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Abbreviations and Acronyms

ABAD	Agency for Barani Areas Development
ADB	Asian Development Bank
ADF	Air Dry Forage
ADP	Annual Development Programme
AJK	Azad State of Jammu & Kashmir
AKLASC	Azad Kashmir Logging and Saw Milling Corporation
AMSL	Above Mean Sea Level
AZRI	Arid Zone Research Center
BCM	Billion Cubic Meters
BTAP	Billion Trees Afforestation Project
CCF	Chief Conservator of Forests
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CF	Conservator of Forests
CO ₂	Carbon Dioxide
CPEC	China Pakistan Economic Corridor
D.I. Khan	Dera Ismail Khan
DFO	Divisional Forest Officer
DM	Dry Matter
DRR	Disaster Risk Reduction
EAD	Economic Affairs Division
EU	European Union
FAO	Food and Agriculture Organisation of United Nations
FATA	Federally Administered Tribal Area
FDC	Forest Development Corporation
FDF	Forest Development Fund
FR	Frontier Region
FRF	Forest Regeneration Fund
FSMP	Forestry Sector Master Plan
FSR&DP	Forestry Sector Resource & Development Project
GB	Gilgit Baltistan (Special Status- designated area)
GCISC	Global Climate Change Impact Study Center
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GIS	Geographic Information System
GNP	Gross National Product
GOP	Government of Pakistan
GPS	Geographic Positioning System
GtZ (GiZ)	German Development Agency
HESS	House Hold Energy Strategy Study
ICIMOD	International Center of Integrated Mountain Development
ICT	Islamabad Capital Territory
IFAD	International Fund for Agriculture Development
IGF	Inspector General of Forests
IUCN	International Union for Conservation of Nature
JFMC	Joint Forest Management Committee
KAGB	Kashmir and GB Affairs Ministry
KP	Khyber Pakhtunkhwa Province (Former NWFP)
MEA	Multilateral Environmental Agreement
MKDA	Murree Kahuta Development Authority
MoCC	Ministry of Climate Change
MoE	Ministry of Environment
NARC	National Agriculture Research Council
NCCW	National Council for Conservation of Wildlife

NCS	National Conservation Strategy
NEAP	National Environmental Action Plan
NFRRAS	National Forest and Range Resources Assessment Study
NIH	National Institute of Health Sciences
NLUP	National Land Use Plan
NR	Not Reported
NRM	Natural Resource Management
NTFP	Non Timber Forest Products
OIGF	Office of Inspector General of Forests
P&D	Planning and Development
PDD	Project Design Document
PES	Payment for Ecological Services
PFI	Pakistan Forest Institute
PFRI	Punjab Forestry Research Institute, Gatwalla
PMD	Pakistan Meteorological Department
PSDP	Public Sector Development Programme
REDD+	Reducing Emissions from Deforestation and Degradation of forests and Inducing SFM
RF	Reserve Forest
RFO	Range Forest Officer
RPP	Readiness Preparedness Proposal
SAFRON	Ministry of States and Frontier Regions
SAZDA	Sindh Arid Zone Development Authority
SDC	Swiss Agency for Development Cooperation
SDFO	Sub Divisional Forest Officer
SFM	Sustainable Forest Management.
STHB	Study on Timber Harvesting Ban
UNDP	United Nations Development Programme
VDC	Village Development Committee
WAPDA	Water and Power Development Authority
WB	World Bank
WFP	World Food Programme of UN
WWF	Worldwide Fund for Nature Conservation

FOREWORD

Pakistan is blessed with a variety of natural forest resources, spread over nine ecological zones across the country, covering an area of 4.47 million hectares. These forests are of high significance, providing natural resource management-based livelihoods to millions of rural poor. Forests provide various products, services and functions. The main products are timber, fuelwood, fodder and non-timber forest products. The main functions of forests include continuous water flow, biodiversity, and ecotourism and climate change mitigation. However, due to the fast growing population in Pakistan and the related high demand for various products and services, forestry ecosystems are under heavy pressure. Further, due to the continued deforestation and forest degradation, the positive environmental impacts of forestry is declining thus requiring urgent attention from policy makers.



Malik Amin Aslam
Advisor to the Prime Minister
On Climate Change

Realizing the importance of the situation, the current Government has put the forestry resource conservation and management at the top of its agenda. The successful experience of the “One Billion Tree Tsunami” Afforestation Project under the Green Growth Initiative in Khyber Pakhtunkhwa has led to the launch of the 10 Billion Tree Afforestation Programme.

The current Forestry Sector Review by the Food and Agriculture Organization of the United Nations (FAO) with financial support from the World Bank is timely, as it will help in the implementation of the ongoing forestry and natural resources management initiatives by the Government. The main threats to the forestry resources identified in the review are real time issues and require immediate solutions. The valuation of the forestry services and the introduction of payment for the ecosystem services suggested by the review are good mechanisms for sustainable management of forests. Moreover, the hotspots identified in the review will provide a basis for future investment avenue on forestry resource conservation and management. The Review emphasizes the regular provision of updated and accurate data for the forestry sector planning. The proposal of undertaking a comprehensive baseline information study following the World Bank *Forestry Master Plan of 1992* is a valid suggestion and should be implemented. The recommendations of the review are valid and need to be implemented in the short, medium and long terms. Integrated and participatory management are the proven approaches for enhancing forestry resources. These approaches need to be adopted at implementation and field levels. Similarly, the shift from timber harvesting to the multiple use of the forestry resources will be of key significance to achieve sustainable forest management.

The Ministry of Climate Change acknowledges the efforts of FAO in providing technical assistance to the Government of Pakistan on sustainable natural resource management and conservation. The Forestry Sector Review Report is one of the key documents which will contribute to developing a fruitful Forestry Sector Development programme for the country.

A handwritten signature in black ink, consisting of a stylized 'A' followed by a horizontal line and a small flourish.

Malik Amin Aslam

Advisor to Prime Minister on Climate Change
Ministry of Climate Change

PROLOGUE

The Global Long -Term Climate Risk Index, published by Germ Watch, 2017, ranks Pakistan the 7th country most affected by climate change. Much of the country's vulnerability is linked to its arid and semi-arid climate, its dependency on a single river system and on snow and glacial melt water for agriculture. Pakistan's forestry resources can play an important role in climate change mitigation if managed and conserved appropriately. Northern Pakistan is the catchment for the storage of precipitation, which is a source of continuous water supply to agriculture crops in the down country, considered the food basket of Pakistan. It is also home to some of the world's threatened forest species like Juniper and Chilgoza. Due to pressure from an increasing population, deforestation and degradation are happening at an alarming rate (27 000 hectares/year according to FAO 2010 estimates). Halting this trend requires reliable and accurate data, and clear implementation plans championed by local communities and institutions.



Mina' Dowlatchahi
FAO Representative Pakistan

The World Bank supported the publication of the Forestry Sector Master Plan which provided the first-ever national data for 1991-1992. Since then, systematic national-level surveys have not been undertaken. Realizing the importance of the forestry sector's contribution to climate change mitigation and consequently to the improvement of local livelihoods, the World Bank and FAO-Pakistan launched the Forestry Sector Review in 2017. The objective of the Review is to provide a better understanding of current and potential environmental, social, and economic impacts of the forestry ecosystem in the country. The findings of this study will enable the Ministry of Climate Change, Provincial Forest Departments, and Development partners to make decisions based on evidence.

This review provides estimates of the total extent of forestry resources and identifies opportunities and hotspots while providing key recommendations for realizing a future sustainable forest system in Pakistan. Appropriate mechanisms and a well-defined strategy are required to address the numerous issues involved in sustainable forest management. The Review also highlights the involvement and contributions of local communities as an essential element for natural resource management and biodiversity conservation.

FAO appreciates the Government of Pakistan's consideration in granting forestry resource conservation and management its highest priority as evidenced by its support of The *10 Billion Trees Afforestation Project*. This project will pave the way for the sustainable management of forests resulting in diverse forest products, services and functions at a production rate that is close to the country's full potential.

I would like to thank the World Bank for funding this critical Review. It provides the Government of Pakistan a solid basis on which to build a renewed Sustainable Forest Management program.

Ms. Minà Dowlatchahi

FAO Representative, Pakistan

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Critical guidance and inputs were provided by Ms. Minà Dowlatchahi, FAO Representative in Pakistan. Mr Nasar Hayat, Assistant FAO-PK Representative, Programs, provided key support during the inception phase. Their efforts are highly appreciated.

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Dr. Faizul Bari
Principal Author and NRM Advisor

EXECUTIVE SUMMARY

The Islamic Republic of Pakistan is situated between 24° to 37° North latitudes and 61° to 76° East longitudes, covers an area of 88.430 million hectare and has population of 207 774 million. Pakistan is predominantly a mountainous country; its elevation varies from sea level to 8 611 meters and has almost 65 percent of its area under mountains. Approximately 49 percent of the area is arid receiving less than 250 mm of rainfall annually, while 35 percent of the area is semi-arid with annual rainfall of about 250-500 mm. The remaining 16 percent area occurs in sub-humid zone in northern mountainous tract and contains productive coniferous forests. Thus, the forestry sector has an important role in sustainable agriculture in Pakistan, as the bulk of irrigation water originates in these forest lands

Pakistan is a federation of four provinces; Balochistan, Khyber Pakhtunkhwa (KP), Punjab and Sindh. The country has three special areas i.e. Federally Administered Tribal Area (FATA)¹, Gilgit Baltistan (GB) and Islamabad Capital Territory (ICT). Pakistan has glaciers, water bodies and settlements over 6.8 percent of total land mass of the country; agriculture extends over 29.2 percent of the area, while another 8.7 percent area is reported as barren; remaining 55.3 percent area is under management of forestry sector; of which 5.1 percent is under forests, 1.7 percent is pastures, and 45.1 percent is under range lands. Pakistan is a forest poor country with a small area of 4.478 million ha (5.1 percent) under forests. This amounts to 0.021 ha per person, compared to the world average of 1 ha/person. The contribution of the forestry sector to the GNP and GDP as per official estimates seems quite insignificant, primarily due to the fact that a multitude of non-timber forest products (NTFP) and non-tangible environmental and ecological benefits of the forests are not taken into account.

Trees on farmlands are an important source of wood stock that helps in bridging the huge gap between demand and supply and in fulfilling domestic requirements of farming families for forest products, besides producing sizeable income for households in Pakistan. The following changes were observed in farms tree resource during the period from 1992 to 2004:

- The average number of trees per ha had increased from 20.5 to 25.9 registering 26 percent increase;
- The total number of trees in farm lands had increased from 331 to 554 million;
- The stock had increased from 76.6 to 97 million m³ i.e. by 26.6 percent.

Important rangelands include alpine pastures, sub-alpine pastures, trans-Himalayan grazing lands, Himalayan forest grazing lands, Pothwar scrub, desert ranges, Kohistan ranges, Suleman and Balochistan ranges. Due to misuse and centuries of overgrazing, the productivity of rangelands has been adversely affected. Thus, the rangelands are producing at less than their potential.

It has been observed that the total forest area of the country has increased by 0.979 million ha during the period from 1992 to 2011. The implementation of one Billion Tree Afforestation Project (from 2014 to 2019) in KP alone brought 6.3 percent additional area to the forest cover, in this way the forest cover of KP increased from 20.3 percent to 26.6 percent. The total area planted or regenerated under this project is in the tune of 593 292 ha. The forest area of AJK, Punjab and Sindh has increased, while that of Balochistan and GB has decreased during this period. The changes in forest types are as follow:

- Overall increase of 0.296 million ha in area under coniferous forests during the period from 1992 to 2011;

¹ This review was completed before the merger of FATA in Khyber Pukhtunkhwa, therefore in this document the abbreviation FATA has been used.

- The area under scrub forests has slightly increased from 1.191 million ha in 1992 to 1.323 million ha in 2011;
- The overall area of riverine forests has increased from 0.173 million ha to 0.216 million ha;
- Mangrove forests were degraded at a rate of 4 900 hectares per annum from 1992 to 2001 and showed an overall increase from 0.207 million ha in 1992 to 0.355 million ha in 2011.

Due to the vast territorial expanse and presence of diverse ecosystems, Pakistan is home to a large array of Non-Timber Forest Products (NTFPs). The main products are medicinal, aromatic and culinary herbs, forage and fodder, resin, oils, gums, *mazri* leaves, honey, silk, mushrooms, wild fruits, chilgoza nuts, pistachio nuts, wild almonds, wild pomegranate etc.

Forests and range lands are also a source of the following important forest services:

- Regulation of water yield (sustained supply) and quality maintenance for irrigation and power generation;
- Reduction of reservoir sedimentation and irrigation system;
- Mitigation of harsh climatic effects;
- Oxygen production;
- CO₂ absorption (carbon sequestration);
- Increase in soil fertility – organic matter added to soils; micro-organisms in soil;
- Maintenance of life support systems and environmental balance;
- Trapping of dust particles and other suspended pollutants;
- Biodiversity conservation.

Based on their value for species-richness, uniqueness of flora and fauna, economic importance and extent of threat to ecosystems, the habitat and plant associations in the country that are considered hotspots are Chilgoza Forests of Sulaiman Range, South Waziristan and Chitral, Juniper Forests of Ziarat, Balochistan, and Riverine Forests of Sukker and Mangrove Forests of Karachi.

In view of the scarcity and resultant high prices of timber and fuelwood, per capita consumption of timber in Pakistan is estimated at 0.032 m³ and that of fuel-wood as 0.184 m³ per annum. Timber is mainly used in construction, mining, furniture industries, match and transport sectors, village carpentry, wooden crates, boxes and paper and pulp factories. Fuelwood is normally used for cooking, heating, brick kilns, cottage industries, tobacco curing, lime, and pottery. The total demand for wood and wood-based products in the country is estimated at 40.93 million m³; of which 6.06 million m³ is demand for timber and of 34.87 million m³ for fuelwood.

The *direct drivers of deforestation* and forest degradation include; conversion of forest land to agriculture land, expansion of rural infrastructure, overharvesting of forest products, high fuelwood demand and consumption, poor harvesting practices, overgrazing and forest fires. While the *indirect/underlying drivers of deforestation* and forest degradation encompasses high population growth, rural poverty, unclear land tenure, the flaws in the existing policies and limited financial resources for the green sector. The indirect drivers of deforestation are complex, and issues like poverty and population pressure can only be addressed if appropriate policies and mechanisms are adopted at national level. The sector can focus more on the direct drivers of deforestation and forest degradation, while addressing the indirect drivers of deforestation and degradation can be achieved through national efforts and cross-sectoral linkages.

Initiatives such as One Billion Tree Project in Khyber Pakhtunkhwa, aiming at increasing forest cover, are instrumental in raising awareness among policy makers and general public of the importance of conservation and management of natural resources for livelihood improvement long term sustainable development.



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Chapter 1

Introduction and context

CHAPTER 1

INTRODUCTION AND CONTEXT

1.1 Background

The World Bank (WB) has commissioned the Food and Agriculture Organization of the United Nations (FAO) to review national Forestry resources in order for the WB to develop a better understanding of the current and potential environmental, social and economic impacts of forest ecosystems on the country. The study findings will enable WB to identify concrete measures for assisting the Government of Pakistan to promote national Sustainable Forest Management practices.

1.2 Scope and coverage of the report

The report, based on a desk review, is aimed at giving an overview of the Forestry Sector in Pakistan which will contribute to the WB proper understanding of the sector and to enable it to correctly support development in the sector. Based on available information, the report will review baseline information on policy and institutions; forest investments; and success and failures based on past projects and interventions and will make practical and workable recommendations.

The main purpose of the report is to collect and review information relating to:

- Main types of forests and forest landscapes in various ecological zones of the country;
- Economic, social and environmental uses of forests and forest landscapes;
- Forestry sector impact on job creation, income generation, and contributions to other economic sectors;
- Prevailing practices and institutional arrangements that stakeholders (forest department's, communities, and others) have adopted for the management of forests and forest landscapes;
- Practices and arrangements affecting the status and trends of the concerned forests and forest landscapes in terms of forest degradation and desertification;
- Hotspots of forest degradation and deforestation and examination of how such hotspots overlap with poverty issues of forest-dependent communities;
- Policy, legal planning, and implementation issues that are responsible for degradation of resources;
- Results, successes and failures of major projects at the national and local levels in recent years and learnings;
- Promote sustainable forest management, investments and technical assistance needed to address forest management issues;
- Risks and opportunities associated with such recommendations, if any, will be analyzed in the review.

1.3 Process

The information has been collected after a thorough review of available literature, published and unpublished reports, as well as information shared by Regional Consultants and professional's under the overall guidance and supervision of Dr Faizul Bari, Natural Resource Management Advisor, FAO Pakistan.

Based on this information, major issues were identified and their likely implications were assessed. A future course of action was suggested considering a review of success and failures of previous major investments and interventions. Thereafter, a draft report was shared with the World Bank and key stakeholders for feedback. On this basis, a final report was produced.

1.4 Structure of the report

Chapter-1, Introduction and the context, provides the background, scope, and outline of the report, and shares the process adopted for compiling the report, as well as its structure. Chapter-2, Resources, Products, Services, and Hotspots, describes forests, farm forestry, plantations, range, pastures and the significance of these resources for the nation; by expanding on their products, services, and functions; and further identifies the hotspots. Chapter-3 addresses Supply and Demand. Chapter-4 analyzes sector-specific investments and describes and reviews key projects, while Chapter-5 carries out a comprehensive institutional review of the Forestry sector. Chapter-6 highlights salient drivers of deforestation and describes the main challenges to the Forestry sector in Pakistan. Lastly, Chapter-7 concludes the review and lays down major recommendations on aspects related to policy, legislation, institutional concerns, planning, monitoring and implementation issues to provide a sound basis for putting in place a sustainable resource management framework with strategy to finalize critical investment priorities for potential development partners are also identified.



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Chapter 2

Resource, products, services and hotspots

CHAPTER 2

RESOURCES, PRODUCTS, SERVICES AND HOTSPOTS

2.1 Introduction

2.1.1 Location and climate

The Islamic Republic of Pakistan is situated between 24° to 37° North latitudes and 61° to 76° East longitudes (*Mufti et al.*, 2003) and covers an area of 88.430 million hectares (*Bukhara et al.*, 2012). The country is an oblong stretch that extends more than 1 800 km in length from the north (Khunjrab Pass) to the south (Gwadar seaport) and about 1 064 km in width along seacoast from east to west. Pakistan is predominantly a mountainous country; its elevation varies from zero meters at sea coast to 8 611 meters above mean sea level (amsl) at K-2. It has almost 65 percent of its area under mountains (*Mufti et al.*, 2003). Major mountain ranges; namely the Karakorum, Hindukush, and Himalayas occur in the north, followed by plateaus (Pothwar and Balochistan) comprising of low lying hills; next are plains and finally is a coastal area in the extreme south along the Arabian Sea.

Most of the area of the country lies in arid and semiarid zones, approximately 49 percent of the area is arid that receives less than 250 mm of rainfall annually, while 35 percent area being semiarid receives rainfall from 250-500 mm. The rest of 16 percent area occurs in the sub-humid zone in the northern mountainous tract and contains productive coniferous forests (Jan 1992). Consequently, in almost 84 percent of the area receiving less rainfall; agriculture cannot be practiced without irrigation. Thus, the forestry sector has an important role for sustaining agriculture sector in the country, as the bulk of irrigation water originates from these forestlands in the country.

The mean annual precipitation varies from 50 mm in the south to 2 000 mm in the north in the monsoon zone. The country is situated in heat surplus zone. The highest temperature ever recorded in Pakistan is 53.5 °C, which is also the fourth-highest temperature ever recorded on earth (Pakistan Meteorological Department, 2010).

Pakistan is a federation of four provinces; Balochistan, Khyber Pakhtunkhwa (KP), Punjab and Sindh. The country has three special areas i.e. Federally Administered Tribal Area (FATA), Gilgit Baltistan (GB) and Islamabad Capital Territory (ICT). Federal Government through the Ministry of States and Frontier Regions manages FATA (now merged with KP). The GB has been given the status of the self-governing body and is administered through Ministry of Kashmir and GB. The ICT is a capital area administered through the Ministry of Interiors Government of Pakistan.

2.1.2 Land-use

Land use pattern reported in the Land cover Atlas of Pakistan (*Bukhari et al.*, 2012) as shown in the Table-1, indicates that glaciers, water bodies, and settlements occupy 6.8 percent of total land mass of the country; agriculture extends over 29.2 percent of the area, while another 8.7 percent area is reported as barren; remaining 55.3 percent area is under management of forestry sector; of which 5.1 percent is under forests, 3.4 under scrubs, 1.7 percent is pastures, and 45.1 percent is under range and pasture lands.

Table 1: Province-wise land use statistics of Pakistan (hectares)

<i>Land use</i>	<i>AJK</i>	<i>Balochistan</i>	<i>FATA</i>	<i>GB</i>	<i>ICT</i>	<i>KP</i>	<i>Punjab</i>	<i>Sindh</i>	<i>Total</i>	<i>Percentage</i>
<i>Glaciers</i>	125 812	0	10 433	2 445 235	0	813 530	0	0	3 395 010	3.840
<i>Alpine pastures</i>	84 256	0	5 242	636 125	0	649 721	0	0	1 375 344	1.555
<i>Sub-alpine forests</i>	3 366	0	0	23 679	0	44 542	0	0	71 587	0.081
<i>Forests</i>	431 772	498 906	534 579	313 812	20 343	1 464 062	553 862	660 584	4 477 920	5.064
<i>Rangeland</i>	152 631	29 094 114	1 179 419	3 095 799	9 838	794 471	3 759 493	1 836 882	39 922 648	45.146
<i>Scrubs</i>	79 681	635 936	346 485	182 880	3 283	533 523	698 367	585 292	3 065 447	3.466
<i>Agriculture</i>	246 733	2 750 131	300 339	115 447	39 620	2 224 739	13 254 336	6 593 492	25 524 867	28.864
<i>Orchards</i>	0	75 609	0	0	0	15 519	68 809	99 942	259 879	0.294
<i>Barren land</i>	12 331	1 503 299	266 994	126 206	2 187	646 305	1 291 126	3 838 788	7 687 236	8.693
<i>Settlements</i>	11 263	90 895	16 868	1 396	13 965	110 536	537 042	191 277	973 242	1.100
<i>Water bodies</i>	30 193	545 906	72 909	40 778	713	151 688	377 414	457 661	1 677 262	1.897
<i>Total</i>	1 178 038	35 194 796	2 733 268	6 981 387	89 950	7 448 636	20 540 449	14 263 918	88 430 442	100.000

Source: Bukhari et al, 2012

2.1.3 Data sources

In the absence of reliable data estimates covering the extent of area under forests and rangelands, total growing stock and the increment put on by it, the supply and demand of timber, fuelwood, and other forest products are difficult to assess. Traditionally, the area of forests and rangelands were reported either based on land revenue record or manual field surveys of the resource, while volume, growth, and demand of forests was assessed by the working plans that were normally drawn for a period of ten years for management of specific forest areas after detailed inventory of volume, increment, supply and demand on resource. During the formulation of the Forestry Sector Master Plan (FSMP) in 1992, the area under forests and rangelands was for the first time digitally assessed with the help of Landsat imagery of 30m² resolution. Growing stock and the growth were also estimated along with supply and demand of wood on a national level; the gap between demand and supply of wood was assessed and projections were made for a period of 25 years. Although it was intended that temporal forestry data will be assessed at the interval of each five years after FSMP to regularly update the data and develop a reliable basis for frequent analysis of the resource, it could not be done, except for verification of forest area on the basis of 1997 and 2001 images only once in 2004.

A brief overview of available data sources pertaining to both forest area as well as forest and farm trees resource estimates is given in the following section.

FSMP provides first-ever national-level data, covers 87.980 million ha area, which was compiled during 1991-92 and published in 1992 under the administrative control of the office of Inspector General Forests (OIGF, 1992). It used 54 scenes of Landsat satellite images (1990-91) of 30m² resolution covering the entire country; however, estimates of Federally Administered Tribal Area (FATA) have not been given a separate coverage. Therefore, most probably FATA has been merged in that of Khyber Pakhtunkhwa (KP) Landsat satellite images. FSMP reports have estimated total standing volume of coniferous forests and trees on farmlands, total annual increment, and growth as well as the demand for wood in the country in detail. It has made projections to estimate wood supply and demand for the next 25 years and made recommendations to narrow down the gap in supply and demand.

National Land Use Plan (NLUP) report was published by the then Ministry of Environment (MoE) now renamed as Ministry of Climate Change (MoCC) based on Landsat-5 TM satellite images of 1989-99. It covers 83.425 million ha area of four provinces including FATA estimates of which seems to be included in KP.

The National Forest & Range Resource Assessment Study (NFRRAS) covers an exactly same area that was covered earlier by the FSMP, using Landsat Thematic Mapper (TM) images of 30 m² resolution of 1997 and 2001. The outcome report was published by the Ministry of Environment (MoE) in 2004, with the objective of detecting changes occurred in forests and rangeland areas through periodic assessments. The results of these assessments were confirmed with the help of 2 000 stratified randomized sampling points.

Land-cover Atlas of Pakistan (2012) used SPOT-5 satellite images (2007-8) of KP, and Azad State of Jammu & Kashmir (AJK) while images of Punjab, Sindh, Balochistan and Gilgit Baltistan (GB) were obtained from Google Earth. The visual interpretation of images was carried out using ERDAS Imagine and Arc GIS software, and results were validated through ground-truthing by using 1957 sample points identified through stratified randomized sampling techniques. It assessed all forest types in detail and has given data of all provinces, and regions including FATA, and ICT separately. The draft report was shared with the provinces in 2011 for comments. The report contains a district-wise estimate of 131 districts of all provinces, Islamabad District of ICT seven agencies, and six Frontier Regions (FRs) in FATA.

The cited document containing data on Forestry Statistics of Pakistan (Shah and Mohammad 2016, Pakistan Forest Institute, Peshawar) gives an estimate of forest area annual harvesting, and supply of wood and demand based on departmental figures and secondary data.

The Pakistan Forestry Outlook study (GOP, 2009) compiled by the Office of Inspector General of Forests (OIGF) for Food and Agriculture Organization of United Nations (FAO) reports the latest position based on a secondary review of earlier reports and projection of data.

The report titled “The Household Energy Strategy Study” (HESS) published by the Ministry of Energy Government of Pakistan in 1993. Furthermore the survey to “Assess Wood Vegetation and Wood Volume on Non-forest Areas in Pakistan” (OIGF, 2004) was developed for OIGF. The Directorate of Research and Development, Government of KP compiled a report on Fuel-wood per capita as well as total household consumption in Khyber Pakhtunkhwa (Javed and Shah, 2015). However, it only estimates consumption of fuelwood and does not provide data about farm trees resource.

In addition, a number of other regional studies have been carried out from time to time, including the Provincial Forest Resource Inventory (PFRI) in 2005; study on Timber Harvesting Ban (STHB) in 2010; district-wise natural resource database report of 2012, and Carbon Stock Assessment Report of 2017 of KP and Forest Carbon Inventory Report of GB in 2017 also digitally assessed area under forest cover in KP and GB, respectively. The International Center for Integrated Mountain Development (ICIMOD) has also carried out study namely “Mapping Deforestation and Forest Degradation Patterns in Western Himalaya Pakistan 2016” which covers the hilly parts of AJK, GB, and KP. But none of these studies cover the entire resource of the country as well as all types of forests. The forests area estimates based on various studies referred above are given in Annex-IX.

Consequently, the current study is based on the estimates of forest area assessed in the Land-cover Atlas, 2012; after incorporating the images of high resolution that were validated by adequate ground truthing. Moreover, this study has the advantage of a detailed classification of all forest ecosystems of the country. For estimates of other attributes of forests and farmlands, latest available data was sourced from the State of Forestry, 2016, Pakistan Forestry Outlook, 2009 and Forests and Biodiversity (2010).

2.2 Resources

The resources base in the country is comprised mainly of forests and rangelands. The forests are categorized as natural and manmade. The manmade forests consist of trees on farmland and plantations. The plantations can further be categorized into compact blocks and extensive linear plantations raised along major roads, canals and railway tracks throughout the country. Accordingly, the resource base consists of natural forests, plantations, trees on farmlands, rangelands and pastures.

Pakistan is a forest-poor country with a small area of 4.478 million ha (5.1 percent), under forests. This amounts to 0.021 ha per person, compared to the world average of 1 ha/person. Contribution of forestry sector to the GNP and GDP as per official estimates seems quite insignificant primarily due to the fact that a multitude of non-timber forest products (NTFP) and non-tangible environmental and ecological benefits of the forests are not taken into account because of the fact that focus of management traditionally and historically remains on commercial timber production and that is also restricted to the forest land under the administrative control of the Forest Departments. Nonetheless, the critical role that forests play in the national economy can hardly be overemphasized.

2.2.1 Natural forests

As already discussed in para 2.1.3, the report has relied on data available in Land-cover Atlas (2012). Accordingly, Province-wise and forest type-wise area of forests in Pakistan is given in Table-2.

Table-2 : Detail of forest area and types in Pakistan (million ha) by Province

Forest Types	AJK	Balochistan	FATA	GB	ICT	KP	Punjab	Sindh	Total	Percentage
Dry Temperate	48 013	125 485	317 924	254 961	0	532 591	0	0	1 278 974	28.6
Moist Temperate	162 647	0	1 648	0	0	391 668	17 249	0	573 212	12.8
Chir Pine	105 343	0	6 447	0	0	217 753	27 283	0	356 826	8.0
Scrub	93 538	294 636	135 313	0	17 708	222 373	345 374	0	1 108 942	24.8
Tropical Thorn	0	76 425	34 120	0	0	12 007	42 556	52 501	217 609	4.8
Riverain	0	0	0	0	0	0	32 099	183 835	215 934	4.8
Mangroves	0	2 360	0	0	0	0	0	353 062	355 422	7.9
Oak Forests	3 484	0	28 588	58 851	0	83 480	0	0	174 403	3.9
Subtotal (Natural)	413 025	498 906	524 040	313 812	17 708	1 459 872	464 561	589 398	4 281 322	95.6
Plantations	18 747	0	10 539	0	2 635	4 190	89 309	71 186	196 598	4.4
Subtotal (Forests)	431 772	498 906	534 579	313 812	20 343	1 464 062	553 862	660 584	4 477 920	100.0
Total Area	1 178 038	35 194 796	2 733 268	6 981 387	89 950	7 448 636	20 540 449	14 263 918	88 430 442	-
Percentage of Natural Forests	35.1	1.4	19.2	4.5	19.6	19.6	2.3	4.1	4.8	-
Percentage of Total Forests	36.7	1.4	19.6	4.5	22.6	19.7	2.7	4.6	5.1	-

Source: Bukhari *et al.* 2012

A perusal of information given in Table-2 indicates that total area under natural forests is 4.281 million ha (4.8 percent) in the country. The natural forests in AJK, Balochistan, FATA, GB, ICT, KP, Punjab, and Sindh extend over 35.1, 1.4, 19.2, 4.5, 19.6, 19.6 and 2.3 percent of their areas, respectively.

Natural forests comprise of dry temperate, moist temperate, oak sub-tropical *Chir* pine forests, scrub forests, mazri palm forests, tropical thorn forests, riverine forests, and mangroves. The Land-cover Atlas (2012) has however not reported *mazri* forests. Manmade forests comprise farm forestry, linear and compact plantations.

The natural forest ecosystems of Pakistan are briefly described in the following sections:

2.2.1.1 Himalayan dry temperate forests

The dry temperate forests are spread over an area of 1.278 million ha in drier inner Himalayas beyond the effective reach of monsoon rains between 1 525 to 3 350 meters above sea level (amsl). This tract receives heavy snow during winter and stores a considerable amount of water in glaciers. These forests have a comparatively open canopy; they are extremely fragile and susceptible to excessive soil erosion causing low regeneration.

Deodar (*Cedrus deodara*), Blue pine (*Pinus wallichiana*), Chilgoza pine (*Pinus gerardiana*), Juniper (*Juniperus excelsa*), Fir (*Abies webiana*), and Spruce (*Picea smithiana*) are main timber-yielding species. *Fraxinus sp.*, *Acer sp.*, *Daphne sp.*, *Lonicera* and *Prunus spp.* are main broadleaved associates, while *Artemisia*, *Astragalus Carum bulbocastanum*, *Thymus sp.*, *Ferula sp.* and *Unab* (*Zizyphus vulgare*) are some of the important shrubs constituting undergrowth in the forests. These forests are the main source of valuable constructional timber obtained from deodar (Cedar) and blue pine trees. A variety of non-timber forest products (NTFPs) including *Chilgoza* (Pine nuts), walnuts, wild almonds, morels, honey, medicinal and culinary herbs are collected from these forests mainly by forest-dwelling communities.

About 3.8 percent of dry temperate forests occur in Upper Neelum and Leepa valleys in AJK, 9.8 percent in Zhob, Musakhel, Ziarat, Quetta, Pishin, Loralai and Kalat districts in Balochistan, 24.9 percent in Khyber, Kurram, Orakzai, North and South Waziristan Agencies and FR D.I.Khan in FATA 19.9 percent in Chilas, Astore, Gizar and Baltistan districts in GB; 41.6 percent in Chitral, Upper Dir and Kohistan districts and Kalam (Swat), Upper Kaghan (Mansehra) valleys in KP.

Dry temperate forests in Balochistan are comprised of two very important and unique ecosystems of Juniper and Chilgoza. Juniper forests are located in Ziarat, Quetta, Pishin, Kalat, Mastung and Loralai districts while Chilgoza pine forests occur on Suleman Mountain Range in Zhob and Musakhel districts. The Juniper forests of Ziarat are amongst the largest contiguous surviving forests of Juniper in the world; rightly known as living fossils. They are extremely slow-growing and attain a height of one meter and dbh of 2.5 cm in a period of sixty years. However, these forests are subject to degradation due to competition for land use including agriculture and human settlements. In addition these forests are vulnerable due to heavy biotic and livestock pressure. Dry temperate forests of FATA are privately owned and communally managed. It has been noted that these forests have been severely damaged during the influx of Afghan Refugees and recent insurgencies causing rapid degradation of dry temperate forests.

2.2.1.2 Himalayan moist temperate forests

The Himalayan Moist Temperature Forests cover an area of 0.573 million ha occurring between 1 375 to 3 050 m amsl in outer Himalayas in monsoon rainfall zone, of which 28.4 percent occur in Neelum and Jehlum valleys of Muzaffarabad district and Rawlakot, Bagh and Haveli districts in AJK; 0.3 percent in Orakzai agency in FATA; 68.3 percent in Upper Dir, Swat, Shangla, Battagram, Mansehra and Abbottabad Districts in KP and 3.0 percent in Murree hills of Rawalpindi District in Punjab.

Blue Pine (*Pinus wallichiana*), Fir (*Abies webiana*), Spruce (*Picea smithiana*) and some Deodar (*Cedrus deodara*) are main species, while *Quercus*, *Alnus*, *Ulmus*, *Corylus*, *Acer*, *Aesculus*, *Taxus* and *Prunus* species are important broadleaved associates. The shrubs include *Punica granatum*, *Berberis lyceum*, and *Skimmia laureola*.

Moist Temperate Forests is a very important forest type as it is evergreen and has luxurious undergrowth which attracts a high number of grazing animals. Further, the bulk of construction and furniture timber is obtained from these forests. As a result, the forests in Mansehra, Battagram, Torgar, Shangla, and Upper Dir Districts have been drastically degraded, while in Abbottabad and Swat, the degradation has been controlled to a great extent by the diversion of fuelwood pressure to plantations and supply of natural gas. These forests are also under tremendous biotic pressure.

2.2.1.3 Sub-tropical chir pine forests

The *Chir* pine Forests occur in a narrow strip between 900 to 1 700 m above mean sea level in Lower Himalayas over an area of 0.357 million ha in monsoon zone of AJK, KP and Murree Hills in Punjab. The bulk of the forests occur in KP over 61.8 percent of its area; followed by AJK (29.5 percent); Murree hills in Punjab (6.9 percent). In FATA (1.8 percent) remnants of *Chir* forests can be seen at higher elevations in Bajaur and Mohmand Agencies. Its associates include *Quercus incana*, *Lyonia ovalifolia*, *Rhododendron arboreum*, *Pistacia integerrima*, *Sisymbrium cumini*, *Mallotus philippinensis*, *Xylosma longifolium*, *Quercus glauca*, and *Ficus* spp; sometimes with, but often without, a dry evergreen shrub layer and little or no underwood.

Being located near dwellings, these forests are excessively grazed and heavy cutting and lopping are carried out year-round for fuelwood. They are subjected to frequent forest fires, due to the accumulation of inflammable pine needles. However, the forests regenerate profusely and can also be successfully planted. There is a multitude of lower age classes in these forests, which reflect that the mature crop has been harvested paving way for regeneration. These forests can be easily regenerated by controlling grazing and forest fires. In KP considerable chunks of private barren lands have been planted with *Chir* pine under Tarbela Magla Watershed Projects, whereas substantial areas of degraded natural forests have recently been successfully regenerated under "Billion Trees Afforestation Project". As a result of protection against grazing and negative anthropogenic activities, profuse regeneration has come up in the enclosures. The situation in AJK is comparable to that of KP, but *Chir* forests in FATA are extremely degraded.

2.2.1.4 Scrub forests

This forest type extends over an area of 1.109 million ha and occurs from 400 m to 1 000m in foothills and lower slopes of Himalayas, Salt Range and Kala Chitta in Punjab, the Suleiman Range in Balochistan, FATA KP, ICT and AJK.

Olea ferruginea, *Acacia modesta*, and *Pistacia integerrima* are some of the dominant tree species in this forest type. The associates include *Dodonaea viscosa*, *Reptonia buxifolia*, *Capparis decidua*, *Tecoma undulata*, *Gymnosporia royleana*, *Monothea buxifolia*, *Butea monosperma*, and *Zizyphus nummularia*.

This forest type is located in valley bottoms, low lying hills and plateaus subjected to intense grazing pressure during winter and to cutting/lopping for fuelwood and fodder around the year causing rampant deforestation and degradation.

2.2.1.5 Tropical thorn forests

The Tropical Thorn forest type occurs from sea level to 400 m throughout the Indus plain. Although entire Indus plain falls in this zone, the type is presently confined hardly to 0.217 million ha; of which the bulk occurs in Balochistan (35.1 percent); followed by Sindh (24.1 percent); Punjab (19.6 percent); FATA (15.7 percent) and KP (5.5 percent). These forests are under intense pressure due to extensive clearing of vegetation for cultivation and dwellings.

Tropical thorn forests are characterized by an open canopy and consist mainly of xerophytic vegetation like *Acacia nilotica*, *A. senegal*, *A. jacquemontii*, *Salvadora oleoides*, *Prosopis cineraria*, *Tamarix aphylla*, *Zizyphus mauritiana*, *Z. nummularia*, *Capparis decidua*, *Tecoma undulata*, *Calotropis procera*, *Commiphora mukul* and *Euphorbia caudicifolia*. These forests have an extreme open canopy and have very low per unit production.

2.2.1.6 Riverain forests

The Riverain forests or *Belas*, as these are vernacularly called, occur over an area of 0.216 m ha in flood plains along banks of major rivers, particularly the Indus and its tributaries. Main tree species include *Acacia nilotica*, *Tamarix aphylla*, *Prosopis cineraria*, *Dalbergia sissoo*, and *Populus euphratica*. 14.9 percent of riverine forests occur in Punjab and the remaining 85.1 percent in Sindh.

These forests get inundated between June and August resulting in moisture and sedimentary soil deposits which in turn promote growth and regeneration. Riverain forests are the main source of income in Sindh. They provide protection to arable lands, strengthen river embankments and provide timber and fuelwood for local needs, pit props for coal mines, habitat for wildlife, fodder and grazing grounds for livestock. Despite considerable ecological and environmental importance of these forests, their extent species composition and overall condition has considerably deteriorated since the establishment of upstream dams, barrages, and protection *bunds* to protect adjoining dwellings and arable lands from repeated flooding.

The FSMP had an estimated IRR of 0.83 percent to 9.86 percent for Shisham (*Dalbergia Sissoo*) and 5.92 percent to 9.73 percent for Babul (*Acacia nilotica*). The present worth of investment becomes zero at a 10 percent interest rate due to low returns. As such, the sustainability of these forests is in jeopardy. The Public Limited Forest Company was established in South Punjab to attract private investment for raising industrial plantations over degraded lands in *belas*.

2.2.1.7 Mangrove forests

These are more or less gregarious forests of low height and occur over an area of 0.355 million ha along the coast of the Arabian Sea in Karachi (Sindh) and Pasni (Balochistan). *Avicennia marina* is the dominant tree growing in these forests, whereas *Rhizophora macronata* and *Ceriops tagal* are amongst its important associates. The mangrove ecosystems are very important, but their survival has been threatened due to the reduced inflow of sweet water resulting in excessive salinity coupled with inadequate or no management. The forests are under extreme biotic pressure and degraded to a greater extent.

2.2.1.8 Oak forests

Oak is found mixed in conifer forests along riparian systems and also as pure stands from 1 200 to 1 500-meter amsl in both dry and moist temperate zones. Pure Oak stands occupy 0.174 m ha area and contain *Quercus ilex*, *Q semicarpifolia*, *Q incana*, *Q glauca* and *Q dilatata*.

Quercus ilex forests, also known as evergreen oak forests, they are usually found in the upper reaches of dry temperate zones of Neelum valley of AJK; Mohamand, Kurram, South Waziristan and Orakzai agencies in FATA, Hazara, Chitral, Upper Dir and Swat in Khyber Pakhtunkhwa (KP). Whereas other types of oak forests including *Quercus incana* and *Q. dilatata* occur in moist zones at higher and lower altitudes respectively. These forests mostly grow in small and fragmented patches and are subjected to heavy pressure for firewood fodder, and grazing with scanty regeneration. However, due to excessive grazing the regeneration of these forests cannot be established without causing rampant soil erosion.

2.2.1.9 *Mazri* palm forests of wood

The special type of dwarf palm forests of *Mazri* (*Nannorrhops ritchiana*) is widespread in northern Balochistan, FATA, and southern KP. *Mazri* is a small to medium size shrub attaining a height up to 2 meters. It grows mainly in the sandy tracts along mountain streams and in depressions of the subtropical zone; however, it ascends up to 914 m amsl in Suleman range and 1 524 m amsl in Sibbi and Makran. Its leaves are collected from natural forests growing in Khuzdar, Lasbela, Awaran, Kech, Loralai, Ziarat, Harnai, and Musa Khel districts of Balochistan; Kurram, Orakzai, North and South Waziristan Agencies in FATA; and Kohat, Hangu and Karak districts in KP. It is also cultivated on boundaries of farmlands in Paniala area of D.I. Khan District in KP. This type is not included in Landcover atlas, but it has been mentioned in FSMP reports. According to these reports it covers about 24 000 ha area in KP.

The palm leaves are used to weave mats, baskets, ropes, brooms, hand fans, sandals, hats, decorative pottery and *ban* (fine ropes for weaving cots or sleeping beds). Dry trunk and foliage are used as fuel, while its seed is also edible. The *mazri* cottage industry is an important source of livelihood for a large number of rural people, particularly women, who do the bulk of weaving of *mazri* products.

Mazri forests are subjected to extensive encroachments for conversion into dwellings and cultivation. Extensive chunks of *mazri* forests have already been cleared of vegetation or excessively degraded. It is agreed that without serious conservation efforts these forests will soon become extinct causing a great livelihood threats to rural communities.

2.2.2 Plantations

2.2.2.1 Irrigated plantations

Irrigated plantations were initially established in 1866 in Changa Manga in Punjab and subsequently, these plantations were extended to other available sub-marginal irrigated lands to provide energy for railway steam engines and to satisfy market demands for hardwood timber. These forests have been developed over 0.283 m ha (Shah and Mohammad, 2016) in irrigated canal command areas of Punjab and Sindh, while a small patch also exists in Balochistan. Species like *Dalbergia sissoo*, *Bombax ceiba*, *Morus Alba*, *Melia azedrechata*, *Poplars*, *Salix* and *Eucalyptus* are grown in these forests.

FSMP reports that in both Punjab and Sindh a sizeable area was lying unutilized for these plantations. Moreover, most of these plantations are heavily infested with mesquite. Due to the high establishment cost and low productivity compared to potential and scarcity of water, retention of irrigated plantations seems difficult unless the return is significantly enhanced. Therefore, under this scenario the cause and effect of water economics have to be analyzed in-depth as these plantations are mainly grown on agricultural lands using scarce irrigation water. There is a need for alternate land use, particularly when the primary objective of providing fuelwood to locomotive engines is no longer valid.

2.2.2.2 Linear plantations

Linear plantations are normally raised along canals, roads and railway lines. Although a substantial area of the country contains linear plantations, an estimate of the area under linear plantations is lacking in the Landcover Atlas. The State of Forestry in Pakistan (Shah and Mohammad, 2016) reports that linear plantations have been raised over an area of 57 912 avenue kms; containing 2 000 Ave: kms in Balochistan, 13 Ave: kms in GB, 8 665 Ave: kms in KP, 47 041 Ave: kms in Punjab, and 193 Ave: kms in Sindh along canals, roads and railways (Shah and Mohammad, 2016) for the productive utilization of state land, as well as to provide shade, enhance scenic beauty, and improve the climate. The main species of linear plantations are *Dalbergia sissoo*, *Acacia nilotica*, *Albizzia spp.*, *Tamarix spp.* and *Eucalyptus*.

2.2.3 Farm forestry

Trees on farmlands are an important source of wood stock useful for bridging the huge gap between supply and demand and for meeting farmers' domestic requirements for forest products. They also generate sizeable incomes for households in Pakistan. Consequently, since the 1980s, emphasis on improving trees on farmlands has remained as one of the fundamental points for various forest strategies in the country. As a result, the promotion of private forest nurseries and entrepreneurship amongst tree farmers were highly encouraged. The production of timber and fuel wood on farmlands have considerably increased since then.

As discussed under para 2.1.3, available data pertaining to the status of farm trees resources in Pakistan is outdated. The provincial and regional status of farm trees resources and species-wise detail of wood stock on farm lands, as per these reports, is provided in Annex-I and II, detail of average trees annually felled and planted/regenerated under farm forestry is provided in Annex-III. Perusal of these Annexes reveals that the following changes were observed during the period from 1992 to 2004 (OIGF 2004):

- The area of farmlands had increased by half a million ha;
- Average number of trees per ha had increased from 20.5 to 25.9 registering 26 percent increase;
- The total number of trees on farm lands had increased from 331 to 554 million showing 68 percent increase;
- The stock had increased from 76.6 to 97 million m³ i.e. by 26.6 percent;
- Annual growth of stock increased from 0.8 to 1.17 million m³ registering 46 percent increase;
- Block equivalent area of resource increased from 466 000 to 781 000 ha showing an increase of 7.5 percent;
- Number of Eucalyptus, Poplar and Mango trees has increased;
- The number of trees felled annually was less than trees that were added to farm resource.

2.2.4 Range and pasture lands

Livestock rearing is an integral part of agriculture and an important source of livelihood for rural economies in Pakistan, as 11.61 percent of GDP was realized from this sector in 2015-16 (Economic Survey 2017). The grazing areas (excluding forests) are equivalent to 41.368 million ha (Table-3).

Table-3: Distribution of range and pasturelands in Pakistan (ha) by Province

Range Types	AJK	Balochistan	FATA	GB	ICT	KP	Punjab	Sindh	Total
Alpine pasture	0.084	0	0.005	0.637	0	0.649	0	0	1.375
Alpine Scrub	0.004	0	0	0.023	0	0.044	0	0	0.071
Range Lands	0.153	29.094	1.179	3.096	0.010	0.794	3.759	1.837	39.922
Total	0.241	29.094	1.184	3.756	0.010	1.487	3.759	1.837	41.368

Source: Bukhari *et al*, 2012

Important rangelands include alpine pastures, sub-alpine pastures, trans-Himalayan grazing lands, Himalayan forest grazing lands, Pothwar scrub, desert ranges, Kohistan ranges, Suleman and Balochistan ranges.

The alpine pastures extend over an area of 1.375 million ha and occur between 3 500-3 800 meter amsl, beyond tree limit and below permanent snow and glaciers in the northern mountainous tract in Azad Jammu and Kashmir, FATA, Gilgit Baltistan and Khyber Pakhtunkhwa. These pastures are comprised mainly of a dense herbaceous cover of forbs and grass and are extensively used as summer pastures by nomads and transhumant graziers.

Sub-alpine pastures occur above 3 350 m up to tree limit in a narrow strip; covering 0.072 million ha and contain stunted trees of *Abies webiana* and *Pinus wallichiana* and shrub formations of 1 m to 2 m height. The

characteristic genera are *Salix*, *Lonicera*, *Berberis* and *Cotoneaster* with *Juniperus* and occasionally *Rhododendron* or *Ephedra*. The trees rarely exceed 60 feet in height, they are broadleaved, crooked and branchy. There is a spring flush of herbaceous flowers, ferns, forbs and grass often forming dense cover. These type of trees are commonly found in AJK, GB and KP. Although, the sub-alpine pastures are also known as sub-alpine scrubs and contain woody vegetation, however, they are not timber yielding forests.

The pastures and rangelands in the northern parts are more productive than those in the central and western parts of the country. Due to misuse and centuries of overgrazing, the productivity of rangelands has been adversely affected. Thus, the rangelands are producing below potential. This low productivity can be improved by adopting various management practices such as periodic closures, re-seeding, and improved grazing management along with breed improvement and promotion of stall feeding.

2.2.5 Land tenure

The forests in Pakistan are usually under public or private ownership. Generally the state manages all public and the majority of privately owned forests through provincial and regional forest departments; however, forests in merged FATA are exclusively privately managed, while a few small pieces of natural forests occurring outside demarcated forests called; *mazroas* and all private plantations, excluding those of conifers in Hazara which are privately managed throughout the country. Figure-2 contains information pertaining to the legal classification of forests, which shows that an area of 5.931 million ha is under management of Forest Departments of which 4.507 million ha contain forests and 1.424 million ha is rangeland. Of this area 2.264 million ha i.e. 50 percent area is covered by work plans (Shah and Mohammad, 2016). Thus for another 50 percent forests requisite estimates/statistics are not available even with the forest departments.

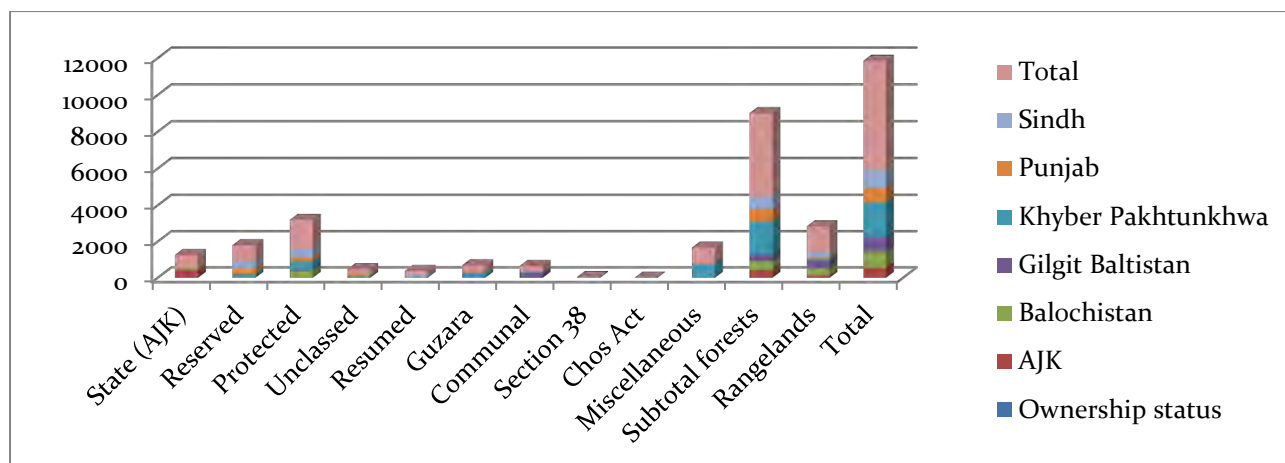


Figure-2: State-controlled forest and rangelands areas by legal classification (in ha) by Province

All reserve forests are owned by the state notified as such under relevant law, and are exclusively managed by Forest Departments. In AJK and Balochistan state forests have status of a reserve forests, but have not been legally notified as such. Similarly, unclassified forests in Punjab are also being managed as reserve forests without any formal notification. The forest reservation process is cumbersome and protracted, during which rights of claimants are settled. The protected forests are also owned and managed by the State, but are heavily burdened with legislative rights. Local people have some rights and concessions in these protected forests for grant of timber for house construction, grazing, grass cutting, collection of dry wood, etc. The Forest Department was initially created and tasked to manage reserve and protected forests only; while, the management of other types of forests and specialized functions like watershed and rangelands management have gradually been added to its portfolio.

The Resumed forest lands were surrendered by wealthy landlords under Land Reforms Acts of 1959 and 1972 (Jan 1992). Most of these resumed forest lands, particularly those in Hazara have been subsequently declared as Protected Forests, while the remainder of the resumed forest lands are being managed by the Forest Departments. A case in point, is the *Guzara* (subsistence) forests which are privately owned but are managed by the forest departments. Twentypercent of its net sale proceeds goes to the state as a management fee. These forests were set aside to meet the *bona fide* domestic needs of local communities during land settlement in Hazara (KP), and Murree hills (Punjab) in 1872.

2.3 Products and services

2.3.1 Products

A selection of main forest products are discussed in the following sections:

2.3.1.1 Wood

Timber and fuelwood are the major forest products, making forests and farm lands the main source of wood production in the country. Reliable up to date statistics on the total growing stock and annual increment/production of timber from forests for the entire country, however are not available as all forests in Balochistan and FATA 72 percent of forests in GB 57.5 percent in KP and 61.5 percent in Punjab continue to be governed in the absence of a proper management plan (Shah and Mohammad, 2016). Most of the work plans for Sindh and for the rest of forests in AJK, KP and Punjab have also expired and thus the available data is outdated. As previously mentioned, the only countrywide assessment of forest resources was made by FSMP in 1992, now outdated. The reports compiled after FSMP have also relied on estimates of FSMP and generated data with necessary adjustments and projections. Assuming that the growth figures assessed by FSMP (Annex-IV) in 1992 are still valid, the projected indicative annual growth of wood in forest area is estimated at 8.12 million m³ (Annex-V).

2.3.1.2 Trees on farmlands

Trees growing on farmlands are an important source for bridging the gap between demand and supply and to provide fuelwood at the doorstep of consumers in rural areas. As a result of increasing price of fuelwood and timber, farm forestry has become a highly profitable business to the extent that instances of production of industrial timber by replacing traditional agricultural crops are not uncommon in rural areas of Pakistan. Consequently, cultivation of trees on farmlands has increased over the last few years. The *State of Forestry in Pakistan* reports the annual production of 8.83 million m³ wood on farmlands, of which; 5.38 million m³ is timber and 3.45 million m³ is fuelwood (Shah and Mohammad, 2016).

The data of previous studies referred in section 2.1.3 indicates a healthy trend in the number of trees regenerated/planted in every province/region being higher than the number of trees felled per year (Annex-III). Thus the farm forestry provides hope for bridging the gap between supply and demand for forest products. It can also be used as a tool to reduce pressure on natural forests, provided its potential can be properly harnessed by enhancing synergies between trees and agricultural crops. A word of caution, however as trees on farmlands are not a substitute for critical environmental and ecological functions played by the natural forests.

2.3.1.3 Non-timber forest products (NTFPs)

Due to the vast territorial expanse and diverse ecosystems, Pakistan is home to a large array of Non-Timber Forest Products (NTFPs), which play an important role in the livelihoods of forest-dependent communities.

Income from non-timber forest products is much more regular and sustainable than that of timber. Some of the important products are medicinal, aromatic and culinary herbs, forage and fodder, barava, Kana resin, oils, gums, *mazri* leaves, honey, silk, mushrooms, wild fruits, chilgoza nuts, pistachio nuts, wild almonds, wild pomegranate and Barva plant. Unfortunately, given their importance, these products were not duly considered in earlier forest policies and management regimes. Instead, they were considered trivial and minor compared to timber and fuelwood, which were seen as the major products.

Mazri, resin, and Ephedra are the only three NTFPs for which production data has been officially compiled, whereas for the rest of the products only guestimates can be made. Kana is another important grass with a viable market. The latest national-level data for these three items are also from 2003-2004. The resin extraction has been stopped since 1990. Production of Ephedra has also stopped; however, *mazri* leaves are being collected on a small scale. Some of the major NTFPs have been discussed in the following sections:

Medicinal plants

Pakistan has around 6 000 species of wild plants out of which about 700 are considered medicinally important (Forests and Biodiversity, 2010). According to the National Institute of Health (NIH), approximately 400 plant species are used extensively in traditional medicines. The *Tibbi Pharmacopoeia* of Pakistan (a pharmacopoeia of traditional drugs compiled by the *Tibbi Board*) has listed around 900 single drugs and about 500 compound preparations derived from medicinal plants (Forests and Biodiversity, 2010).

Medicinal plants of alpine and high altitude forest areas are *Podophyllum hexandrum*, *Saussurea costus*, *Picrorrhiza kurroa*, *Aconitum heterophyllum*, and *Corydalis* spp. Medicinal plants of temperate Forest are *Atropa acuminata*, *Angelica glauca*, *Paeonia emodi*, *Geranium wallichianum*, *Artemisia* spp., *Glycyrrhiza glabra*, and *Ephedra* spp. Medicinal Plants of sub-tropical foothills include *Terminalia* spp., *Mallotus philippensis*, *Phyllanthus embilica*, *Butea monosperma*, while, the medicinal plants of cold arid and semi-arid areas contain species like *Artemisia* spp., *Ephedra gerardiana*, *E. procera*, *Bunium persicum*, and warm arid areas have species like *Commiphora wightii* (Forests and Biodiversity, 2010).

There are about 30 large herbal medicine manufacturing companies in Pakistan, which produce *Unani* and homeopathic medicines on a commercial scale, using medicinal plants collected from the forests. In addition, there are more than one hundred non-organized homeopathic medicine manufacturers' nationwide producing herbal medicines. The annual sale of herbal medicines is estimated to be 6 billion rupees (Forests and Biodiversity, 2010). The annual turnover of some large herbal manufacturers is comparable to multinational companies in Pakistan. Traditional healers (around 100 000 in numbers, including *hakims* and homeopaths and around 300 *vaid*s) serve about 60 percent of the population, especially those living in remote rural areas (Forests and Biodiversity, 2010).

Chilgoza pine nuts

Chilgoza trees grow between 2 000 m to 3 350 m amsl in the Hindukush-Karakoram-Himalaya region of Northern Pakistan. Chilgoza is valued for its nuts for which there is high local, national and international demand. Seeds of this pine are edible and are harvested in autumn and early winter. It is estimated that a single standing Chilgoza pine tree can produce nuts worth Rs 4 500 per year making it an important source of income for many poor households (Bari, 2017).

The Chilgoza forests are situated in the dry temperate areas of Pakistan; in Balochistan, FATA, GB, and KP. These forests occur either in pure stands or as mixed stands with other coniferous species. The ownership also varies in provinces/regions. In Balochistan, FATA, and GB, the chilgoza forests are privately owned, held either individually or by jointly by several landowners. However, the management of these forests in Balochistan and GB rests with the Forestry Departments. In KP these forests have been declared protected and are owned by

the State however, the local rights- holders have user rights and privileges for utilizing various products including chilgoza.

During 2012, a total of 1 461.1 tons of nuts were exported generating approx 13.56 million USD, while in 2013, 1 738 tons were exported with revenues of about 20 million USD (Bari, 2017).

Mushrooms

Morchella true morel or black mushroom is a genus of edible mushrooms. These mushrooms are honeycomb-like and their upper portion is composed of a network of ridges, with pits between them. The color of morels ranges from light grey to dark brown. They are prized for culinary uses, particularly as a gourmet food. There are varieties of black mushrooms or morels locally known as “*Guchi*” that include *Morchella esculanta*, *M. conica*, and *M. angusticipt*. Among these three species, the *M. esculanta* is a most important market mushroom.

Morels are collected from mid-April to mid-June by summer graziers in temperate forests and sub-alpine zones soon after first shower. The collection is done mostly by children, women and by transhumant graziers, while moving up to greener pastures as a lucrative side business. The mushrooms are ultimately sold by local grocers to intermediary dealers. The dealers put them on sale to wholesalers in Akbari Mandi, Lahore, from where these are exported to various destinations, mainly in Europe. Total annual trade of dried morels in Pakistan is estimated to be in the order of 50 tons per annum (Iqbal, 1993).

Aromatic plants

Punica granatum and *Carum balbocastanum* are the main aromatic condiments that commonly grown in northern Pakistan. *Punica granatum* grows in scrub forest zones. Rural communities collect its fruits for household use and for sale in the market. *Carum balbocastanum* (*kala zeera*) is wildy growing aromatic plant mixed with grass in the dry-temperate zone. Both species are of considerable economic importance for forest-dwelling rural communities.

Resin

The subtropical Chir Pine forests are an important source of resin production. However, resin tapping has been stopped by the Forest Department due to frequent fire incidents and damage to trees caused by faulty and excessive blazing. Nonetheless, there is a demand from the forest owners to restart resin extraction, as it is a regular source of income for them compared to the income from timber which accrues only sporadically.

Wild honey

Wild honey is collected from indigenous (wild) and exotic (domesticated) honeybees. The quality of honey depends on flora consumed. *Ber* honey is in great demand in Middle East markets.

Honey collected from wild beehives is an important source of nutrition, as well as income for forest dwellers in the country. Between 55 to 65 tons of honey are collected each year in the country from wild beehives by about 15 000 persons (Ahmad and Muzaffar, 1987; Iqbal, 1991).

Traditional beekeeping by rearing colonies of Oriental bees (*Apis cerana*) in earthen pots and log hollows fixed in the walls of the houses is popular among women living in remote forest areas in the north and northwest parts of the country. The number of these beehives is 35 000 to 40 000, producing about 50 tons of honey. The honey is sold to local grocers at Rs 60 to 80 per kilogram. An average colony yields 4 to 5 kilograms of honey, but 35 to 45 percent of the colonies are sub-standard and produce little or no honey (Ahmad and Muzaffar, 1987).

A survey (Iqbal, 1993), observed that Oriental bees do not colonize the hives as frequently as they did 10 to 12 years ago, possibly because the local bees are unable to compete with the 20 000 colonies of European bees (*A. mellifera*) brought by the Afghan refugees into the tracts. Consequently, natural populations of the local bees have dwindled. To overcome the problem and to augment income of the rural women it is recommended that modern beekeeping with European bees should be introduced among the traditional markets (Iqbal, 1993).

The entire production of honey is used within the country as food and in a number of medicinal formulations. Although modern beekeeping is gaining popularity in the country, the demand for honey cannot be met and honey worth Rs 3 to 4 million is imported each year.

Mazri

Average *mazri* leaves production from state-managed forests of Kohat, Karak and Hangu districts of KP is 2 050 tons per annum, while around 500 tons *mazri* leaves are collected from private plantations of Paniala in D.I.Khan district (Mohammad and Shah, 2005). There is no reliable estimate of production from Balochistan and FATA, however, Mohammad and Shah, (2005) have reported that 2 700 to 3 500 tons of *mazri* leaves are imported to Billitang and Gumbat *mazri* markets in Kohat from Balochistan annually.

Wildlife and fisheries

A number of big and small game wildlife animal's, birds and fish live in the forests and adjacent streams. Some very rare species of birds are found in the forests as well. It is estimated that about 28.80 million tons of shrimp and 2.441 million tons of fish are caught from mangroves in the Indus Delta (OIGF, 2009).

2.3.2 Fodder production and livestock grazing

The forests, alpine, subalpine pastures and rangelands provide forage for both sedentary and migratory livestock. The rangelands are mostly excessively degraded on average, production of 0.66-ton air-dry forage per hectare (Mohammad, 1989) has been reported, while it has also been reported that improved and properly managed rangelands are capable of producing up to 20.8 tons air-dry forage (ADF) per hectare (Mohammad, 1989). Consequently, it is indicated that currently, 27.302 million tons of dry forage matter is annually available for the livestock, which can be increased considerably under proper management.

According to the FSMP report, about 70 percent of required livestock feed is supplied from forests. Based on the estimates, rangelands provide 75 percent of sheep and goat feed, and 30 percent of cattle and buffalo feed. This ratio has been adopted for the purpose of this study as such.

As discussed in Chapter 3 estimated income from rangelands due to an increase in livestock is estimated at Rs 46.100 billion, while income from livestock products is valued at Rs 1641.10 billion. Thus, estimated, income from forage from rangelands and forests is of the size of Rs 1687.2 billion per annum.

2.4 Forests and rangelands services

Besides providing varied products and yielding tangible benefits, forests and rangelands are also a source of important services that are economically far more important than the products. However, while assessing the economic value of forests, these services are either ignored or not properly quantified and evaluated. The following important services offered by forests have been identified by the Pakistan Forestry Outlook Study (OIGF, 2009):

- Regulation of water yield (sustained supply) and quality for irrigation and power generation;
- Reduction of reservoir sedimentation and irrigation systems;

- Lessening of the effects of harsh climates;
- Production of oxygen;
- CO₂ Absorption (carbon sequestration);
- Increase in soil fertility – organic matter added to soils; micro-organisms in the soil;
- Absorption/intake of canopy precipitation and increased infiltration;
- Production of useful algae, fungi, insects and other products;
- Maintenance of life support systems and environmental balance;
- Trapping of dust particles and other suspended pollutants;
- Soil conservation and landslide control;
- Resource for outdoor recreation and ecotourism;
- Biodiversity conservation.

Unfortunately, to date there is no proper assessment of services rendered by the forest and range ecosystems in Pakistan. Quantification of intangible benefits of forests and their assessment is necessary to properly evaluate the economic importance of forests and rangelands. Several important ecosystem services are addressed below:

2.4.1 Carbon sequestration and emissions

Assessment of carbon stocks held up by forests, carbon sequestration and reduction in carbon dioxide (CO₂) emissions from forests are now gaining increased importance to sustain biomass and to earn sustainable income on the basis of standing stock. However, except for KP and GB, no reliable estimates exist for carbon stock, carbon sequestration potential and CO₂ emissions. Therefore, research on other forest areas is now being carried out under “Readiness Preparation Proposal (R-PP)” which is an ongoing project implemented by OIGF.

The total Carbon Stock of KP Forests has been estimated at 153.312 million tons, of which 46 percent stock has been held up in above ground biomass, 14 percent in below ground biomass, one percent in leaf/ litter and 39 percent in the soil. In KP 96.5 percent carbon stock is held up by coniferous forests and alpine scrub, while only 3.5 percent by low lying forests (Ali, 2017). It has been reported that KP forests can sequester annually 6.001 million tons of CO₂ emit 6.4 million tons of CO₂ from timber extraction as per historical data and has the potential of sequestering more than 2,00 million tons of CO₂ through plantation and regeneration induced by “*Billion Trees Afforestation Project*”. KP has about 40 percent of forest area and carbon sequestration potential of 14.4 million tons of carbon dioxide (Ali, 2017). The Carbon stock of GB forests is estimated at 16.95 million tons of which 80 percent is above ground and 20 percent below ground. It was estimated that the forests of Gilgit Baltistan can sequester 1 283 406 tons CO₂ per year (Ali et al., 2017).

From the above description, it can be concluded that the coniferous forests of KP, AJK, GB, and upper Punjab have the capacity to earn substantial carbon credits. In this respect R-PP project is developing the necessary data and requisite systems.

2.4.2 Biodiversity conservation

Owing to geographic location and topographic variations, Pakistan’s flora and fauna have a blend of Palaearctic and Indo-Malayan elements. As many as 5 500 to 6 000 species of vascular plants have been recorded in the country (IUCN, 1991). (Davis et al., 1988) and Stewart (1982) have reported 128 ferns, 23 gymnosperms, 1 140 monocotyledonous plants and 4 500 dicotyledonous plants in Pakistan, of which around 400 plant species are endemic (GOP, 2000), belonging to 169 genera and 46 families (Ali and Qaisar, 1986). The families with the largest rate of endemism are Papilionaceae (57 species), Umbeliferae (33), Compositeae (21) and Brassicaceae (20). The centers of endemism having 90 percent representation are located in northern and northwestern mountains above 1 200m elevation. Despite excessive deforestation and degradation, Roberts (1986) has

reported that around 66 percent land area of the country has still climax vegetation associations. WWF in 1984 listed 500 plant species as rare and threatened, while *Ulmus wallichiana* has been included in IUCN Red Data Book.

There is a remarkable diversity of forest habitats and biodiversity in Pakistan. About 7.1 percent of plant species are endemic (OIGF, 2009). Similarly Chilgoza and Mazri (dwarf palm) is also of considerable importance, being endemic in nature. Chilgoza Juniper Mangrove and riverine forests are among endangered ecosystems in Pakistan (GOP, 2000)

The endangered mammals dependent on forest and rangeland habitats include the woolly flying squirrel, markhor (*Capra falconeri*), Urial (*Ovis orientalis*), goitred gazelle (*Gazella subgutturosa*), Marco Polo sheep (*Ovis ammon polii*), snow leopard, brown bear and the Balochistan black bear (OIGF, 2009).

Due to the scarcity of woody biomass, numbers of fast-growing exotic plants have been introduced in the country, of which Mesquite (*Prosopis juliflora*), Paper mulberry (*Broussonetia papyrifera*), Parthenium (*Parthenium hysterophorus*) and Lantana (*Lantana camara*) have become invasive (Forests and Biodiversity, 2010).

2.4.3 Watershed value

The country is drained through the Indus River System and its tributaries with a drainage area of 944 165 km², of which 528 909 km² occurs in Pakistan (Mufti et al., 2003). Its five major eastern tributaries are Jehlum, Chenab, Ravi, Beas, and Sutlej, while Soan, Haro, Siran and Daor also joins it from the eastern side. River Kabul, Swat, Panjkora, Kohat Toi, Gambila, Gomai, Zhob, and Kurram are its notable western tributaries.

Based on an average flow of 77 years (1922-23 to 1999-2000), it is estimated that the watershed of the Indus river system yield an average flow of 171.2 BCM (Kahloon and Majid, 2003). It has been estimated that 22.952 BCM water from the hill torrents can be utilized, while in Indus Basin unconfined water aquifer, which is recharged through seepage from the irrigation system has a potential of 61.7 BCM (Kahloon and Majid, 2003).

The forests and rangelands play a critical role in regulating stream flows, improving groundwater recharge, storing water in soil and reducing erosion. Almost ninety percent of water in Pakistan's stream system originates from northern mountainous watersheds, of which about 30 percent is generated by glaciers and monsoon showers. The most valuable function of forests and rangelands in Pakistan is to sustain the supply of sediment-free water for generating low-cost sustainable energy and at the same time utilize water supply for agriculture purposes. It has been estimated that 12 930 km² snow and ice has been held up in 97 020 km² surface area of glaciers and seasonal snow in the north (Mufti et al., 2003), which besides generating 27 percent of national electricity also provides water for irrigation in the Indus basin, also known as the food basket of the country. It has been estimated that 96 percent of water is used for irrigation, 2 percent for industrial use and 2 percent for domestic use (Kahloon and Majid 2003). Water from the watersheds of the Indus River feeds 55 700 km of the canal system in Pakistan. The share of agricultural sector in the Gross Domestic Product (GDP) of Pakistan is about 21 percent and together with agro-based products the sector fetches almost 80 percent of the country's total export earnings. The timely and adequate availability of water and watershed management is an important factor for the sustainability of agriculture sector in Pakistan.

Pakistan is endowed with hydro-power potential of approximately 42.651 MW (Annex-VI), while currently only 6.720 MW is installed capacity (Annex-VII), which lies in KP, Gilgit Baltistan, Azad Jammu, and Kashmir and Punjab. However the considerable hydro-power potential which remains untapped needs to be harnessed in light of the acute power shortage situation being faced by the nation (GOP, 2008).

Indus River carries one of the greatest sediment loads of about 431.9 million m³ from upstream areas per year of which, about 246.8 million m³ sediment is deposited in downstream reservoirs, and canals. It is estimated that the Indus River brings on average 200 million tons of sediment to Tarbela reservoir and Jehlum River brings about 59 million tons sediment to Mangla dam reservoir (*Mufti et al., 2003*). Consequently the storage capacity of Tarbela and Mangla dams is estimated to be getting reduced by 167.75 million m³ and 4847 mm³ per annum respectively (OIGF, 2009). The annual loss to the nation caused by deforestation and consequent floods, erosion of fertile soil from upland catchments and siltation of reservoirs has been estimated to be Rs 2.3 billion (OIGF, 2009).

Loss of vegetative cover in watersheds seriously impairs the hydrological cycle and results in landslides, and flash floods causing damage to infrastructure, settlements and even causing loss of human lives and livestock. As a result watershed management in the mountains has emerged as a national priority with the construction of mega dams and reservoirs to generate hydropower and supply of water to the gigantic irrigation system to support agriculture. The overriding objective of managing eastern watersheds is reducing sedimentation enhancing the safe lifespan of reservoirs and controlling flash and riverine floods, while in western (watersheds the main objective is groundwater recharge and collection of surface water to ensure cropping in drought periods).

2.4.4 Eco-tourism

Pakistan has been bestowed with a unique landscape, majestic mountains, world famous peaks, spectacular glaciers, serene and scenic valleys, unique and beautiful forests, lush green pastures, meandering rivers, beautiful lakes and charismatic wildlife, providing fascinating nature-based sports and nature-based tourism potential that attracts both foreign and local tourists.

Fortunately, the concept of ecotourism and its potential are now gradually being recognized, and a number of national parks and wilderness areas have been established. The local government administration and community have instituted a nominal entry fee for tourists, to ensure recreation while addressing resource degradation and environmental concerns.

The Tourism Department reports that on average around one million foreign tourists visited the country annually post 2009, but during 2016 due to the improved law and order situation and better transport and road facilities, the number of visiting foreign tourists increased to 1.7 million and domestic tourists to 38.3 million. Last year according to the World Tourism Council, Pakistan earned US\$ 19.4 billion from the tourism sector. The sector has great potential and it is expected that earnings from nature-based tourism will significantly increase in future. It has been estimated that during 2011 about 8.5 percent of tourists were attracted by scenic beauty 3.3 percent by mountains 8.9 percent by climate and 0.7 percent by wildlife (Annex-VIII). Thus almost 21.4 percent of tourists were attracted by nature-based eco-tourism. Consequently, it can be safely concluded that 21 percent of income and employment generated by the tourism industry can be attributed to eco-tourism.

2.4.5 Forest-based jobs and income generation

The people living in poverty pockets and remote rural areas largely depend on forestry and rangelands for their livelihoods; particularly for getting timber, fuel-wood, fodder NTFPs, and grazing livestock.

The Forestry Department employs 17 280 staff with a large number of laborers engaged regularly as chainmen of forest check posts, laborers in forest nurseries, plantations and timber watchmen, firewood and NTFPs depots, or, as seasonal laborers working on planting, soil conservation, felling conversion and fire-fighting. It has been reported that 600 000 workers were engaged annually by the Forestry Departments (Jan 1992).

A large number of people earn their livelihoods from farm forestry, a collection of NTFPs, processing of forest-based products (both cottage and industries) and eco-tourism. It has been reported that about 100 000 people are involved in the wood fuel trade in Pakistan and this business generates about Rs.11.3 billion annually (OIGF, 2009). Similarly, more than half a million workers are reportedly engaged by wood-based industries.

2.4.6 Contribution to other economic sectors

Forestry impacts other economic sectors. The mangrove forests, for example, provide most important but unquantifiable benefits, which include protection of the coast from wind and sea currents, protection of coastal villages against the tidal action, cyclones, and erosion. They support the breeding of prawns and fish and act as a natural barrier against ecological and climatic disasters to safeguard the life, land, and property of coastal people. Conservation of biodiversity, recreation, ecotourism and camouflaging naval infrastructure are other services being provided by these forests.

The agricultural and industrial economy of Pakistan entirely depends on the sustained supply of water from its reservoirs, rivers and also on the efficient functioning of an extensive canal system. About 21 percent of the area of Pakistan, comprising mostly arid and semi-arid zones, is under irrigated agriculture. When the water level recedes in reservoirs, running of mills, tube wells and other machines is hampered, due to a frequent breakdown in the power supply. Water yield is not properly regulated from areas devoid of vegetation, resulting in flash floods followed by drought.

Similarly, due to scenic forest landscapes, eco-tourism is promoted. The secluded valleys produce healthy, disease-free, seeds used to grow offseason vegetables. Livestock is also dependent on forests and rangelands for grazing fodder and browse.

2.5 Hotspots

Due to widespread negative anthropogenic activities, conversion of natural ecosystems to agriculture and dwellings and unprecedented depletion of forests, almost all natural forest ecosystems in Pakistan are now critically threatened. Unfortunately, no systematic and comprehensive assessment of this regretful ecosystem degradation has yet been made in order to carry out the objective ranking of hotspots. The selection criteria for inclusion of hotspots encompasses the following characteristics; value for species-richness; the uniqueness of flora and fauna; economic importance and extent of threat to ecosystems due to biotic and climatic factors. Based on these criteria the following habitat and plant associations in the country are considered as hotspots for priority action:

List of hotspots in Pakistan

Location and type of hotspots (Forests/Ecosystem)	Characteristics	Significance	Threats
Chilgoza Forests of Suleman Range in Zhob and Sherani Distt: (Balochistan), FR DIKhan and North and South Waziristan Agency and Chitral	Grow on exposed parts in dry temperate forests of Suleman range with shallow mountain soils from 500-3 400 m amsl. The tract is home to abstract poverty.	<ul style="list-style-type: none"> • The biggest forests in Suleman range covering 64 000 ha and 95 000 ha in FATA; • Yield 130 tons valued pine nuts in Balochistan and about 400 tons in FATA annually; • Generates income of about Rs 544 million annually; • Constitute vital catchment of Zhob and Gomol rivers; • Major source of livelihoods for local communities; • Is consumed as dry fruit with medicinal properties; • Exported abroad and earns valuable foreign exchange for the nation; • It is endemic to Pakistan, Afghanistan, and Iran. 	<ul style="list-style-type: none"> • Excessive grazing cutting for fuel and timber; • Excessive; collection of seeds and lopping off branches, which contain future cones.
Juniper Forests of Ziarat, Kalat, Balochistan	Huge contiguous and ancient rightly called living fossils. Unique and rare resource. The tract is one of the poorest areas in the country	<ul style="list-style-type: none"> • Largest remaining contiguous juniper forest in the world; • Unique flora and fauna; • Extremely slow growing, Some trees are 1 500 years old. 	<ul style="list-style-type: none"> • Extremely slow growing; • Pressure for grazing and fuelwood collection; • Habitat fragmentation.
Riverine Forests of Sukker, Sindh	Grow in river flood plains along both sides of Indus and major canals. The belas are inhabited by the poorest segment of the society.	<ul style="list-style-type: none"> • Major source of timber; • Protection to flooding through stabilizing protection bunds; • Contain important flora and fauna • Riparian ecosystem; • Good example of first colonization and ecological succession. 	<ul style="list-style-type: none"> • Due to decreased inundation and over grazing; • Excessive grazing; • and shisham dieback.
Mangroves Forests of Karachi, Sindh	Grow in swamp and marshy areas along sea coast in deltas having an inflow of sweet water. The inhabitants of adjacent populations are extremely poor	<ul style="list-style-type: none"> • Constitute 6th largest chunk of dry tropical mangroves in the world; • Protection of seaport from siltation • Protection of coastal villages against tidal action, winds; • Support breeding of prawns, shrimps and fish and act as a natural barrier against ecological and climatic disasters; • Conservation of biodiversity; • Recreation and ecotourism. 	<ul style="list-style-type: none"> • Subjected to heavy human pressure and ecological changes; • Reduced fresh water from upstream; • Excessive grazing and fuelwood cutting; • Habitat fragmentation.

Source: Biodiversity Action Plan for Pakistan 2000



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Chapter 3
Supply and demand

CHAPTER 3

SUPPLY AND DEMAND

3.1 Population

According to the 2017 population census, Pakistan has an estimated population of 207.774 million; excluding the population of AJK and GB. The population of AJK (as per 2017 census) is 404 million. Taking the current population estimate of 1.8 million for GB, based on projected figures on the basis of 1998 census, the total population of Pakistan is estimated at 213.61 million, of which 36.4 percent is urban and 63.6 percent is rural. Population statistics by Province is given in Table-4.

Table-4: Province-wise population of Pakistan in 2017

Province/Region	Population 2017	Urban population (Percent)	Growth rate (Percent)
Balochistan	12.34	27.55	3.37
FATA	5.0	2.84	2.41
ICA	2.0	50.58	4.9
KP	30.52	18.77	2.89
Punjab	110.01	36.71	2.13
Sindh	47.89	52.02	2.41
Sub-total (Pak 2017 Census)	207.77	36.38	2.4
AJK	4.04		
GB	1.80		
Grand Total	213.61		

Source: Census of 2017, and projected figure for GB on the basis of 1998 census

3.2 Livestock

The livestock population of the country is estimated at 176.659 million (Economic Survey of Pakistan and Livestock sector, 2013). Table-5 gives estimated figures of livestock in 2004-05 and 2013-14. Thus, livestock population has increased at the annual growth rate of 2.6 percent. Livestock represents an added source of income and products but at the same time has adverse effects on natural ecosystems if not managed and planned properly.

Table-5: Livestock population of Pakistan

PERIOD	CATTLE	BUFFALOES	SHEEP	GOATS	CAMELS	ASSES	HORSES	MULES	TOTAL
2004-05	24.218	26.295	24.923	56.665	0.736	4.199	0.313	0.251	137.600
2012-13	39.743	34.702	29.096	66.615	1.021	4.942	0.361	0.179	176.659

Source: Economic survey of Pakistan and Livestock sector, 2013-14

3.3 Trends in changes in forest area

The forest area of Pakistan has been analyzed in the National Forest and Range Resource study once on the basis of images taken in 1997 and 2001, and the Forestry Sector Resource & Development Project developed the Landcover Atlas, 2012 on the basis of 2007 and 2011 snapshot. The changes in provincial forest cover are reflected in Annex-IX and shown in graph (Figure-3).

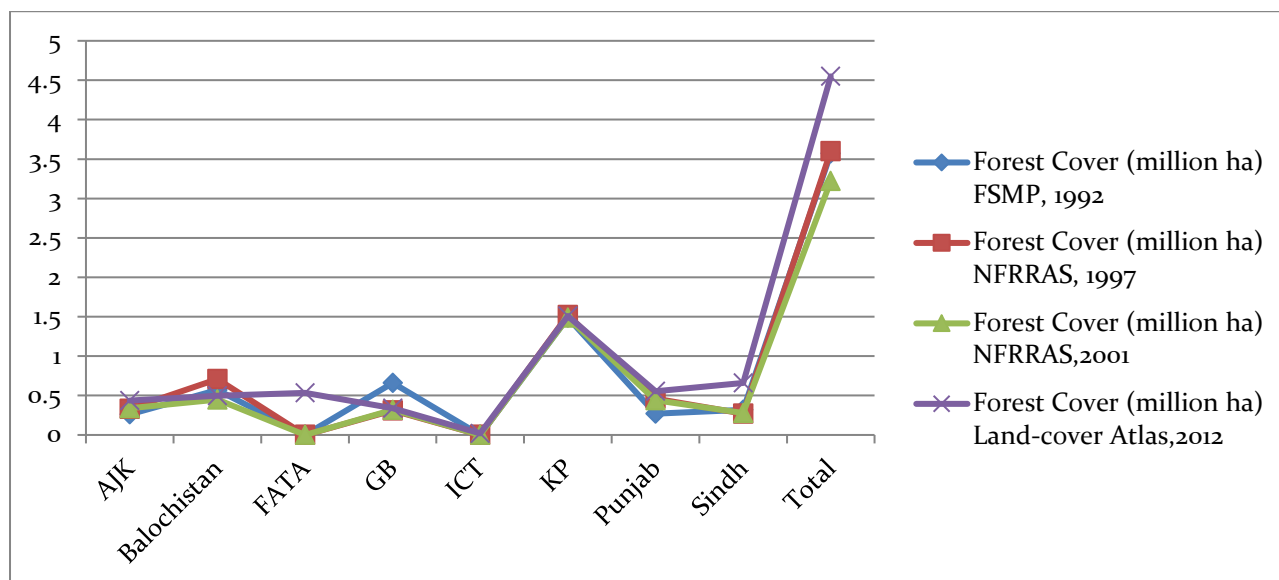


Figure-3 Changes in forest cover from 1992 to 2012 (Million ha) by Province

Based on results of the above studies, it is clear that the total forest area of the country has increased by 0.979 million ha during the period of 20 years from 1992 to 2011. The forest area of AJK, KP, Punjab and Sindh has increased, while forest area of Balochistan and GB has decreased during this period. Similarly, by comparing data of 1992 and 2011 it becomes clear that the following changes in forest types have occurred:

- The area of coniferous forests in the country reduced at a rate of 40 100 hectares per annum between 1992 and 2001. During the first 5 years the rate of depletion of forest resource was 86 800 hectares per annum but between the period of 1997 to 2001 a positive trend has been witnessed, whereby coniferous forests have started replenishing at a rate of 6 600 hectares per annum. Thus, there has been an overall increase of 0.296 million ha in the area under coniferous forests during the period from 1992 to 2011.
- On the other hand, the scrub forests have shown an upward trend in the area during the period from 1992 to 1997, when area increased from 1.191 million ha to 1.652 million ha. During the subsequent five years however the area under scrub forests decreased to 1.323 m ha. In nutshell the area under scrub forests has slightly decreased from 1.191 million ha in 1992 to 1.323 million ha in 2011.
- The riverain forests have decreased at the rate of 2.300 hectares per annum from 1992 to 2001. During later five years, however, the rate of degradation has slowed down and subsequently area has increased. While comparing data of 1992 and 2011, it becomes evident that the overall area of riverine forests has increased from 0.173 million ha to 0.216 million ha.
- Mangrove forests faced degradation at a rate of 4 900 hectares per annum during the period between 1992 to 2001. However, the area of mangrove forests has shown an overall increase from 0.207 million ha in 1992 to 0.355 million ha in 2011.

3.4 Supply of wood

3.4.1 Supply of wood from forests

The annual growth of wood in forests and farmlands has not been assessed at national level since 2004. Therefore, all national level studies thereafter have provided estimates based on projections from the FSMP data. Accordingly, it has been guestimated in section 2.3.1.1 that forests have annual growth potential of 8.12 million m³ wood.

The latest annual growth potential is uncertain, however, the actual yield of timber from state controlled forests in 2012-13 was 0.3468 million m³ and fuelwood was 0.3914 million m³. Hence, in total the volume of 0.638 million m³ has been supplied from state controlled forests in 2012-13 legally, while the estimation of a collection of dry and wind fallen trees and illegal removal of timber and fuel-wood for the same period is necessary to ensure sustainable management in our forests.

It has also been reported that 0.338 million m³ timber and 0.079 million m³ wood products were imported during 2012-13. Hence, total regulated supply from state forests and imports work out to 0.735 million m³.

3.4.2 Supply of wood from farmlands

The potential of annual sustainable supply from farmlands based on the latest field survey is not available. The State of Forestry 2016 estimates that 39.87 million m³ of wood was supplied by farmlands during 2012-13; of which 5.38 million m³ was in the form of timber and 34.49 million m³ was firewood (Shah and Mohammad, 2016).

Assuming the same trend observed from 1992 to 2003 continues from 2004 to 2017 as well, the overall stocking in farmlands is roughly estimated to be approx 197 million m³ with annual growth about 18.8 million m³ (Annex-X a & b)

3.5 Demand for wood

In view of the scarcity and resultant high prices of timber and fuelwood, per capita consumption of timber in Pakistan is estimated at 0.032 m³ and that of fuel-wood as 0.184 m³ per annum (Shah and Mohammad, 2016). Timber is mainly used in construction, mining, furniture industries, match and transport sectors, village carpentry, wooden crates, boxes, paper and pulp factories. The fuel-wood is normally used for cooking, heating, brick kilns, cottage industries, tobacco curing, lime, and pottery.

The total demand of wood and wood based products in the country is estimated at 40.93 million m³; of which 6.06 million m³ is demand for timber and of 34.87 million m³ for fuelwood.

3.6 Gap between demand and supply of wood

The guestimated annual supply of wood from forests is 8.2 million m³, from farmlands it is 18.8 million m³, while the import is about 0.417 million m³. Hence about overall supply is estimated at 27.417 million m³. Whereas, the demand for wood is estimated at 40.93 million m³, thereby, causing a deficiency of about 6.06 million m³.

In addition to improving supply, demand needs to be reduced as best as possible by introducing energy efficient alternatives. One way to curtail the demand for fuelwood is to improve the efficiency of stoves used for cooking and heating and the kilns used in tobacco curing and bricks. Efforts have been made in this respect

with positive outcomes. Therefore, it is imperative that such initiatives be replicated on a larger scale. Further, not only are these improved cooking stoves more efficient, but they are environmentally friendly and emit less smoke representing a considerable health benefit.

3.7 Supply of livestock and livestock products

An annual increase of 3.27 m livestock is reported based on inter-censal estimates taken in 1996 and 2006. Results show that on average each year 0.7 m heads of buffaloes, 0.92 m cattle 1.26 million goats and 0.3 million sheep, 0.01 million camels, 0.07 million asses and 0.01 million mules are added. Of this 1.64 million livestock production containing 0.21 million buffaloes, 0.27 million cattle, 0.94 million goats and 0.22 million sheep can be attributed to rangelands.

About 50.6 million tons of milk was produced in the country during 2013-14, of which 41.133 m tons was available for human consumption. In addition to milk, 1.887 m tons beef, 0.657 m tons mutton, 0.0441 m tons wool, 0.0251 m tons hair, 0.802 m tons bones, 0.255 m tons fats, 0.062 m tons blood, 0.0149 m tons hides and 0.0519 m tons skins were produced during the year 2013-14 (Economic Survey of Pakistan 2016). On the basis of the above given criteria, the increase in the number of animals and their produce are attributable to grazing in rangelands (given in Annex-XI), which shows that the rangelands provide financial benefits of approximately Rs 1 687.2 billion annually. However, this is one side of the equation. A proper assessment of the effects of such large numbers of livestock on forests and rangelands, may show a net economic loss.

3.8 Demand for forage (DM)

The livestock equivalent of 117.5 million animal units in Pakistan, with a daily forage requirement of about 2.27 million tons of dry matter (DM), consume 830.0 million tons DM per year. Assuming that 30 percent of buffaloes and cattle, 75 percent of sheep and goats, 50 percent horses and 100 percent camels asses and mules depend upon grazing lands, 52.5 million animal units are estimated to be completely dependent on range lands. Hence, 371 million tons of DM forage requirement is estimated annually from rangelands. Since FSMP estimates that the livestock gets 70 percent of forage needs from forests and range lands, as such the forage consumption from grazing livestock works out to be 260 million tons DM against sustainable supply of 27.302 million tons DM forage. Such a huge gap between supply and demand of forage from forests and rangelands indicates heavy pressure and deterioration of these valuable resources, for which the nation is sustaining heavy losses in terms of environmental deterioration and ecological imbalances. This is in line with the findings of National Conservation Strategy (NCS 1992), implying that the recommendations of NCS have never been implemented in true spirit.

3.9 Market price for timber and fuelwood

The detail of wholesale prices of local and imported timber from Karachi (2011), Chakdarra, Lower Dir (2013) and Goharabad, Abbottabad (2013) is reflected in the table below. The timber and fuelwood markets in Karachi, Lahore, Rawalpindi, Peshawar, Quetta and Mingora markets of 2004-05 and 2010-11 (Shah and Mohammad, 2016) are reflected in Figures 4 and 5, respectively.

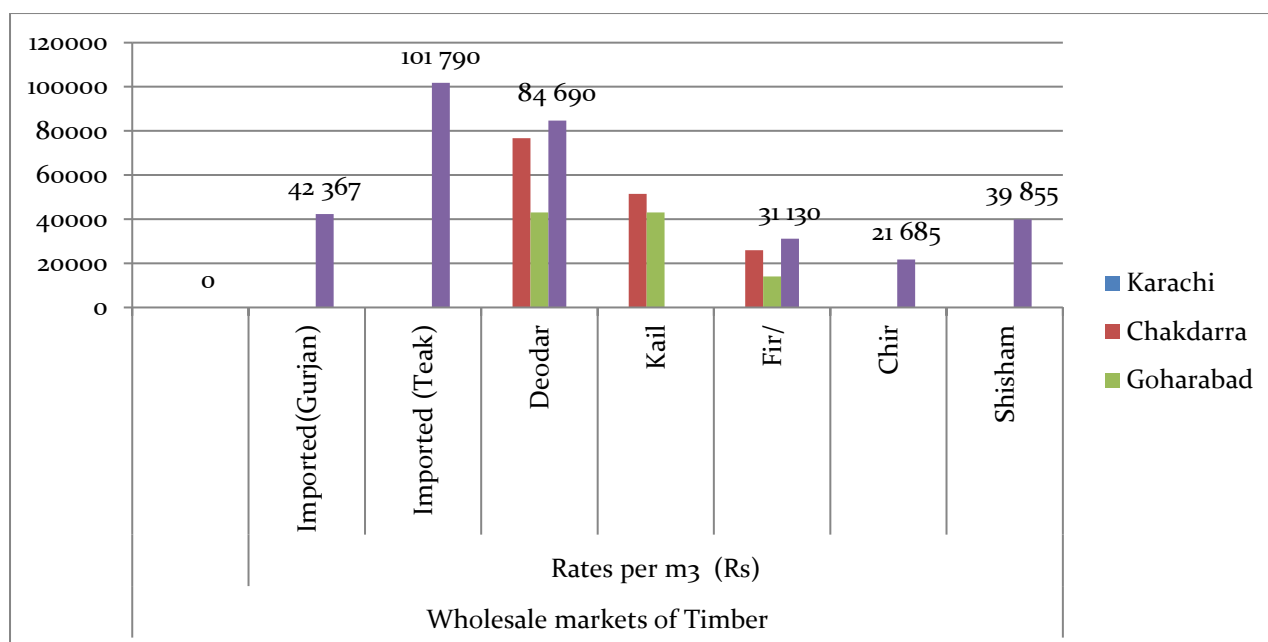


Figure-4: Prices of timber in wholesale markets in Pakistan (Rs/m³)

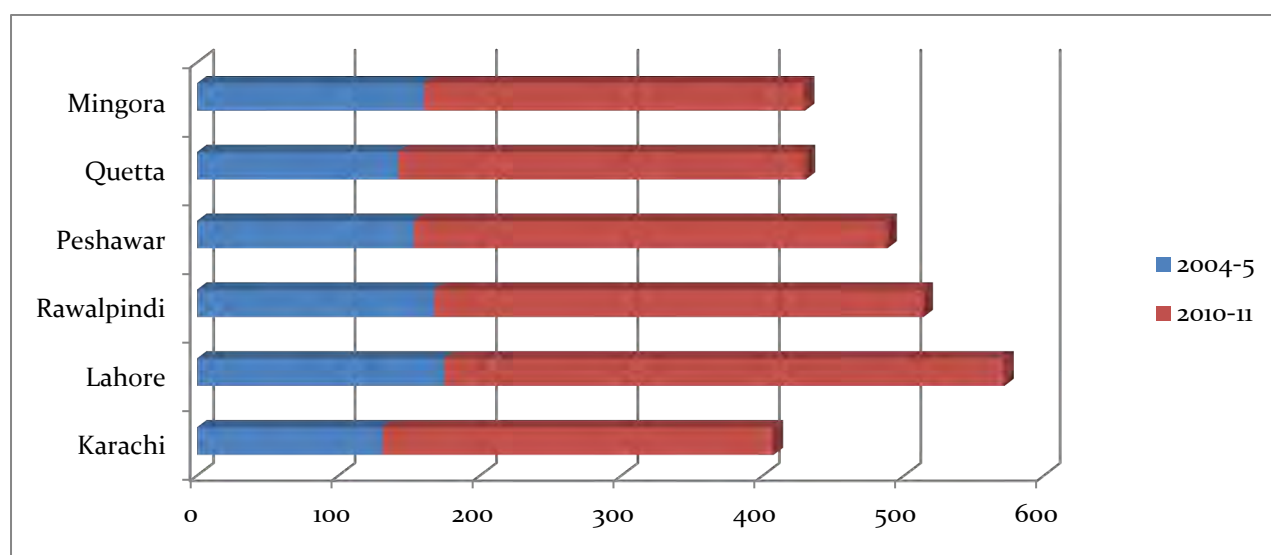


Figure-5: Prices of fuelwood in major markets in Pakistan (Rs / 40KG)



Chapter 4

Investment in the forestry sector

CHAPTER 4

INVESTMENT IN THE FORESTRY SECTOR

4.1 Funding sources

Funding in support of the forestry and rangelands sector is normally provided through one or more of the following national sources:

a) Recurrent or normal budget:

This is the routine budget voted by the concerned State Assembly to fulfill the administrative and routine functions of the Department. It covers establishment charges, consumables, operational and transport charges besides expenditure on routine works like felling, marking and transportation of timber.

b) Development budget:

This budget is used to fund special investment and development activities of the Department; including the creation of resource and execution of conservancy and development works beyond the jurisdiction of the normal routine of works. Development funds are demanded through project document called PC-1. The Development budgets of the provinces are called Annual Development Programme (ADP), while that of the Federal Government is called the Public Sector Development Programme (PSDP).

c) Endowment and other flexible funding sources:

Endowment and other flexible funding sources are developed to provide leverage to implementing departments to ensure timely availability of funds for season bound activities without lengthy and cumbersome procedures for accessing funds. Under Forestry Sector Reforms undertaken in the KP, an endowment fund called Forestry Development Fund (FDF) has been instituted. Until now more than three billion rupees have been generated, of which a sizeable amount of about two billion rupees has already been incurred on forestry activities. In Gilgit-Baltistan also an endowment fund namely Forest Regeneration Fund (FRF) has been established. So far an amount of Rs 1 000,00 million has been deposited in this endowment fund and Rs 437.894 million has been invested in forestry activities. In case of FATA Forest Development Fund (FDF) has been established by levying a tax of Rs 800 per each permit

issued by the Political Agents (PA), while authorizing transportation of timber from Tribal Areas to the settled districts in the country. Ironically, however this amount is seldom used for forest development, contrary to its basic objective.

Funding through UN bodies and UNFCCC frameworks like GEF, Green Climate Fund and other climate change-related sources such as REDD+ are also available. Such funding sources have hardly been tapped, primarily due to lack of capacity in the Forestry Departments to fulfill prerequisites for these mechanisms.

d) Donor grant and loans: Donor grant and loan funding are provided under bilateral and multilateral funding arrangements through the Economic Affairs Division (EAD). Funding is project-based and provided for a specific period only.

e) Funding from forest companies, and the private sector:

Funding from Forest Companies the Private sector like Forest Development Corporation and companies under Corporate Social Responsibility is also made available for forestry interventions.

f) UN funding and GEF:

Funding through UN bodies and UNFCCC frameworks like Global Environmental Facility (GEF), Green Climate Fund (GCF) and other climate change-related sources such as REDD+ are also available. Such funding sources have hardly been tapped primarily due to lack of capacity in the Forestry Departments to fulfill prerequisites for these mechanisms.

4.2 Investment in the forestry sector

Forestry is a season, long-term and high gestation enterprise. It requires appropriate skills, experience, proper planning, commitment and timely availability of funds for achieving the desired levels of success. According to the set process, the investment in the forestry sector is made through recurrent budget and also through development budget. However, the funding through endowment funds are erratic and has historically remained at a low priority.

The developmental budget is normally arranged through donors and provincial ADPs and funding through federal PSDP, have now become occasional, after devolution. Green Pakistan Programme is, a new initiative of the Federal Government under PSDP, which has recently been initiated in response to Billion Trees Afforestation Programme of KP government. The donors funding is normally project bound. In case of FATA and GB, however entire funding under normal, as well as developmental budget comes from the Federal Government. The donor funding in the Forestry sector was more liberally available till the year 2000 but it has now almost dried up, except for GEF projects. Table 6 gives detail of average annual investment made in the Forestry Sectors.

Table-6: Province-wise annual expenditure of forestry departments in Pakistan (Rs Million) for 2016

<i>Funding sources</i>	AJK	Balochistan	FATA	GB	KP	Punjab	Sindh	Total
<i>Recurrent budget</i>	597.667	563.700	262.44	272.38	1 138.594	3 303.828	400.00	6538.609
<i>ADP</i>	335.21	298.23	975.35	168.00	280.00	2 000.000	322.827	4379.617
<i>PSDP</i>	120.00	-	-	-	-	-	-	120.00
<i>Donors</i>	216.00	-	-	-	-	-	-	216.00
<i>Others</i>	-	-	-	-	100.0	-	-	100.00
<i>Total</i>	1 268.877	861.93	1 237.79	440.38	1 518.594	5 303.828	722.827	11 354.226

Source: Data collected from CCFs concerned (Excluding BTAP and GP funding)

An amount of Rs 11.354 billion has been allocated to the forestry sector in 2016-17; out of which Rs. 6.538 billion have been allocated under recurrent budget and Rs. 4.816 billion under development budget. As much as 66.2 percent of the recurrent budget is spent on establishment; 7.4 percent on sowing and planting; 9.8 percent on conservancy and works and 16.6 percent on other miscellaneous charges (Shah and Mohammad, 2016). An average investment of 7 110, 1 447, 1 132, 868, 780 and 500 per ha of forest area was made in Punjab, AJK, Balochistan, GB, KP, Sindh, and FATA respectively during the period of 2009 to 2011 under the recurrent budget.

Of the total Development budget an average of 10.9 percent is spent on the establishment, 35.3 percent on other charges, while 53.8 percent is invested directly on the developmental work. The highest development

expenditure per ha has been in Punjab (Rs 4305 per ha), followed by FATA (1861), AJK (1625) Balochistan (599) and Sindh (556), while in KP there has been the least investment of Rs. 260 per ha. Thus, investment in Forestry Development programs does not correspond with the growing gap between supply and demand for forest products. Normally allocation of development funds for this important sector in most of the provinces/regions has remained less than one percent of the total size of the development budget, except FATA where allocation is 4.59 percent.

Recently, in KP Government has initiated the “Billion Trees Afforestation Project” (BTAP) to plant one billion seedlings in a period of four years. This program was concluded ahead of schedule with a total reported investment of Rs. 11 billion. Hence, the annual investment of development in Forestry in KP has jumped from Rs. 300 million to almost Rs. 4 500 million per annum but this increase in investment level is temporary until the completion of the project. Therefore, while calculating average investment for KP, the enhanced funding for BTAP has not been taken into account for the future expenditure.

Donor investment in the Forestry sector has almost dried up. There is a great potential for accessing climate change-related funding like GEF and GCF but due to capacity gaps availing such funds is difficult without external support. In particular, there is a need to link current Forestry Development Programs like the “Billion Trees Afforestation Project” of KP and the “Green Pakistan” initiative by the Federal Government to REDD+ and other such funding mechanisms.

4.3 Major projects

Recognizing the importance of the Forestry sector and its enormous economic, social and ecological significance, the Government of Pakistan has launched a number of major projects in different provinces. However, unfortunately, projects reports have piled up in libraries and the literature generated has rarely been mainstreamed and used in the routine work of Forestry Departments. It seems worthwhile, to carry out a detailed review of success and failures during the execution of these projects, in order to internalize the lessons learned and avoid duplication and wastage of the valuable resources. These studies and reports should be easily accessible online.

With a view to assisting policy-makers and planners in developing sustainable strategies for future investments in the forest sector a cursory review of several important national Forestry and Range Management projects is provided below.

4.3.1 Forestry planning and development project (FP&D)

The Forestry Planning and Development Project was a pioneer farm forestry project implemented at the national level from 1983 to 1993. It was funded by USAID, through a grant in aid for development of indigenous energy supplies and to achieve energy self-sufficiency through promoting farm forestry. It was implemented by the office of IGF through Winrock International; a consulting firm and was executed by forest departments in all the provinces.

It promoted farm forestry by establishing a network of farmers and engaging them in nursery raising enterprise. The choice of species to be grown in nurseries was done on the basis of farmers demand through preference surveys. The seedlings grown in private nurseries were supplied to the farmers free of cost for planting. The project had a strong training component and women farmers were encouraged to grow plants.

The project was a success and paved way for developing the agro-forestry resource in the country, besides introducing the concept of private sector involvement in forestry interventions. It highlighted the critical role that community and farm forestry as an intervention can play to increase farm trees resource and reduce the burden on natural forest ecosystems. It successfully demonstrated that farmers are willing and capable to raise forest nurseries, if market and inputs are made available and skills transferred appropriately. It was also learned that such programmes need strong extension network, good capacity building programme and effective participatory monitoring system to ensure that the seedlings distributed have been planted, protected and allowed to grow into trees. The intervention of private and community nurseries has now been

widely replicated and helped in reducing pressure on forest functionaries on one hand and increasing farm resource on the other. It has also been learned that instead of providing seedlings with 100 percent subsidy, selling of plants at subsidized price is more beneficial; as it respects market mechanism and binds farmer not to waste plants purchased out of his hard cash. The project also succeeded in breaking the myth that private sector is unable to raise forest nurseries. Consequently, nursery raising in private sector has flourished in the country because of implementation of the project.

4.3.2 Tarbella Mangla watershed management project

Tarbella Mangla Watershed Management Project was established as a pilot project in 1964 in the Kunhar river catchment; which is a tributary of the Jehlum River and flows into Mangla Dam catchment. It was initiated in order to improve watershed management and to stop siltation of the Mangla dam. The pilot project focused on treatment of vulnerable private arable lands as well as rangelands. After the successful implementation of the project at Mangla dam, it was then extended to the catchment of Tarbela Dam. The programme was supported by World Food Programme (WFP), International Fund for Agriculture Development (IFAD), Water and Power Development Authority (WAPDA), Public Sector Development Programme (PSDP) and GiZ (German Development Organization) during various phases of its implementation. It has now been converted into a normal activity and extended to the entire Hazara and Malakand Civil Divisions, except Chitral, Upper Kohistan and Palas Districts. This project has also been replicated in AJK through Suketar Watershed Watershed Planning and Management Project in Balochistan, FAO- as well as in UNDP-funded post-earthquake, rehabilitation watershed projects for KP and AJK.

The project demonstrated that proper watershed management will yield visible impact; provided that integrated watershed management plans are in place with integrated planning and implementation practices. After the 2005 earthquake the integrated treatment of sub-watersheds became more common in monsoon-prone areas. Now small catchments are treated after preparing integrated and holistic watershed management plans. This project also highlights the critical role that forestry can play in reducing risks and creating resilience against natural hazards.

4.3.3 Sindh forestry sector development project (SFSDP)

The Sindh Forestry Sector Development Project was initially planned to implement recommendations of FSMP through support of Asian Development Bank (ADB) in order to bridge the gap between supply and demand of timber and fuelwood. The project focused on the institutional strengthening, promotion of private sector engagement, rehabilitation of degraded riverine forests and irrigated plantations, as well as farm forestry.

The success of this project was limited only to the farm forestry; the desired impact was not reached due to the target-oriented approach that was used. The project developed work plans for managing state forests sustainably, but almost all of these plans are now expired. The project focused on landowners and did not effectively target the tenants.

4.3.4 Forestry sector project (FSP)

The Forestry Sector Project was implemented in KP (1995-2004) as a follow up to the recommendations of FSMP with regard to increasing productivity of high hill forests intensifying management protecting watershed and improving institutional capacity of the department. The ADB (28 million US\$) and Dutch Government (14 million US\$) funded the project and also provided technical support. Under the project Provincial forest policy was formulated, outdated Forest Act of 1927 was replaced with Forest Ordinance, 2002; new forest rules were framed; multi-tiered resource planning were introduced, and concept of participatory forestry was integrated in the routine functioning of the department, besides rehabilitating 175 000 ha wastelands, improving 79 000 ha rangelands and supporting farm trees resource over 30 000 ha. It also brought about structural reform, introduced matrix management and created specialized directorates of Research and Development, Institutional and Human Resource Development (I&HRD), Community and Gender Development and

Extension, and Directorate of NTFP, besides converting Working Plan Circle into Forestry Planning and Monitoring Circle

During the implementation phase of FSP it was observed that there was a need to promote sustainable management attitude, skills and capacity of traditional foresters for any kind of immediate change. This was only possible through strong awareness raising and capacity building campaigns, as well as through necessary exposure. Therefore it is recommended that under such circumstances, it is imperative to create the acceptability and clarity of the project being implemented to the targeted sector, to make them feel comfortable otherwise such programmes and projects can prove to be counterproductive.

4.3.5 Integrated range and livestock development project (IRLDP)

The IRLDP was implemented in Balochistan from September 1992 to June 1998, with support from UNDP and was executed by the FAO in collaboration with the Balochistan Forest and Wildlife Department. From July 1998 IRLDP merged with UNDP sister projects to form the Area Development Programme of Balochistan (ADPB).

The IRLDP was a pioneering attempt to introduce the community-based natural resource management in Balochistan. It aimed at restoring and improving grazing lands to increase income from livestock.

It was concluded that a change in community attitude is possible, but is a slow process and requires long term commitment. It also proved that rangelands are not wastelands but are an important resource and are to be managed accordingly.

4.3.6 Kalam integrated development project (KIDP)

Kalam Integrated Development Project was implemented in Kalam and Utror Valleys of Malakand Division in KP, with financial assistance from Swiss Development Cooperation (SDC) from 1981 to 1998 with an investment of 41.510 million Swiss Francs. The project focused on improving forest management and forest harvesting techniques through small contractors, promoting off-season vegetables and improving village infrastructure through partnership oriented village development program.

As a result of this program, an integrated, holistic and participatory development approach was established. It paved way for involvement of local communities in Forest Management, in subsequent projects. Once people understood the value of natural resources, they started protecting and managing their resources. Although the program was a great success as a whole, it focused more on rural development than improving Forest Management. Due to the increased income and tourism activities in the valley, pressure on natural forests has increased further.

4.3.7 Malakand Dir social forestry project (MDSFP)

Malakand Dir Social Forestry Project was a flagship project of the Forestry Sector. It was implemented in Swat, Malakand and Dir districts in KP from 1987 to 1997. The project not only aimed at afforestation of barren private and community owned hillsides through organizing local communities but also targeted blanks in the protected forests in Dir. The project laid emphasis on sustainable management of land-use, development of community forests and rangelands and rural development, besides that the project also promoted energy efficiency for reducing consumption of fuelwood.

The project developed a new forestry extension and implementation approach called Village Land Use Planning (VLUP). It proved that although the participatory development is initially slow and costly, yet once it sets in, it improves pace, reduces cost and helps in sustaining created assets. The project design proved to be quite effective for developing forestry in wastelands through local participation. The project also proved that by introducing energy efficient stoves the fuelwood consumption could be significantly reduced.

4.3.8 Siran kaghan intensive forest management project (SKIFMP) - GiZ

Siran Kaghan Intensive Forest Management Project was started in coniferous forests of Kaghan valley in 1980 with the financial and technical support of GiZ to intensify felling and replacing single tree selection system (dispersed harvesting, costly and uncontrollable) with group selection followed by artificial restocking. It was later on extended to Siran Valley as well and renamed as Siran Kaghan Forestry Development Project.

The project proved that intensification of felling is feasible in high hill forests. Natural regeneration take more time and can be devoured by grazing animals, while artificial restocking with protection can improve stocking and reduce gestation period of future crop but hampers biodiversity. The Concept of Joint Forest Management Committees was also tested for the first time under this project and a legal basis was provided for JFM through amendment of forest laws, but the initiative could not flourish due to resistance from the traditional mindset.

4.3.9 Integrated land management project in districts Muzaffarabad Bagh and Poonch

A multi-phased Integrated Land Management (ILM) Program (1995 - 2015) was implemented in three districts of Muzaffarabad, Poonch/Bagh and Kotli in AJK with the financial support from WFP, and AusAID with a total outlay of Rs. 410.305 million. Development activities under the programme were mainly restricted to private and communal lands. The programme activities included; establishment of fuel wood and fodder plantations, soil and water conservation improvement of agriculture land development of water facilities for irrigation and domestic use, construction of bridle paths and fair weather rural roads.

Based on the experience it was observed that such integrated programmes can only be implemented through cross-sectorial coordination.

4.3.10 Billion trees afforestation project

The Government of Khyber Pakhtunkhwa has launched a massive game changer and flagship project in Khyber Pakhtunkhwa namely *“one Billion Trees Tsunami Afforestation Project”*. Under this project trees have been planted /regerated in over an area of about 593 292 ha area; with a total of 1.2 billion with an investment of Rs. 11 billion. This project brought 6.3 percent additional area under forest, cover. As a result, in addition to rehabilitation of forests, considerable carbon sink has been created which will gradually reduce the pressure on natural forests. The Forest Department on 14th November 2017, during a ceremony has announced that against target of 1 000 million seedlings 1 018 million seedlings have been planted and regenerated under the project.

After the successful implementation of this project and its experience, the lesson learned was that process is much more important than targets. The public provides support towards good initiatives and becomes part of it as long as the proposed initiative does not hamper their livelihood patterns and resources and is beneficial for the overall community.

Under this project, the rehabilitation of natural stands was possible through natural regeneration by closing the forest period. For this purpose, only a certain part of the forest was closed, so that the local community can divert its use conveniently to the adjoining forests. However due to closure grazing space was reduced; thereby demand for fodder increased. The increased fodder quality and quantity due to protection results in improvement in livestock and their products. This is one of the successful project accepted by the Bonn Challenge and also appreciated by various international agencies for its high success rate and its contribution to local livelihood and restoration of forestry resources in the province. The project was able to create 0.5 million jobs in the forestry sector.

After the successful implementation of this project, the Federal Government of Pakistan has launched a similar project at the national level known as the “Ten billion tree afforestation project”, which will be implemented throughout the country.

4.3.11 South Punjab forestry company (SPFC)

The riverine forests have been adversely affected due to construction of flood control bunds; and consequent decrease in flood inundations. Resultantly, ground water level has dropped to the extent that irrigation through indigenous “*bela* technique” has become impracticable. Under *bela* technique shallow wells were dug out in plantations for irrigation. The scarcity of water coupled with paucity of funds; rendered watering of plantations impossible in riverine forests of southern Punjab. In order to re-establish these forests, through public private partnership the Government of Punjab has established SPFC under section 42 of the Companies Ordinance, 1984.

The SPFC has 123 000 ha *bela* land in Bahawalnagar, Bahawalpur, Dera Ghazi Khan, Muzaffargarh, Rahimyar Khan and Rajanpur. It has started leasing lands for a period of 15 years lease to establish forest or forest based enterprises over the land on profit sharing basis. The bids have been opened on October 2, 2017. The land slots will be awarded to the successful bidders based on evaluation and approval of bids to start forestry operations as soon as possible.

4.3.12 Green Pakistan programme (GPP)

OIGF has launched a massive 5-year plantation program under explicit directives by the Prime Minister of Pakistan, to add 100 million plants in the landscape and restore degraded ecosystems on 50 percent cost sharing basis with the provinces/regions. The program was initiated in February, 2017. The project includes planting one thousand avenue miles of plantations along canal side and roads in Punjab, KP and Sindh; rehabilitation of irrigated plantations in Changa Manga, Daphar, Bahawalpur and Chichawatni; rehabilitating mangrove forests in Karachi and Badin; improving forests of Khirthar Range in Sindh, Juniper forests of Ziarat and Chilgoza forest in Suleiman Ranges of Balochistan. Coniferous forests in GB, AJK, Murree, Hazara, Kotli sattian, Malakand and FATA (Orakzai, North Waziristan, etc.) will also be improved during the project. The project has just been started; as such it is too early to draw lessons and conclusions at this stage.

4.3.13 REDD+ Readiness Preparation Proposal Project (R-PP)

Pakistan is currently in the implementation phase of REDD+ (Reduction of Emissions from deforestation and degradation) program, which has been introduced as a tool for forest conservation. The World Bank through Forest Carbon Partnership Facility (FCPF) has launched this US \$4 million project over three years (Jan 2014-Dec 2017) worth. The World Bank as the delivery partner to FCPF is providing financial and technical support to execute this program.

The main objectives of REDD+ program is to formulate REDD+ strategy and its implementation framework; REDD+ technical support which includes the development of Forest Reference Emissions Levels (FRELs); designing a national Measurement, Reporting and Verification (MRV) systems for emissions reduction and monitoring system for non-carbon benefits; REDD+ Readiness Management which includes managing and implementing the REDD+ activities; building capacity; national level consultations on REDD+; the last objective is to design and test REDD+ payment for Environmental Services scheme (PES) in at least three provinces, depending on the available funds.

The Government of Pakistan held a mid-term review of the REDD+ R-PP activities to monitor the progress of readiness activities in the country, to document the lessons learned and identify the existing gaps for the next phase and related financial requirement.

Under the REDD + grant to the IGF office with the mandate to establish the national forest monitoring system (NFMS) , developing reference level (FREL), Measurement review and Verification (MRV) and social and environmental safeguards. For this purpose the Office of Inspector General of Forests (OIGF) has commissioned a number of international studies. After fulfilling the basic requirement, REDD plus piloting will be initiated. During pilot phase Project Design Documents (PDDs) will be developed.



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Chapter 5
Institutional review

CHAPTER 5

INSTITUTIONAL REVIEW

5.1 Policy

5.1.1 Historical perspective

Pakistan has inherited an institutional mechanism, management system and infrastructure of forestry which was developed before the partition in 1947. Although Forestry was a provincial subject since 1935, due to its linkages with the environment on concurrent list and following pre-partition arrangements, the offices of IGF and PFI were established as Federal Institutions, and policies were developed by the office of IGF at the federal level. Thus the legal instruments developed during the pre-partition era have been adopted since then and continue to be practiced.

5.1.2 Evolution and focus of National forest policies

After partition, the 1894 policy of united India became irrelevant for resource deficient Pakistan; hence from 1955 onwards, Pakistan developed its own forest policies. It is important to indicate that forest policies in Pakistan now draw authority through principles of policy, which are enunciated in Chapter-2 subsection (1) of the constitution of Pakistan, 1973 (Jan 1992) which states that:

“The principles set out in this chapter shall be known as the principles of policy, and it is responsibility of each organ and authority of the state, and of each person performing functions on behalf of an organ or authority of the state, to act in accordance with those principles in so far they relate to the functions of the organ or authority.”

The focus areas and implementation status of national policies are highlighted in Annex-XII.

5.1.3 Key Features of the National Forest and Climate Change Policies

The OIGF has compiled National Forest Policy 2016, which has been approved in the meeting of Council of Common Interest in February 2017; however, it is still subject for building consensus with the provinces.

The national forest policy document lays down the objectives and strategies, and emphasizes upon expansion protection and sustainable use of national forests; protected areas; natural habitats and watersheds to restore ecological functions; improve livelihoods and secure human safety in consonance with national priorities and international agreements. In addition, all the objectives are tuned to promote ecological, social and cultural functions of forests through sustainable management and optimum use of forest products including wood and non-wood forest products. It also strives to promote ecological corridors, enhancing role and contribution of forests in reducing carbon emissions and enhancing forest carbon pools, facilitating implementation of international conventions and agreements related to forestry, wetlands, biodiversity and Climate Change. Other important policies and initiatives that are relevant to the Forestry Sector are;

- National Conservation Strategy (NCS), 1992 which was reviewed in 1999;
- Forestry Sector Master Plan, 1992;
- The Household Energy Strategy Study (HESS), 1993;
- National Biodiversity Action Plan, 2000;
- National Environmental Action Plan (NEAP), 2001;
- National Environment Policy, 2005;

- National Climate Change Policy, 2012;
- REDD+ Readiness Preparation Proposal document and process;
- Ratified multilateral environmental agreements relating to Forests by the Government of Pakistan.

The objective and section 4 of the Climate Change Policy 2012, emphasizes on the conservation of natural resources and promoting sustainable management of scarce forestry resources. The scope of this part of the policy is to recommend adaptation measures to prepare Pakistan's forestry sector to withstand present and possible future impacts of climate change. The salient policy measures are intended to address the key areas like; awareness raising, research; reforms in governance; enhancing adaptive capacity; arresting soil erosion; reducing incidences of forest fires, and conserving biodiversity and other vulnerable forest and rangeland ecosystems.

The National Conservation Strategy (NCS) was developed with the help of IUCN Pakistan from 1990 to 1992. It calls for the conservation of sustainable development and efficient use of natural resources.

The FSMP was developed by OIGF in 1991-92 mainly to ensure sustainable management of natural resources based on credible information. It proposed a concrete measure to improve conservation of resource for the next 25 years.

The National Environmental Action Plan (NEAP) provided support and guidance for environmental policy, good governance and emphasized on adopting an ecosystem management approach to conserve the resource. It further laid emphasis on sustaining natural resource-based livelihoods, protection and integrated management of upland forest ecosystems, improvement of marine and coastal ecosystem, conservation of biodiversity, management of dry-land, water conservation, renewable energy and maintenance of all natural ecosystems.

The National Environment Policy calls for action while reporting that 2 to 2.5 percent of deforestation were happening annually and forest, range, and marine ecosystems were reducing at an alarming rate. It also emphasizes on the importance of community participation.

Consequently, it is evident that the policy paradigm at the federal level is highly conducive for the conservation of natural resources in general and forest and rangelands in particular.

5.1.4 Provincial forest and climate change policies

It is imperative to formulate provincial forest policies under the umbrella of the Federal Forest Policies, in view of specific socio-economic environment, extent, and type of forest resource base, climatic patterns, growth potential, and demand on resources and market situation for forestry products obtaining in each Province or Region. More so, financial allocation for forestry and allied resources is also made by the provincial governments. Consequently, instead of implementing policies formulated by the federal government, it is essential to have provincial forest policies specific to the needs and aspirations of the provinces and regions.

In this connection the government of KP took the lead during the reform process undertaken from 1995 to 2004 under Forestry Sector Project (FSP) and promulgated its first provincial forest policy in 1999. The government of Punjab followed suit and promulgated its policy in 1999 and revised it in 2016, which is being processed for approval. The AJK has developed its own policy draft in 2013 and GB in 2015. Although other provinces and territories have not yet formulated their formal forest policies they are pursuing undocumented policies in one form or the other.

The KP Forest Policy, 1999 lays down objectives aims to manage forests for the benefit of the community, strives to conserve and enhance protective and productive functions of forests and calls for improved management of rangelands, satiating demand and promotion of NTFP and eco-tourism as well as biodiversity

conservation. It endeavors to promote landscape approach entailing integrated, participatory, inclusive, just, gender sensitive, decentralized and devolved forest governance and improved monitoring and supervision; especially in ecologically sensitive areas.

The Punjab Forestry Policy describes the situation of the available resources and identifies that increasing area under state control is not possible. It emphasizes on optimal stocking of existing forests, rehabilitation of problem sites, community and private sector involvement, watershed and biodiversity conservation and appreciates the importance of forestry education, research, extension, and other institutional arrangements.

The AJK draft Forest Policy 2013 aims at restoring, developing and maintaining natural forests; increasing productivity of forests to meet requirements of timber, fuelwood fodder and non-wood forest products; encouraging efficient utilization of wood and non-wood forest products, maximizing wood substitution; developing forest resource base to enhance carbon sequestration capacity and mitigating climate change effects, promoting farm forestry and social forestry to meet timber, fuelwood, and fodder needs of the communities and reduce pressure on natural forests. It also mainstreams sustainable forest management into sectoral policies. In addition, AJK government has also formulated its climate change policy, which was approved in August 2017.

Balochistan does not have a provincial policy for the forestry and allied resources. The concept of community participation and improved resource management has been introduced and is now being gradually accepted through a number of innovative projects. It is, therefore, expected that these concepts will find a place in the provincial forest policy expected to be formulated in near future.

In the case of FATA because of its peculiar status a forest policy and forest laws do not yet exist, however, a draft forest law has been formulated. The natural resources including forests are traditionally managed by the communities, without any involvement of officials from the Forestry Department. There, is however, a need to document and understand these traditional institutions and customary laws, which can be used in the formulation of future policies after the merger of the region with the adjacent province of KP. So far the main thrust of the Forestry Department remains on raising forest nurseries and plantations in a traditional manner.

The GB draft Forest Policy 2015 strives to re-organize Forest Department, enhance its capacity to strengthen protection of forests aiming at inducing sustainable management, conserving the biological diversity, ensuring sustainable livelihoods, promoting NTFP's, wood substitution, development of alternative energy resources and promoting social forestry as major tool to extend the resource base and offset the pressure on natural forests.

Sindh Government has not developed its own policy but has witnessed consequences of Agroforestry Lease Policy 2005, under which 70 000 ha of forest land located in riverain and irrigated plantations have been leased out for the promotion of agroforestry. There is, however, a strong need for formulation of a comprehensive forest policy for Sind, after analyzing the experiences of leasing out of the forest lands to private individuals.

5.1.5 Main weaknesses of policies

As a result of the formulation of forest policies by the Federal Government, guidance and support have been provided to the provincial forest departments for the conservation of forest resources. These policies have also, facilitated in assigning new roles of watershed, rangelands and wildlife management to the Forest Departments. The credit of conversion of 3 percent of command area under new canals for raising irrigated plantations in Sindh and Punjab, and transferring of land along roads and canals and railway tracks to Forest Departments for establishing linear plantations also goes to these policy directives by the Federal Government. The policies, however, have broadly failed to realize most of the objectives mainly due to the following inherent weaknesses:

- The Forest Policy formulation process in Pakistan has mostly remained top-down and autocratic. The policy guidelines were traditionally formulated by the office of IGF. Thus, this bureaucratic policy

formulation process failed to involve real stakeholders on one hand, and to avail support of political leadership for its optimum implementation on the other hand especially about resource allocation. It may be pertinent to mention that forestry resources are mostly allocated by provincial Planning and Development Departments and political leadership at the provincial level.

- Lack of political will to implement these policies have been missing. Also the support for forest development was not included in the manifestos of major political parties in Pakistan.
- No monitoring and evaluation and feedback mechanism have been established to incrementally improve policies in light of experience gained. Every time a new policy was formulated, no attempt was made to analyze and evaluate the successes or failures of previous policies.
- Such policies can at best be described as a wish list of technocrats, which could not avail support of the major segments of the society due to top-down approach rather having a bottom-up approach as well as involving the key stakeholders who are actually involved at the grass-root levels.
- The policies failed to break the management ethos of meeting revenue requirements mainly through timber sales of the provincial and regional governments – so deeply embedded in the psyche of the forest service since its genesis during colonial times. Overemphasis on revenue generation through timber production from state forest lands overshadowed critically important ecological and environmental functions of the forests.
- As a result, the forest service generally remained oblivious of its fundamental role of providing services to the masses. Consequently, it failed to take over its new roles and functions of community and participatory forestry in the true sense, as envisaged and emphasized by in a number of donor-assisted projects.
- Almost all the forest policies of Pakistan failed to place requisite focus on providing and sustaining livelihood to local communities. The stakeholders often find themselves in a situation where state policies either do not support or have harmful effects on their livelihood strategies like timber harvesting ban, Forestry Cooperatives, and Goat Eradication Ordinance. It is in this scenario that policies do not meet the expectations of people who, in turn, are forced to utilize the natural resources unsustainably to secure their livelihoods. Consequently, neither the developmental nor the conservational objectives set forth in these policies could be achieved. The timber production bias in these policies relegated NTFPs to insignificance, despite their crucial role in sustainable livelihood for the forest-dependent communities.
- Mostly, local communities were considered a threat to conservation. Consequently, their meaningful participation in resource conservation, plantation, and development of forests has not been given due attention. Hence, social and cultural aspects in forest management were ignored.
- The 1980 forest policy recognized the importance of the involvement of local people in tree plantation but at the same time, it limited the rights of local people by bringing more land under the control of state and establishment of national parks.
- The policies did not attempt to enhance supply base through liberalized imports and decreasing demand by using wood and fuelwood substitutes as well as energy conservation through fuel-efficient technologies and constructed of insulated houses.
- Despite the significant importance of forest services and functions, the valuation of these services could never be recognized or have been emphasized in any of these policies. Resultantly, the economic contribution of the forests could never be appropriately reflected in GDP. Therefore, the foresters could not convince policy makers and planners for receiving a due share in national and provincial investment plans.
- Role of private sector in the promotion of commercial and industrial plantations has also not been recognized and promoted.
- Forestry being a cross-sectoral enterprise requires active collaboration with other sectors, particularly Agriculture, Livestock, Mining and Tourism, just to mention a few. However, no cross-sectoral linkages and cooperation could be established and the forest departments continued working in isolation to the detriment of the national forest resources
- Despite strong urge, the entire forest areas could not be brought under the purview of work plans. This has seriously affected the health of forests and paved way for resource depletion.

- Centralization of the policies formulation process in OIGF, without any effective mechanism of ensuring its implementation and effective monitoring, is considered as one of the major causes of the policies failure.
- International agreements and conventions had been negotiated and ratified at the federal level, without appropriate and meaningful consultation and involvement of provinces; for instance the forest departments are not consulted or involved in preparing the interventions for the international agreements. Therefore, in many instances it has been observed that the forest department at the provincial level sometimes is unable to fully appreciate international obligations of the federal government.

5.2 Legal Framework

Indian Forest Act, 1927 was under implementation at the time of independence. It was adopted as such by the National Assembly of Pakistan in 1947 and renamed as “Pakistan Forest Act 1927”. This has become a prime piece of legislation and was extended to almost entire country except for FATA and a few other locations. With the passage of time, new legislation were enacted from time to time to regulate forestry and allied resources in various provinces. List of such laws is given in Annex-XIII.

The KP during reforms process (1995 to 2004) has enacted a new Forest Ordinance in line with new provincial forest policy. All the Forest Rules were also reformulated to align them with new concepts and to provide legal support for community participation. KP has also recently revised its Wildlife Act. Balochistan has enacted new Wildlife Act in 2014 and prepared draft Forestry Act, 2017 which is ready for processing and approval. The forestry legislation in all other provinces and regions are almost outdated and require updating to suit current day requirements. The provisions contained in a number of other forestry-related Acts can also be embodied in one main Act to regulate forestry conservation and development more conveniently. The FATA forests also need to be brought under forestry legislation, as soon as a decision of its merger has been implemented.

The new legislation needs to reduce discretionary powers; ensure sustainable forest management and landscape forestry; forbid the transfer of forestry land for non-forestry purposes; should bind forest harvesting with the existence of valid and quality work plans; provide a legal basis for community role and effective monitoring of plan prescriptions and their implementation. It should also embody provisions for Climate Change related activities and regulatory actions pertaining to multilateral environmental agreements.

Moreover, inherent weaknesses in the implementation of forestry laws like inadequate reporting of forest offense cases (damage reports), improper investigations weak prosecution failures in presenting proper evidence and credible witnesses result in acquittals or nominal penalties, which encourage criminals to continue committing more offenses. Due to a weak writ of law, weak legislation, weak prosecution, the apathy of forest officials and low priority of the forestry related cases in courts the threat perception has significantly been reduced. It is, therefore, imperative that threat perception for habitual forest offenders and notorious criminals should be restored through appropriate implementation mechanism of forestry laws.

5.3 Institution types

5.3.1 Administrative institutions

All of these federating units and special areas have their own independent arrangements for the management of forests and its allied resources. The system and administrative and technical organizational structure inherited from pre-partition India is still being followed with minor adjustments. Under this system the tiers of forest management are as follows:

Name of Post

Secretary Forests
 Chief Conservator of Forests (CCF)
 Conservator of Forests (CF)
 Divisional Forest Officer (DFO)
 SDFO/Range Officer
 Forester (Block Officer)
 Forest Guard

Name of office/jurisdiction

Province
 Province/Region
 Circle
 Division
 Sub-division/Range
 Block comprising of a few beats
 Beat comprising of a few forest compartments

Presently AJK has three Chief Conservators of Forests; Balochistan has two regions namely, Northern and Southern, each headed by a CCF; GB and FATA are administered by Conservators of Forests directly reporting to Secretaries, and Khyber Pakhtunkhwa has three regions, namely, Central, Malakand and Hazara, each headed by a CCF. Punjab has three Forest Regions called Central (Lahore), Northern (Rawalpindi) and Southern (Multan) each headed by a CCF besides DG Wildlife. In case of Sindh there is one CCF. The CCFs are supported by Conservators and allied staff. The detail of staff is given in Table-7.

Table-7: Professional staff strength of Forest Departments

Province/Region	Total Forest Area (million ha)	CCFs	CFs Managerial	CFs Functional	DFOs Managerial	DFOs Functional	Total staff
AJK	0.42	4	7	5	15	12	2 358
Balochistan	0.49	2	13	2	51	5	2 033
FATA	0.52	-	1	-	7	1	607
GB	00.31	-	3	1	16	2	805
KP	1.46	3	5	6	30	17	2 600
Punjab	0.46	4	11	3	44	9	6 840
Sindh	0.59	1	10	1	28	6	2 055
Total	4.28	14	50	18	191	52	17 280

Source Data from CCFs and CFs of forestry departments

The pivotal positions for forest management are that of Forest Circles and Forest Divisions. Figure-6 below compares the size of Forest Circles and Forest Divisions in each province/region.

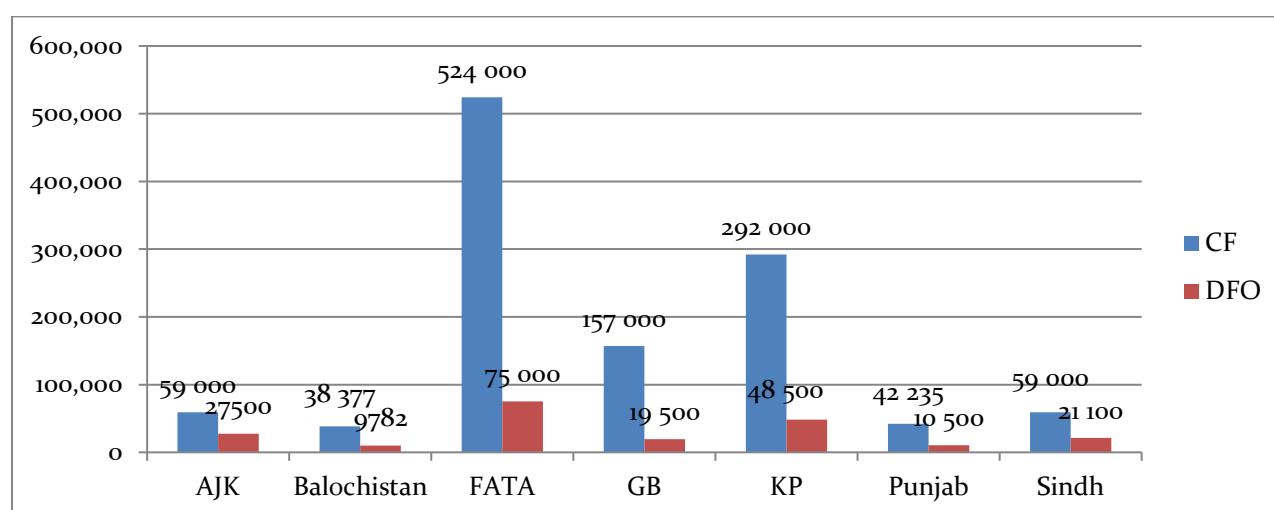


Fig-6 a: Average area of administrative Charges in ha (Circles and divisions) by Province

It has been suggested that optimum size of the Forest Circle should contain 20 000 ha forests area a Forest Division should have 5 000 ha of forests and of a Sub-Division as 1200 ha whereas, in KP, for example, average

size of a Forest Beat is of 1 350 ha and of average Forest Block is 6 500 ha (Jan 1992). Thus, the sizes of administrative units of forestry are far too big and require suitable rationalization, to ensure intensive management and effective protection.

The forestry organizational system is now quite outdated and consists of managers only, while both managers, specialists and researchers are required on the team. Similarly, there is a need to establish strong extension wings for launching effective awareness campaigns for mobilizing various segments of the society for the promotion of forestry.

5.3.2 Research institutions

The principal Forestry and Allied Resources research institution, in the country is Pakistan Forest Institute Peshawar (PFI), which has been devolved to KP after 18th constitutional amendment, but the institution is still mandated for serving the entire country thus creating considerable administrative and operational confusion. PFI has recently completed carbon stock assessment in GB and KP. It carries out research pertaining to silviculture, genetics, mensuration, wildlife, watershed, range management, forest products, medicinal plants, pathology, entomology and NTFPs including sericulture. It also offers BSc B.S. and M.Sc. level courses in Forestry to students from the open market, as well as to the nominees of the provincial forest departments.

Apart from PFI, the Punjab Forest Department has established Punjab Forest Research Institute, Gathwala (PFRI) near Faisalabad in 1982. The PFRI primarily focuses research in agro-forestry, arid zone forestry, rangelands development, and entomology. Sindh has Forest Research Center at Miani, Hyderabad, KP has applied research directorate at Peshawar and Balochistan, and AJK has their respective research divisions located at Quetta and Muzaffarabad respectively.

The quality of research in PFI over the years has significantly deteriorated due to uncertain conditions of staff after devolution, ongoing leadership crises and the retirement of highly experienced and trained professionals who are not replaced. There is no long and short-term research vision and agenda with the PFI. Ownership of the institution by the federation and other provinces has been lost, because of its devolution to the KP Province. As a result, the Research Review Committee, which had representation by the Chief Conservators of all the provinces, has become redundant and dysfunctional. At the same time, the PFI has no formal linkages with research programs in the provinces. It has recently started a student research program on various aspects of BTAP, which will hopefully create some vital information for the clients; else there is no linkage of forestry research with the existing field problems. The situation practically is redeemed by reconstituting the Research Review Committee by bringing renowned forestry professionals on board: irrespective of their status, province of domicile and designation.

In light of the above, there is room for considerable improvement in the functioning of the institution, provided its leadership can explore alternative options of strengthening linkages with the industrial sector, improving and diversifying its educational programs by launching a program of continuing education and gradually revamping it as an academy of excellence for training in forestry and allied disciplines.

5.3.3 Educational institutions

The professional education leading to Bachelor and Master-level programs in Forestry has previously remained an exclusive mandate of PFI. However with the start of forestry programs by the following Universities in the country, the PFI has lost this exclusive privilege as well:

- Benazir Bhutto University, Sheringal, Upper Dir, Khyber Pakhtunkhwa;
- Haripur University, Haripur, Khyber Pakhtunkhwa;
- Allama Iqbal Open University, Islamabad;
- Arid Agriculture University, Rawalpindi, Punjab;
- Agriculture University, Faisalabad Punjab;

- Bahaudin Zaqaria University, Multan, Punjab;
- Sindh Agriculture University, Tandojam Sindh.

Technical level training of foresters and forest guards are offered by the following institutions:

- Punjab Forest School Ghoragali;
- Punjab Forest School Bahawalpur;
- Sarhad Forest School, Abbottabad;
- Miani Forest School, Hyderabad, Sindh;
- AJK Forest School Muzaffarabad, AJK;
- Balochistan Forest School in Ziarat (under process).

Although the main output of PFI is to provide trained manpower in Pakistan, but its syllabi requires extensive overhauling and incorporation of new emerging disciplines like Climate Change, Disaster Risk Reduction (DRR), Carbon Stock Assessment and specialized degrees in Watershed Management, Range Management, Social Forestry, Agro-forestry, Fish and Wildlife Management, Remote Sensing, Forestry Extension, Forest Harvesting and Biometrics, and urgent need for well-qualified faculty members to develop and teach these educational courses.

5.3.4 Autonomous bodies

There are two semiautonomous harvesting corporations, namely, KP Forest Development Corporation and Azad Kashmir Logging and Sawmilling Corporation in KP and AJK, respectively. In Punjab Murree-Kahuta Development Authority (MKDA) is responsible to manage forests in Murree, while South Punjab Forest Company has been established recently to foster public-private partnership for investment in riverine forests. In Sindh Arid Zone Development Authority (SAZDA) manages rangelands, and Sindh Wildlife Board manages wildlife resources in the province. In addition National Council for Conservation of Wildlife has been established in OIGF to regulate trade in wild animals and birds, besides ensuring coordination among various federating units in matters pertaining to policies and conservation of wildlife resources in the country.

5.3.5 Private organizations

The Village Development and Joint forest Management Committees (JFMCs) were organized in KP by the Directorate of Community Development under the reform process. The JFMC's are given charge of managing existing forests through mutually agreed terms of the partnership while Village Development Committees (VDCs) are organized at the village level to support development and conservation of resource on private and community-owned lands. However, due to specific mindset prevalent in the functionaries of the Forest Department these local level institutions are not being supported and allowed to continue playing a role beyond project duration.

5.4 Forestry planning and monitoring institutions

Forestry planning is an important function for ensuring proper forest management. There are two types of planning i.e. *the development planning* and *forest resource management planning*. For forestry development planning a Divisional Forest Officer (DFO) Planning helps the CCF or CFs in case of FATA and GB as their staff officer. The development funds are allocated through annual development programmes (ADPs) in each province/area.

The forest resource planning is carried out through the preparation of Working (Management) Plans for specific forests. The work plans are developed under approved working plan codes. Before preparation of a new working plan or revision of an existing one, a preliminary working plan report is required to be developed by the respective CF or CCF, as the case may be. The working plan is then developed in the light of preliminary working plan report by work plan officer of a rank of a Divisional Forest Officer. These work plans are normally

developed for a period of ten years. The working plan officer assesses a total number of trees growing stock and annual increment along with other relevant parameters, on the basis of which he prescribes annual volume to be harvested (on a sustainable basis) along with the other management prescriptions essential for, sustainable forest management. The work plans are approved by provincial governments through its Secretary Forests. In Punjab, Sindh, and KP there are independent forestry planning circles, while elsewhere DFOs are posted to develop management plans as and when required. While undertaking forest inventory, the exercise is generally restricted to the forests fit for commercial harvesting whereas the rest of forests are excluded from this exercise. The exercise, therefore, is of limited value, while compiling information about growing stock at Provincial, Regional or National levels. These work plans are also of limited value as they lack instrumental information about environmental services, carbon stock, CO₂ emissions, sequestration, biodiversity, NTFPs, watershed, range management, farm trees stock, demand for products and value chains etc. As well as total stock available in the forests.

Thus there is considerable room to revise codes, improve design and quality of work plans, and cover entire forests with plans in order to bring plans at par with the present day demands and invoke sustainable management of forests. Whereas, the monitoring of forestry development projects is carried out by the respective P&D Departments, and internally by the department of forestry itself, there is however no mechanism for effective monitoring of the implementation of prescriptions of work plans, which has been turned into timber harvesting plans instead of management plans.



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Chapter-6

Main issues affecting the forestry sector

CHAPTER-6

MAIN ISSUES AFFECTING THE FORESTRY SECTOR

Despite the availability of full-fledged forest departments, allocation of available resources to the sector, and efforts leading to the conservation and protection of forests, the challenges behind the widening gap between supply and demand of forest products, low productivity, lack of regeneration in forests, inefficient logging and harvesting can not be tackled effectively as of yet, resulting in the continuous depletion of the resource base. Further, the issues of low investment in forestry programmes, relegation of NTFPs to insignificance by labeling them as minor forest products, lack of linkages between upland riparian forestry and lowland agriculture, lack of emphasis on watershed and rangelands management and inadequate involvement of stakeholders in decision-making and management are some of the factors responsible for the failure in achieving sustainable forest management.

These key challenges need to be analyzed in-depth to identify the root causes of deforestation and forest degradation in Pakistan. Only by so doing will it be possible to devise viable strategic options and recommendations to stop resource degradation and to successfully introduce sustainable forest management at landscape level. The major challenges to the Forestry sector can be broadly grouped into:

- Extraneous issues falling outside the purview of the forestry sector, such as population growth;
- Institutional weaknesses in policy, legal and organizational structure and capacity issues;
- Implementation issues such as compartmentalized working and weaknesses in planning monitoring uncontrolled grazing, community involvement, and forest fires;
- Failure in addressing technical issues such as a gap in demand and supply, watershed, NTFP, forest fires grazing and rangelands, and the management of pastures;
- Lack of resources and reliable data necessary to improve the management regime;
- Failure in capturing available resources and tapping funding windows;
- Climate Change related issues like harsh climate, climate variability, climate change, disasters and diseases.

The main challenges confronting the Forestry sector are discussed below.

6.1 Extraneous challenges

Rapid growth in population, extreme poverty, land tenure, equity, mining, and lack of political support are some of the extraneous factors adversely affecting the conservation of natural resources in the country.

6.1.1 Population

Pakistan has an estimated population of 213.61 million in 2017. The population of areas now comprising Pakistan was barely 37.5 million in 1950, which increased to 80.5 million in 1980, to 144.6 million in 2000 and to 213.61 million by now. Hence over a period of 68 years (from 1950 to 2017), the population has increased almost by six times. The increase in population and its current density are shown in Figure 7 and 8 respectively. Of this population, 41.6 percent is comprised of age gradation up to 14 years and 34.5 percent are of age gradation from 15 to 64 years, while another 3.4 percent of the population is of age beyond 65 years.

With such heavy population pressure and consequential heavy demand on natural resource sustaining forests even at current level seems an uphill task as remaining meager forest resources are insufficient to fulfil the demand for timber fuelwood and Non-Timber, Forest Products (NTFPs) on a sustainable basis.

Demographic data suggests that the existing pressure from increases in population will further rise when 76 percent population in less than 25 years (41.6 percent under 15 and 34.5 percent from 16 to 25 years of age) will begin to construct new homes. In view of future planning, housing societies are mushrooming especially in mega cities of Karachi, Lahore, Faisalabad, Rawalpindi, Peshawar, and Islamabad. Due to land hunger and lust for money, many big investors are grabbing forest lands resulting in resource depletion.

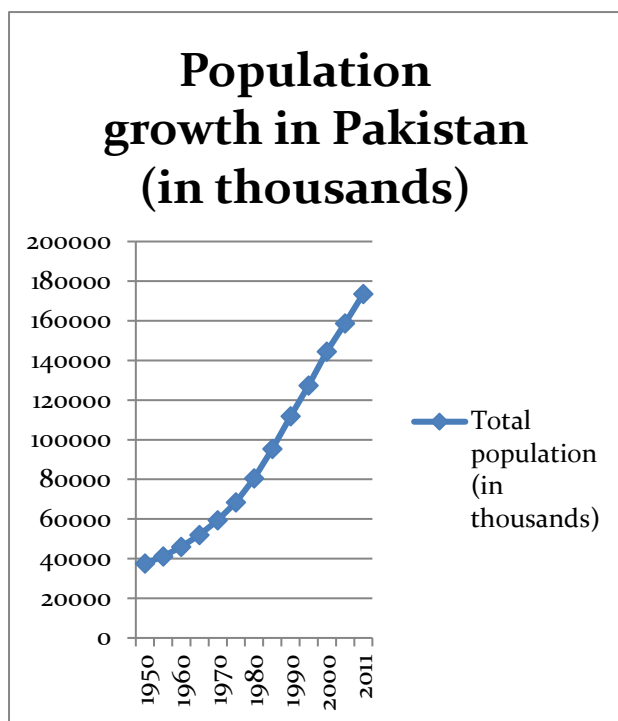


Figure-7: Increase in population from 1950-2011

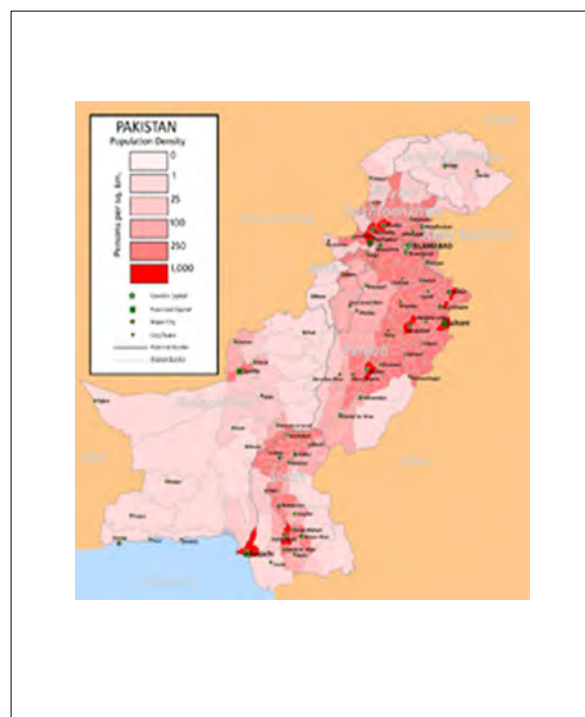


Figure-8: Current population density

6.1.2 Poverty

It is a universal truth that the rural poor have an increased dependence on forests and allied common resources for their livelihoods. According to the multidimensional poverty report of Pakistan launched in June 2016, nearly 39 percent, people of Pakistan are living below the poverty line. In rural areas the incidence of poverty is far more acute with almost 54.6 percent of the rural population. The report reveals that two-thirds of people in FATA (73 percent), and Balochistan (71 percent) live in multidimensional poverty. Poverty in Khyber Pakhtunkhwa stands at 49 percent, in Gilgit-Baltistan and Sindh at 43 percent in Punjab at 31 percent and in Azad Jammu and Kashmir at 25 percent. Consequently, the resource conservation efforts must go hand in hand with poverty alleviation efforts to conserve resource in acute rural poverty pockets.

6.1.3 Land tenure and benefits-sharing mechanism

A well defined and clear land tenure system motivates owners to invest in, and protect and conserve the resource for realizing benefits on a sustainable basis. Unnecessarily complicated, unclear and confusing tenure laws give rise to conflicts and result in exploitation of resource. Natural forests in Malakand Forest Circle were inherited from erstwhile, princely states of Swat, Dir, and Chitral. In most of these areas, the land settlement has not yet been done. The forests were surrendered by princely states to the provincial government, hence forests are owned by the state but communities have been given a disproportionate concession of 60 to 80

percent share in sale proceeds. Consequently, a false myth of *de-facto* ownership has arisen among the concessions. Due to this confusion, the community lacks an interest in managing and conserving the resource. Uncertain tenure and property rights prevent tenants, share croppers, landless inhabitants, and nomadic grazier communities from protecting, conserving and investing time energy and money in forest conservation or raising trees resource, which do not belong to them. Similarly, in areas where the settlement of land and rights has not yet taken place (FATA, GB, Malakand, and Kohistan) the forests are subjected to the tragedy of commons.

The FSMP has compared stocking of reserved protected and *Guzara* forests of KP and showed that stocking in reserved forests was 310 m³/ha, in protected forests it was 190 m³/ha, while of in case of *Guzara* forests it was 120 m³/ha. Similarly, changes in tenure type have probably also influenced the presence and distribution of mature crop and ratio of economic species. Thus, it is clear that security of tenure is crucial for resource conservation.

6.1.4 Mining, land hunger and infrastructure projects

It has been observed that conversion of forest land to agriculture, settlements, mining and communication infrastructure on a large scale has remained a major threat to forest resource conservation. Large tracts of tropical thorn, scrub and riverine forests in the Indus plains have already disappeared due to pressures stemming from irrigated agriculture. Economic policies have also widened income disparities and forced people to exploit natural resources at rates that are no longer sustainable.

Pakistan possesses huge mineral deposits of copper, gold, lead, zinc, coal, industrial stones, quality gemstones, and rare metals. Mineral exploration currently contributes 0.5 percent of GDP. The mining for natural resources particularly coal and oil and gas is expanding fast, especially along the western route of China Pakistan Economic Corridor (CPEC). The CPEC for its power projects has also decided to mine and utilize vast coal deposits in southern Punjab and Sindh.

At times the mineral resources are found in forests protected areas or rangelands. Consequently, the vegetation is cleared and the ecosystem is fragmented through unsafe mining. There is contradiction or confusion in forestry and mining legislation at times, which complicates the issue even further. In such areas unsafe mining is a major source of deforestation and forest degradation. Therefore, guidelines need to be developed and safeguards need to be incorporated in forest policy and legislation to avoid reckless destruction of natural resources and further fragmentation of natural ecosystems.

In KP huge chunks of reserved forests have been transferred from Masar RF for new Balakot City. of Miran RF, D.I. Khan to military and in Kaghan RF to Suki Kinari hydropower project. In Kashmir, 3.66 percent forest land has been diverted for mega projects etc.

The China–Pakistan Economic Corridor (CPEC) is a joint venture of China and Pakistan with a foreseen investment of US\$ 62 billion. It is aimed at the rapidly expanding and upgrading infrastructure in Pakistan to enable China to export its goods to Africa and the Middle East. It involves a number of roads, railways, hydropower projects, the establishment of special economic zones, livelihoods projects, promotion of water resources, development of livestock and small and medium entrepreneurs and agriculture projects. Keeping the above facts in mind is rightly considered as a game and fate changer for Pakistan, as its investment will be more than the overall foreign investment made in the country since independence. When fully operational the corridor is expected to result in generating revenue of several billion dollars from transit trade, increased local industrial production better prices of inputs consumed increased trade, new markets and improved tourism. It is expected that the project will result in the creation of up to 700 000 direct jobs in 2015 to 2030 and add to 2 to 2.5 percent in annual economic growth of Pakistan. The early effects on economic growth have already started and economic ranking of the country has shown improvement.

However, due to rising standards of the housing sector, the use of timber will increase putting additional pressure on forest resource. The corridor will pass through some of the ecologically fragile areas; and will result in soil erosion and massive earth movement, landslides, and disruption in natural drainage. Therefore it is imperative to increase investment in the forest sector to offset the likely adverse impacts of CPEC.

6.1.5 Political support

Due to lack of awareness and owing to the long gestation periods, Forestry is not seen as a priority among the common population as are sectors of daily concern such as drinking water, roads, health, and education. As such, forestry is either altogether not included or is a low priority on leading political party agendas. Hence, it becomes difficult to motivate politicians for liberal resource allocation for forestry. However, in the wake of Pakistan's added vulnerability to likely adverse impacts of Climate Change, the situation is slowly improving.

6.2 Institutional issues

6.2.1 Policy weaknesses

The salient weaknesses observed in forest policies policy formulation process and implementation of policies have been discussed in para 5.1.5, these issues need to be addressed in order to implement sustainable management in forests. It is worth mentioning that there are no provincial forest policies of Sindh, Balochistan, and FATA, whereas AJK and GB have policy drafts only, and KP policy has not been reviewed since its promulgation. A strong coherence between policy and legal instruments is necessary in addition to the fulfillment of obligations as agreed to in Multilateral Environmental Agreements (MEAs).

6.2.2 Legal issues

The Forest Act, 1927 is the major legal instrument for the conservation of forest and rangeland ecosystems enacted in the country, which has become almost outdated and requires extensive overhauling. To this end, revision and updating of forestry legislation in Punjab, Sindh, and Balochistan, is already underway, albeit at an extremely slow pace. In the case of FATA, there is no legal instrument for supporting the management of natural forests. The prosecution system including; issuance of damage reports; investigation of the offense case; preparation of *challans*; production of evidence and impartial and credible witnesses are very weak and requires appropriate improvement and strengthening in order to control damage and create appropriate deterrence for habitual offenders and criminals.

Besides, inherent weaknesses in forestry laws, poor governance, and weak implementation have considerably eroded the efficacy of forestry legislation. The forest offense cases are considered of less importance and are processed slowly and mostly kept undecided for long periods. The system of compounding of forest offense cases, after the seizure of timber and implements at the life risk by officials, warrants appropriate encouragement and timely provision of rewards, but this system is gradually being rolled down. Sometimes forestry laws clash with non-forestry legislation; like mining Act. Forest departments have been unable to cope with the situation and effectively defend growing forest encroachments, theft and illegal logging cases in civil courts. The new legislation should address such weaknesses in the prosecution of forest offense cases, besides paving way for the effective and legal role of community in conservation and development of the resource.

6.2.3 Organizational and capacity issues

The traditional forest education system aims to produce managers and generalists, while there is a real need to produce researchers, subject specialist's, extension specialists, and host of other specialties. After initial education, no refresher courses are conducted, and promotion officers are not trained to meet the needs of new positions. A system of continuing education must be put in place.

Jurisdictions of various administrative units are too extensive to be managed effectively and intensively. At the same time, the capacity of staff is not up to mark, particularly at para-professional levels. The professionals are not regularly exposed to new emerging concepts, issues, and disciplines. The syllabi taught in forest schools and PFI, as well as universities, require revision, while the faculty needs to be upgraded to properly teach such courses.

The research capacity is also extremely low. Research agenda is mostly unavailable and there is hardly any link between managers and researchers. In most cases, research has no relevance to the problems confronting managers. In the absence of extension and outreach arms, research findings cannot reach the field.

6.3 Implementation issues

6.3.1 Planning

More than 50 percent of forests in the country are being managed without proper working plans. Existing plans are drafted in haste, and seen as a requirement rather than as a document critical for effective management and sustainability of the resource.

The working plan code developed in the 1930s has become outdated due to advances in knowledge and technologies. Disgruntled officers with an inadequate vision and capacity are normally posted as Working Plan Officers, mostly to revise or develop a new plan. The majority of working plans are revised without preliminary working plan reports, in contradiction with the provision of the code. The rigour of plans is gradually deteriorating. Most of the new plans are a verbatim reproduction of previous ones with new figures. The planning analysis undertaken by previous senior management is often proven weak and as such it is impossible to identify the causes for which objectives were not met.

The trend towards promoting timber for management of the forests has relegated other important ecological environmental and livelihood functions of the forests to insignificance. In the absence of adequate forest work plans, viable management strategies cannot be formulated and the decision-making process is left to the will and mercy of local managers.

In the case of forests that are covered under management plans, resource inventory is traditionally carried out only in those forest compartments which are considered suitable for timber harvesting. Consequently the forest managers have no information of full stock under their control. Moreover, due to an incomplete picture of the resource base, the impact of managerial decisions cannot be properly assessed nor can managerial performance be evaluated resulting in lack of accountability. This, paves the way for malpractices which will further deterioration of the resource. Thus the management planning process is a vicious circle.

Whereas harvesting prescriptions are implemented with dedication, remaining prescriptions are mostly ignored, resulting in further deterioration of the resource. Therefore, forest management and timber harvesting have become synonyms and other prescriptions are seldom implemented.

6.3.2 Monitoring

There is no mechanism for effectively monitoring the implementation of work plans, except by updating the compartment history files. Compartment history files are seldom maintained and updated. This may be due to ulterior motives of absolving responsible staff. Similarly, a regular change detection system in areas of high incidence of damage is lacking, as well as reliable baseline data. Thus, despite resource depletion, neither of these shortcoming can be attributed to staff nor can the recovery of damages be affected.

6.3.3 Grazing

Unsystematic and continuous grazing is practiced in almost all forests in Pakistan irrespective of whether it is legal or not. Normally the forest stands have sufficient seed stores in forest soil, which gets activated under silviculturally suitable conditions and germinates profusely into seedlings, but due to continuous and uncontrolled grazing, the seed either fails to germinate altogether or the seedlings germinated in forests gets devoured through browsing and trampling. Consequently, the regeneration fails to establish into seedlings and saplings. This is probably so far the biggest challenge and an important cause of depletion of natural forest stands. The Provincial Forest Resource Inventory (PFRI) report of KP has reported that 74 percent of coniferous forests had no regeneration. A sizeable chunk of these depleted forests of KP have now been successfully regenerated simply by controlling grazing and cutting in forests with the help of local organized communities.

6.3.4 Compartmentalized sectorial implementation

Traditionally all departments work in isolation in closed compartments. Consequently, the cross-sectoral issues are neither addressed holistically nor on time and with collective wisdom. At times one department creates perverse conditions for another. The majority of forestry issues, being cross-sectoral in nature, cannot be resolved in isolation without coordination among the other sectors. The issues and factors like over-population, poverty alleviation, resource allocation, export and import of forest product, coordination with other line departments in afforestation, allocation of water for irrigated plantations, mining in forest lands, road construction and oil and gas exploration require broad-based consensus and cross-sectoral coordination. Consequently, departments fail to treat the resource issues holistically under watershed or landscape approach. Similarly, due to the fragmentation of functions, the community must approach a number of departments. The Livestock Department is responsible for veterinary treatments and the breed improvement, the Forest Department for management of rangelands and pastures while the Agriculture Department is responsible for fodder production. Hence without cross-sectoral coordination among these Departments the livestock sector cannot develop optimally.

It has been noted that within the forestry sector there is no formal system for sharing experiences, problems, successes, and failures among the provinces. The OIGF, except for convening two annual meetings held for the inauguration of spring and monsoon plantation events, has no practical programme to ensure effective collaboration among provincial Forest Departments. Similarly, there is lack of coordination, cooperation and linkages with other relevant institutions like Planning and Development (P&D), Finance, Agriculture, Energy, Power, Soil Conservation, Livestock, and Irrigation Departments and Water and Power Development Authority (WAPDA), Sindh Arid Zone Development Authority (SAZDA), Arid Zone Research Institute (AZRI), National Agriculture Research Council (NARC), Universities Agency for Barani Areas Development (ABAD), National Council for Conservation of Wildlife (NCCW), Murree Kahuta Development Authority (MKDA), Forest Development Corporation (FDC), and Azad Kashmir Logging and Sawmilling Corporation (AKLASC).

6.3.5 Forest fires

Forest fires are quite frequent in Pakistan. A survey conducted by PFI in 2000 revealed that of a total area of 3.950 million ha, 49 986 ha (i.e. 1.27 percent) were affected annually by forest fires. Forest fires damage forest trees, regeneration and undergrowth as well as associated fauna and other elements (OIGF, 2009).

6.3.6 Community participation

The Forest Departments are custodians of the State as well as manager of the private forests assigned to them, while the local population depends on forests for its livelihoods. All natural forests in FATA and most of the forests in Balochistan, GB, as well as *Guzara* forests in KP and Murree hills in Punjab are privately owned. The forests taken over by the government from erstwhile princely states of Dir, Swat and Chitral are heavily burdened with local rights. These forests are state-owned and are designated protected areas which require

appropriate involvement by the owners and rights-holders in policy formulation as well as in management. Conflicts arise when the owners and rights-holders are kept out of decision-making processes.

The land tenure studies suggest that enabling policies and legislation that facilitate community participation and enhance community ownership is necessary to rehabilitate degraded forests and rangelands. However no remarkable breakthrough has been achieved in this regard, despite repeated attempts by a number of donor-assisted projects, primarily due to the resistance from within the Departments and hijacking of the process by external vested interests. The attempts of managing and promoting Joint Forest Management (JFM) through cooperative societies and even Village Development Committees in KP have failed primarily due to the apathy of Forest Department staff.

6.3.7 Learning

Many donor-assisted projects have been implemented in various parts of the country in which various approaches and concepts have been tested. However, after completion of these projects their experiences have neither been properly documented nor have any attempts been made to internalize their findings and results. Consequently, the wealth of knowledge and experiences has been lost, is inaccessible or is piled up in reports making implementation impossible.

6.3.8 Demand and supply

As discussed in Chapter 3, there is a huge gap between demand and sustainable supply base. The Federal Government in 1993 imposed a ban on green cutting in the wake of the catastrophic floods of September 1992 without ensuring an alternate source of feeding market. Consequently, the legal supply base has been further squeezed resulting in escalated timber prices. This has led to lucrative timber theft and smuggling on one hand and alienating and intimidating owners to play role in resource conservation on the other. Further, due to poor governance, lack of inter-sectoral coordination and corruption, the Departments failed to halt illegal cutting. Unfortunately, this has resulted in the malicious destruction of forests. Ironically, each time the timber harvested illegally in KP and GB was regularized with minor penalties, which further weakened the conservation network. Therefore, resource conservation requires that the gap in demand and supply be narrowed by increasing the resource base and doing away altogether with ad-hoc policies legitimizing illicit timber.

6.4 Technical issues

6.4.1 Watershed management

In view of its population growth and resultant water stress, Pakistan needs to double its agricultural output every 15 years (*Kahloon et al., 2003*). Water requirement is expected to increase, while the availability of sufficient water seems insufficient especially in the wake of Climate Change impacts.

Under the given circumstances, the treatment of watersheds seems crucial. However, due to continuous mismanagement, watersheds are being further degraded. Consequently, northeastern watersheds occurring in monsoon zone with episodes of flash and riverine floods, mass erosion, landslides, soil erosion, gullying and nutrient leaching are increasing, while, due to reduced infiltration, groundwater is depleting in water-stressed western watersheds.

An integrated approach to watershed management with effective community participation must be adopted

6.4.2 Range and pasture management

Livestock rearing is an integral component of the local agrarian economy. Livestock is reared through sedentary, transhumant and migratory grazing systems in the country. The Forest Departments have been mandated with range management. Unfortunately, however, the sector has somehow remained neglected

despite its importance in the national economy and even though the livestock grazing has a direct bearing on forests. It is hoped that with the introduction of sustainable forest management on landscape level Integrated NRM approaches, the range and pasture management component of the ecosystem will get due attention and recognition by resource managers.

6.4.3 Non-timber forest products (NTFPs)

NTFPs provide livelihood to a number of households in rural areas, where alternate sources of livelihoods are extremely scarce. The process of NTFPs provides employment opportunities to a sizeable number of poor people. However, the bulk of income accrues to wholesalers and middlemen at the expense of producers and collectors. Often, NTFPs are collected without the awareness of its regenerative capacity and maximum production potential. Hence, unsystematically the entire plants are uprooted resulting in deterioration of resource itself. This calls for promotion of value chains and value addition at the source; so that the producer can get the maximum benefit from their efforts.

6.4.4 Eco-tourism

The beautiful forested valleys offer natural beauty, good climate, pollution free environment and opportunity for a number of healthy sports that attract both foreign and domestic tourists. However, due to unsystematic tourism, the area is exposed to disproportionate pressure, natural beauty is overshadowed, pollution and the fragile ecosystem is damaged beyond repair. Income opportunities for local communities are reduced capacity building of local communities is needed for conservation of the resource in order to enhance eco-tourism

6.5 Undervaluation of resource and lack of data

6.5.1 Valuation of resource

The valuation of ecosystem services from forest resources is important, as it helps in assessing the actual value of forests, its tangible and intangible products, and services which are rendered for the wellbeing of humanity. Ecosystem valuation also, promotes tradeoffs between upstream service providers and downstream beneficiaries by introducing a system of compensating service providers through payments received from beneficiaries for the services offered. In order to introduce the concept of the Payment for Ecosystem Services (PES), the first and foremost condition is to identify the real value of the service provided and the potential for PES. Proper valuation of ecosystem services will also enhance investment in the sector.

Due to lack of valuation of carbon stock held up in forests and reduction in carbon dioxide due to sequestration the potential benefits through mechanisms like CDM and REDD+ cannot be availed.

6.5.2 Payment for environmental services (PES)

At present in Pakistan there is poor understanding and low awareness amongst the key stakeholders; including Departmental staff, communities and private sector about the new concept: Payment for Environmental Services. Similarly, the upstream and downstream relationship is also not fully understood. Adoption of these concepts is hindered greatly by the general lack of understanding.

For effective implementation of the PES, it is important that a clear benefit-sharing mechanism; that is, ensuring equitable distribution of benefits and accrued income, is in place. Hence unclear land tenure laws in forest ecosystems is a major challenge as the complex relationship between the resource owners and user groups makes the equitable distribution of benefits difficult. At the same time, there are informal and undocumented traditional systems through which non-owners can receive benefits from the products and services offered by a given ecosystem. The formalization of these customary rights and privileges may result in conflict between the owners and users, as owners would not like to formalize the traditional use, while users would like to retain and regularize such rights.

6.5.3 Lack of proper and reliable data

Forestry data originates from lower field formations of Forestry Departments in the country. Forestry statistics were compiled through annual administration reports by the Departments and consolidated by PFI into Forest Statistics annually. However, lately, the compilation of such important data has been discontinued, resulting in of the lack of availability to crucial information. In addition, the data collected is seldom reliable. The only reliable data on a national level was developed by OIGF in 1992 through FSMP.

Data generated in 1992 continues to be used to project figures for vital forestry statistics. However being grossly outdated, this data has been rendered unreliable as a basis for resource management decisions. Consequently, neither the exact extent of resource and magnitude of challenges is known in order to devise adequate response strategies, nor can policymakers be apprised of the actual situation so that they may allocate proportionate funding.

6.6 Lack of resources

6.6.1 Funding

In view of the problems enlisted here, the existing allocation of funds, both recurrent and developmental, made to the Forestry sector is far less than the actual requirements. Investment in the Forestry sector needs to be enhanced proportionately in order to bridge the gap between funding, demand and supply.

6.6.2 Access to donor funding

Although bilateral funding window for Forestry interventions has almost dried up, the multilateral funding and climate change-related funding opportunities have increased recently. However, the Department lacks an appropriate understanding of procedures and capacity to access these resources. In light of this, the Forestry Departments must develop the necessary capacities among its staff in order to tap such windows of opportunities.

6.7 Climate change issues

6.7.1 Climatic adversity

Most of the area of Pakistan lies in the arid and semi-arid zones with extremely low production potential. This is aggravated by excessive grazing. Therefore, growing forestry plantations is difficult and requires optimum resources, skill and protection of seedlings. This necessitates adaptation of water harvesting and conservation practices along with the application of arid forestry techniques to support the restoration of natural vegetative cover.

6.7.2 Climate variability and climate change

The greatest challenge facing Pakistan is climate variability and climate change. Pakistan has been ranked as the seventh most vulnerable country. Annex-14 (a) shows changes in temperature and rainfall by comparing data of 1971-2000 with that of 1931-1960 and Annex-14 (b) gives projections for 2001-2030 by comparing with data for 1971-2000 (Pakistan Metrological Department, 2009).

The data suggest that temperature is rising and precipitation is falling in GB, along the coastal belt, and in the central zone, whereas in North East and South East temperature is falling and precipitation is increasing, while in the North West temperature is rising and precipitation is falling. Thus, besides high climatic variability, pronounced climatic changes are taking place which are believed to adversely influence the vegetation and water availability in the majority of the country. These areas will need adaptation measures and added water storage for agriculture use.

The Pakistan Meteorological Department (PMD), in a recent monsoon rainfall distribution analysis, assessed the climate change has rendered a 100 km spatial shift towards the west in the overall monsoon pattern in the country. Summer monsoon rainfalls have shifted towards late season; similarly, winter rain and snowfall have also shifted towards late February and March.

The variability of extreme climatic events witnessed during the last two decades and attributed to global warming makes climate change as the greatest environmental challenge of the twenty-first century. The conifers and scrub forests are believed to be hit hard (Bukari and Bajwa, 2012).

6.7.3 Disasters and diseases

The catastrophic floods of 1992 in northern Pakistan were attributed to large-scale deforestation in mountains that led to a ban by the Government of Pakistan on commercial harvesting of forests. The frequency of risks and disasters in Pakistan has dramatically increased over the last two decades.

This increased frequency of disasters is attributed to impacts of climate change and deforestation on steep mountainous tracts. Therefore, besides mitigation and adaptation community-based disaster risk reduction needs to be promoted to raise alarm and enable communities to cope with disasters in advance.

Similarly, climate change has resulted in the multiplication of new pathogens insect's rodents and agents causing various diseases in forest crops and ecosystems. Some of these diseases like die back in Shisham (Rose wood) have caused excessive damage.

6.8 Drivers of deforestation and forest degradation

The main drivers of the deforestation and forest degradation in Pakistan are increased demand for timber and fuelwood, gaps in policy and legislation, weak forestry organizations and institutions, conventional timber-based management system, unsustainable forest harvesting, inconsistent and unreliable data of forest resources, lack of support to promote forestry limited forestry, research and communication gap between research organizations and forest managers. The root causes of the drivers of deforestation and forest ecosystem degradation need to be properly addressed for the sustainability of forest resources in the country. These drivers are both direct and indirect.

The *direct drivers of deforestation* and forest degradation include; conversion of forest land to agriculture land, expansion of rural infrastructure, overharvesting of forest products, high fuelwood demand and consumption, poor harvesting practices, overgrazing, and forest fires. While the *indirect/underlying drivers of deforestation* and forest degradation encompasses high population growth, rural poverty, unclear land tenure, the flaws in the existing policies and the limited financial resources for the green sectors. The direct drivers of deforestation and forest degradations are basically simple and straight forward, which could be meaningfully addressed through appropriate efforts, while the indirect drivers of deforestation are more complex, and issues like poverty and population pressure can only be addressed if appropriate policies and mechanisms are adopted at national level. The sector can focus more on the direct drivers of deforestation and forest degradation while addressing the indirect drivers of deforestation and degradation can be achieved through cross-sectoral collaboration.

In order to address the above issues of deforestation and forest ecosystem degradation to keep the forest ecosystem able to provide optimum ecosystem services on a sustainable basis there is a need of introducing integrated and comprehensive policy and process-oriented community development in the forestry sector.



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Chapter 7 Recommendations

CHAPTER 7

RECOMMENDATIONS

Forestry resources in the country are scarce, depleted and exposed to numerous threats. In light of the current status of the Forestry sector in Pakistan, the following recommendations are proposed as a way forward for making a difference in the sector.

7.1 Extraneous issues

The extraneous issues are complex in nature, as they stem from factors and actors lying outside the purview of the forestry sector. Therefore, the Forestry Departments alone cannot effectively tackle them. Persistent awareness raising and effective advocacy activities are needed to initiate multi-sectoral coordinated actions.

7.1.1 Population

- Formulate a well-thought-out coping strategy after a thorough analysis of the supply and demand situation of wood and wood products in the country in light of existing demographic situation;
- Launch an awareness-raising campaign addressing various segments of the society by establishing a Forestry Extension Service in the country aimed at promoting farm forestry and mass afforestation;
- Promote alternatives for timber for joinery and furniture in order to reduce wood consumption;
- Promote energy conservation by building energy-efficient houses in cooler areas, use energy efficient stoves, tobacco barns, and brick kilns to reduce fuelwood consumption and associated environmental hazards;
- Develop alternative domestic renewable energy sources by raising fuelwood plantations and promoting the use of solar and wind energy as well as biogas resources;
- Promote the import of timber and wood-based products through exemption of import duty and taxes.

7.1.2 Poverty alleviation

It has been observed that implementing integrated NRM projects can be instrumental in alleviating poverty, especially in rural setups. Consequently, integrated natural resource-based poverty alleviation projects need to be implemented in the local context in poverty pockets focusing on local potential. These projects should strive to:

- Capitalize on comparative advantage that the forest areas offer and grow offseason and high-value crops by exploiting comparative advantage of the tract, climate, and location;
- Promote local governance, improve employment skills and promote alternate livelihoods;
- Promote NTFPs and ecotourism and develop them as sustainable sources of income generation and livelihoods in the remote areas;
- Promote process-oriented holistic and integrated development approach and inculcate the concept of self-reliance in the community;
- Include all NRM sectors like forestry, range, agriculture, horticulture, NTFP, livestock, poultry, water development, wildlife and tourism;
- Support local communities through the promotion of opportunity-based cottage industries by arranging loans and developing capacity;
- Strengthen community capacity by developing skills to increase employability.

7.1.3 Land tenure

Past experiences show that land tenure issues need to be tackled with care through sound strategy, focusing on the following recommendations:

- Advocate with the government to undertake land settlement in areas with unsettled rights;
- Rights may be exercised judiciously through the involvement of the communities in the decision making process;
- The forest lands may be demarcated, and coordinates may be notified and shared with the revenue department and central offices to preclude possibilities of any subsequent alterations and obliterations;
- The existing state-owned forested lands including protected, resumed, state and un-classified forests may be declared reserved after forest settlement, and rights and concessions may be clarified to remove doubts and confusions about the tenure;
- Increase penalty for encroachment, and obliteration of boundary pillars and for forest land grabbing;
- The existing RPP process of social safeguards may be supported to carve out suitable benefits sharing system between owners and users.

7.1.4 Ensure safe mining and stop transfer of forest land for non-forestry uses

Unsafe mining and lease/transfer of forest lands for purposes other than forestry is a great threat that the sector is faced with. The following actions are recommended for safe mining in forest areas:

- Study the problems of mining and land transfer/encroachment throughout the country and devise a strategy having the clear code, and guidelines for regulating interaction with mining concessionaires and potential seekers of forest land on lease;
- Provide legal coverage to the system of safe mining in forested lands, to take away undue pressure for surrendering land for mining;
- Raise community awareness about negative impacts of mining and motivate them to organize pressure group, when and where the system is manipulated through muscle and power;
- The fragmentation of ecosystem and habitats may be avoided and wherever, necessary ecological corridors may be developed;
- Improve understanding and collaboration with mining departments and take them on board in vital decisions;
- Lease policy should be properly defined and an effective monitoring system put in place in order to preclude violations.

7.1.5 Political support

Forestry has remained a low priority and has hardly enjoyed any political support. Contrarily, the political muscles have been used in forest liquidation to appease vested interests. However, in view of Pakistan's increased vulnerability to adverse impacts of climate change, the scenario is gradually changing and the balance is tilting in favor of forestry resource development. It is expected that in future political support might increase for this neglected sector. However, the need for sensitization and raising awareness among politicians, through a well-articulated strategy, can hardly be overemphasized.

7.2 Institutional issues

7.2.1 Policy

- It is necessary to formulate forest policies at both provincial and regional levels. In this respect, it is critical to provide support and facilitation to the government of Balochistan, Sindh, and FATA for the formulation of forest and rangelands policies. Whereas, there is a need to encourage other provinces and regions to review and update their existing forest policies.
- While formulating, updating and reviewing the forest policy it is necessary to make sure that overall focus should be on the need for increasing the supply base for wood, and reduce its demand by proposing increased imports of timber and wood products. The policies should also lay emphasis on the importance of introducing timber and energy substitutes through improving tree stock on farmlands, both free/subsidized supply of seedlings as well as by creation of enterprise orientation through value addition at local levels and market chain developments.
- The policy should strive to promote valuation of forest services to sensitize policy makers to create fiscal space for increased investment in the sector. Equally important is to set-up mechanisms for payment for ecological services by the downstream beneficiaries to the upstream communities investing in forest conservation to enhance the production of goods and services.
- The policy should also lay emphasis on exploring investment opportunities through innovative but non-consumptive mechanisms like carbon trading, eco-tourism and NTFPs collection, and sale.
- The land grabbing has become a great issue in view of acute land hunger in the country. Lease the policy provisions must ensure that no forest land out except for forestry operations and that too under proper safeguards.
- The policy should provide necessary support for mitigating or reducing the adverse impacts of local or regional development initiatives, particularly mining on forests and the negative influences of the factors external to forestry.
- The policy should bind the Departments to ensure coverage of entire forests through working plans.
- The policy should not create unnecessary restrictions without valid reasons and alternate options for users. The imposition of ban on cutting of green trees in 1993 in the aftermath of catastrophic floods of 1992, without creating an alternate arrangement to feed market, has simply weakened respect for law and provided space to criminals to thrive in the sector and feed market through illegal means.

7.2.2 Legislative recommendations

The forestry legislation in the country, except in KP and Gilgit Baltistan, requires a revision to bring it in line with the present day requirements by addressing the weaknesses observed in the legislative framework. Therefore, legal instruments need a thorough review to ensure that the law provides coverage to new concepts, work plans and has clear linkages with policy recommendations. Lease and transfer of forest land for purposes other than forestry uses may be legally forbidden and laws pertaining to the encroachment of forest lands may be made more stringent to preclude the possibility of land grabbing. Provision for mitigating adverse impacts of development initiatives on forests and the negative influences of the factors external to forestry may be embodied in law. Reasons for non-implementation of certain pieces of laws; like the Forestry Commissions Act, 1999 in KP need to be explored and these Acts may be implemented after necessary improvement. Similarly, the prosecution system may be improved; by providing services of legal experts building capacity of staff especially in issuing damage report, conducting an inquiry and providing credible evidence. The judiciary dealing with forestry cases may be sensitized about repercussions of leniency in forest offense cases.

7.2.3 Organizational recommendations

Based on review and creation of acceptability for reforms forestry organizations require reformation in line with following recommendations:

- Jurisdiction of various administrative, managerial and protective units in the Department require rationalization;
- Accountability and transparency needs to be infused in departmental working to improve governance;
- Devolution of authority and powers and decentralization of certain functions has become inevitable to provide services to local communities at their doorstep;
- There is a need to set-up a new Department for extension facilities and outreach programmes;
- Establish an effective planning and monitoring system for the timely detection of weaknesses and irregularities;
- Improve induction procedures for fresh intakes to ensure quality and efficiency;
- Set up a programme of capacity building and in-service training to regularly upgrade the capacity of employees particularly before each promotion.

7.2.4 Capacity-related recommendations

Foresters produced are not fully equipped with the capacity to address chronic problems confronting the sector. Hence, this sector needs support after a careful review of the existing situation. The quality of forestry education and research is not up to the mark and is gradually deteriorating. PFI being the mother institution needs special emphasis.

- Review and improvement of syllabi and introduction of requisite types of courses;
- Carry out quality training for the existing faculty members in order to enable them to teach improved and advance syllabi;
- Transformation of PFI into a pre-service and in-service training academy for forestry professionals of all provinces and regions;
- Jurisdiction of various administrative, managerial and protective units in the department require rationalization;
- Universities can focus on production of forestry scientists, having a capacity of research and specialization in the watershed, range management, biodiversity, Climate Change, Wildlife, and Fisheries etc;
- PFI can specialize as a training academy to train managers and practitioners;
- A system of devising need-based research needs to be developed;
- The research facilities developed in provinces are to be strengthened and coordinated with PFI;
- Launch a continuing education program to impart training and upgrade skills of in-service forestry professionals.

7.3 Issues at implementation level

7.3.1 Planning

In order to improve forest planning the following recommendations are worth consideration:

- Work plan code developed in 1930 before partition for Utter Pradesh (UP), India is still in use, which has become outdated and requires urgent revision to bring it at par with present-day requirements;
- The planning process needs to be made legally binding for management and carrying out development interventions in the forests;

- The work plan template needs revival and improvement and system of preparation of preliminary work plan reports, as a pre-requisite to guide working plan officers;
- The areas like FATA and Balochistan require support in developing management plans;
- The GIS and remote sensing facilities and monitoring capacity needs to be set-up in Department;
- The baselines for biodiversity and resource assessment for NTFPs collection may also be revised;
- The effective monitoring of prescriptions of plans and the effectiveness of its prescriptions through third parties need to be introduced;
- The development of plans through engaging private sector will improve its quality and help in instituting sustainable management in forests.

7.3.2 Monitoring

Forestry service has a well-developed record maintaining and reporting system. It is, however, not being maintained properly and the system of annual forest inspections has almost been discontinued, consequently, history files, which constitute an important instrument of monitoring and data collection, has become ineffective. In this connection following recommendations are made:

- The system of annual offices inspection right from offices of CF down to Range Officers/SDFOs may be restored and it may be ensured that all forms are being properly maintained;
- Compartment history files should be regularly updated and should invariably be inspected by touring officers. Disbursement of TA can be made contingent to recording a note in history files. The history files should contain a full record of resource characteristics, growth parameters, and record of damage as well as regulated felling, natural calamities and inspection notes of touring officers;
- An effective monitoring system for monitoring quality of a working plan prescriptions and of management reviews need to be instituted;
- Besides this manual monitoring system, hotspots of damages may be identified through remote images and such areas may be regularly monitored so as to timely fix responsibility for damage on the field staff responsible for it. A system of recovery of the losses sustained by the forests also needs to be instituted to create a deterrent effect.

7.3.3 Interdepartmental coordination and integrated approach

- In a broader context integrated natural resource management is defined as a framework to integrate policy and practices for multiple land uses, within a given ecosystem, to ensure equitable and sustainable use of land uses while strengthening measures to mitigate and adapt to climate change. It also aims to balance competing demands on land through the implementation of adaptive and integrated management systems. These include not only the physical characteristic features of the landscape itself but all of the internal and external socio-economic and socio-political drivers that affect land use, particularly related to conservation, forestry, and agriculture. In short, a landscape approach seeks to address the increasingly complex and widespread environmental economic social and political challenges that transcend traditional management boundaries.
- The systems for promoting inter-and intra-departmental coordination and collaboration is highly desirable. The system of integrated planning of natural resources needs to be initiated, while implementation can be undertaken both through sectoral as well as through cross-sectoral initiatives.

7.3.4 Fighting forest fires

The forest fires are of frequent occurrence during the hot summer season, mainly in Chir and Scrub forests. In order to protect forests against fire damages the following are the recommendations:

- Grass cutting should be allowed before the onset of fire season or removed departmentally. The combustible needles may be collected and either safely burnt through controlled burning or collected and placed on sale;
- Fire towers for surveillance should be established at highest points in the forests to timely notify any potential fire incident so that it can be tackled on time with the help of locals before it spreads further;
- The practice of fire watchers, fire lines and controlled burning may be reintroduced under proper written/recorded firefighting system;
- The community may be kept in the loop and trained in firefighting;
- The team of firefighters equipped with modern tools and adequately trained to tackle forest fire should be deployed at central positions especially in areas where there are frequent forest fires.

7.3.5 Internalizing learning

A number of pilot projects have been successful, but the innovations and interventions designed and tested at the pilot phase have seldom been adopted and internalized. In order to mainstream such learning experiences in the routine work of the forestry sector, the following recommendations are made:

- A comprehensive review of all such projects should be carried out to document their results and to look into the reasons and factors for successes and failures, as well as those inhibiting their internalization as yet. Such exercise will help in taking adequate safeguards and measures while designing any future projects, besides helping in their internalization;
- The agreed interventions may be implemented on a pilot scale through normal departmental resources and final adjustments in the process may be decided. The necessary adjustments in the technology and process so decided may be carried out for up-scaling of such interventions to ensure smooth mainstreaming;
- The required capacity building of staff should be undertaken;
- A system of generation of learning and mainstreaming should be instituted in the departments;
- It is pertinent to add that normally reforestation is undertaken through planting and sowing, but the Billion Trees Project has successfully regenerated forest blanks by promoting natural regeneration through establishing enclosures in collaboration with local communities. This method has been proved a success. It is ecologically suitable, biodiversity-friendly, cost-effective and takes less time and efforts in rehabilitating extensive areas. Such mechanism is recommended for future conservation programme.

7.3.6 Community engagement

Past experiences in forest management, have confirmed that when owners and local communities felt the ownership of the project and were meaningfully associated in forest management, results were positive both in terms of conservation as well as development of resource. However, due to a specific mindset, fear of exposing managers to public accountability and of losing perks and powers; engagement by owners and local communities is still resisted by the traditional foresters. The following recommendations are made to promote community participation:

- A number of donor funded developmental projects have tested and refined mechanism of community involvement in natural resource management especially in activities like raising plantations on private and communal land. There is a need to upscale such projects;
- The mechanisms developed on the pilot scale may be refined and necessary adjustments can be made for their up-scaling and mainstreaming;
- The intervention suited for the involvement of owners and local community may be standardized and enforced after necessary capacity building trainings;
- The process may be given due importance and targeted approach should be avoided;

- The closure of forests through community involvement can rehabilitate degraded forests in a cost-effective manner. Therefore it should be mainstreamed and internalized.

7.3.7 Private sector engagement

The involvement of the private sector is also necessary for natural resource management. The majority of forestry activities can be easily undertaken by the private sector in a more cost-effective manner. These include seed collection, private nursery raising, plantations, and utilization of non-timber forest products, establishing wood-based cottage industries; undertake bioengineering structures, biodiversity conservation, controlled timber harvesting, grazing management, and capacity building in value chain development.

7.4 Technical issues

7.4.1 Watershed management

- In order to address the issues of vital catchments, overcome water scarcity, reduce risk of flash and riverine floods, regulate stream flow increase infiltration, enhance ground-water recharge and adapt to added drought conditions the tested technology of watershed management should be extended to entire northern catchments of important streams and should be mainstreamed as regular function in forestry menu. This has become more essential in view of the looming dangers of climate change. The preliminary information presented in the report about changes in rainfall patterns, its distribution, frequency, and intensity express that the northern monsoon zone has its own problems of decrease in temperature and intense rains causing flash floods, while western mountains are becoming drier and the temperature is increasing. Consequently, both require different types of watershed management interventions. The dry-zone watershed will focus on groundwater recharge, water harvesting and adaptation measure to enable the dwellers of the arid zone to tie over in extreme drought periods.
- Watershed management is also necessary to increase the safe life span of reservoirs, as such it should be made an integral part of the design and cost of all future dams.
- It would have been ideal to manage these watersheds under the principles of “Payment for Environmental Services (PES) and “Beneficiaries to Bear the Cost”, but political consideration may outweigh the environmental and economic requirements.

7.4.2 Range and pastureland management

Range and pasture lands constitute one of the biggest land use, whereas, the livestock rearing contribute a significant share in GDP. Therefore, range and pasture owing to its enormous social, economic and ecological significance need proper management, which unfortunately has been ignored and neglected in resource allocation due to a number of reasons. The migratory and transhumant mode of grazing also needs serious attention and regularization on scientific grounds. Due to these reasons, investment in rangelands will stabilize ecology and improve the economy at the same time, besides mitigation of adverse climate change impacts.

7.4.3 Non-timber forest products (NTFP) promotion

In view of the importance of NTFP in forest management, biodiversity conservation and for stabilizing local livelihoods and provide raw material to a number of industrial and cottage units the following recommendations are made:

- An estimate of total resource and harvestable surplus may be worked out for each NTFP species;
- The method of picking, drying and storage may be standardized and communities may be trained to apply new methods;

- The processing and grading may be introduced and market information should be provided to the producer;
- The preference and requirement of the end user may be identified to the producer so that the quality standards can be developed;
- Collective marketing systems may be developed and when and where possible linkages between producers and market as well as a bulk consumer maybe be developed;
- The enterprises for processing may be encouraged near production areas.

7.4.4 Eco-tourism promotion

Similarly, eco-tourism needs to be developed as a source of sustainable rural livelihood through a well-conceived strategy focusing on:

- Development of alternate tourist points to decrease pressure on existing tourist stations;
- Promotion of eco-tourism by building the capacity of staff and organizing guided tours;
- Promotion of a local funding mechanism to help managers to organize timely actions to avoid pollution caused by tourists;
- Development of facilities which are visibly synchronous with the natural surroundings;
- Promotion of PES
- Training of communities to respond to tourism needs in the terms of boarding, lodging, and transportation.

7.5 Valuation of resource

7.5.1 Valuation of ecosystem services

A system for regularly evaluating ecosystem services should be developed and their relevant capacities developed among staff for its effective use

7.5.2 Ecosystem services identification and valuation

In order to establish a sustainable and stable system of payment between upstream and downstream inhabitants for services rendered, a mechanism of “Payment for Ecosystem Services” should be developed. The valuation of resource could prove the best method for raising awareness among policymakers, which in turn will help in increasing investment in the sector and attracting political support for forestry, thereby paving the way to enforce sustainable management in forests. In this context, the following recommendations are made:

- Identify important services provided by various forest types that are suitable to promote PES;
- The valuation of ecosystem services may be carried out and its mechanism may be standardized for replication and capacity may be built to institutionalize valuation as a regular activity;
- The valued rate/price of commodities and services may be used to determine economic returns and the real price of commodity both tangible and intangible products and services;
- The valuation figures may be shared with economists to estimate the actual contribution of the sector to the GDP and GNP. Their valuation figures should also be made available to the public;
- Carbon stock assessment may be carried out, PDD prepared and extent of sequestration and avoidable emission may be worked out and CERs may be availed for sale in the market regarding priority areas to encourage department and owners to promote REDD+ and fetch income through conservation rather than cutting of trees;
- This will build local trust and make people understand that non-tangible products are also tradable;

- The preliminary efforts may be initiated to start payment for ecosystem services and the service providers may be compensated;
- Once essential priority areas for the successful PES initiative have been identified, the private sector may be encouraged and associated for playing its role in instituting value chain and value addition of NTFPs found in the ecosystem;
- New work plans must incorporate details of carbon stocks and sequestration and reduction potential of emissions for REDD+, Ecosystem Services, their value and potential of PES.

7.6 Scarcity of funds

In this regard the following recommendations are worth consideration:

- The valuation of resource and appropriate awareness raising of politicians, planners and policy makers will help in cultivating soft corner for liberal funding for the forestry sector. Once the income through REDD+ and eco-tourism will start accruing, the interest and opportunity of added local investment will increase;
- The Forest Development Fund established in KP and GB should also be replicated in other provinces and Regions;
- The charges regarding Forest Development Fund levied on timber transport in FATA should be placed at the disposal of the Forestry Department for investment in forestry related activities;
- The capacity of the Forestry Department staff should be developed for availing funding opportunities such as the Green Climate Fund and others.

7.7 Climate change issues

7.7.1 Climatic adversity

Considerable expertise exists for afforestation in sub-humid and semi-arid zones. However, most of Pakistan lies in the arid zone, where the capacity of the Forestry Departments needs to be enhanced focusing on arid zone forestry, water harvesting and conservation.

7.7.2 Climate change and variability

In view of the climatic adversity, the following recommendations are made:

- The impacts of Climate Change is expected to vary considerably from area to area; thus, it is necessary to identify regional and local patterns of climate change scenarios and consequent impacts to identify areas with comparative advantage and vulnerabilities;
- Identifying which ecosystems and species are most vulnerable and how and to what extent climate change will impact livelihoods and cause any shift in population/migration;
- The Climate Change related data should be compiled together and made available for researchers and students;
- There is a need to carry out vulnerability assessment in critical ecosystems and develop localized treatment strategies. Based on the assessments already done the north western, coastal, central northern areas may be given priority in treatment as they are the most vulnerable;
- Devise and implement projects to promote mitigation and adaptation measure;
- Ensure that development does not create new or additional climate variability.

7.8 Lack of forestry data

Availability of essential data is an important prerequisite for proper, planning, management and monitoring of the resource. Existing data, however, is fragmented, disjointed and unreliable. It is therefore, recommended that:

- The exercise for the collection of data at the national level should be carried out once again, in order to have the latest update of the situation and to compare changes taking place after 25 years since the study for FSMP was carried out;
- A system for data collection at the national level should be put in place so that the relevant data can be collected automatically at intervals of 10 years parallel of agriculture and livestock census carried out at the national level in order to enable the sector to take appropriate decisions for benefit of masses and resources;
- Forest Management Plans should be developed for all the forests in the country on a priority basis and a computerized system of implementation of prescriptions of the work plans should be put in place so that at the time of revision of each work plan includes basic information readily available to the work Plan Officers.

7.9 Priority issues for development partners

It is imperative for the development partners to devise a focused, forward-looking and impact-oriented long-term investment and support strategy to institute sustainable development of forests, and for securing local livelihoods. It is worth mentioning that forestry is a long-term enterprise, as such this sector has complex issues. Therefore, forestry interventions require long-term and consistent support to have visible and sustainable impacts. The short-term investment in forestry seldom creates desired and lasting impacts. The following set of recommendations require immediate attention and focus for support of the development partners.

7.9.1 Supporting Green Pakistan Programme

This is a national programme and has already been inceptioned. Therefore, merging donor investment with the already available platform may be a good opportunity for the development partner to consider. The possibility of integrating this programme with the recently concluded Billion Trees Afforestation Project of the Government of KP may also be worthwhile, so that huge investment may not go waste for want of follow up, maintenance, protection and management of young plantations.

7.9.2 Institutional support

It is vital that the institutional issues be addressed to improve governance and build capacity of the Forestry Departments; enhance the flow of investment to induce sustainable forest management and landscape level as well as the integrated forest management in the country. In this context, it is essential that unaccomplished institutional reform agenda of various donor- assisted projects implemented in the past be taken to their logical conclusion, to ensure that donor investment successfully meets the desired objectives. A comprehensive program of capacity building awareness raising improving policy paradigm and the national level baseline study will have to be launched in parallel.

7.9.3 Supporting education and research

- Forestry education provides the foundation for an efficient forest service. Previously, the PFI was the only national level institution imparting graduate level forestry programs in the country. These

programs were tailored to meet the requirements of the Forestry Departments in terms of providing professional manpower. Lately, the PFI has, however, lost its national standing due to its devolution to KP Province. Coupled with other inherent problems, including lack of leadership and availability of qualified faculty and experienced researches, it has also lost its status of a premier institution of forestry research and education in the country.

- At the same time, it is also facing the challenge of the opening of forestry education in a number of public-sector universities in the country. Whereas this is advantageous in terms of inducing competition and the possibility of offering opportunities for introducing specialization in the discipline of Forestry and allied sciences.
- Therefore, it is fundamental that the proposed investment aiming at the institutional reform of the forest departments, should also simultaneously consider a review of forestry education and research in the country.

7.9.4 Conservation and resource building

Conservation and resource building initiatives can be funded through banks short-term. Much information is available. Experience and best practices can be documented for replication. The depleted forests can be rehabilitated through activating natural seed bank and supplementing and protecting natural regeneration as has been practiced by BTAP.

7.9.5 Promoting watershed and range management

The watershed management is very important to reduce the frequency of hazards and promote planned adaptation, while, range and pasture management can support livestock rearing beside securing vulnerable ecosystems.

7.9.6 NTFPs promotion

The NTFPs are a major source of income and livelihoods for local forest-dependent communities. The support and promotion of value chains is a necessary action step.

7.9.7 Introducing climate sensitive development

Climate sensitive development is a highly relevant sector for investment, particularly focusing on adaptation. As there is sufficient grant funding available, the World Bank can help in building capacity to enable access to these sources of funding.

7.9.8 Treating hotspots

Hotspots present the best investment opportunities to secure sustenance and strengthen livelihoods and adjoining communities.

7.10 Phasing priority interventions

The proposed interventions require a well thought-out and phased program such as the following:

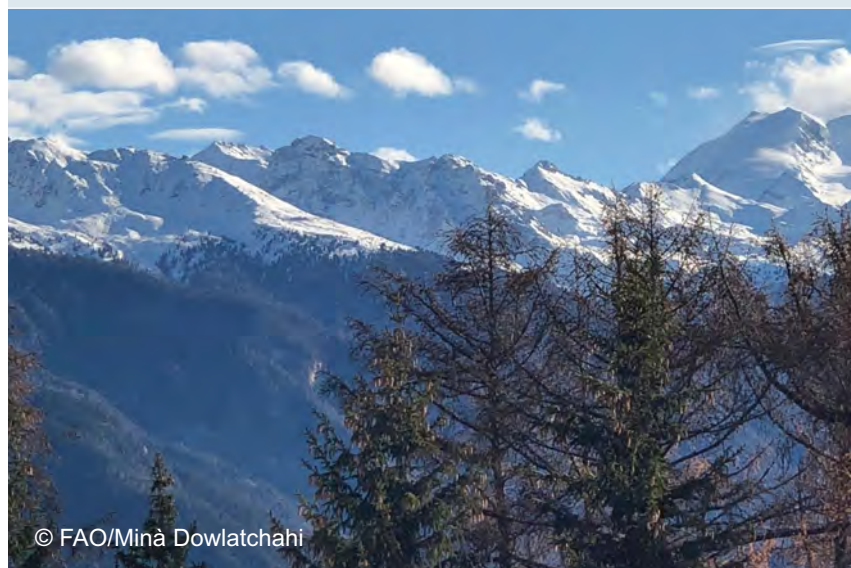
Intervention	Activities	Activities of short-term	Medium term	Long-term
Structural	Population	<ul style="list-style-type: none"> Study impact of demographic changes Devise a coping strategy Raise awareness Energy conservation Liberalized imports of forest products 	<ul style="list-style-type: none"> Improve coordination Introduce alternate sources of energy 	<ul style="list-style-type: none"> Stabilize population
	Poverty	<ul style="list-style-type: none"> INRM projects in poverty pockets 	<ul style="list-style-type: none"> Sustainable Forest Management 	<ul style="list-style-type: none"> Landscape-level INRM
	Land tenure	<ul style="list-style-type: none"> Demarcation 	<ul style="list-style-type: none"> Land settlements 	<ul style="list-style-type: none"> Forest Settlement
	Mining	<ul style="list-style-type: none"> Study impacts Devise guidelines Forbid land transfer 	<ul style="list-style-type: none"> Revise law Coordinate with the Mining Department 	
Institutional	Policy	<ul style="list-style-type: none"> Policy reviews Revisions Formulation 	<ul style="list-style-type: none"> Set a policy review, evaluation, and monitoring system 	
	Law	<ul style="list-style-type: none"> Review and identify weaknesses Develop a draft Process the draft for approval and enactment Improve the prosecution system 	<ul style="list-style-type: none"> Sensitize judiciary Training of forestry staff in the prosecution of forest offense system 	
	Organizational	<ul style="list-style-type: none"> Conduct administrative review Sensitization to overcome inertia and resistance to change Develop reform vision Develop a reform plan Build capacity 	<ul style="list-style-type: none"> Conduct reforms Rationalize jurisdiction 	<ul style="list-style-type: none"> Institute new system
	Institutions	<ul style="list-style-type: none"> Review institutional setup Develop plan Revise Syllabi Improve faculty 	<ul style="list-style-type: none"> Build capacity Research Capacity Start specialized courses 	
	Planning	<ul style="list-style-type: none"> Revise the working plan code Revise the working plan format Segregate strategic and operational plans Develop new plans 	<ul style="list-style-type: none"> Revise all expired plans Preliminary report Working plan evaluation system 	<ul style="list-style-type: none"> Institute system
	Monitoring	<ul style="list-style-type: none"> Develop a system Update history files Reintroduce office inspections system Monitor implementation and prescriptions 	<ul style="list-style-type: none"> Evaluate plans Develop a change detection system 	<ul style="list-style-type: none"> Apply change detection system
	Fir fighting	<ul style="list-style-type: none"> Towers 	<ul style="list-style-type: none"> Advance system 	

		<ul style="list-style-type: none"> ▪ Fire lines ▪ Controlled burning ▪ Community awareness ▪ Capacity building 		
	Community participation	<ul style="list-style-type: none"> ▪ Revive JFM and VDCs ▪ Integrate them in the normal working of the department ▪ Validate experience ▪ Develop a system 	▪ Implement a system	▪ Run system
	Mainstreaming learning	<ul style="list-style-type: none"> ▪ Compile learning ▪ Validate learning 	▪ Develop a strategy	▪ Mainstream learning
Technical	Watersheds	<ul style="list-style-type: none"> ▪ Identify watersheds ▪ Develop integrated MRM plans for sub-watersheds ▪ Develop capacity ▪ Institutionalize a system PES 	▪ Implement plans	▪ Mainstream watershed
	Range Management	<ul style="list-style-type: none"> ▪ Conduct studies ▪ Develop a vision for range pastures ▪ Pilot projects 	<ul style="list-style-type: none"> ▪ Upscale learning ▪ Coordination with livestock and forage scientists 	▪ Mainstream work
	NTFPs	<ul style="list-style-type: none"> ▪ Identification and listing list ▪ Resource surveys ▪ Develop plans ▪ Improve system ▪ Analyze supply chains 	<ul style="list-style-type: none"> ▪ Link with processors and the Companies dealing with the products ▪ Value addition at local levels ▪ Develop value chains ▪ Validate learning 	▪ Mainstream learning
Valuation	Ecosystem services	<ul style="list-style-type: none"> ▪ Develop a system ▪ Conduct valuation ▪ Build capacity 	<ul style="list-style-type: none"> ▪ Awareness raising ▪ Rectify estimates 	▪ Mainstream
	PES	<ul style="list-style-type: none"> ▪ Develop a system ▪ Tools ▪ Capacity 	▪ Raise awareness	▪ Establish a system
	Carbon marketing	<ul style="list-style-type: none"> ▪ Support RPP ▪ Devise tools ▪ Help in development in PDDs 	▪ Market CERs	▪ Develop a system
Funding		<ul style="list-style-type: none"> ▪ Build a directory of donors ▪ Build capacity 	▪ Access funds	▪ Develop a system
Natural calamities	CC	<ul style="list-style-type: none"> ▪ Analyze impacts ▪ Identify vulnerable areas ▪ Develop adaptation and mitigation plans 	▪ Start implementation	▪ Institute system
	DRR	<ul style="list-style-type: none"> ▪ Improve the DRR system ▪ Develop CBDRR plans ▪ Pilot and upscale 	<ul style="list-style-type: none"> ▪ Institute system ▪ Integrate with the PDMA system 	

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Annexes

ANNEXES

Annex-1: Province-wise detail of Area trees growth and volume of wood in farmlands in Pakistan

Particulars	Unit	AJK		Balochistan		Gilgit Baltistan		Khyber Pakhtunkhwa		Punjab		Sindh		Total	
		FSMP	OIGF	FSMP	OIGF	FSMP	OIGF	FSMP	OIGF	FSMP	OIGF	FSMP	OIGF	FSMP	OIGF
Area	000 ha	171	322	1 575	2 388	100	100	1 659	2 264	12 100	1 1267	3 726	3 498	19 331	19 839
Average no of trees	trees/ha	40.6	37.6	8.6	20.27	72.4	76.15	33.9	67.1	17.7	27	8.7	8.62	181.9	236.74
Total trees	000 No	6 943	12 101	13 545	48 411	7 240	7 615	56 240	151 914	214 170	304 209	32 416	30 118	330 554	554 368
Equivalent Block Area	000 ha	6.9	12.1	22.6	80.7	6	6.3	70.3	189.9	306	435	54	50.2	465.8	774.2
Yield	m3/ha/yr,	12	29	17	5.6	10	47.6	15	18	17	15	17	14.7	88	129.9
Total growth	000 ha/yr,	83	352	384	453	60	300	1 050	3 415	5 202	6 539	918	737	7 697	11 725
Volume	000 m3	2 060	2 443	3 430	18 568	7 960	2 082	8 560	18 416	46 100	48 084	8 530	7 840	76 640	97 433

Source; FSMP 1992 and OIGF 2004

Annex- II: Province-wise and species-wise detail of trees grown in farmlands in Pakistan (Million m³)

Species	AJK		Balochistan		Gilgit Baltistan		KP		Punjab		Sindh		Total	
	FSMP	OIGF	FSMP	OIGF	FSMP	OIGF	FSMP	OIGF	FSMP	OIGF	FSMP	OIGF	FSMP	OIGF
Kikar/Babul	0.05	-	0.00	0.264	0.00	-	0.11	-	8.21	6.920	1.66	2.266	10.03	9.450
Shisham	0.12	0.158	-	-	-	-	0.47	0.230	14.41	9.713	0.42	0.289	15.42	10.390
Eucalaptus	0.00	0.057	-	-	-	-	0.03	0.279	0.11	0.716	0.22	1.038	0.36	2.090
Mango	-	-	-	0.180	-	-	-	-	1.79	6.241	1.01	2.673	2.80	9.094
Mulberry	0.06	0.758	0.09	-	2.19	0.895	0.46	0.778	1.06	0.888	-	0.093	3.86	3.412
Chir Pine	0.98	-	-	-	-	-	0.61	0.403	3.94	-	-	-	5.53	0.432
Kail	0.07	-	-	-	-	-	-	-	0.02	-	-	-	0.09	-
Poplar	0.03	0.075	-	-	1.56	0.301	1.36	4.536	0.49	1.149	0.03	0.022	3.46	2.709
Willow	0.01	0.028	-	0.150	0.27	0.253	0.07	0.404	0.08	1.827	-	-	0.43	2.662
Walnut				-		-		0.571		-		-		0.571
Kandi				0.088		-				-		0.646		0.734
Bhan						-				-		0.009		0.009
Other species	0.74	1.365	3.34	17.886	3.94	0.633	5.46	11.215	15.99	20.630	5.20	0.786	34.66	55.790
Total	2.06	2.443	3.43	18.568	7.96	2.082	8.56	18.416	46.10	48.084	8.53	7.840	76.64	97.433

Source FSMP 1992 and OIGF 2004

Annex-III: Average number of trees felled and regenerated in one year from farmlands by Province

Province/Territory	FSMP Felling's	FSMP Regeneration	Ratio FSMP	Ratio OIGF Study
AJK	91	856	1:90	1:31
Balochistan	195	2 760	1:14	1:1,60
Gilgit Baltistan	67	1 394	1:21	1:1.59
Khyber Pakhtunkhwa	1 611	69 787	1:43	1:1.96
Punjab	10 736	60 225	1:60	1:4.04
Sindh	1 246	4 003	1:30	1:1.90
Total	13 946	139 025	1:10	1:3.94

Source FSMP 2012 and OIGF farm forestry report 2004 (Average on the basis of three years preceding to study)

Annex-IV: Estimated annual growth of wood in Pakistan (000 m³) by Province

Forest Types	AJK	Balochistan	GB	KP	Punjab	Sindh	Total
Conifers	516	8	683	2 030	45	-	3 282
Scrub	13	101	-	431	53	-	598
Riverain	5	40	-	32	135	479	691
Irrigated plantation	-	4	-	-	508	180	692
Mangroves	-	-	-	-	-	29	29
Sub-total	534	153	683	2 493	741	688	5 292
Plantations	70	-	-	840	300	75	1 285
Linear	-	-	-	8	112	-	120
Total Forests	604	153	683	3 341	1 153	763	6 697
Farm Resource	84	391	60	1 050	5 202	918	7 705
Total	688	544	743	4 391	6 355	1 681	14 402

Source: (Wani et al, 2004)

Annex-V: Estimate of growth in forests of Pakistan by Province

Province/region	Forest Areas as per FSMP (000 ha)	Total growth in forests FSMP (000 m ³)	Growth per/ha (m ³ /ha)	Current area (million ha)	Assessed growth (million m ³)
AJK	258	604	2.34	0.431	1.00
Baluchistan	569	153	0.26	0.499	0.12
FATA ²	-	-	-	0.535	0.55
GB	660	683	1.03	0.313	0.32
ICT ³	-	-	-	0.020	0.08
KP	1 492	3 341	2.23	1.464	3.26
Punjab	268	1 153	4.30	0.554	2,38
Sindh	340	763	2.24	0.661	1.48
Total	3 587	6 697	1.86	4.477	8.12

Source: FSMP 1992

² Assumed that FATA has same growth as GB

³ Assumed ICT has same growth as that of Punjab

Annex-VI: Hydropower projects at different levels of planning and installation in Pakistan

Province	Projects in Operation (MW)	Projects in process(MW)	Projects with Feasibility Study (MW)	Projects with Pre-Feasibility Study Raw Site (MW)	Total
AJK	1033.635	1 804.965	468.2	1 329.000	4 635.800
Baluchistan	-	-	-	0.500	0.500
FATA	17.000	83.400	740	-	840.400
GB	93.732	18.000	576.5	11 719.000	12 407.232
KP	4 093.800	395.000	201.0	14 010.000	18 697.000
Punjab	1 684.500	106.000	3 752.170	349 500.000	5 892.170
Sindh	-	-	49.5	128.550	178.050
Total	6 922.117	2 404.565	5 787.370	27 536.550	42 651.152

Source: Adapted from Highlights Ministry of Water and Power 2008

Annex-VII: Installed hydropower stations in Pakistan by Province

Province/Are	Name of Dam	Location	District	Capacity (MW)
Azad State of Jammu & Kashmir	Mangla Dam	Mangla	Mirpur	1000
	Jagran Hydropower Plant	Jagran	Muzaffarabad	30.417
	Kathai	Kathai	Hattian	1.6 18
	Leepa			1.6
Sub-total AJK				1 033.635
FATA	Gomal Zam Dam	Khajori Kach Areas	South Waziristan Agency	17
Gilgit Baltistan				93.732
Khyber Pakhtunkhwa	Tarbela Dam	Tarbela	Haripur	3478
	Warsak Dam	Warsak	Peshawar	243
	Duber Khwar Dam	Pattan	Kohistan	130
	Allai Khwar Hydropower Plant	Allai	Battagram	121
	Khan Khwar Hydropower Plant	Besham	Shangla	72
	Jabban Hydropower Plant	Jabban	Malakand	22
	Dargai Hydropower Plant	Dargai	Malakand	20
	Kurram Garhi	Kurram Garhi	Bannu	4
	Chitral Hydropower Plant	Chitral	Chitral	1
	Reshun	Reshun	Chitral	2.8
Sub-total KP				4 093.8
Punjab Province	Nandipur Hydropower Plant	Gujranwala	Gujranwala	14
	Renala Khurd Hydropower Plant	Renala Khurd	Okara	1

	Shadiwal Hydropower Plant	Shadiwal	Gujrat	13.5
	Ghazi-Barotha Hydropower Project	Barotha	Attock	1 450
	Chashma Barrage	Chashma	Mianwali	184
	Rasul Barrage	Rasul	Mandi Bahauddin	22
Sub-total Punjab				1 684.5
G-Total				6 919.867

Source: Highlights Ministry of Water and Power 2008 (Information updated)

Annex-VIII: Major attractions for tourists in Pakistan during 2011

Reasons of tourist attraction	Tourists (000 Nos.)	Percentage share
Scenic Beauty	77.1	8.5
Mountains	29.9	3.3
Culture	69.8	7.7
Archaeological sites/historical places	29.9	3.3
Old bazaars/shopping places	58.0	6.4
People	178.6	19.7
Deserts	4.5	0.5
Climate	80.7	8.9
Handicrafts	21.8	2.4
Sports	12.7	1.4
Entertainments	27.2	3.0
Wildlife	6.3	0.7
Local Foods	141.5	15.6
Shopping	121.5	13.4
Beaches	7.3	0.8
Others	49.0	4.4
Total	906.8	100.0

Source: Tourism division Govt of Pakistan (2011)

Annex-IX: Comparison of forest area estimates among various studies (million ha)

Province/territory	Departmental figures	FSMP 1992	NLUP 1998-99	NFRAS		Landcover Atlas 2012	Landcover Atlas 2012
				1997	2001		
Azad Jammu & Kashmir (AJK)	0.42	0.275	NR	0.330	0.340	0.435	0.432
Balochistan	0.50	0.592	0.508	0.710	0.450	0.499	0.499
FATA	Included in KP	Included in KP	NR	NR	NR	0.534	0.534
Gilgit Baltistan	0.35	0.666	NR	0.310	0.320	0.337	0.314
Islamabad Capital Territory	NR	NR	NR	NR	NR	0.020	0.020
Khyber Pakhtunkhwa	1.85	1.684	2.311	1.520	1.490	1.508	1.464
Punjab	0.67	0.608	0.855	0.460	0.440	0.554	0.554
Sindh	0.72	0.399	0.848	0.270	0.280	0.660	0.660
Total	4.51	4.224	4.523	3.600	3.320	4.549	4.478
Percentage	5.1	4.7	5.1	4.1	3.8	5.1	5.1

Source: (Bukhari et al, 2012) and Shah and Mohammad 2016

Annex-X (a): Farm tree resource in 2017 in Pakistan by Province

Province/region	Area of farm lands (ha)			Average Volume per ha (FSMP and OIGF)		Volume of Farm Stock as per on current (area (million m ³))	percent Annual increase 12 years	Projected Volume (million m ³)
	FSMP	OIGF Study	FR&DP					
AJK	171 523	322 302	246 733	11.99	7.59	1.872	-3.1	1.118
Baluchistan	1 574 898	2 388 340	2 750 131	2.18	7.78	21.396	21.4	80.875
FATA	Included in KP	Included in KP	300 339	5.16	8.13	2.442	4.8	3.965
Gilgit Baltistan	100 000	100 000	115 447	15.19	20.82	2.403	3.1	3.371
ICT	Included in Punjab	Included in Punjab	39 620	3.81	4.27	0.169	1.0	0.169
KP	1 658 680	2 264 22	2 224 739	5.16	8.13	18.087	4.8	29.373
Punjab	12 099 508	11 266 526	13 254 336	3.81	4.27	56.596	1.0	63.953
Sindh	3 725 884	3 494 473	6 593 492	2.29	2.24	14.769	-0.18	14.423
Total	19 330 493	19 835 862	25 524 867	3.63	4.91	117.734	2.94	197.247

Source: Calculated on the basis of FSMP

Annex-X (b): Estimated growth in farm trees in Pakistan in 2017 by Province

Province/region	Total tree Volume OIGF 2003 (000 m ³)	Assessed Growth OIGF 2003 (000 m ³)	percentage	Volume 2017 (m m ³)	Estimated growth (m m ³)
AJK	2 443	352	14.4	1.118	0.161
Balochistan	18 568	453	2.4	80.875	1.941
FATA	-	-	-	3.965	0.730
Gilgit Baltistan	2082	300	14.42	3371	0.480
ICT	-	-	-	-	-
KP	18 416	3415	18.54	29.373	5.440
Punjab	48 084	6539	13.59	63.953	8.690
Sindh	7 840	737	9.40	14.423	1.356
Total	97 433	11725	-	197.247	18.792

Source: OIGF 2004

Annex- XI: Detail of livestock products produced and attributable to grazing in rangelands

Products	Total production (m tons)	Attributable to rangelands (m tons)	Assumed Rate (Rs per ton)	Amount attributable to rangelands (million Rs)
Milk	41.133	12.34	80 000	987 200
Beef	1.887	0.56	300 000	168 000
Mutton	0.657	0.20	600 000	394 200
Wool	0.0441	0.03	100 000	3 000
Hair	0.0251	0.02	50 000	1 000
Bones	0.802	0.33	10 000	3 300
Fats	0.2558	0.10	800 000	80 000
Blood	0.0628	0.10	20 000	2 000
Hides	0.0149	0.01	80 000	800
Skin	0.0519	0.04	40 000	1 600
Total				1 641 100

Source: Agriculture statistics 2013

Annex- XII: Detail of forest policies in Pakistan

Policy	Main features	Implementation status
1955	<ul style="list-style-type: none"> • Conserve resource for benefit of nation through local support; • Protective role given preference over productive and commercial role; • Extend management to private forests; • Increase area under irrigated and linear plantations. 	<ul style="list-style-type: none"> • No special effort; • Preference on timber continued; • Guzaras transferred; • Roads canals transferred except Sindh.
1962	<ul style="list-style-type: none"> • Focus on commercial concerns; • Protection against fires, insect's, diseases and other hazards; • Increase supply base, planting along roads, canals, railways and river banks along with afforestation on, private and arable lands; • Functions of soil conservation, watershed management and range management were assigned to forestry sector; • Planting of fast growing exotics and reduction of rotation age of local species suggested. 	<ul style="list-style-type: none"> • Intensified timber bias; • Forest fires control; • 3 percent of new land for irrigated plantations; • New role assigned on paper but no change except watershed; • Emphasis on exotics increased.
1980	<ul style="list-style-type: none"> • Improve fuel wood supply; • Promote community involvement; • Promote social forestry; • Improved harvesting; • Promote integrated development; • Increase protection of ecosystems and; • Increase production of medicinal plants and industrial timber. 	<ul style="list-style-type: none"> • Considerable work done; • No significant improvement; • Just started; • FDC AKLASC made; • Protected areas declared; • No work done.
1991	<ul style="list-style-type: none"> • Emphasis on promotion of social forestry and agro-forestry, Planting in available blank areas; • Promote Sericulture, watershed, rangelands and protection of ecosystems; • Added emphasis on research and education; • Social forestry; • Environmental forestry; • GIS based monitoring; • Covering through plans; 	<ul style="list-style-type: none"> • Emphasis laid; • No significant improvement; • Not much improvement; • Focus diluted; • NCS preparation; • Only in KP GIS lab developed; • Only partially.

Source: Jan 1992.

Annex- XIII: Detail of legal instruments in Pakistan by province

SNo	Level/Province	Legal Instruments
1	Generic	<ul style="list-style-type: none"> The Pakistan Forest Act, 1927 extends to Punjab, Sindh, GB and Balochistan (The erstwhile Kalat Sate i.e. the districts: Kalat, Khuzdar, Lasbela, Gwadar, Panjgur, Turbat, Kharan, Bolan and Kachhi.) The West Pakistan Firewood and Charcoal (restriction) Act, 1964 The West Pakistan land preservation ordinance, 1964 The Pakistan Cattle Trespass Act
2	AJK	<ul style="list-style-type: none"> The Jammu & Kashmir Forest Regulation No. 2 of 1930; The Forest (Sale of Timber) Act, 1930; The Azad Kashmir Logging and Saw Mills Corporation Ordinance, 1968; The Azad Jammu and Kashmir Plantation and Maintenance of Trees Act 1973; The Azad Jammu and Kashmir Protection of Forests and Distribution of Timber-Ordinance, 1980; and The Azad Jammu and Kashmir Wildlife Act, 1975.
3	Balochistan	<ul style="list-style-type: none"> Forest Act 1878, applicable to the former British Balochistan territories comprising the districts of Quetta, Chagai, Pishin, Qila Abdullah, Qila Saifullah, Zhob, Sibi, Ziarat, Loralai, Musakhel and Barkhan. the Balochistan Forest Regulation Amendment Act, 1974 The Balochistan Wildlife (Protection, Preservation, Conservation and Management) Act, 2014
4	FATA	<ul style="list-style-type: none"> No specific forestry legislation has so far been extended to FATA .
5	GB	<ul style="list-style-type: none"> Diamer Accession Deed, 1952: Gilgit Private Forest Regulation, 1970 Pakistan Forest Act, 1927 Amendment order 1993
6	KP	<ul style="list-style-type: none"> NWFP Forest Ordinance, 2002 The NWFP Protection of Trees and Brushwood Act, 1949 The NWFP Forest Development Corporation Ordinance, 1980 Khyber Pakhtunkhwa Forestry Commission Act, 1999. Khyber Pakhtunkhwa Wildlife Act, 2006
7	Punjab	<ul style="list-style-type: none"> Punjab Land Preservation Act, 1900 (Chos Act) The Punjab Forest (Sale and Timber) Act, 1913. The Punjab Plantation and Maintenance of Trees Act, 1974. The Cholistan Development Authority Act, 1976 The Murree Kahuta Development Authority Act, 1986
8	Sindh	<ul style="list-style-type: none"> Sindh Arid Zone Arid Zone Development Authority Act, 1985 Sindh Wildlife Ordinance 1972.

Source: Jan 1992 and record of CCFs

Annex- XIV (a): Changes in rainfall and temperature in Pakistan

Region	Temperature rise C°	Temperature fall C°	Precipitation rise (percent)	Precipitation fall (percent)
North East	Nil	0.5-1.0	15-20	Nil
North West	0.5-0.8	Nil	Nil	10
South East	Nil	0.3-0.7	5-10	Nil
Coastal	Nil	0.1-0.3	Nil	5-10
Central	0.5-1.1	Nil	Nil	7-15
Northern Areas	0.7-1.5	Nil	Nil	5-12

Source: Pakistan meteorological department

Annex- XIV (b): Projections of temperature and precipitation in Pakistan for the period from 2001 to 2030

Region	Temperature rise °C	Temperature fall °C	Precipitation rise (percent)	Precipitation fall (percent)
North East	Nil	0.8-1.2	20-25	Nil
North West	1.0 -1.58	Nil	Nil	10-20
South East	Nil	0.5-0.8	5-15	Nil
Coastal	0.3-0.5	Nil	Nil	15-25
Central	1.0-1.5	Nil	Nil	20-30
Northern Areas	1.5-2.5	Nil	Nil	20-25

Source: Pakistan meteorological department

Pakistan has meager forestry resource of about 4.47 million hectares covering 5.1 percent of its total geographical area. This resource is of high significance in terms of its provision of various products, services and functions. Due to increasing pressure from the rise in population coupled with other factors including climate change, the resource is degrading at an accelerated rate. Statistics show that the main driver of deforestation is fuelwood consumption. With this in mind, the Government of Pakistan has put the forestry sector at the top of its development agenda. Mega-projects like One Billion Trees has been completed in the Khyber Paktunkhwa provinces with the same model now being applied nationwide to raise 10 billion plants.

The main objective of this publication is to provide an overview of the forestry resources in the country, the main drivers of deforestation, and the hotspots, which require the Government's immediate attention. The Review also identifies opportunities for future investment in the forestry sector to increase the prospects for climate change mitigation and livelihoods improvement. The publication is based on secondary data, recent research findings and surveys, lessons learnt from previous forestry projects and includes a list of recommendations for sustainable forest management in the short, medium and long-term.



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