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Land Degradation in Pakistan: A Serious Threat to Environments and Economic Sustainability

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Pakistan is facing numerous environmental threats that are affecting its sustainable economic future. Amongst, land degradation emerges to be the worst warning.

According to a pioneering study on the subject, the costs of land degradation in South Asian countries (India, Pakistan, Bangladesh, Iran, Afghanistan, Nepal, Sri Lanka, Bhutan) is at least US\$ 10 billion annually. This is approximately 2% of the region's GDP which is equal to 7% of the value of its agricultural output.

The breakdown of losses, according to types of land degradation, are: water erosion US\$ 5.4 billion; wind erosion US\$ 1.8 billion; fertility decline US\$ 0.6-1.2 billion; waterlogging US\$ 0.5 billion and salinisation US\$ 1.5 billion.

The study found that altogether 140 million hectares, which is equal to 43% of the region's total agricultural land, suffered from one or the other form of land degradation. Of this, 31 million hectares were strongly degraded and 63 million hectares moderately degraded. The worst country affected was Iran, with 94% of agricultural land degraded, followed by Bangladesh (75%), Pakistan (61%), Sri Lanka (44%), Afghanistan (33%), Nepal (26%), India (25%) and Bhutan (10%).

In Pakistan, land degradation mainly encompasses deforestation and desertification, salinity and sodicity, soil erosion, water logging, depletion of soil fertility and negative nutrient balances.

1. Deforestation and Desertification

Pakistan has a total forest area of about 12 million hectares. Out of that, the total forest, scrub, and planted trees spread on 4.2 million hectares, natural and modified coniferous scrub, riverain and mangrove forests spaced 3.5 million hectares, tall tree forests encompass 2.4 million hectares, scrub forest exist on 1.1 million hectares, and plantations occupy 0.7 million hectares.

The forest area of Punjab is only less than 3% per cent whereas in Sindh it becomes even half of that. The continuous destruction of forests is causing a substantial loss. The declining rate of woody biomass

is the second highest in the world. It ranges between 4-6% per year. Almost 7,000 to 9,000 hectares are deforested every year and this rate is especially severe in the north where the per capita consumption for fuelwood is 10 times higher due to the ruthless winters.

Due to increase in population, the consumption of household firewood would probably go up to 3% per year. Pakistan's woody biomass may be totally consumed within the next 10-15 years. The lopping of trees for commercial purposes has also greatly accelerated forest depletion. Unrestricted livestock grazing is also a severe threat. Regional case studies also portray a dismal picture.

A study of the Siran project area, Hazara, NWFP, shows a 52% decline in the resource between 1967 and 1992. Similar cases are present in the Kaghan Valley and Allai Valley. The mangrove forests of the Indus Delta has halved from 2,600 square kilometres in the late 1970s to 1,300 in the 1990s, due to the grazing by camels. Almost 50% of the original riverain forests have been degenerated beyond economic viability. More than 60% of the natural grazing areas of the country have production levels lower than one third of their biological potential. More than one-third of the country area has been classified as under risk of desertification. Deforestation, over cultivation, excessive cutting of fuelwood and incorrect irrigation practices all have a share in this problem. The data reported for a five years period, from 1997-98 to 2001-02 ([Table 1](#)), revealed that the extent of area afforested and regenerated is more or less stagnant.

Table 1. Area afforested and regenerated (000 ha) in Pakistan during 1997-98 to 2001-02

Year	Punjab		Sindh		NWFP		Balochistan		Pakistan	
1997-98	2.9	(3.0)	2.8	(11.5)	14.7	(1.9)	1.0	(0.1)	21.4	(16.5)
1998-99	5.3	(3.0)	0.3	(12.0)	15.0	(2.0)	0.5	(-)	21.1	(17.0)
1999-00	8.3	(2.0)	0.2	(9.3)	16.8	(2.7)	0.3	(-)	25.6	(14.0)
2000-01	6.9	(4.8)	1.0	(5.6)	17.5	(3.7)	0.4	(0.1)	25.8	(14.2)
2001-02	7.0	(4.1)	1.0	(5.0)	16.8	(4.0)	0.5	(0.2)	25.3	(13.2)

Figures within parenthesis denote to area regenerated

2. Salinity and Sodicty

The extent of area affected by salinity and sodicity is presented in [Table 2](#). In majority of the soils of plains in Pakistan, the rainfall is usually low and the evapotranspiration is higher than the annual precipitation resulting in build up of salts in the soil profile and their accumulation on the soil surface. At country level, 6.28 million ha of area is affected with salinity and sodicity. The majority of salt-affected soils are saline-sodic in nature. These salt affected soils are causing potential reduction in yield.

Table 2. Soils affected by various types of salinity and sodicity (000 ha)

Type of Soil	Punjab	Sindh	NWFP/FATA	Balochistan	Pakistan
Soils with surface/patchy salinity and sodicity					
Irrigated	472.4	118.1	5.2	3.0	598.7
Un-irrigated	-	-	-	-	-
Gypsiferous saline/saline-sodic soils					
Irrigated	152.1	743.4	-	76.6	972.1

Un-irrigated	124.5	536.3	-	160.1	820.9
Porous saline sodic soils					
Irrigated	790.8	257.0	25.7	29.4	1102.9
Un-irrigated	501.0	150.1	7.8	364.0	1022.9
Dense saline sodic soils					
Irrigated	96.7	32.5	0.9	-	130.1
Un-irrigated	530.0	379.7	8.9	714.8	1633.4
Total:	2667.1	2217.1	48.5	1347.9	6281.0

3. Soil Erosion

Soil erosion implies loss or removal of surface soil material through the action of moving water, wind or ice. The extent of the area affected by water and wind erosion is given in [Table 3](#) and [Table 4](#) respectively. About 13.05 million hectares of area is affected by water erosion and about 6.17 million hectares is affected by wind erosion. Soil erosion is taking place at an alarming rate and is mainly due to deforestation in the north. Water erosion is prominent on steep slopes such as the Potohar track and surrounding areas, an area extensively used for cultivation. The highest recorded rate of erosion is estimated to be 150-165 tonnes/hectare/year. The Indus River carried the fifth largest load of sediment (4.49t/h) in the world in 1990. According to some estimates the Indus is adding 500,000 tonnes of sediment to the Tarbela Reservoir every day, reducing the life of the dam by 22% and the capacity of reservoir by 16%.

Wind erosion has a relatively lower impact than water erosion. However, the combination of the two is more devastating. This reduces the productivity of the land by 1.5-7.5% per year. This affects almost one-fifth of the Punjab.

Table 3. Area affected by water erosion (000 ha)

Degree of erosion	Punjab	Sindh	NWFP/FATA	Balochistan	Northern Area	Pakistan
Slight (sheet & rill erosion)	61.2	-	156.3	-	110.5	328.0
Moderate (sheet & rill erosion)	896.8	-	853.8	1858.6	25.8	3635.0
Severe (rill, gully and/or stream bank erosion)	588.1	58.9	1765.1	2724.4	504.2	5640.7
Very severe (gully, pipe & pinnacle erosion)	357.9	-	1517.0	-	1571.6	3446.5
Total	1904.0	58.9	4292.2	4583.0	2212.1	13050.2

Table 4. Area affected by wind erosion (000 ha)

Degree of erosion	Punjab	Sindh	NWFP/FATA	Balochistan	Pakistan
Slight	2251.4	295.0	13.1	36.0	2595.5
Moderate	279.1	70.2	3.8	143.6	469.7

Severe to very severe	1274.0	1686.8	19.6	100.9	3081.3
Total:	3804.5	2052.0	36.5	280.5	6173.5

4. Water Logging

The extent of waterlogged area is given in [Table 5](#). The figures are based on the surveys which were completed about 15 years ago. It appears that problem of water logging may not be as serious now as it was in the past. The problem has reduced due to prolonged drought and excessive mining of ground water.

Table 5. Extent of waterlogged area (000 ha)

Water table depth	Punjab	Sindh	NWFP*	Balochistan	Pakistan
a) Cultivated area	685.8	508.6	90.7	142.1	1427.2
100 to 150 cm	239.2	39.4	39.7	**	318.3
50 to 100 cm	78.6	189.2	20.7	4.3	292.8
Less than 50 cm	368.0	280.0	30.3	137.8	816.1
b) Uncultivated area (less than 150 cm)	10.0	116.0	1.1	15.6	142.7
Total:	695.8	624.6	91.8	157.7	1569.9

* Includes FATA, PATA and Northern Areas

** Negligible extent

5. Depletion of Soil Fertility and Negative Nutrient Balances

The fertility status of Pakistani soils is rapidly depleting. The data generated by the public and private organizations in the country reflect the general agreement about the deficiency of nitrogen in 100% soils. Same is the situation with organic matter content, which is on around average 0.5% only. In case of phosphorus, more than 90% soils are deficient.

Potassium deficiency in Pakistani soils, which was not a soil fertility problem earlier, is increasing rapidly due to the discriminate use of only nitrogenous and phosphatic fertilizers. Various public and private organizations in the country are reporting a soil potassium deficiency in the range of 20-40%. For that reason, NPK formulations for various crops have also been introduced in Pakistan. Among micronutrients, field scale deficiencies of economic significance prevail in case of zinc, boron, and iron.

The nutrient balance sheet of Pakistani soils is represented in [Table 6](#) which reflects a severe mining trend. All the provinces show negative nitrogen balance, although in Punjab the deficit is declining. Over the decade, negative phosphorus balances did not change significantly in Punjab but worsened in the other three provinces. In 1985-86, the level of deficit was highest in Punjab. However, in 1995-96 they were all fairly similar. Potash balances deteriorated over the decade.

Table 6. Nutrient balance Sheet in Pakistan (1985-86 and 1995-96)

Province	N (kg/ha)		P2O5 (kg/ha)		K2O (kg/ha)	
	1985-86	1995-96	1985-86	1995-96	1985-86	1995-96

Punjab	-19.2	-8.6	-10.5	-10.7	-23.7	-27.3
Sindh	-5.0	-7.0	-8.5	-11.7	-7.7	-17.3
NWFP	-9.6	-10.7	-8.4	-10.7	-20.9	-29.7
Balochistan	-21.6	-27.2	-7.4	-11.4	-14.2	-25.6
Pakistan	-15.6	-9.4	-9.8	-10.9	-20.0	-25.8

The estimated loss of productivity as a result of land degradation is US \$ 353 million annually, and the loss to rangeland productivity is between US \$ 90 - 160 million/year.

All of the above environmental issues are summarily heading Pakistan towards more economic instability. According to a conservative estimate, the impacts of degradation and biodiversity loss on productivity and public health are in the tune of 3% of GDP per year. It would be higher if toxic waste disposal, biodiversity, river and coastal resource depletion were taken into account.

It is therefore very necessary for the sustainable economic future of Pakistan and a friendly environment to cope with land degradation problem on war-footing bases. Productive lands and healthy environment are the only gift worth passing to our next generations.

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