth rate and congestion in unserviced areas are a strain on the natural environment and resources, and the social capacity for its management. Municipal services in these cities are inadequate, resulting in poor management of urban wastes.

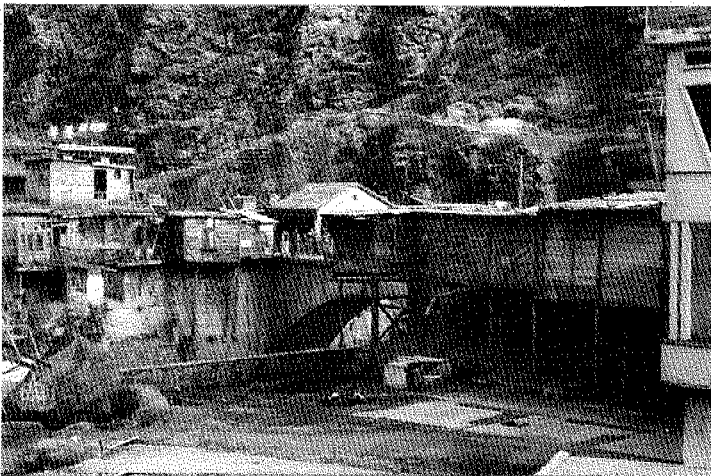
#### *Environmental problems*

Rapid urbanization and a substantial increase in the number of vehicles are adding to the deterioration of air quality, especially in the cities of Peshawar, Charsadda and Nowshera. The vehicles on the roads are old, improperly tuned and ill-maintained with the result that emissions of carbon monoxide, hydrocarbons, and nitrous oxides are above the acceptable levels in the atmosphere. Adulteration of fuel aggravates the problem of air pollution and emission of noxious gases.

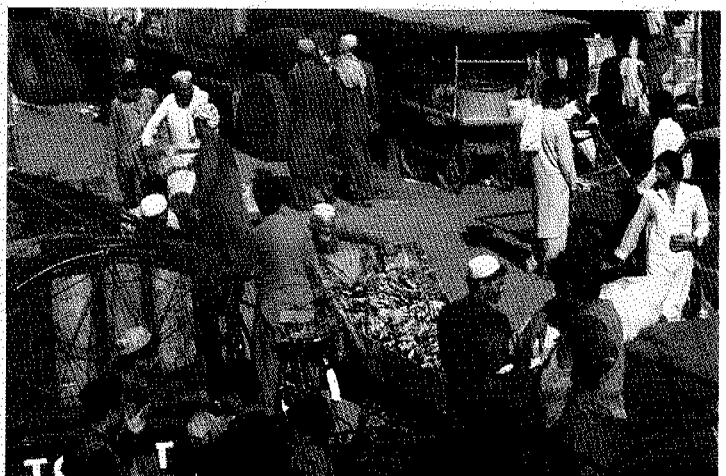
Air pollution is also aggravated due to unregulated emissions from the industry located in and around almost every urban centre. For example, the dense smoke from the foundries and the emission of chlorine from Adamjee Chemical Works, Nowshera has made the air unbearable for human health. Particulates including heavy smoke from the industries, especially, the steel re-rolling mills in Peshawar and Nowshera contribute to respiratory problems. (Hanif, M. et al., Survey Report on Hazardous Chemical Industries and Safety Measures in Pakistan, 1989.)

No treatment of industrial and municipal wastes occurs in NWFP, with the result that untreated toxic

*The Katchi abadis (squatter settlements) are even built in the river*



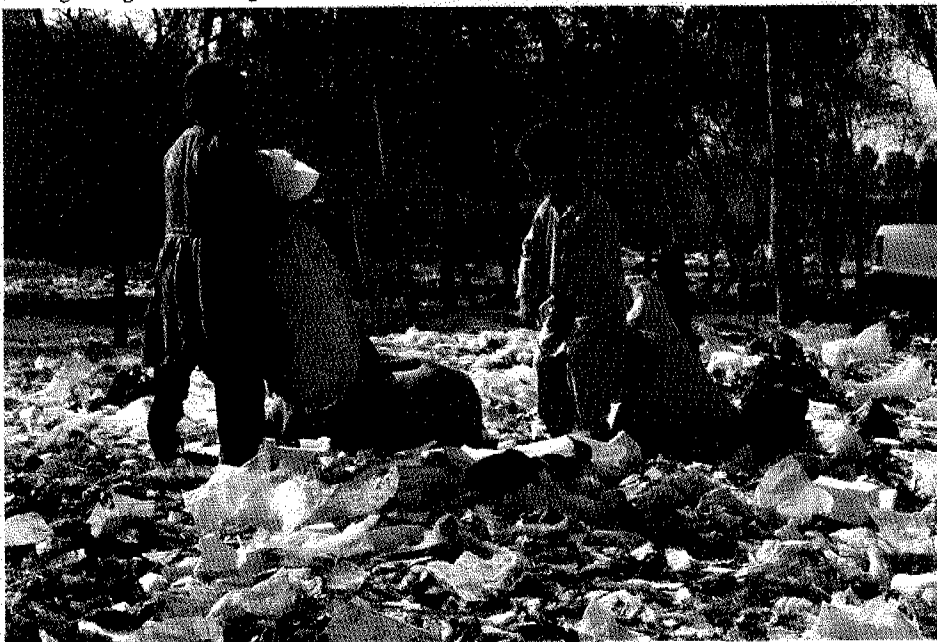
*Overcrowded streets*





*Extended family house in the Kalash Valley (Chitral)*

*Young refugee scavengers*



and hazardous wastes are discharged into the rivers and streams. Several studies have mentioned that quality of water in Peshawar, Mardan and Swat districts is unsafe for drinking. Water pollution is one of the main causes of disease.

The municipal solid wastes contain items discarded from households and other establishments. In the informal sector, town dwellers comprising a very poor cross-section of the population collect the recyclable items, like plastics, rags, glass, paper and metals that become raw materials for small-scale industries. However, large quantities of garbage remain in open dumps in major urban areas and the Katchi abadis. These dumps are breeding points for diseases such as cholera, typhoid, hepatitis, skin and respiratory diseases transmitted by animals and humans. The wastes also penetrate through the soil into the groundwater. Sanitary conditions are less than adequate due to lack of improper human waste disposal and accumulation of sludge in ditches and ponds.

Town dwellers also engage in indiscriminate burning of municipal solid wastes on roadsides. The low-temperature open-burning of these wastes, especially plastics produces toxic emissions. Unfortunately, the dwellers have to live with exposure to such emissions or allow these open dumps to decay with time and breed viruses and infections for the even wider spread of disease. Equine wastes also dry on the road under the hot sun and convert into respirable dust causing bacteriological infections in humans.

Several institutes and NGOs have developed methods to alleviate some of the environmental problems. But fundamental changes are necessary to improve the living conditions of the town dwellers, such as:

- reducing population growth,
- creating job opportunities in rural areas,
- enforcing the environmental legislation.

These items are politically sensitive and require large sums of money.

## **10.5 Women**

NWFP has a biomass subsistence economy in which women play an important role. Biomass economies are basically non-commercial and the requirements can be met from the immediate environment. Women have always borne the traditional responsibility of running the household with the added responsibility of gathering fuel (crop residues, cow dung and wood), fodder, water, organic manure, building material (thatch and timber) as well as medicinal herbs. As users and collectors of bio-energy, women are directly threatened by ecological degradation as it implies walking greater distances and an increase in their workload.

The grazing of animals in all farming systems and economic classes is usually neither practised nor decided by women. Nevertheless, grazing habits are changing. When grazing opportunities diminish, more animals have to be stall-fed which increases the women's tasks for feeding, watering and cleaning the sheds.

In major urban centres and cities the women have to deal with the issues of ensuring proper water and sanitation facilities for the household, they are the ones likely to suffer most when problems arise. The women need education and training in basic practices of health and hygiene. Thus, water supply and sanitation schemes have particularly targeted women. It is believed that this type of collaboration and involvement of women in human waste disposal and sanitary drainage could help mitigate the impact of environmental damage due to poor sanitary conditions and inadequate drainage, in both urban and rural areas.

## 10.6 Impact of environmental pollution on human health

The problems of public health in NWFP arise from such factors as lack of safe drinking water supply, inadequate sanitation and air pollution. The major sources for water contamination in the Province are biological pollution of water, sewerage pollution, contamination from solid waste and industrial pollution. The presence of water-borne diseases like malaria, cholera, enteric fever (typhoid), dysentery, gastroenteritis and infectious hepatitis, and water-washed diseases like trachoma, scabies, conjunctivitis and helminthic infections, guinea worm and hookworm, indicate the poor quality of water supply in the Province. Moreover, the studies described below give a clear picture of the quality of water supplied to the consumers and its effect on increasing mortality and morbidity levels in the Province.

A study conducted by the P&D Department of NWFP, titled "WHO Dual-Focus Project on Water-Quality Surveillance within the Municipal Limits of Peshawar City" (1990), found that where the biological quality of water at 840 supply points was tested for faecal coliform, over a period of six months the cumulative finding disclosed the presence of 60 coliform/100 ml (normal value being 3 coliform/100 ml) at all points. However, this find-

ing was in an ascending order, starting from 24/100 ml in the first month and culminating in 60/100 ml during the last month. However, if all the water-supply points within the municipal limits had been included, the result would have been much higher.

Another study conducted by Pakistan Council for Scientific and Industrial Research (PCSIR) Peshawar, "Monitoring and Pollution Studies of Drinking Water in some areas of Peshawar", revealed a high nitrate content. Heavy metal concentrations, including copper and lead, were also found. The rise in nitrate and metal concentration are explained by increasing industrial and agricultural activity over the years. Toxic and physiological effects of excess of nitrate, copper and lead are well known. High nitrate content in water is the main cause for cyanosis in infants under three months. Lead is a cumulative poison that has major toxic effects such as anaemia, neurological dysfunction and renal impairment.

There is a relationship between the increase in air-pollution ratio and the rise in the incidence of respiratory diseases. Air pollution also increases the frequency with which people, especially children contract short-term respiratory ailments. Of the total 17 187 km of roads in the Province, 5712 km are unpaved. Dust from these unpaved roads is consumed by the population and is a major source of ear, nose and throat diseases in NWFP.

## 10.7 Poverty

Pakistan's environmental problems are the result of industrialization, haphazard development patterns and misuse or abuse of natural resources. Tackling these issues is complicated by the unequal social, economic and political relationships that exist in society. Poverty is the main impediment to addressing the problems relating to environmental damage, because of the increasing demands on the already meagre resources of the country, exacerbated by a high population-growth rate. Furthermore, neither policy planners nor the urban nor rural populations are fully aware of the ill effects of environmental degradation, and lack the necessary vision for tackling these problems. Thus, for an understanding of Pakistan's environment-related problems, it is important to take into account the whole range of social, economic and political issues related to development.

NWFP has accorded immense significance to a clean and healthy environment and has emphasized certain priorities for sustainable growth and management of its economy. These include increasing forest cover in NWFP; leaving richer soils, and cleaner air and water for the next generation; controlling population growth to a level that society and the natural environment can

manage; increasing literacy, particularly among females; improving literacy and training, enhancing the status of women in society; empowering local communities to take action or initiatives that will directly impact their livelihoods; improving the physical and social infrastructure to provide a better environment for future generations.

The government is aware of the need for incentives for promoting investment, job creation, promoting literacy, providing of health facilities and has outlined some noteworthy objectives for development. It has also emphasized the importance of identifying realistic goals for achieving these objectives. Environmental planning has recently been added to the mandate of the Planning and Development Department of NWFP government, making environment and sustainable growth a central issue for economic growth. It remains to be seen in how far environmental policies will be implemented.

<sup>1</sup> "Impact of Metropolitan Expansion on the Ecology of the Rural Urban Fringe", Dr. Aslam Khan.

<sup>2</sup> Source: Pakistan Low-Costing Housing Project, ADB, 1990.

# 11. THE LEGAL AND INSTITUTIONAL FRAMEWORK

## 11.1 Environmental legislation

As in other parts of Pakistan, most of NWFP's legislation relating to natural resources dates back to the colonial era. Among the major laws the earliest ones are the Canal and Drainage Act (1873), the Fisheries Act (1897), the Timber Act (1913), the Forest Act (1927) and the Hazara Forests Act (1930). Subsequent legislation on water and forests has addressed more specific concerns and includes NWFP Wildlife Protection, Conservation and Management Act (1975), and NWFP Water User Association Ordinance (1981).

Contemporary environmental legislation originates with the federally mandated Pakistan Environmental Protection Ordinance (EPO, 1983). There is, however, no protection accorded to natural resources in this ordinance and, as yet,



no provincial equivalent of this legislation. However, in May 1993, the Environmental Protection Council established under the EPO met for the first time and agreed to delegate some of its functions to the provinces. A committee has been set up to determine the precise scope of delegation; residuary functions will continue to be vested with Federal Government. It is noted that environment is a "concurrent subject," in accordance with the Constitution of Pakistan, or in other words, both the Federation and the provinces can legislate on it. In case of a conflict of laws however, Federal legislation prevails.

While these developments take place at provincial level, several laws pertaining to industrial, mining and commercial activities are available from the past. Though not intended to mainly improve or sustain natural resources, these laws contain some provisions of relevance to environmental protection and are discussed in detail in OECF (1992), which contains a comprehensive description of environment-related legislation in Pakistan. Another such reference is Federal Environment and Urban Affairs Division (EUAD, 1993), from which a listing of national and NWFP environmental legislation is presented in Appendix 17 to this report.

It is worth reiterating that the administrative procedures and magisterial powers of the civil-service district administration can also be used advantageously (as they have been in India) to protect natural resources. For elected officials, NWFP Local Government Manual contains several areas of importance to the environment. Moreover, in recent years, a case has been developed among lawyers and the judiciary in Pakistan that the law of tort available under the country's civil code might have more potential in the area of environment than has been recognized to date. Possibilities for public-interest litigation under existing laws have also been indicated (and achieved in India under similar legislation).

Other Pakistani legislation relevant to environmental issues of this project are as follows:

- The Land Acquisition Act, 1894 (including later amendments).
- The Antiquities Act, 1975.
- The Forest Act, 1927 and later amendments.
- NWFP Wildlife Protection, Preservation, Conservation and Management Act, 1975.
- The Punjab Wildlife Protection Act, 1974.

- The Local Government Ordinance, 1979 (Section 93 pertaining to environmental pollution).
- The Electricity Act (IX) 1910.
- The Factories Act.
- The Control of Pollution and Preservation of Living Environment, 1983. Ordinance N<sup>o</sup>: XXXVII.
- Environmental Impact Assessment Guidelines, 1987.
- The Soil Reclamation Act (N<sup>o</sup> XXI), 1992 and later amendments.
- The Canal and Drainage Act (N<sup>o</sup> VIII), 1975 and later amendments, acts and ordinances.

## 11.2 Institutions concerned with natural-resource management

The major official institutions active in natural-resource management in NWFP are the Department of Agriculture, the Department of Forestry, Fisheries and Wildlife, and the Department of Irrigation and Power. The Department of Agriculture is responsible for agricultural extension and in-service training, research and in-service training for on-farm water management, civil works and extension in OFWM projects. Through its Fruit and Vegetable Development Board it is responsible for extension and in-service training in horticulture.

The Department of Forestry, Fisheries and Wildlife has two Chief Conservators for forestry (one for territorial and one for social forestry), a Conservator for Wildlife, and a Director for Fisheries. This is a new organizational setup (effective 1993), under which the territorial wing of the Department is responsible for the standing forest, and the social forestry wing for promotional forestry and extension. In-service training in forestry is provided by the Department. The harvesting and marketing of timber, and infrastructure development for forest exploitation is undertaken through the autonomous Forest Development Corporation of NWFP. Although there is no specialist agency for rangeland and pasture development, the subject is included within the Forestry Department's mandate.

Responsibility for agricultural education and research rests with NWFP Agricultural University (which includes a new department for water management). The university manages all the provincial agricultural research institutes and centres, as well as operating an outreach programme for extension. Related train-

ing and education in the natural resources is provided in the various in-service training institutes of the Provincial Departments; the Pakistan Forestry Institute (PFI, a Federal Government institution, which also undertakes forestry research); and the Department of Environmental Planning and Management (DEPM) of the University of Peshawar. Short courses are organized by the Pakistan Academy for Rural Development (a Federal institution).

Provincial policy, co-ordination and the screening of development projects for environmental impact are the responsibilities of the PE&D Department through its Environment Section (established January 1992) and the Environmental Protection Agency (EPA). The Environment Section undertakes four main tasks. The first is the three-year programme to develop the Sarhad<sup>1</sup> Provincial Conservation Strategy (SPCS) with the support and technical assistance of IUCN. This is the first provincial conservation strategy to get underway since the completion of the National Conservation Strategy. Simultaneous with the SPCS preparation, the Section's second main task is to address urgent concerns through the formulation of appropriate pilot projects in support of the SPCS. These projects will feed back into the SPCS. The third main task, which is constrained at present by the lack of expertise, is to subject the development planning process to environmental impact screening. In its initial stages, this task is undertaken by the Chief of the Environment Section in his role as a member of the Provincial Development Working Party. The fourth major task of the Environment Section is to develop provincial environmental legislation.

NWFP's regulatory body for the environment is the Environmental Protection Agency, established in 1989 as a project in the Physical Planning and Housing Department. The EPA has been upgraded into a Directorate of the PE&D Department. Beginning in July 1993, the EPA has been added to the regular budget of the Provincial Government, and is being upgraded to a fully-fledged Attached Department of PE&D. Headed by a Director General reporting to the Secretary, PE&D, the EPA is currently staffed by only two professionals and a few apprentices. It is, however, receiv-

## Institutional framework on biodiversity

*Governmental:* The conservation of biodiversity in NWFP is primarily the responsibility of the Forest, Fisheries and Wildlife Department (Malik, 1990). An independent Wildlife Wing headed by a Conservator of Wildlife runs the affairs of species and protected area management. NWFP is divided into 6 Wildlife Divisions. The Wildlife Wing runs a substantial programme for biodiversity conservation under its Annual Development Programme, including protected area management, captive breeding, and environmental education. Much of the Wing's limited human resources are consumed in the regulation of hunting. More well trained personnel is required for the formulation and execution of the biodiversity conservation programme.

*Non-governmental:* A number of NGOs are addressing biodiversity issues in NWFP. The most active of these is the World Wide Fund for Nature (WWF) Pakistan. The Himalayan Jungle Project (HJP), a joint-venture of Birdlife International, WWF-Pakistan, WPA, NWFP Forest and Wildlife Department and the National Council for Conservation of Wildlife, aims to safeguard the globally outstanding forests and wildlife of the Palas Valley, District Kohistan. HJP is testing an innovative approach, integrating conservation with participatory rural development. IUCN (the World Conservation Union), Pakistan is involved at the policy level in formulation of the Sarhad Provincial Conservation Strategy. IUCN in partnership with NWFP Wildlife Wing is also expected to begin implementation of a GEF-funded project for the sustainable use of wildlife in the northern parts of NWFP during 1994.

## Legislative and policy framework on biodiversity

*National and provincial:* Existing laws do not adequately cover the subject area and are out of date (IUCN, 1993). The legislation has been reviewed by IUCN (1990b). The first legislation of direct relevance to biodiversity conservation in NWFP was the Indian Forest Act 1927, the title of which was subsequently changed to the Pakistan Forest Act, 1927. This controlled hunting and other forms of resource exploitation within areas declared as protected or reserved forests. However, the 1927 Act extended only to the settled areas, which excluded most of the present area of NWFP. Moreover the 1927 Act is not conservation oriented, commercial forestry interests being foremost. Subsequent directives have attempted to bring forests under sound scientific management and included provisions for the creation of national parks to conserve major ecosystems, but were not successful.

Until the passage of NWFP Wildlife (Protection, Preservation, Conservation and Management) Act, 1975, wildlife legalisation provided only for the control of hunting of game species, with no provision for the protection of habitats. The 1975 Act provided, for the first time in the history of NWFP legalisation, for the conservation of habitat (although limited to protected areas) and species other than game species (IUCN, 1990b).

The 1975 Act provides for the establishment of national parks, wildlife sanctuaries and game reserves. A national park is a comparatively large area of outstanding scenic merit and natural interest, wherein the primary objective is to protect the landscape, flora and fauna in its natural state and to which the public are allowed access for purposes of recreation, education and research. A wildlife sanctuary is an area set aside as an undisturbed breeding ground, primarily for the protection of all natural resources, to which public access is prohibited or regulated. A game reserve is an area wherein controlled hunting and shooting is permitted on a permit basis. A private game reserve is an area of private land set aside by its owner for the same purpose as a game reserve.

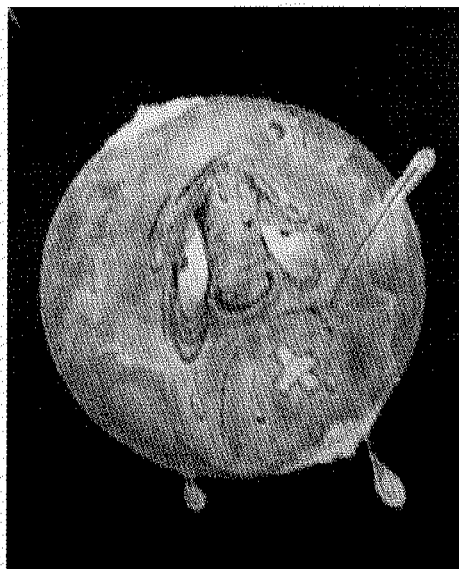
The Pakistan National Conservation Strategy (NCS) was approved as federal government policy in April 1992. NCS has inspired the development of a Sarhad Provincial Conservation Strategy (SPCS) for NWFP. SPCS is a significant step in provincial policy-making and programme formulation in relation to biodiversity conservation.

*International:* Pakistan is a signatory to the Convention on Biological Diversity and is expected to ratify it during 1994. This will have significant implications for NWFP, as national and provincial legislation, policies and programmes will need to be brought in line with the requirements of the convention.

Pakistan is a signatory to the Convention Concerning the Protection of World Cultural and Natural Heritage (World Heritage Convention) and the Convention on Wetlands of International Importance. Especially as Waterfowl Habitat (Ramsar Convention), the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) and the Convention of International Trade in Endangered Species (CITES). In addition, Pakistan is a member of the World Conservation Union (IUCN) and the International Waterfowl and Wetland Research Bureau (IWRB).

No natural sites have been inscribed in NWFP to date under the World Heritage Convention. Ramsar sites in NWFP are listed under Protected Areas in Appendix 7. Pakistan participates in the UNESCO Man and Biosphere Programme, but no biosphere reserves have been notified in NWFP.

**Help!..** Poster hanging in the office of the Environmental Protection Agency (EPA) in Peshawar



The green future seen by children



ing support under a six-year, World Bank-assisted institutional strengthening project, to:

- (i) increase its technical capacity for research and environmental quality monitoring, and
- (ii) increase the manpower of the agency.

Environmental research and testing facilities exist at least on thirteen locations in and around Peshawar. Appendix 2 of this report lists these facilities, the availability and conditions of relevant equipment, and the qualifications, experience and level of available technical manpower.

A large number of Federal Government organizations based outside the Province also have a bearing on its environmental management. The most senior is the Pakistan Environmental Protection Agency, established under the 1983 Pakistan Environmental Protection Ordinance for developing and monitoring environmental standards, and developing environmental legislation and appropriate co-ordination. The Pakistan Agricultural Research Council is responsible for co-ordinating national research endeavour in agriculture, including the development and recommendation of new varieties; it also collects and stores germ plasm from throughout the country, and conducts research on rangeland development, water management, farm machinery, etc. Agricultural research is also carried out by the Pakistan Atomic Energy Commission.

The development of irrigation and power infrastructure, and projects for the control of waterlogging and salinity involve the autonomous Water and Power Development Authority (WAPDA), shared by the provincial Irrigation Department. Research on irrigation and drainage, and on energy conservation, is the responsibility of the Federal Ministry for Water and Power. For power, NWFP has established its own Sarhad Hydel Development Organization (SHYDO) which aims to develop hydroelectric power in the Province. In addition, a large number of environment-related research institutes are affiliated with the Federal Ministry for Science and Technology. Survey and monitoring organizations include the Soil Survey of Pakistan, the Geological Survey, the Meteorological Department, and SUPARCO

(the Pakistan Space and Upper Atmospheric Research Commission).

Several non-governmental organizations are also active in promoting natural resource management and environmental conservation. Among these, the largest ones working directly with villagers, are the Aga Khan Rural Support Programme in Chitral and the Sarhad Rural Support Corporation in Kohat and Charsadda Districts. Several smaller NGOs are also active, some working with rural communities, and others on environmental awareness aspects. The IUCN provides networking and documentation support upon request. It also provides technical support to the Environment Unit of PE&D in preparation of the Sarhad Provincial Conservation Strategy (SPCS).

### 11.3 Analysis of institutional and legal framework

Among the provinces of Pakistan, NWFP is unique in its capacity to pursue sustainable development. Its position benefits greatly from NWFP Government's early and increasing commitment to environmental issues (it is the first province to initiate a conservation strategy) and a history of progress in community participation (there are participatory projects in most districts of the Province).

There are, however, several fundamental weaknesses which NWFP shares with the rest of the country, including the following: the education system is grossly inadequate, both in coverage and in quality; the relevant laws were devised with the aim of protecting resources for the benefit of the state, to the exclusion of the people; the bureaucracy is oriented towards exercising top-down control over the population, rather than engaging it in planning and delivering development; extension and support systems reach only a fraction of the population, and the official system of development administration remains detached from the grassroots; the institutions, personnel, plans, procedures, laws and enforcement mechanisms that affect the environment are new, or only in their formative stages; the citizenry (including the NGO community), though concerned about the environment, is unable to mount organ-

ized and sustained initiatives; the media and intelligentsia have yet to develop a focus or popular positions on local (including environmental) issues; local government itself is underdeveloped, and without adequate technical capacity, financial authority or public accountability; and the relationship between state and society in general lacks trust and confidence.

Given these systematic weaknesses, progress is further retarded when the environment is seen as an official rather than a social mandate: When conservation strategies (national and provincial), legislation, restrictions, incentive systems, planning and development in general, are devolved from the "top" of a government to the "bottom" of society, and when no effective mechanisms exist for Government to develop the agenda for sustainable development in partnership with local communities and the private sector, the result is an abdication of responsibility at all levels. For example, during the ten years since the formulation of the EPO in 1983, Federal and provincial agencies waited for the national leadership to endorse the EPO and "delegate" responsibilities to the provinces; and they waited since 1986 for the completion of the NCS, which was effected in 1992 with formal approval of the Federal Cabinet. Now provincial agencies, local governments and NGOs await the completion of the provincial strategy, provincial legislation and provincial institution building, and the availability of donor support once these preconditions are fulfilled. The private sector is also content to wait-and-see as long as actions are pending from official agencies and citizens' groups.

Given the pervasive removal of responsibility within society, progress is bound to be slow, selective and uncertain, unless broad-based initiatives are developed now, with responsibility for all involved. This is a challenge for all, including the Government of NWFP, its supporting donors, NGOs and other independent groups, the mass media, local governments and local communities. Meeting this challenge will require all these actors to move in unfamiliar directions, define new institutional roles, open up the processes of decision making, and take on new partners in policy, planning and implementation. Although progress on the ground is yet to be

seen, NWFP offers the prospect of positive movement toward meeting this challenge, more than other provinces.

### 11.4 Monitoring the environment

Effective monitoring of the environment depends on the legislative and institutional framework available for effective policy formulation and enforcement. This process was initiated in Pakistan in the early 1980s. A number of laws have been enacted by the Government of Pakistan to regulate the public practice regarding land use, water use, land reclamation and drainage, forestry, wildlife, archaeological and historical properties, public health, energy, etc. However, the milestone of Pakistani environmental law and regulation came about with the announcement of Ordinance N<sup>o</sup> XXXVII 'Control of Pollution and Preservation of Living Environment', which was enacted in December 1983. This was made effective from February 1984 with the establishment of the Pakistan Environmental Protection Council (PEPC) and the Pakistan Environmental Protection Agency (PEPA). The PEPC is a policy-making body, while PEPA has the responsibility for establishing environmental quality standards, and implementing and enforcing the Ordinance. Provincial Environmental Protection Agencies have also been established to assist the PEPA. An EPA has been established in Peshawar for monitoring in NWFP since 1987.

The Ordinance requires the preparation of an environmental impact statement for projects of significant size or projects likely to have significant environmental impact. For the preparation of such a document, the Government of Pakistan published its Environmental Impact Assessment Guidelines in 1986, covering various project fields, including dams and reservoirs, and the development of energy resources. The Government of Pakistan has issued a standard proforma questionnaire for the preparation of environmental-impact statements. These statements are compiled by WAPDA and reviewed by PEPA, which will recommend to the Government of Pakistan whether the project should be allowed to proceed.

<sup>1</sup> "Sarhad," literally "frontier," is a local term for NWFP.

## 12. TOWARDS A MORE EFFECTIVE ENVIRONMENTAL MANAGEMENT

### 12.1 Introduction

Although a new focus of attention, environmental management, is a field of policy that is rapidly gaining recognition and popularity in North-West Frontier Province (NWFP). As outlined in previous chapters, the Government of NWFP has started to formulate the Sarhad Provincial Conservation Strategy (SPCS), which should result in a comprehensive policy for managing the environment in NWFP. Organizations responsible for initiating proper environmental management have been created and/or strengthened. In addition to existing projects, donor organizations are actively involved in formulating environmental studies and identifying projects that should contribute to the improvement of environmental management.

The analysis of the state of the environment in NWFP, presented in this Environmental Profile, shows that substantial environmental problems exist. These problems will influence the economic and social development of NWFP, both on the short and long-term. This chapter examines what needs to be done in NWFP to ensure that economic and social development efforts are in accordance with environment conditions.

### 12.2 Strengths and weaknesses of present environmental management in NWFP

The present quality and intensity of environmental management in NWFP are strongly influenced by the fact that environment has only recently been acknowledged as a comprehensive policy area, extending beyond a sectorial interpretation of the environment. As expected, environmental management is currently strongest in those sectors where strong (governmental) management capacities traditionally existed and still exist, and where donor support has been focused. For NWFP, this has resulted in a situation in which natural-

resource management is accorded a much greater priority than the management of the urban environment.

As in many other countries, environmental management in NWFP has been aimed more at rehabilitating environmental degradation than at preventing it. Initiatives in the latter category can mostly be found in social forestry and watershed management programmes, and are, to a large extent, joint activities with donor organizations. Environmental management strategies, which deal with prevention or rehabilitation of air, water and soil pollution are completely lacking until now. Discussions with donor organizations to meet these demands have started only recently<sup>1</sup>.

The development of an effective and strong environmental management is hampered by the lack of strong organizations in the field of environment in NWFP. On the government side, there are two organizations with an exclusive environmental mandate: the Environment Section of the Planning, Development and Environment Department (PE&D) and the Environmental Protection Agency (EPA) which belongs to the same department. Both organizations are relatively new and still trying to establish their position in provincial and national bureaucracy. The Government of NWFP (GoNWFP) has, with the assistance of donor organizations, started projects that should lead to the strengthening of these two essential organizations.

It is increasingly acknowledged in relevant academic and donor circles that sound and effective environmental management depends on the availability of a strong environmental institutional capacity<sup>2</sup>. The development of the required capacity should be understood to be an ongoing process that is location and culture-specific. This implies that environmental problems cannot be solved (only) by applying technical solutions, which have been introduced from the outside. Development of Capacity in the Environment should, among other things, be process oriented; strengthen institutional pluralism; be owned by the local society, in this case NWFP.

Any attempts to improve the quality of environmental management in NWFP should focus on two important present weaknesses in environmental manage-



ment. To achieve improvements it is essential that the domination of the present (limited) Capacity in Environment by governmental organizations is changed. Successful environmental management depends on the appropriate distribution of environmental management functions over different types of organizations. Until now, both non-governmental organizations (NGOs) and the private sector have played a very limited role in environmental management in NWFP. This reflects the general weak role, which NGOs play in development in NWFP. In recent years, influenced by donor organizations and the achievements of especially the Aga Khan Rural Support Programme and the International Union for Conservation of Nature and Natural Resources (IUCN), the opinions and attitudes of the Government of Pakistan (GoP) and GoNWFP regarding the potential role of NGOs, have changed in a positive manner. However, this has not yet led to a significant permanent role for NGOs and other community-based groups in design and execution of environmental management functions. The same can be said of the private sector. Until now, the private sector, represented by organizations like chambers of commerce, has not been involved in a substantial manner in the debate on improved environmental management. A promising initiative, the establishment of round tables, in which industry was to be one of the partners, seems to have stalled. The second weakness to be addressed is the limited Capacity in the Environment at the local level in NWFP. This concerns the divisional, district and Union Council level. Appropriate and effective management of natural re-

sources needs a strong partnership of all relevant stakeholders, situated at the level where the problems are situated: the village or watershed. This weakness in Capacity in Environment, also, reflects a more general situation in NWFP. The majority of governmental departments and their services are strongly centralized in their structure and decision making. Joint projects of the GoNWFP and donor organizations, however, have made a start with overcoming this deficiency. These projects, especially in the field of social forestry, have contributed to the strengthening of local capacity, while, at the same time, successful attempts have been made to broaden the capacity through the establishment of Village Development Committees (VDCs) or other forms of community-based initiatives. These groups have played an important role in raising awareness at village level. Also, the projects' dissemination activities have benefited greatly from the existence of these VDCs. The sustainability of the approach developed by these projects is, however, still unproven. The dependence of the concerned GoNWFP line departments; the counterpart organizations on donor funding and expertise is still considerable.

### 12.3 The long-term vision for environmental management in NWFP

Through the adoption of the National Conservation Strategy (NCS), the Government of Pakistan has committed itself to reorienting its development efforts towards sustainable development. As expressed in the NCS, this is a long-

term process that will require a fundamental reorientation in attitudes, institutional structures and policies of a large number of actors.

A four-component action plan has been prepared, on which the implementation of the NCS should be based. The areas covered in this plan are:

- Strengthening of institutions, in particular technical, regulatory and participatory institutions
- Creation of a supportive framework or regulations and economic incentives
- Formulation of a broad-based communications campaign for mass awareness
- Implementation of projects in NCS priority areas.

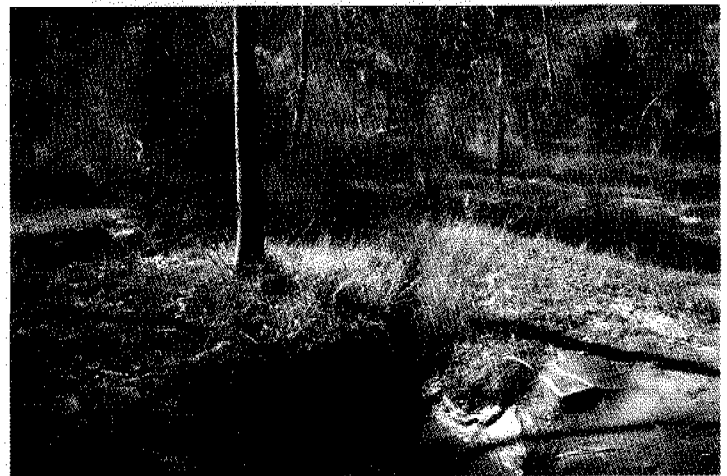
More detailed long-term goals for environmental management in Pakistan have been clearly described in the NCS and the numerous background documents produced for the NCS and other, sectoral, policy papers, like e.g. Forestry Sector Master Plan and Household Energy Strategy Study.

The Government of NWFP has put its weight behind the directions formulated in the NCS. Through its decision to start formulating the SPCS, it has expressed its willingness to start on what will be a long but worthwhile road towards sustainable development.

### 12.4 Short-term goals for environmental management in NWFP

In its plans for the SPCS, GoNWFP has indicated that the SPCS formulation process is to be more action-oriented

*Grasses and trees protect the hills from erosion and keep them productive*



than the NCS was for much of its life. Policy formulation is to be linked to implementing pilot projects. Twelve priority areas have been identified under the SPCS: environmental legislation; business-government round table; Kabul river clean up; urban waste; cleaner air programme; sustainable agriculture; community development; cultural heritage; forests, watersheds, grazing lands, fisheries and wildlife; population; clean drinking water; and education and communication.

GoNWFP is justified in its criticism of the general (policy) character of the NCS. However, considering the strong bias that exists in development planning in Pakistan to use projects as the main implementation method, GoNWFP's decision to link the SPCS policy-formulation component to the implementation of pilot projects, increases the risk that the process approach, which was the strong point of the NCS, will be jeopardized.

The recommended direction for the SPCS, and other environment management-oriented policies, can be summarized in a series of short-term (3-5 years) goals. These can be divided into five categories: research; training; policy formulation; policies; and policy instruments.

***i) An appropriate network of environmental research organizations is in place in NWFP which have started to generate data relevant for policy makers***

Successful environmental management in NWFP depends to a large extent on the availability of reliable information on the character and intensity of processes of environmental degradation as well as

the basic functioning of the environment in NWFP. In the development and use of the required research capacity the following points should be considered:

- a comprehensive research agenda should be formulated specifying the types and amounts of environment-related research to be conducted in the (near) future;

- the present unclarity about the division of responsibilities between Federal and provincial levels for conducting environmental research should be clarified. Within the responsibilities agreed upon for the provincial level, a further division of responsibilities over the main (governmental and private) organizations conducting research in NWFP should be agreed upon. This consensus should be the basis for possible investment plans, additional recruitment and training.

- ongoing and planned research should be co-ordinated. Donor organizations who fund a large part of the research, have a special responsibility in this context.

- more attention should be given to improving the accessibility of existing and additionally collected information; a resource centre has to be established which would be responsible for collecting all relevant information. Organizations that could host such a focal point are EPA, IUCN or Environmental Planning and Management Department (EPMD).

- more attention should be given to improving the translation of (technical) research into policies. Today, large amounts of research work are conducted in isolation from policy mak-

ers, who could greatly benefit from such research.

- decisions on the supply of additional research equipment should only be taken after an analysis of the use rate of existing and already committed equipment.

- to increase the efficiency of environmental research, the possibilities for privatizing environmental research should be actively looked into. Privatization can have a positive impact on especially the continuity of skills and knowledge.

***ii) A structure is in place in which different training initiatives are integrated that produce environmental professionals in accordance with demand***

Training of environmental professionals will be an important activity in the coming years in NWFP. The success and relevance of training will increase through observing the following considerations:

- target groups for training can be defined as: 1) high and mid-level staff in line departments both at provincial and local level; 2) political decision-makers; 3) influential figures in the private sector (industry, transport, agriculture, forestry, etc.); 4) leading persons and members of NGOs and community-based organizations (CBOs); 5) media.

- a needs assessment of the number and types of environmental professionals required in the (near) future should be compiled, taking into account the capacity and quality of present and planned training initiatives.

- a division of responsibilities should be drawn up between the various

*Controlled grazing with herds keep the grasses on the hillsides healthy*



organizations involved in training environmental professionals.

- here is a strong lack of a cadre that could provide the training in NWFP. Under the present structure and plans, it is intended that EPA, NWFP will be responsible for training. It should be expected that external assistance will be required for building the training capacity and in the first few years to assist in carrying out training activities. Active attempts should be made to use other training facilities in Pakistan, e.g. the Sustainable Development Policy Institute (SDPI) in Islamabad.

- training is required in: recognizing environmental problems; determining the impact of environmental problems; developing alternative solutions to overcome environmental problems; implementing environmental strategies.

- organizations should be created to enable conditions to absorb environmental professionals in governmental, NGOs and the private sector.

### **iii) Environmental policies and management procedures are formulated in a broad-based participatory fashion**

One of the strengths of the NCS was the process approach. Over 3000 individuals, representing a broad array of governmental, non governmental, private sector and media organizations, were involved in the formulation of the NCS through workshops, seminars, discussion papers. This process orientation has succeeded in prompting a broad-based discussion of Environment and Development. The continuation and intensification of this broad-based discussion at provincial and local levels must be regarded as the highest priority for all groups involved in the process of sustainable development. Lasting improvements in Environmental Management in NWFP will only be possible if there is broad-based support. The Sarhad Provincial Conservation Strategy offers excellent opportunities to facilitate this discussion. Donor organizations should make every effort to contribute to, and take part in this consultation process. To ensure that participation by different stakeholders (important affected groups

and persons) will be institutionalized, it is proposed that:

- appropriate forums will be created where environmental stakeholders meet to discuss and plan. There is a need for a general forum whose main task would be to ascertain that general environmental goals are in harmony with general developmental goals. This also includes the reconciliation of sectorial policies into a comprehensive environmental management strategy. Required administrative backup can be derived from the SPCS/IUCN unit.

- additional sectoral forums are formed in the following sectors: agriculture; forestry and watershed management; industry and energy; traffic; urban development. Members will be drawn from the provincial and local level in NWFP, as well as from the Federal level. Recruitment of members should not be limited to the governmental sector. Regarding the impact of donor activities, it should be considered whether to involve Chief Technical Advisers from relevant projects and their direct counterparts. Tasks for these sectorial forums would be to determine the research agenda; make recommendations for priority areas where foreign support is needed; judge existing legislation and propose directions for modification where required; formulate training strategy based on needs assessment; monitor relevant developments in the sector concerned.

### **iv) Comprehensive environmental management strategy for NWFP is available, as well as sectoral and regional policies which reflect a balance between the need to act and the capacity available to act**

Overall developmental goals for NWFP oriented at sustainable development, have to be elaborated. On the basis of these agreed overall goals, the SPCS/IUCN unit should formulate sectoral and regional policies and oversee their implementation. Policy formulation should take the following into account for the individual sectors:

*forestry and watershed management*  
Considerable experience has been gained with social forestry and watershed management practises. The regional coverage of NWFP with these

appropriate approaches is not complete and should be extended further. Forestry policy should address how local NWFP (governmental and non-governmental) organizations can adopt the approaches developed in such a manner that full regional coverage is achieved and that the quality is maintained.

#### *agriculture*

Environmental problems in agriculture are related to water management (waterlogging), and soil and water pollution in the irrigated areas. In barani areas, the main problems are declining soil fertility and erosion. Considerable experience exists with the implementation of projects to overcome waterlogging problems in the irrigated areas. The approach followed is costly and has a strong technical bias. Policies in this field should concentrate on involving the target group to a larger extent that should lead to better water and land management techniques. Possible soil and water pollution as a consequence of fertilizer, pesticide and herbicide use still requires considerable study.

#### *industry*

The first steps to be taken in this field should be to consolidate existing information and strengthen ongoing information collection, whereby especially regional coverage should be observed. The economic viability of future technologies should be studied in conjunction with setting up a system of incentives or disincentives (subsidies, taxes, fines, etc.) for industry. In the years to come, financial-resource mobilization and enforcement of environmental standards will be two key areas in the field of industry-related environmental pollution. To demonstrate the viability of effective pollution control, pilot projects should be carried out, whereby the emphasis is not only placed on demonstrating the technical viability, but especially on the financial viability (from the perspective of the industry) as well.

#### *transport*

A very large part of air pollution in urban centres in NWFP is believed to be caused by traffic. Considering the importance of the environmental problems caused by transport, there is a need for a dual approach. First, as in the case of industry, there is a need to strengthen and expand the ongoing data collection

to obtain a comprehensive overview of the types and sizes of environmental impacts. Structural solutions like introducing lead-free petrol, or improving public transport, will take at least five years. In the meantime, smaller pilot activities should be planned and implemented to assess their potential contribution towards solving the problems.

#### *urban development*

Priorities in urban development should be increased with sewerage system coverage; sewage treatment; improved solid-waste collection; improved coverage with clean drinking water. Technologies in this field are fairly well-developed and proven. Financing improved services is a problem due to the limited revenue generation. Increased community involvement is essential. This will require an extensive overhaul of the local governmental organizations (Municipal Councils).

#### *population*

Population growth is acknowledged to be closely interrelated with environmental degradation. The effectiveness of population-control programmes in NWFP has been limited. The emphasis in the years to come should focus on building the required support for population-control programmes, and to put in place the infrastructure required, as well as implementing pilot programmes required for future large-scale programmes.

#### *biodiversity*

Protection of the biodiversity in NWFP will depend on a stricter adherence to Environmental Impact Assessment (EIA) procedures. Considering the weak capacity that exists today, it is recommended that GoNWFP select a number of priority areas, both in terms of areas and types of ecosystems and species. In addition, awareness-increasing activities should be intensified to convince the (local) population of the economic and cultural importance of biodiversity. The pilot projects of the World Wildlife Fund (WWF), which combine tourism, hunting and a sustained use of fragile ecosystems, need to be continued and expanded.

#### **v) environmental policy instruments which are suitable for and effective**

#### ***in NWFP context have been developed and tested***

The success and effectiveness of environmental management policies will depend on the availability of effective policy instruments. The development of environmental policy instruments in NWFP has met with mixed results.

Attention needs to be given to the following:

- EIA procedures should be reviewed, both on the donor and Pakistani side to ensure sufficient attention is paid to preventing potential environmental damage in the early phase of planning new projects.
- available environmental legislation should be reviewed and most probably changed. Environmental policy should be formulated in such a manner that it is in line with the expected capacity for enforcement, while at the same time legislation should address the existing environmental-problems. This will require a modification in the National Environmental Quality Standards (NEQS). The adopted NEQS relate only to the quality of air and water. There is a further need to address legislation and standards concerned with the management of natural resources.
- effective enforcement of environmental legislation will depend on the availability of a well-defined system of penalties and fines. Considerable work will be required on this in the next years.
- the development of economic policy instruments to regulate environmental behaviour of the main economic actors. The limited proven successes with economic policy instruments (incentives and disincentives) in NWFP to date, call for a careful approach. Economic policy instruments should be aimed at both the formal and informal economic sectors.
- the present tendency of conducting environmental awareness-raising campaigns in an unfocused manner should be reconsidered. It is recommended to look more clearly at what target group should receive which message. Careful monitoring is therefore required.

## **12.5 Strategies and options to improve environmental management in NWFP**

Economic growth and environmental protection are two processes that are strongly related. A lack of economic growth in NWFP will make it difficult to finance environmental-protection activities. At the same time, economic growth is also responsible for an increase in processes like air pollution. In its plans for the future, GoNWFP should find ways to satisfy all concerned parties. Sustainable Development in NWFP requires economic growth and social development that is carried out in an environmentally sustainable manner.

Successful development of Capacity in the Environment, in NWFP, to support attempts to improve environmental management will require a strong commitment, both from the sides of the GoNWFP and the main donor organizations; the two most important actors in the development process in NWFP.

With the emergence of new institutions, policies and programmes for the environment, there is a need for thoughtful assignment of institutional roles. Which functions belong to the government, which to the NGOs, and which can be addressed by the private sector? Traditional roles need reiteration as well as review within Government.

The role of the new Environment Section in PE&D should be developed in line with that of the policy-oriented PE&D, rather than the implementation-oriented line departments, which are responsible for project planning and execution. Today, the planning and co-ordination function of PE&D, as elsewhere in the Pakistan's planning system, revolve essentially around capital budgeting. Because capital budgets depend overwhelmingly on donor assistance, policy making and development strategies, by default, have become a largely donor-driven phenomenon, sometimes implicit in project design, and sometimes explicit in conditionalities. PE&D in general, and its Environment Section in particular can and should play a facilitating role in bringing policy making and development strategy into the public



domain, where they belong. This would entail facilitating the preparation of option papers, position papers, and the like, but also the establishment of institutionalized arrangements as recommended before (Round tables, forums, etc.) to ensure an ongoing dialogue with legislators, private sector, elected local bodies, NGOs, other interest groups, ordinary citizens and donor organizations.

NWFP EPA should develop as a regulatory agency. Its mandate would revolve around environmental screening, impact assessments and environmental audits, supported by environmental quality monitoring, some applied research, and selective mass awareness campaigns. As a keeper of the public interest in the environment, the EPA is, at this early stage of its life, well-placed within the PE&D Department, outside

the administrative control of line agencies whose environmental impact it will need to question from time to time in the public interest. Eventually, it could become an independent Government department, or more ambitiously, it could be re-oriented as a public-private partnership for regulating the environment, with institutionalized functional links to local environmental groups and local government in all parts of the Province.

Donor organizations have played a significant role in the development process in NWFP. The contribution of these organizations has been in the form of finance; the largest part of the Annual Development Budget in NWFP is donor-funded. As important as the financial contribution has been the input of ideas and new developmental concepts in NWFP, e.g. social forestry.

The present and planned involvement of donor organizations in environmental projects must continue for a considerable number of years. The projects aimed at assisting the Environment Section in the formulation of the SPCS (Swiss-funded) and the Environmental Protection and Resource Conservation Project (World Bank-funded) which, amongst others, has a significant institutional development component, are of great importance. One of the challenges to be met by GoNWFP will be to coordinate other donor-funded sectorial development projects in such a manner that a clear link is established between these projects and the contents of the SPCS. Donor organizations should take a more active approach towards coordinating their activities amongst themselves and with both Pakistani governmental and non-governmental groups.

### Suggested priorities for the conservation of biodiversity in NWFP

#### **Legislation and policy**

*Review and revise legislation for the conservation of biodiversity to complement work at the national level and fill gaps at the provincial level. In particular, to provide an appropriate legal framework for protected area designation and management, integrated resource management and community participation, and to accord legitimacy to customary (as opposed to statutory) legal policy instruments.*

*Develop provincial policies on biodiversity conservation. There are relatively few formally adopted environmental policies in NWFP. These are needed to provide additional levels of detail and interpretation to the environmental legal framework.*

*Develop a portfolio of incentives for biodiversity conservation. These might include integration with development, subsidies, tax relief, recognition of ownership rights, technical advice and information, insurance, research grants, loans, marketing facilities, concessions on resources - all of which are aimed at empowerment of local communities.*

#### **Institutional strengthening and re-orientation**

*Strengthen the capacity of line agencies (including forestry, fisheries, wildlife and agriculture departments) where necessary to deliver their respective mandates for biodiversity conservation. In particular: revise the structure of the Forest Department to provide for a greater mandate for wildlife and protected areas programmes; reorientate line agencies to facilitate community participation and reduce the current emphasis on regulation; develop a*

*biodiversity monitoring and data-handling capacity in the wildlife department.*

#### **Biodiversity conservation study, strategy and action plan**

*Prepare a NWFP Biodiversity Study, and NWFP Biodiversity Strategy and an NWFP Biodiversity Action Plan to meet provincial and national needs and global obligations under the NCS and Biodiversity Convention. The Study will describe and analyse in an objective-led way all aspects of biodiversity at the provincial level, within its national and global context. The Strategy should outline provincial policies, instruments and mechanisms for biodiversity conservation. The Action Plan should specify a schedule of activities according to objectively identified priorities.*

#### **Protected area planning and development**

*Conduct protected area systems review of NWFP: to identify and designate the most important representative areas that need protection; to complete the protected area network to ensure it represents samples of all ecosystems; to make the existing network viable by enlargement of individual protected areas and the creation of corridors between them; to integrate protected areas into the larger planning framework. Avoid imposition of protected areas - it can be counterproductive.*

*Implement the Action Programme for the Conservation of Wetlands in South and West Asia (Anon, 1992) as it relates to NWFP.*

#### **Recovery plans for threatened species**

*Develop recovery plans for threatened species in NWFP. This requires systematic determination of status. Aim to manage threats rather than regulate. Give priority to*

*in situ over ex situ measures wherever possible.*

#### **Community participation**

*Recognize and act upon the imperative of local participation. Develop public involvement policies and mechanisms for relevant departments, and train staff and managers, to ensure village-level involvement.*

*Develop an enabling environment for the development of NGO programmes for the conservation of biodiversity in NWFP.*

#### **Integration of conservation and development**

*Initiate and extend participatory, integrated resource management projects in priority bioregions. This will include developing line agency and NGO capacities to implement participatory projects; the use of PRA and other techniques to facilitate meaningful participation; the design of appropriate incentives for community participation; conflict resolution and the mediation of conservation 'covenant'; reconciliation of customary and statutory systems of resource ownership and management.*

*Integrate biodiversity conservation considerations into other sectorial policies and programmes.*

#### **Conservation of genetic resources**

*Develop programmes for the conservation of crop and livestock genetic resources.*

#### **Environmental education**

*Develop environmental education programmes and materials with specific local relevance to NWFP. These should take as a starting point the environmental knowledge existing within the community, rather than seeking to impose modern systems of knowledge.*

This should result in a more structured and intense dialogue between donor organizations and GoNWFP and other relevant groups in NWFP.

NWFP's leadership in promoting community participation in the 1980s has resulted in a large and diverse number of community-based development organizations. The existence of these organizations puts NWFP in a privileged position; the success of improved environmental management will depend on effective partnerships between government and community at the local level. After the emphasis on establishing the organizations in the 1980s, the emphasis in the 1990s should be on consolidation. Special attention should be given to ensuring the financial, technical and managerial sustainability of these organizations. This will require a reassessment of the role of the Local Gov-

ernment and Rural Development Department. Possible links with the Serhad Rural Support Corporation (SRSC) and National Rural Support Programme (NRSP) need to be explored further.

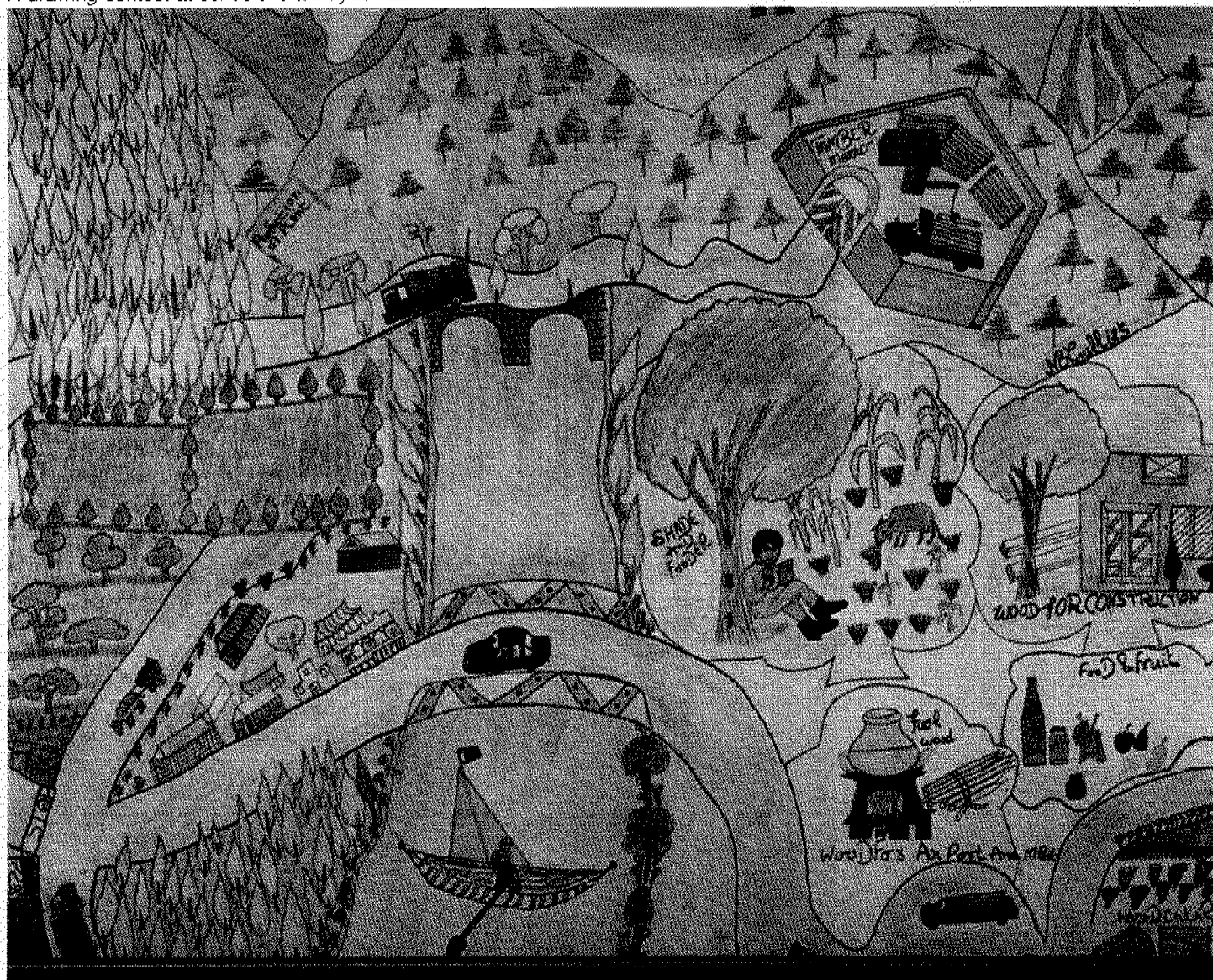
Finally, the success of improving environmental management in NWFP will depend on the financial scope that exists for strengthening the capacity in the environment, carrying out environment-oriented research, and implementing environment-oriented projects. The majority of environment-related activities are currently funded through line departments as part of the normal sectorial budgets. No special budget titles have been created to fund environment-oriented implementation activities. To ensure the sustainability of present and future activities, it will be necessary to increase the share of funding through the Recurrent Budget. Another need is

to review plans for increased revenue generation through raised user fees for services. If GoNWFP is sincere in its attempts to involve the community in the formulation and implementation of environmental policies and programmes, it should avoid the one-sided increase of user fees with the aim to cover the Government's financial shortfalls, without improving the quality of services substantially.

<sup>1</sup> GoNWFP has approached the German government for support for its Clean-Air Programme. The German Government has expressed a willingness to consider the request.

<sup>2</sup> In a task force on Capacity Development in the Environment formed by the OECD/DAC, Capacity in the Environment was defined as: "the ability of individuals, groups, organisations and institutions in a given context to address environmental issues as a part of a range of efforts to achieve sustainable development".

*A drawing contest at schools is a way to raise environmental awareness*



## LIST OF ABBREVIATIONS

AC	Assistant Commissioner		Industrial Research
BOD	Biological Oxygen Demand	PE&D	Planning, Environment & Development Department
CBO	Community-Based Organization		
CCA	Culturable Command Area	SPCS	Sarhad Provincial Conservation Strategy
CIDA	Canadian International Development Agency	PEPA	Pakistan Environmental Protection Agency
CMR	Child Mortality Rate	PEPC	Pakistan Environmental Protection Council
CNRM	Commission for Natural Resources Management	PEPF	Pakistan Environmental Protection Foundation
CO	Carbon monoxide	PFI	Pakistan Forestry Institute
COD	Chemical Oxygen Demand	PMC	Peshawar Municipal Corporation
DC	Deputy Commissioner	PMU	Project Management Unit
DEPM	Department of Environmental Planning and Management	ppm	parts per million
EC	Electrical Conductivity	PUDB	Provincial Urban Development Board
EIA	Environmental Impact Assessment	SCARP	Salinity Control and Reclamation Project
EPC	Environmental Protection Council	SDPI	Sustainable Development Policy Institute
EPMD	Environmental Planning and Management Department	SHYDO	Sarhad Hydel Development Organization
EPO	Environmental Protection Ordinance	SO <sub>2</sub>	Sulphur dioxide
ESSA	Environmental and Social Soundness Analysis	sq. km	square kilometre
EUAD	Federal Environment and Urban Affairs Division	SSOP	Soil Survey of Pakistan
FATA	Federally Administered Tribal Areas	SUPARCO	Pakistan Space and Upper Atmospheric Research
FVDB	Fruit and Vegetable Development Board	TDS	Total Dissolved Solids
FSMP	Forestry Sector Master Plan	TEMU	Traffic Engineering and Management Unit
FYP	Five Year Plan	VDC	Village Development Committee
GoNFWP	Government of NWFP	WAPDA	Water and Power Development Authority
GOP	Government of Pakistan	WWF	World Wildlife Fund
GRP	Gross Regional Products		
GTZ	German Agency for Technical Cooperation		
ha-m	hectare-metre (10 000 m <sup>2</sup> )		
HESS	House hold Energy Strategy Study		
IMR	Infant Mortality Rate		
IUCN	International Union for Conservation of Nature and Natural Resources		
LF	Labour Force		
LG&RD	Local Government and Rural Development Department		
m	metre		
MAF	Ministry of Agriculture and Forestry		
mg/l	milligram per litre		
mha	million hectares		
mha-m	million hectare-metre		
NCS	National Conservation Strategy		
NEQS	National Environmental Quality Standards		
NGO	Non-Governmental Organization		
NO	nitrogen oxide		
NO <sub>2</sub>	nitrogen dioxide		
NOX	total nitrogen oxides, equal to the sum of NO + NO <sub>2</sub>		
NWFP	North West Frontier Province		
O <sub>3</sub>	Ozone		
°C	degrees celcius		
PAH	polycyclic aromatic hydrocarbons		
PARC	Pakistan Agricultural Research Council		
PATA	Provincially Administered Tribal Areas		
PCSIR	Pakistan Council for Scientific and		

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## Colophon

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### *Implemented by:*

DHV Consultants BV  
Laan 1914, No.35  
Tel: + 31-33682500  
P.O. Box 1399  
3800 BJ Amersfoort  
The Netherlands  
Fax: +31-33682601  
Tlx: 79348 dhv nl

EDC (Pvt.) Limited  
Enterprise & Development  
74 Khayaban-e-Iqbal, F-8/2  
P.O. Box 2389  
Islamabad, Pakistan  
Tel: (92-51) 255823  
Fax: (92-51) 254024  
Tlx: 5811 NAIBA PK

### *Editors*

Dr. Ir. Albert van Dijk  
Ms Maliha H. Hussein

### *English proofreading:*

A. S. Broad

### *Environmental Profile Team:*

L.T.M. Hermans, MSc  
Dr. T. Husain  
Ms M.H. Hussein  
Dr. G.M. Khattak  
Ms S. Malik  
Ms S. Mehmud  
N. Murtaza, MSc  
Dr. Nasir Ud Din  
Dr. S.A. Qutab  
Ms H. Rais  
Dr. Ir. A. van Dijk  
Ms L. Vels, MSc  
Dr. Zahur Alam

### *Reference Team:*

R. Beck, MSc  
G. Duke, MSc  
C. Huizinga, MSc  
Dr. M. Isa  
S. Mehmood, MSc  
S.A. Naveed, MSc  
J. Nieuwenhuis, MSc  
Dr. B. Qureshi  
M. Rafiq, MSc  
Ms Reehana Raza  
Dr. R. Roohi

### *Photographs:*

H.J. Achterberg  
A. van Dijk  
G. Duke  
L.T.M. Hermans  
A. Schoemaker  
Social Forestry Project Malakand-Dir  
World Wild Fund For Nature

### *Maps, graphs, diagrams and layout:*

J.G. de Kruijff  
Mustafa Yaman

### *Other contributors:*

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