

**NATIONAL ACTION PROGRAMME
TO
COMBAT DESERTIFICATION
IN
PAKISTAN**

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and Rural Development (MELGRD)
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Executive Summary

Desertification means land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities, leading to reduction or loss of the biological or economic productivity and complexity of rainfed cropland, irrigated cropland, or range, pasture, forest and woodlands.

Pakistan is predominantly an arid to semi-arid country with 68 m. ha of land lying in regions where the annual rainfall is less than 300 mm. One fourth of the country's land area, which is suitable for intensive agriculture is seriously subjected to wind and water erosion, salinity/sodicity, water-logging, flooding and loss of organic matter. Water mining without ground water recharge in Balochistan, over-exploitation and misuse of rangelands, mangroves, fragile ecosystems like sandy deserts, Rod Kohi and coastal areas are rendering many areas unproductive and threatening the agricultural economy of the country. The two important driving forces of land degradation in Pakistan are limited land resources and population increase, a consequence of which is poverty.

Main issues related to desertification in Pakistan include: water erosion, wind erosion, depletion of soil fertility, deforestation, livestock grazing pressure, loss of biodiversity, water-logging and salinity, drought and flooding and socio-economic constraints. About 11 million hectares are affected by water erosion and 3-5 million hectares by wind erosion. The amount of soil removed by wind is about 28% of total soil loss. Due to deforestation, forest cover is shrinking by 3.1% and woody biomass by 5% annually (7000-9000 ha taken away annually). Free grazing of livestock, aridity and prolonged drought in arid lands have affected the biodiversity in various regions. About 15.5 million ha are affected by water-logging and 5.0 million ha by salinity/sodicity. Recent drought has affected 2.2 million people and 7.2 million livestock.

Some technological interventions to address the issues of desertification have been successfully implemented in different parts of Pakistan. Some of these include; Rangelands Utilization Model in Pothwar Plateau, Gully Land Management through Soil Conservation and Water Harvesting, Range Improvement through Community Participation, Salinity Control and Reclamation of Affected Areas, Rehabilitation of Desert Ranges through Reseeding, Forage Reserve Establishment in Arid Highland Balochistan, Reclamation of salt-affected areas, Desertification Control in Cholistan and Restoration of Land Productivity in Barani Lands.

National Action Programme (NAP) identifies the factors contributing to the process of desertification in Pakistan and suggests measures and strategy, using an integrated and coordinated bottom-up approach to combat desertification and mitigate the effects of drought. Some of the objectives of the 8th and 9th five years plans which match the objectives of NAP will help its integration with national development plans. The main programme areas proposed to address desertification, *inter alia*, include: afforestation/agro-forestry in degraded areas; improved crop production in dry lands; improved range/livestock feeding and management; soil and water conservation, water harvesting, increased water use efficiency; rehabilitation and reclamation of saline/sodic soils; improvement of drainage and on-farm management, production and promotion of horticultural crops; and conserving biodiversity. NAP also addresses the affects and mitigation of droughts in Pakistan.

NAP proposes that the implementation coordination of NAP be entrusted to Ministry of Environment, Local Government and Rural Development through a National Desertification Control Unit. National Coordination Committee on Desertification headed by the Minister for Environment will oversee the implementation of NAP, also assisted by three sub-committees.

The implementation of NAP would require inter-agency cooperation for joint programming, planning and implementation. A number of federal/provincial organizations and NGOs are working in areas related to desertification control. However, there is need to strengthen their capacity to enable them to participate in the implementation of NAP. The new local government system allows public participation in decision making, community work and development related activities.

The funding sources for the implementation of NAP activities have been suggested as Public Sector Development Programme, Global Mechanism of UNCCD, National Desertification Control Fund, a small fee/cess on the export of some products, a small conservation fee from hunters, green funds by trading environmental support services and international donor agencies such as UNEP, UNDP, GEF, FAO, and WFP.

Chapter-1 Introduction

Pakistan, with a great variety of landscapes has a diversified relief including the majestic high mountain ranges of the Himalayas, Karakorams and Hindu Kush, snow-covered peaks, eternal glaciers, and the inter-mountain valleys in the north, vast rich irrigated plains in the Indus basin, stark deserts and impressively rugged rocky expanse of plateaus in the south-west of Balochistan.

The country is characterized by a continental type of climate, which is arid and semi-arid. There is an extreme variation in temperature depending on the topography of the country, which experiences an overall deficiency in rainfall. One fourth of the country's land area, which is suitable for intensive agriculture, is seriously subjected to wind and water erosion, salinity/sodicity, water logging, flooding and loss of organic matter. Watersheds in upper Indus and its tributaries suffer from unfavorable soil and moisture regimes. Accelerated surface erosion due to deforestation in the catchments is reducing the life of Tarbela and Mangla reservoirs, which provide water for 90 percent of the food and fibre production in the country.

Outside the Indus basin, water mining without ground water recharge has resulted in sharp decline in water table in areas like Balochistan. Over-exploitation and misuse of rangelands extending over a vast area are seriously constraining livestock production, thus adversely affecting the livelihood of pastoral communities. The arid coastal strips and mangrove areas are under increased environmental stress from reduced fresh water flows, sewage and industrial pollution and over-exploitation of other natural resources. The accelerating rate of land degradation in the fragile ecosystems like sandy deserts, Rod Kohi and coastal areas is rendering many areas unproductive and threatening the agricultural economy of the country.

Desertification is a global phenomenon caused by environmental and climatic factors and human activities. More than 100 countries of the world including Pakistan are affected by desertification and are faced with problems of environmental degradation, loss of soil fertility, loss of biodiversity and reduction in land productivity resulting in increased poverty of local communities.

Recognizing the seriousness of the problem at global level, United Nations Environment Programme (UNEP) coordinated the efforts of the nations of the world to frame the United Nations Convention to Combat Desertification (UNCCD), which was opened for signature in 1994. Pakistan signed the Convention in 1994 and ratified in 1997, thus becoming a Party to it.

The Convention, under the Article 9 urges the Parties to prepare and implement a national action programme, utilizing and building on existing relevant successful plans and programmes, to combat desertification and mitigating the effects of drought. Such programme shall be updated through the participatory process on the basis of lesson learned and results of research and be closely interlinked with other national policies and plans for sustainable development.

The Convention emphasizes the national action programmes to identify the factors contributing to desertification, measures necessary to combat desertification and mitigate the effects of drought, specify the respective role of government, local communities and land users, incorporate long-term strategies to combat desertification, integrate with national policies for sustainable development, allow modification to changing circumstances and flexible to cope with different socio-economic, biological and geo-physical conditions, give particular attention to preventive measures for lands not yet degraded, enhance national climatological, meteorological and hydrological capabilities and provide for drought early warning, develop institutional framework for implementation and coordination, and provide effective participation at the local, national and regional level of NGOs and local populations both women and men particularly farmers and pastoralists.

Keeping in view the growing problems of desertification in Pakistan and fulfill the obligation under UNCCD, the need of addressing this grave issue was felt. As a result National Action Programme to Combat Desertification (NAP) in Pakistan has been prepared with the financial and technical support of United Nations Environment Programme (UNEP) and Economic and Social Commission for Asia and Pacific (ESCAP).

Pakistan Agricultural Research Council through its Range Research Institute (RRI) was entrusted to develop NAP in Pakistan. A multi-disciplinary team comprising of experts of various relevant disciplines drafted NAP after a series of discussions and consultations with UNEP/ESCAP and relevant federal, provincial agencies and NGOs. First draft of NAP was discussed in a national workshop organized by PARC/RRI which was attended by all relevant organizations. Recommendations of the workshop were incorporated in the draft and submitted to the Ministry of Environment. This draft was again discussed in a national seminar organized by the Ministry of Environment which proposed certain suggestions according to the change environment and ecological scenarios, which were incorporated in the NAP by RRI. The second draft was circulated to more than 60 relevant organizations by the Ministry of Environment for their views/comments. The written input received from various organizations/individuals was again incorporated by RRI and third draft was sent to the Ministry of Environment in January 2001. The final draft has been finalized after a long drawn-out process of consultation with professionals from federal, provincial and international agencies and NGOs operating in Pakistan. The action programme has been prepared in line with UNCCD guidelines.

The Action Programme calls for a systematic and comprehensive area development approach with people's participation at grassroots level with a bottom-up mechanism for sustainable management of the natural resources in fragile eco-systems so as to combat desertification and halt land degradation.

1.1 Present State

Pakistan is predominantly an arid to semi-arid country with 68 m. ha of land lying in regions where the annual rainfall is less than 300 mm. The extent of arid regions in various provinces of the country is shown in Table 1.1.

Table 1.1 Distribution of Arid Region in Pakistan

Province	<i>(Square Kilometers)</i>				
	Arid	Semi Arid	Sub Humid	Other	Total Area
Punjab	119,310	59,678	17,014	10,197	206,199
Sindh	134,896	6,018	-	-	140,914
Balochistan	149,467	19,723	-	-	347,190
NWFP	6,194	16,491	15,160	36,676	74,521
FATA	-	13,580	11,239	2,401	27,220
Total	409,867	115,490	43,413	49,274	796,044

Source: Sustainable Agriculture, NCS Sector Paper by Dr. G. R Sandhu

1.2 Status Quo Scenario - Land, Population and Desertification

The two most important driving forces of land degradation in Pakistan are limited land resources and population increase. The result is small farms, low production per person and increasing landlessness. A consequence of land shortage is poverty. Land shortage and poverty, taken

together, lead to non-sustainable land management practices, the direct causes of degradation. Poor farmers are led to clear forest, cultivate steep slopes without conservation, overgraze rangelands and make unbalanced fertilizer applications.

Land degradation then leads to reduced productivity: a lower response to the same inputs or, where farmers possess the resources, a need for higher inputs to maintain crop yields and farm incomes. This has the effect of increasing land shortage still further, thus completing the cycle.

Substantial efforts have been made by individual farmers, government and international agencies to counteract the cycle of poverty and land degradation by research and development of improved technology. Much success has been achieved, as in the spread of high-yielding crop varieties and use of fertilizers in the 'green revolution'.

This effort may be nullified if it is not accompanied by reduction in population growth rate. Governments of the region, as well as international agencies, recognize the need to limit increases in population. There is also a growing awareness that population questions cannot be treated in isolation but must be linked with sustainable land development.

1.3 Resource Picture

Out of 79.6 million hectares area of the country, only 20 million hectares are available for farming. Irrigated agriculture is practiced on 16 million hectares and the remaining 4 million hectares are under rainfed (Barani) farming. A sizeable chunk of the landmass, about 31 million hectares, is under forests and rangelands and /or remains untapped. The land use data for the last decade shows that the total area under cultivation remained static (Table 1.2).

Table 1.2 Current Land use in Pakistan Based on Satellite Imagery Interpretation ('000 ha)

Land use class	AJK	Balochistan	Northern Areas	NWFP	Punjab	Sindh	Total
FOREST/TREES							
Conifer	241	42	660	940	30		1913
Scrub	16	504		539	132		1191
Riverain	1	20		13	27	112	173
Mangrove		2				205	207
Irrig. Plantation					79	23	103
Farmland trees	7	23	6	70	306	54	466
Linear planting				2	14		16
Misc. planting	10			120	20	5	155
Total	276	591	666	1763	529	399	4224
AGRICULTURAL							
Irrigation	6	1177	44	993	10743	5705	18668
Rainfed	36	3	4	553	1316		1912
Total	42	1180	48	1546	12059	5705	20580
RANGELANDS							
Degraded	731	11674	896	4106	4466	2809	24682
Non-degraded		892		519	1293	68	2772
Alpine	79		705	269			1053
Total	810	12566	1601	4894	5759	2877	28507
BARREN LAND							
Snow/glacier			27				27
Rock, gravel		17516		138	337	523	18514
Desert		2802			1324	3759	7885
Tidal flats		54				413	467
Total		20372	27	138	1661	4695	26893
WATER BODIES							
Riverbed				48	400	155	603
Lake		5	1	1	1	41	49

Dam, reservoirs	19	1		15	49	54	138
Swamp					27	96	123
Total	19	6	1	64	477	346	913
URBAN		3		4	62	69	138
UNCLASSIFIED							
Above 3650 m	184		3161	1792			5137
Below 3650 m			1536	52			1588
Total	184		4697	1844			6725
All land classes	1331	34718	7040	10253	20070	14091	87980

Source: Forestry Sector Master Plan (1992)

1.4 Rural Poverty

A recent study indicated that poverty levels increased over time in rural area while it declined in urban areas. Another World Bank Study in 2000 shows a continuous decline in poverty between 1987-88 and 1992-93. Poverty decline according to World Bank Study from 1987-88 to 1996-97 has been from 37% to 24%. However, another study mentioned in this reference has shown that poverty has increased from 27% in 1993-94 to 35% in 1998-99. Thus at the end of the last decade more than one-third of the total households in the country were below the poverty line. The level for the rural areas being close to 40%.

1.5 Land-holding Distribution

The agricultural census data (Table 1.3) reveals interesting patterns of land distribution in Pakistan. Over 80% of the farms in provinces except Balochistan are less than 10 hectares in size and occupy no more than 65% of the total farm area. It is important to note that while only 2% of all farms are of bigger size - more than 20 hectares -they occupy over 14% of the total farm area. In Balochistan, these large farms constitute a much larger proportion of all farms and command 46% of all farm area. Following are the three general farm /tenure systems practiced in Pakistan.

- i. Farms cultivated by owners.
- ii. Farms partly cultivated by owners and partly cultivated by tenants
- iii. Farms cultivated entirely by tenants (sharecroppers).

Table 1.3 Farm Size Distributions in Pakistan

Farm size (ha)	Farm number		Farm area	
	Million	%	Million	%
< 0.5	0.68	13	0.19	1
1 < 2	1.04	20	1.45	8
2 < 10	2.32	46	9.41	49
10. < 20	0.24	5	3.03	16
20. < 60	0.09	2	2.61	14
> 60	0.02	-	1.94	10

Source: Agricultural Statistics of Pakistan 1998-99.

The tenure distribution of farms of various sizes is shown in Table 1.4. Most of the small farms are cultivated by owners except in Sindh where tenants seem to dominate. Part owner and part tenant cultivation is quite common in Punjab and NWFP, particularly on farms of medium sizes. Over 68% of the large farms (20 ha) and their area are owner-operated in Sindh and Balochistan. The land ownership data, which are based on land records, are not readily available for recent years. However, land concentration was quite high in Sindh and quite low in NWFP. In fact, in Punjab and NWFP, very high percentage of farm area was in the hands of owners of 10 ha or less.

Table 1.4 Distribution of Farms and Farm Area by Tenure

Farm size (ha)	Farm number (%)			Farm area (%)		
	Owner	Owner-tenant	Tenant	Owner	Owner-tenant	Tenant
< 0.5	90	1.0	9.0	88	2	10
< 2.0	75	7.5	17.5	75	7	18
2. < 10	59	18	23	59	18.5	22.6
10. < 20	63	24	13	62	25	13
20. < 60	72	21	7	72	21	7
> 60	79	16	4	81	16	3

Source: Pakistan Census of Agriculture, 1990

1.6 Agriculture Milieu

Agriculture has been and continues to be the principal driving force of the national economy, accounting for 26% of GDP and, together with agro-based industries, contributing 80% of export earnings. Over half of the labour force is absorbed by the sector, which has been performing below potential as a result of various technical, social and structural constraints. The sector as a whole is passing through a transitional phase from subsistence to increasingly commercial production. There is, however, a gap between the well-resourced commercial sector with large holdings and access to reliable irrigation and the traditional sector, which includes farmers with small subsistence holdings whether irrigated, or Barani, tenants and physically marginal farms outside the Indus basin,

Rural sector in Pakistan is going through a structural change. Although there has been a constant increase in the number of non-farm families in relation to the number of farm households, a substantial increase in the share of small farms in the total farm households and a decline in the number of tenant-operated farms is significantly visible. This change is resulting from “push” factors, such as farm mechanization, displacing tenant and agricultural workers, as well as from “pull” factors stemming from a growing and increasing diversified rural sector offering groups of farmers more opportunities for off-farm work.

1.7 Resource Utilization

Of the total surveyed area, about 20% of the land is potentially good for intensive agriculture, about 2.4% of the land has medium to good potential for forestry and bulk of the land (62%) either lacks or has low potential for crop /forestry production and is primarily used for livestock grazing. The data presented in Table 1.5 indicate the land use pattern since creation of Pakistan. During the five decades (1947-97), the reported area witnessed an upward trend by 12.18 million hectares. During the same period, the total cropped area was expanded to a total of 10.6 million hectares of which 4.4 million hectares were due to expansion of irrigated cropping to new areas and the balance was the outcome of intensification or double cropping.

The increment in the total cropped area has been remarkably steady as a result of the tendency for irrigation to be expanded to large discrete blocks. The expansion phenomenon kept on occurring for the first two decades (1947-67), accounting for 79% of the increase in cropped area. In 1973-77 it accounted for only 33% of the increment in total cropped area. Since 1972, intensified farming has become the principal source of increasing crop yield supported with the availability of an array of modern inputs and technical interventions, and supply of additional irrigation water through tube-wells.

Table 1.5 Land Utilization in Pakistan**(Million hectare)**

Land use	1947-48	1958-59	1963-64	1968-69	1973-74	1978-79	1983-84	1988-89	1996-97	1998-99
Reported area	46.33	49.46	52.20	53.22	54.09	54.82	58.18	57.90	59.23	59.28
Forest area	1.38	1.46	1.92	2.31	2.83	2.82	2.96	3.43	3.58	3.60
Not available for cultivation	20.73	19.76	18.57	20.13	20.74	20.28	22.36	24.06	24.61	24.52
Cultivable waste	9.19	11.25	13.00	11.53	11.00	11.51	12.53	9.39	9.06	9.29
Current fallow	3.74	3.90	4.81	4.76	4.69	4.77	4.67	4.93	5.48	5.10
Net area sown	11.27	13.09	13.90	14.49	14.83	15.43	15.66	16.09	16.50	16.77
Sown more than once	1.04	1.52	1.89	2.14	2.95	3.78	4.33	5.73	6.73	6.19
Total cropped area	12.31	14.61	15.79	16.63	17.78	19.22	19.99	21.82	22.73	22.96

Source: Agricultural statistics of Pakistan, Islamabad.

Chapter-2: Desertification

Desertification means land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities. Land degradation means reduction or loss, in arid, semi-arid and dry sub-humid areas, of the biological or economic productivity and complexity of rainfed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from land uses or from a process or combination of processes, including processes arising from human activities and habitation patterns, such as (i) soil erosion caused by wind and/or water (ii) deterioration of the physical, chemical and biological or economic properties of soil and (iii) long-term loss of natural vegetation (UNCCD).

2.1 Desertification in Pakistan

There is a serious problem of desertification in many parts of the country. Northern mountains of Pakistan are the major source of water for Tarbela and Mangla Dams. However, due to heavy soil erosion, caused by deforestation in the catchments, these reservoirs are silting up, thus reducing the capacity of power generation and availability of irrigation water. Barani lands are subjected to heavy soil erosion, primarily due to improper land use by crop cultivation, livestock grazing and illegal removal of vegetation cover. Deserts have acute problems of shifting sand dunes and salinity. The irrigated areas are infested with the twin-menace of water logging and salinity. Because of mismanagement of Suleiman Rod Kohi areas, there is substantial damage to crops and property by flash floods. Underground water resources in western dry mountains of Balochistan are shrinking, due to very little recharge, overexploitation of the meager quantity of water for horticulture and crop cultivation. The productivity of rangelands is hampered by heavy livestock pressure. The arid coastal strips and mangrove areas are under increased environmental stress from reduced fresh water flows, sewage and industrial pollution and overexploitation of other natural resources

2.2 Key Issues related to desertification

- Water erosion
- Wind erosion
- Depletion of soil fertility
- Deforestation
- Livestock Grazing Pressure
- Loss of Biodiversity
- Water logging and Salinity
- Drought and Flooding
- Socio-economic constraints

2.3 Extent of desertification

Water erosion: The soils in the Indus basin are recent and undeveloped. The surrounding mountains have some of the world's steepest and largest slopes. Intense summer rainfalls alongwith melting of snow in high mountains contribute to the soil erosion hazards. Land use practices, vegetation cover, soil type and structures are other major factors related to soil and water erosion.

In the northern mountainous areas with steep slopes, the water erosion is low in the areas with permanently closed canopy forests, while the erosion is greater in areas with arable crops on steep slopes. About 11 million hectares are affected by water erosion.

Sedimentation of canal irrigation system decreases water and land use efficiency. Some 40 million tones of soils are brought into the Indus basin each year. It shortens the life span of major reservoirs and

reduces their efficiency. The upstream riverside infrastructure is destroyed and top soil is washed away declining productivity of the area. In downstream, the sediment reduces the efficiency of hydropower generation and irrigation systems.

Wind erosion: Land degradation by wind erosion is quite common in the sandy deserts of Thal, Cholistan, Tharparkar and sandy areas along Mekran Coast. Erosion is significant in areas around habitations and watering points trampled by livestock. Here the major degrading factor is the overexploitation of rangelands for fuel-wood cutting and livestock grazing. The global impact of wind erosion is prevalent in areas where sand dunes are leveled for irrigated cropping. These areas have assumed the form of 0.5 m to 4 m high moving sand dunes, posing danger for cultivated land and infrastructure. Some 3-5 million hectares are affected by wind erosion. The amount of soil removed by wind is about 28% of total soil loss. High velocity wind storms cause severe movement of sand dunes depositing thick layer of sand on roads, railway tracks, croplands and threaten village inhabitants.

Deforestation: There is only 5.2% area under forests, which is too low to meet environmental as well as socio-economic needs of the country. Due to deforestation, forest cover is shrinking by 3.1% annually and woody biomass by 5% annually. Natural vegetation reduces sedimentation in water reservoirs and stabilizes sand dunes. Mangrove forests protect the port of Karachi against wave action and act as nursery for shrimp. Every major type of forest or protective cover in Pakistan has suffered heavily in the recent past from indiscriminate cutting, overgrazing, poor management and man-made ecological changes. This has increased desertification, erosion and silting of reservoirs and biological defenses against water logging and salinity are also deteriorated. The ability to resist against soil erosion caused by monsoon rains is largely dependent on vegetation and vigor of vegetation at ground level. Soil erosion increases on degraded grazing land with sparse vegetation cover, which leads to siltation of rivers and channels. Soil fertility declines due to removal of top soil resulting in low production of forage, fodder, fuel wood, timber and grains. Soil erosion in the watershed areas of rivers increases sedimentation load, which reduces the storage capacity of dams.

Livestock Grazing Pressure: Free grazing of livestock is extremely destructive to forest and vegetation cover. With the increase in livestock population there is heavy pressure on natural vegetation. During period of feed scarcity, thousands of cattle, sheep and goats depend on fodder plants, which are lopped to the main stem. Unsystematic livestock grazing reduces the productivity of rangelands due to soil compaction, devegetation of fragile slopes, destruction of terraces and selective destruction of growing trees and shrubs. As economy in desert regions is pastoral, it affects both livelihoods of the desert dwellers as well as influences the fragile environment.

Loss of Biodiversity: Due to ever increasing human and livestock population there is enormous pressure on natural vegetation in almost every agro-ecological region of the country. Overgrazing of rangelands has extensively decreased the carrying capacity. Some areas have also been affected by water logging and salinity damaging the natural flora. Aridity and prolonged drought in arid lands have affected the vegetation cover in these areas. All these factors have contributed towards the loss of biodiversity in various regions of the country. As a result of degradation of natural habitat as well as illegal hunting, 31 species of mammals, 20 species of birds and 5 species of reptiles are listed as endangered in the country.

Water logging and Salinity: The major factor contributing to water logging in cultivated areas is excessive percolation from the canal system, which builds up the ground water level. The human activities such as cultivation of high delta crops on highly or moderately permeable soils, obstruction of natural drainage channels through construction of buildings and roads, improper alignment and poor maintenance of artificial open drainage system, inefficient disposal of excess rain water *etc.* also add to water logging problem. Total waterlogged area with water table depth of 5-10 feet in Pakistan is about 11 million hectares. Salinity and sodicity are associated with irrigation but these also occur as a consequence of soil formation process over the centuries. At present over 2.8 million hectares are affected by

salinity/sodicity in Pakistan. Water logging, salinity and sodicity have reduced the drainage capacity of the soils resulting in lower soil fertility, decline in crop yields and loss of biodiversity.

Drought and Flooding: Drought is a temporary feature caused by anomalies in the usual climate of the region. It occurs in virtually all-climatic regimes, but with higher frequency and probability in the arid and semi-arid regions. Periodic droughts are seen as a major cause of desertification in several desert areas of Pakistan. Recently the provinces of Balochistan, Sindh and southern Punjab have been severely affected due to prolonged dry spell for the last 3 years. It is estimated that 2.2 million people and 7.2 million heads of livestock have been affected. The effects and impact of drought in fragile eco-systems assume serious proportion due to misuse of marginal areas and unwise land use practices and overexploitation of natural resources. Adverse effects of drought on human activity last for many years.

Flood occurrence could be an occasional or regular feature of the region. Being an arid to semi-arid country, floods are usually caused by excessive precipitation particularly during monsoon season due to weather and climatic disturbance. Floods in 1973 and 1992 caused severe damage to the national economy resulting in land degradation and loss of biodiversity. Floods prohibit cultivation in summer season, destroy farm houses and other facilities and bury fertile top soil under relatively infertile sediments.

Socio-economic constraints: Pakistan with a population of over 130 million is ranked 7th most populous country in the world with a growth rate of 2.6 percent per annum. The implications of such a rapid population proliferation are grave and multifaceted. It adversely fosters the process of sub-division and fragmentation of farmlands and adds to the fragile and marginal lands by denudation of forests and rangelands. There is massive migration from rural to urban areas. It is the poorest of the poor who suffers from desertification and drought. Unless properly managed, the already degraded resources will be under heavy pressure. Agriculture, forestry, hunting and fishing account for 66% of the rural work force. Over half of the labour force is engaged by agriculture sector, which has been performing below potential due to various technical, social and structural constraints.

Chapter-3: Success Stories to Address Issues of Desertification

3.1 Rangelands Utilization Model in Pothwar Plateau

PARC initiated a research project at Lohi Bher Range to evolve and test a package of technology for the Pothwar Plateau Rangelands. The Lohi Bher Range covering about 435 ha is located about 20 km south-east of Islamabad. Number of interventions pertaining to range improvement, vegetation dynamics, forage yield, soil and water harvesting techniques were carried out and data recorded. Range utilization model developed at Lohi Bher Range provides useful package for introducing commercial ranching and development of private livestock farms in the Pothwar Plateau.

3.2 Gully Land Management through Soil Conservation and Water Harvesting

Pothwar plateau is experiencing a serious problem of poor management and use of available land and water resources. PARC launched a project entitled “Management of Land and water Resources in Gully-eroded Area in Pothwar Plateau” with the objective to optimize land use and control water for making the soil ideal for crops, pastures and trees to protect it from erosion and other destructive influences.

Contoured trenches were constructed with small bunds across the slope of the land on a contour so that long slope is cut into a series of small ones and each contour bund act as a barrier to the flow of water thus controlling run-off. To drain excess water to high intensity and rainstorms during monsoon season, grassed waterways and outlets were provided. The tree plantation was made in the eye-brow terraces along the contours, whereas the pasture species were planted in the contour-bunded fields without much land shaping. Surface run-off decreased to 19% with the adoption of eyebrow land shaping technique and planting *Leucaena* plant with elephant grass. Performance of *Leucaena* was at the top with average growth rate of 23 cm/month, Eucalyptus, poplar, mulberry, guava, plum, apricot, loquat and *Ailanthus* were also planted successfully.

Vegetation cover and frequency of desirable grass/forests increased due to protection. Under rainfed conditions of Pothwar, grass yield can be increased manifold if simply enclosed and grasses are clipped whenever ready for cutting. The increase in ground cover will also help to overcome the soil erosion problem. Thus, this model demonstrated technology for the utilization/reclamation of gullied land for livestock, crop production and afforestation under rainfed conditions.

3.3 Range Improvement through Community Participation

Pakistan Agricultural Research Council initiated Operational Range Research Programme (ORP) in Pothwar to ensure transfer of technology to the end users, in this case livestock farmers. It essentially involved application of known rangeland interventions on the farmer's field by the farmers with the technical input from the range scientists. Range improvement operations such as reseeding, planting of trees and shrubs and cultivation of fodder crops was done according to land suitability and with the active participation of local farmers.

Within two years the forage production increased five fold improving the production potential, reducing soil erosion and providing better habitat for local fauna and flora. Forage crops such as Dhaman, cowpeas and sorghum became so popular that about 60-70 percent of the farmers in the area grow these fodders. The farmers have also started producing seed of the fodder crops. Impressed with the outcome of ORP approach, several livestock farmers in the Pothwar tract are seeking technical help for establishing small scale commercial ranches/livestock farms.

3.4 Salinity Control and Reclamation of Affected Areas

In Indus basin region of the country majority of the salt-affected soils are saline-sodic. Secondary salinity, which is related to modern irrigation system in Pakistan, is the result of either (a) accelerated redistribution of salts in the soil profile due to high water table or (b) the use of insufficient water to leach salts out of the soil.

To tackle the problem of salinity and water logging, WAPDA undertook a programme of soil reclamation throughout the country in early sixties. Data have been collected in respect of crop acreage, cropping patterns, cropping intensity, crop yield and fertilizer application in the project area. Cropping intensity increased from 75% (pre-project) to 121% in 1985 as a whole and 159% on selected farms. In the SCARP area, cropping pattern of rice, sugarcane, maize, wheat and fodder increased considerably. Yield of major crops like rice, sugarcane, maize and wheat improved considerably.

The development of animal husbandry is very important as it is an integral part of agricultural development. There was a 67% increase in the total population of cattle and buffaloes. Milk production increased by 56.8% and meat production by 66%. Hence, gross value of production showed an increase of 116% over the base year. This has added to the prosperity and health of the people of the project area.

3.5 Rehabilitation of Desert Ranges through Reseeding

Artificial reseeded is prescribed when natural vegetation cannot recover within a short period and there are few desirable species. In desert rangeland, grass is often seeded in strips. In the Thal area, planting tufts of *Cenchrus ciliaris* and *Lasiurus indicus* on shifting sand dunes dramatically increased forage yield. These species have been reseeded successfully over thousands of hectares in Thal and Dehabeji rangelands. *Lasiurus indicus* has done well in sandy soils where annual rainfall is as much as 350 mm. *Cenchrus ciliaris* can be reseeded on all types of rangelands with sandy, sandy loam, stony and deep and red soils. These grasses perform well in the areas with annual rainfall between 150 and 750 mm. With proper water distribution, *Dichanthium annulatum* was seeded over a large area in Rakh Miran (D.I. Khan). It naturally occurs on heavier soils with higher rainfall and performs well in regions where rainfall exceeds 400 mm per year.

3.6 Forage Reserve Establishment in Arid Highland Balochistan

Atriplex canescens, commonly known as fourwing saltbush is an evergreen shrub with dense foliage having extensive root system and is adapted to wide range of soils and climates. Fourwing saltbush can successfully be established in highland Balochistan rangelands by using proper soil moisture conservation techniques. The most desirable characteristics of the plant include its extreme drought and cold tolerance and high quality browse especially during autumn and winter months.

Fourwing saltbush has the tremendous capability of resprouting after cutting/pruning. After establishment, stands cut few inches above ground level during late autumn and winter re-sprout more vigorously during next spring season with fresh and tender leaves and shoots. It shows the potential of this plant as a fuel wood resources in areas with a high demand for fuel wood in addition to forage for livestock.

There is a huge demand of fuel wood in highland Balochistan for cooking and heating rooms during winter period. Local shrubs are uprooted and are used as fuel wood, which leads to the degradation of rangelands. Fourwing saltbush can be promoted as a sustainable source of fuel wood and can help reduce uprooting of local shrubs from already denuded rangelands.

3.7 Reclamation of salt-affected areas

Kallar grass (*Leptochloa fusca*) is widely distributed in the salt-affected areas of Pakistan. This grass has been used to reclaim large salt-affected areas in the Central Punjab and the farmers are now making a

good living by raising buffaloes, cattle, goats and sheep. A large number of small farmers are now adopting this practice, thus reducing rural to urban migration. This grass has the ability to improve the soil upto the extent that some moderately salt tolerant species as *Brasica napus*, barley and some tree species have also been grown successfully.

It was observed that the penetration of Kallar grass roots in sodic soils enhanced hydraulic conductivity, microbial activity, organic matter and ultimately leaching of salts. Since Kallar grass has a quite high lignin content (upto 25%), ploughing under the Kallar grass hay raise the stable organic matter level of soils. It can be concluded that where the soils are saline-sodic or sodic and the supplies of irrigation water are saline, the growing of Kallar grass can be a viable method for the economic utilization of such soil and water resources. At the same time for growing plants on saline-sodic or sodic soils with good quality or sweet irrigation water, Kallar grass may be used as an ameliorative plant.

3.8 Desertification Control in Cholistan

A project was executed in Cholistan by PCRWR with the objective to conduct site-specific research in water, land and plant resources of deserts for making them productive and sustainable, and control desertification for developing a stable environment. The activities included; catchment area development for rainwater harvesting, establishment of ponds from harvested rainwater for drinking of human and livestock, conjunctive use of rainwater and saline water, grass land development, mustard cultivation under saline water irrigation, arid land horticulture under conjunctive irrigations, range land development, jojoba cultivation and desertification assessment and mapping of Cholistan desert. Main grasses and brows able species successfully grown included; *Lasiurus indicus*, *Panicum antidotale*, Wild millet, *Cenchrus ciliaris*, *Acacia nilotica*, *Ampliceps* (*Acacia australina*), *Parkinsonia* and *Atriplex* species

3.9 Restoration of Land Productivity in Barani Lands

Agency for Barani Areas Development (ABAD) has been implementing integrated programmes in rainfed areas to check land degradation. They have been successful in restoring land productivity of agricultural land, biodiversity and vegetation cover in these areas. This is evident from the extent of activities such as: Terracing & leveling (22,444 ha), Land reclamation (6,110 ha), Gully Plugging (8,786 ha), Water disposal outlets (8,786 ha), Fruit trees plantation (264,100 plants), Social forestry (27.473m plants) and Public forestry (5027 ha). ABAD has also initiated a number of activities for the construction of small dams, mini dams, dug wells, and to check the loss of water resource in Pothwar uplands and to harness the maximum benefits from the available water resources. These activities not only developed the water resources but also reduced the soil erosion and increased the vegetative cover that improves the environment and rejuvenate the economic activities.

Chapter-4: Institutional Framework

4.1 Institutional Setup

The implementation of NAP will require inter-agency cooperation for joint programming, planning and in some cases joint implementation and day-to-day operational coordination. For example, range improvement, development and management cannot be carried out without joint programming by Forest, Livestock, Agriculture and Soil Survey Departments, involvement of ranchers and CBOs.

Capacity building of the following organizations and review of their mandates is necessary to focus on the conservation and sustainable use of natural resources in general and to enable them to participate in the implementation of NAP in particular:

Federal

- Pakistan Agricultural Research Council
- Pakistan Council for Research in Water Resources
- Water and Power Development Authority and its institute for Water logging and Salinity Research
- Arid Zone Research Centre, Quetta and its institutes
- Space and Upper Atmosphere Research Commission
- Soil Survey of Pakistan
- Pakistan Forest Institute
- Meteorological Department
- Marine Fisheries Department
- National Council for the Conservation of Wildlife
- National Institute of Oceanography
- Zoological Survey Department

Provincial and local

- Agricultural universities including University of Arid Agriculture
- Agricultural Research Institutes/Stations in arid/semi arid areas
- Agency for Barani Area Development, Punjab
- Fisheries Research Institutes/Stations
- Environmental Protection Agencies
- Forestry Research Institutes/Stations/Divisions
- Sindh Arid Zone Development Authority
- Cholistan Institute of Desert Studies
- Cholistan Development Authority
- Coastal Development Authority (Sindh)
- Wildlife Departments/Boards

NGOs and CBOs

- International Union for Conservation of Natural Resources (IUCN)
- Sustainable Development Policy Institute (SDPI)
- Society for Conservation and Protection Environment (SCOPE)
- Agha Khan Rural Support Programme (AKRSP)
- Pakistan Institute for Environment and Development Action Research (PIEDAR)
- Rural Development Foundation

4.2 Difficulties in Implementation of Previous Plans/Reports

Some of the comprehensive reports and documents prepared with considerable investment, based on sectoral reviews and expert consultations, are as under:

1. Report of National Commission on Agriculture (1988)
2. Forestry Sector Master Plan (1992)
3. Task Force on Agriculture (1994)
4. National Conservations Strategy (1992)
5. National Master Agricultural Research Plan (1996)

The common features of these reports and plans are:

- The policy and institutional reforms recommended in most of the reports have not been attempted in the true sense due to lack of political commitment or change of government.
- Inter-agency linkages and cooperation could not be established as envisaged.
- Resources required for implementation could not be lined up.
- In many cases budget allocation made for even those activities and programs which were initiated, as per recommendations, were curtailed during the implementation stage due to shift in priorities, to divert funds to other projects/schemes considered important by the government.
- No single office or cell/unit was created to coordinate the implementation of the recommendations of the plans/reports as a whole. Responsibility of carrying out the programs across large number of diverse areas was dispersed over many organizations without a central office to facilitate, monitor, compile and document the progress.

Recently conducted independent mid-term review of National Conservation Strategy has suggested the following five key conclusions;

- Achievements under the NCS have been primarily awareness raising and institution building farther than actual improvements to environment and natural resources.
- The NCS is not operating adequately as a national sustainable development strategy.
- The presence of the NCS has strengthened civil society institutions and their influence.
- NCS implementation capacity requires much improvement.
- The catalytic power of the NCS continues but needs reinvigorating and refocusing through development of NCS2.

4.3 Gaps in Capacity

The National Action Plan for Combating Desertification helped to identify gaps in capacity for planning of sectoral projects. Some of the gaps in capacity to integrate Desertification with planning for various sectors are listed as under:

- Lack of appropriate planning process for preparation of project documents i.e. planning phases like project identification, formulation and appraisal are not normally followed.
- Insufficient participation of experts especially in multi-dimensional and integrated projects.
- Hardly any resources are made available to constitute Missions for identification, formulation and appraisal phases of project planning.
- Insufficient participation of beneficiaries in the planning process because the experts involved in project planning have strong assumption that they are the best judges of project interventions.
- PC-I has to be followed strictly and process of modification is extremely difficult. The rigid approach is one of the major limitations for effective implementation of the development projects.
- Replanning, fixing and refixing of targets based on the real-life situation is a difficult task within the rigid framework of PC-I.

- The delay in project funding and inappropriate costing results in delays in completion of projects. Normally the project duration exceeds the planned duration and completion is normally at higher cost.
- Experts normally involved in preparation of project documents are those who are not directly involved in conducting appraisals with the stakeholders. Even in certain cases they do not have capacity to conduct participatory appraisals and planning to identify problems and documentation of options for development of solutions.
- Serious gaps exist in capacity for participatory appraisals, planning and formulation of projects with concerns related to environment, Desertification and global warming.

4.4 Organizations involved in Desertification Control activities

Pakistan Council of Research in Water Resources

- Desertification assessment and mapping of the Cholistan Desert.
- Rain water harvesting in Cholistan.
- Tree plantation by using rain water and ground saline water.
- Sand dune fixation and stabilization.
- Reclamation of desertified land by the introduction of Jojoba, Atriplex.
- Design and preparation of sand trappers.

Pakistan Agricultural Research Council

- Development of desert reclamation techniques by planting of drought tolerant plants with rainwater harvesting, pitcher irrigation and drip irrigation.
- Establishment of shelterbelts and windbreaks for protecting crops and soil conservation.
- Introduction and propagation of promising arid land plants like saltbush, Salicornia, Tamarix, Vetiver grass, Jojoba.
- Agro forestry systems of raising trees in conjunction with crops.
- Reclamation of saline and waterlogged areas by planting salt tolerant trees and shrubs.
- Pumping water by renewable energy.
- Soil and water conservation.
- Ground water management.
- Irrigation efficiency and water management.

University of Agriculture, Faisalabad

Reclamation of saline areas.

Agency for Barani Areas Development (ABAD), Rawalpindi

- Soil and water conservation in rainfed areas.
- Afforestation and range development.
- Water resources development.
- Women training and extension.
- Farm to market roads.
- On-farm water management.
- Micro enterprise development.
- Rural infrastructure development.

Arid Zone Research Institute (AZRI), Bahawalpur

- Arid horticulture.
- Establishment of grasses on sand dunes.
- Medicinal plants of arid areas.

Cholistan Development Authority, Bahawalpur

- Colonization and allotment of Government land.
- Development of water resources and surveys for sweet ground water.
- Development of communication facilities.
- Drought relief and management.

Sindh Arid Zone Development Authority, Karachi

- Development of water resources.
- Communication facilities.
- Agricultural and livestock development and relief and rehabilitate.

Water and Power Development Authority (WAPDA)

Salinity control and reclamation programmes.

Cholistan Institute of Desert Studies (CHIDS), Islamia University, Bahawalpur

- Selection and propagation of salt tolerant and drought resistant shrubs, trees and grasses.
- Studies on desert plants with emphasis on their morphogenic and ethno botanical characters and medicinal value.
- Studies on nomadic lifestyle and socio-economic aspects of the desert dwellers.

Pakistan Forest Institute (PFI), Peshawar

Dry land Afforestation, agro forestry, watershed/rangeland development and management.

Soil Survey of Pakistan, Lahore

- Land capability classification.
- Soil-Vegetation Surveys.

Punjab Forestry Research Institute Gatwala, Faisalabad

Agro forestry, Afforestation.

Punjab Forest Department

Forestry Sector Development Project.

NWFP Forest Department

Forestry Sector Development Project.

Arid Zone Research Centre (AZRC), Quetta

- Soil and water conservation.
- Range/livestock development and management.
- Socio-economic and anthropological studies of arid area/desert communities.
- Selection of food/forage/crops for arid areas.

Non-Governmental Organizations (NGOs)

- International Union for Conservation of Natural Resources (IUCN)
- Sustainable Development Policy Institute (SDPI)
- Society for Conservation and Protection Environment (SCOPE)
- Agha Khan Rural Support Programme (AKRSP)
- Pakistan Institute for Environment and Development Action Research (PIEDAR)
- Rural Development Foundation

4.5 New Local Government System

The provincial governments have installed a new integrated Local Government System. The new system reorients administrative system to allow public participation in decision making. The essence of this system is that the local governments are accountable to citizens for all their decisions. It enables the proactive elements of society to participate in community work and development related activities. It has also removed rural-urban divide.

The new system provides three-tier local government structure in which there is only one line of authority in the district and district bureaucracy is responsible to the elected representatives. More operational autonomy is ensured to the district level offices. Administrative and financial powers of the defunct divisional offices have been, by and large, delegated to the District level.

At the top tier, the District, there is a single integrated local government called District Government. This system addresses the problems of large cities. The middle tier, the Tehsil, has Tehsil Municipal Administration. At the lower tier, the Union Administration, which is a body corporate, covers the rural as well as urban areas across the whole district. The coordination between the three tiers is ensured through the following arrangements:

The Zila Council in a common district or in a city district, apart from reserved seats for women, peasants & workers and minorities, consists of Union Nazims of all the unions in the district or the city district. Similarly the Tehsil/Town Council, apart from reserved seats for women, peasants & workers and minorities, consists of Naib Nazims of all the unions in the Tehsil in a common district or in the town in a city district. This provides vertical linkages between the three tiers of the local governments i.e. the Union, Tehsil, and District. Union Nazim and Naib Union Nazim are elected as joint candidates to the Union Council, which consists of twenty one elected members against general and reserved seats.

The new Local Government System envisages formula-based fiscal transfers to the districts through Provincial Finance Awards. In addition, local governments are allowed to levy specific local taxes/fees.

The law provides legal cover to the formation of Citizen Community Boards to enable citizens to actively participate in the development and Non-development activities of the Local Governments. Fifty percent of the Development budget at the District, Tehsil Town and Union level has been earmarked for CCBs.

The Citizen Community Boards will contribute in project design, implementation, management and monitoring at grass root level with a view to improving services through bottom up planning and development process. The Citizen Community Boards will serve as a channel for mobilizing communities. They will assist in raising funds to solve local problems. The CCBs through voluntary, proactive and self-help initiatives undertake activities for resolving issues at the grass root level.

The involvement of CCBs will ensure transparency and accountability in the development process due to the contribution of the community in the projects. Instead of passive recipients they will become active partners in development. The new local government system/devolution plan has to be incorporated in any sustainable development plan. NAP envisages such laid down principles of local community participation in its implementation.

Chapter-5: Salient Features of National Action Programme

5.1 Vision

To implement UN Convention to Combat Desertification (UNCCD) in Pakistan.

5.2 Mission

To arrest and control land degradation process in Pakistan.

5.3 Purpose

The Purpose of the National Action Programme (NAP) is to identify the factors contributing to the process of desertification in Pakistan and suggest practical measures and strategy, using an integrated and coordinated bottom-up approach to combat desertification and mitigate the effects of drought.

The Action Programme aims at:

- Indicating priority programme areas for initiating projects/activities to address desertification in different land resource units.
- Providing a guideline/framework for sustainable development of the natural resources in areas prone to desertification.
- Alleviating poverty and improving living standard of the people of arid lands by adopting improved technologies and by having access to extension and support services.
- Providing an effective institutional mechanism at various levels for implementation of action programme, formulating policy and conducting research in the arid lands.
- Human resource development through capacity building and creating awareness among the masses for identification and addressing area-specific problems.
- Gender-balanced decision making and effective participation through the recognition of the economic value of women's work.

5.4 Scope

National Action Programme contains a description of the state of country's environment with reference to the phenomenon of desertification, its causes and effects and implication of the current land use practices in the backdrop of the existing socio-economic conditions. It goes on to identify problems and issues, which needs to be addressed. It recommends strategy to intensify efforts at national, provincial, regional and district level to adopt such measures and steps with the active involvement of the all stakeholders including the community organizations and NGOs which help in reversing the trend of desertification and land degradation to improve the quality of life of the affected people.

5.5 Objectives

Main objectives of NAP are;

- Describe the state of environment, geographical setting and extent and severity of the problems of desertification and land degradation in the country.
- Identify issues to be addressed so that the process of desertification could be halted and the trend reversed.
- Propose a strategy and policy for the conservation and sustainable use of land resources and to enhance the productivity of land to improve the quality of life of local people.
- Identify priority programmes on the basis of which discrete and viable projects could be developed and interventions undertaken by the relevant federal and provincial development departments and universities.

- Propose measure to involve community organizations, NGOs and other stakeholders in identifying the needs for development and conservation of renewable resources and facilitate, enable and financially support these organizations to undertake such projects.
- Promote ways and means to create awareness among the masses and educate them about the threat of desertification and its adverse impacts.
- Enhance the capability and capacity of NGOs and community organizations through training programmes with the support of national and international organizations.
- Propose a mechanism for coordinating the efforts of the existing organizations in the country presently involved in activities relating to conservation and management of natural resources, with focus on desertification control, without compromising their autonomy and authority.
- Suggest mechanism for overseeing the implementation of NAP and setting up a system at the national level for coordinating the activities relating to desertification control and to act as an advisory body to the government in all matters relating to the policies and plans for desertification control, drought management, sustainable development and management of dry lands
- Suggest ways and means to generate funds for the implementation of the NAP.

5.6 Policy Reforms

A suitable policy framework is essential for management of natural resources and environmental protection to combat desertification. The overall growth and development in agriculture sector will depend on reversing the trend of misuse or wasteful use of natural resources and also on preservation of the natural resource base.

The existing land use policies are either not specifically tuned or tailored towards conserving and developing natural resources on sustainable basis, or concrete steps and measures to be taken to implement these policies are not specified or initiated. Development plan do highlight environmental concerns but the projects/programs for development and conservation of natural resources do not receive the same priority in terms of financial allocation as recommended in the policy statements.

There are proposals for land/agrarian reforms in NCS and National Commission on Agricultural Report (1988). The policy reforms recommended in these reports, if implemented will support the efforts for desertification control. Some of the policy issues are listed below.

- Continuous monitoring of the groundwater table using a standard method by assigning clear responsibilities to an agency. This should essentially focus on strengthening of an existing institution for data collection and dissemination.
- Abolish the flat rate charge of electricity consumed by tube-wells to minimize the over-extraction of water in desert/arid areas.
- Increase electricity tariff rates for the tube-well owners using flood irrigation and decrease electricity tariff rate for users having high efficiency irrigation systems.
- Crop zoning framework should be enforced in irrigated and non-irrigated environments considering Desertification impacts. Zoning should be based on the optimal range of temperature and adequate levels of growing degree-days required for crop maturity to ensure optimal and sustained productivity.
- At present, there is a wide difference between the value of canal water and groundwater. Assigning higher value to the canal water is a pre-requisite to motivate farmers for efficient use of water. Provincial Irrigation and Drainage Authorities may be given responsibility to raise water tariff to a level where they can manage the irrigation system to the desired levels of equity in water distribution.
- Supply of LPG and cooking stoves on no-loss, no-profit basis to minimize pressure on rangelands and watersheds for fuel wood. This activity will help in minimizing exposure of women to gaseous emissions.

- Establishment of mechanisms for the purchase of animals (private-public partnership) from the drought or disaster-stricken areas.
- Modification of curricula of general, agricultural and engineering universities to incorporate material on “Desertification Impacts Assessment and Adaptations” in courses like sociology, economics, plant breeding, agronomy, plant pathology, entomology, soil science, irrigation, drainage, hydrology, climatology, range management, forestry, etc.
- Universities and training institutes as a matter of urgency should develop curricula for a Crash Programme on “Desertification Impacts and Adaptations”, which can be offered to planners, administrators, researchers, development agents and end users’.
- Radio/TV campaigns for sensitizing the tube well operators, farmers and public at large for minimal extraction and efficient use of water.

5.7 Integration with National Development Plans

Agriculture is still the single largest sector of the economy and provides employment to about half the country’s labour, and agriculture and agro-based products account for more than 70% of the total export earnings. Apart from other measures for development of agriculture, attainment of ecological security by protecting the resource base of land, water, forests and rangelands *etc.* is essential.

The development process in the country shall have to rely on the conservation and improvement of country’s natural resources base of land, water, forests *etc.* NAP will have to be integrated with national development plans. Provisions are also made for programmes identified in the National Conservation Strategy, separately in the plan.

Environmental stability has been accepted as a critical component of development by the planners and the policy makers in the country and the principle of merging environment and economic in decision making has been agreed upon. The main problems encountered in dry land development in Pakistan include a fragile resource base overburdened by an impoverished population and policies, which address environmental concerns but lack implementation through bottom-up mechanism. As the communities in arid/desert areas are poor, the trend of environmental degradation can be checked by reducing poverty and development of social infrastructure in these areas.

Some of the objectives of eighth five year plan (1993-98) which will continue to be aimed at in the 9th and subsequent plans and will help in the implementation of the NAP. The development process has to be made more relevant and sustainable to address problems with complex scopes. Therefore:

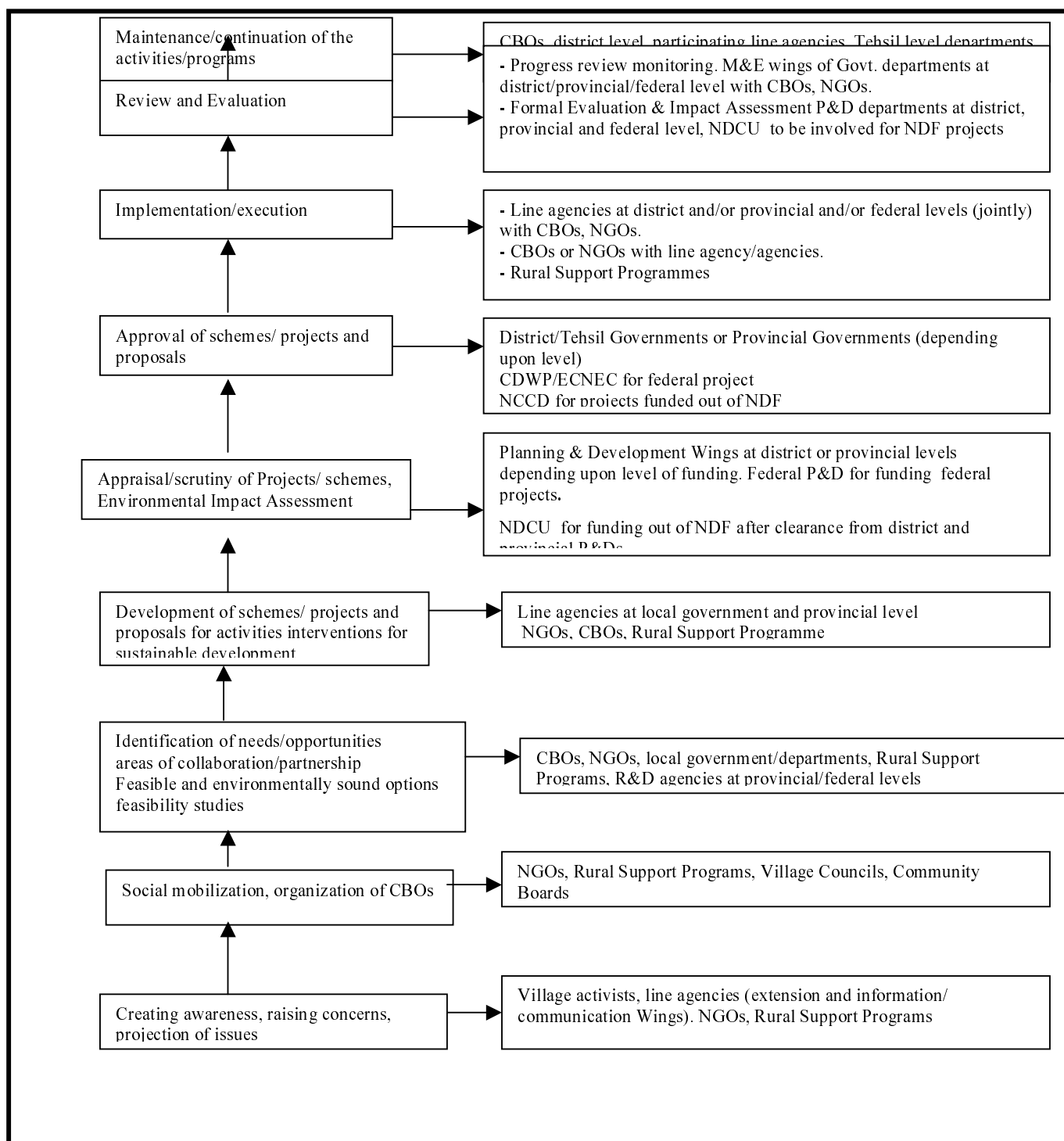
- Development agencies should develop incentives to encourage participatory and integrated development focussed on bridging the gap between scientific interventions and field level application of interventions;
- Research and education institutions should as a matter of urgency, increase professional recognition for contribution in an inter-disciplinary and an integrated mode;
- Specialists working in the line departments should seek ways to integrate their knowledge and activities, including desertification, in to sustainable development;
- Research agencies should work to develop integrative systems models to address sectoral problems critical to long-term natural resource management in the light of desertification.

More emphasis has been placed on decentralization and devolution of power in the new plan to make the districts as basic Governance and Development units. This will go a long way to strengthen the capacity of local population to participate in decision-making that is relevant to combating desertification through the implementation of NAP with bottom-up mechanism.

Process of Bottom-up Mechanism of Implementation

Process

Actors



5.8 Implementation Coordination

5.8.1 Implementation Arrangements for NAP

A number of federal and provincial ministries/departments and R&D organizations are directly or indirectly concerned with the desertification control programmes and conservation of natural resources in dry lands. Formulation of policies, programming and planning relating to the implementation of projects under NAP are the responsibility of concerned federal and provincial agencies. A strong coordination and monitoring effort is also needed for the implementation of NAP.

5.8.2 National Desertification Control Unit

It is proposed that the implementation coordination of NAP be entrusted to Ministry of Environment, Local Government and Rural Development, which may be declared as the National Coordinating Body (NCB). A National Desertification Control Unit (NDCU) headed by a qualified and experienced person of a higher status with adequate scientific and support staff and other resources, be created in MELGRD to act as National Focal Point (NFP) to coordinate the implementation of NAP. The implementation of NAP cannot be conceived without the existence of properly staffed, adequately funded and fully functional NDCU.

5.8.3 Thematic Programme Networks (TPNs)

MELGRD is focal point of UNCCD in Pakistan and is responsible for coordinating six TPNs at the regional level. List of TPNs is given as under:

1. Desertification assessment and monitoring.
2. Agro-forestry management and soil conservation in arid, semi-arid and dry sub-humid areas.
3. Rangeland management in arid areas including fixation of shifting sand dunes.
4. Water resources management for agriculture in arid, semi-arid and dry sub-humid areas.
5. Drought impact mitigation.
6. Integrated local areas development programme.

5.8.4 National Coordination Committee on Desertification (NCCD)

The existing National Coordination Committee on Desertification (NCCD) needs to be reconstituted and made fully functional with the following membership to oversee the implementation of NAP and the projects/activities initiated under this plan.

Minister for Environment, Local Government and Rural Development (Chair)

Secretary Finance

Secretary Food, Agriculture and Livestock

Secretary Water and Power

Secretary Planning & Development

Secretary Science and Technology

Secretary Environment, Local Government and Rural Development

Secretary Economic Affairs Division

Chairman PARC

Chairman PCRWR

Director General ABAD

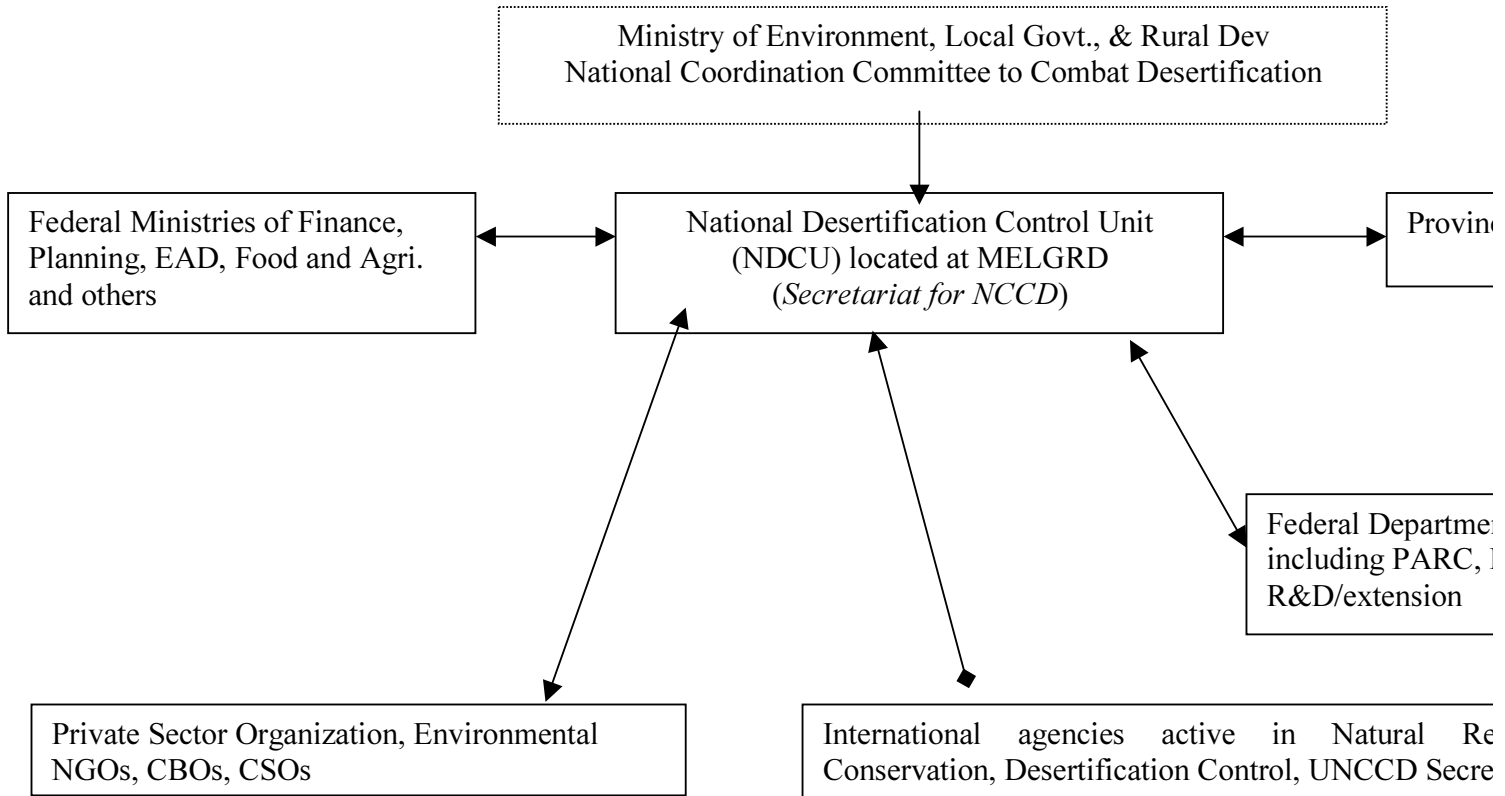
Additional Chief Secretaries P&D/Chairman P&D in the provinces.

Chief Executive National Rural Support Programme

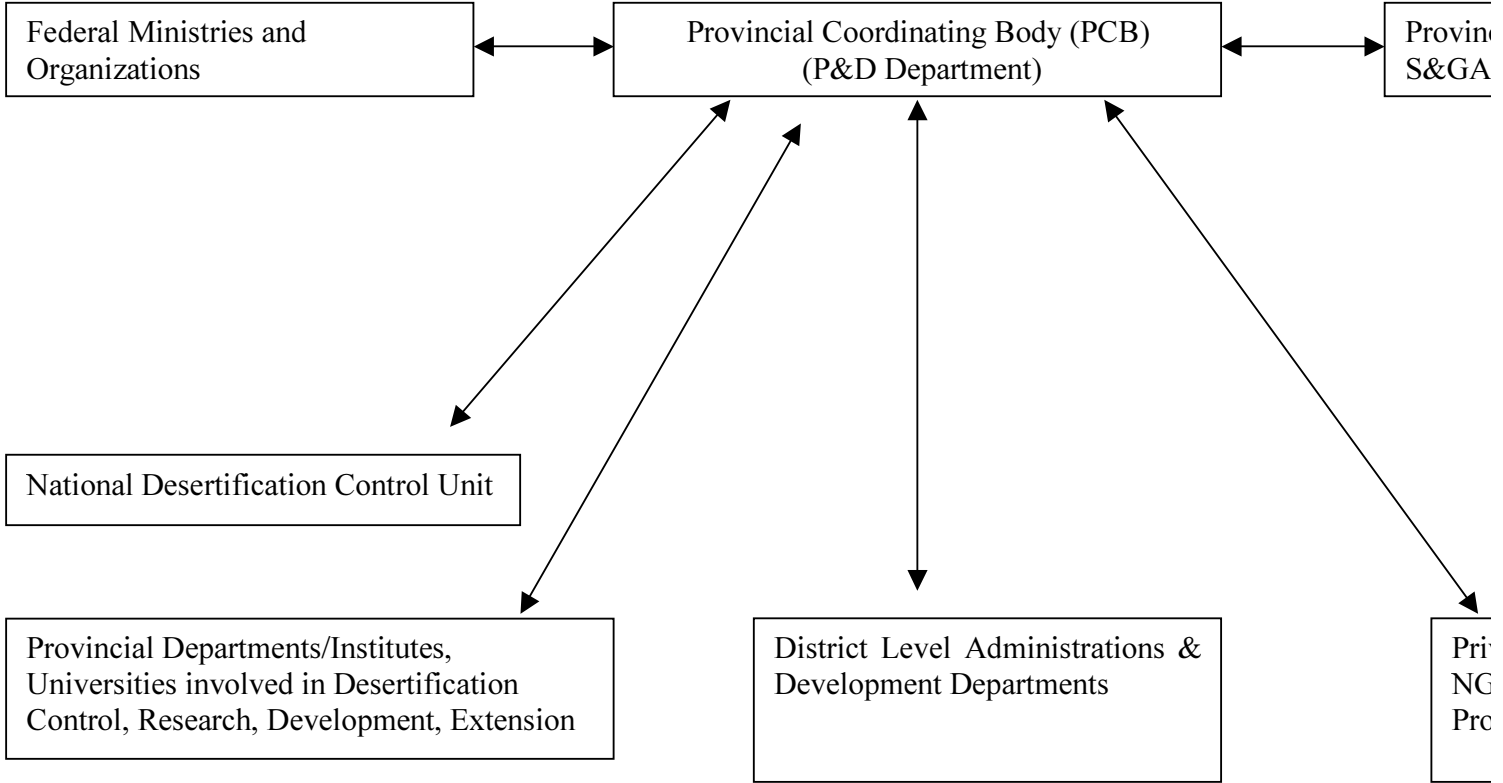
Two Public Representatives or MNA/Senators from arid/desert areas.

Head National Desertification Control Unit (Secretary)

Functional Linkages at Federal Level for Implementation of NAP



Functional Linkages at Provincial and District Level



Three sub-committees of the NCCD are proposed to deal with the following subjects/matters.

- **Technical committee:** Comprising scientists, heads of scientific research organizations and departments such as:

Chairman, Pakistan Agricultural Research Council (Chair)
Chairman, PCRWR
Chairman, Pakistan Science Foundation
Director General, Soil Survey of Pakistan
Inspector General of Forests
Animal Husbandry Commissioner
Agriculture Development Commissioner
Vice Chancellors of Agricultural Universities
Heads of Provincial Planning & Development Departments
Representations of Environmental NGOs
Director General, IWASRI
Director General, ISRIP
Director General, FPAS

The committee will propose, consider, appraise and review research, development, extension and education programmes and projects on desertification control on behalf of NCCD and recommend inter-sectoral adjustments and allocation of resources.

Budget and finance committee: Comprising two members of NCCD, representative of Ministry of Finance of the level of Joint Secretary, head of NDCU and representatives of Provincial Planning and Development Departments.

This committee will consider ways and means to augment the financial resources for desertification control and will deal with all matters relating to funding of desertification control projects, schemes and management of NDF fund on behalf of NCCD.

Information, extension and communication committee: Comprising two members of NCCD two representatives of NGOs, heads of Planning and Development Departments and head of NDCU. This committee will consider ways and means to create awareness about effects of desertification, use of media in dissemination of information and involvement of individuals, groups and NGOs in efforts to promote policies and programmes helpful in desertification control and mitigate the effects of drought.

5.9 Participation of NGOs and CBOs in the Implementation of NAP

A number of NGOs are carrying out rural development, social welfare, environmental conservation and educational activities. Among the international NGOs, IUCN and the World Wide Fund for Nature (WWF) are more active in Pakistan through their regional and country offices. National Rural Support Program at federal level and Provincial Rural Support Programs have been initiated and entrusted with the responsibility of fostering a network of grassroots level institutions to enable communities to plan and execute their own development initiatives. These rural support programs are supported by the Government for social organization and establishing linkages with government line agencies, donors, NGOs and the private sector.

Field oriented NGOs, particularly those with interest in desertification control, must be involved to follow a participatory approach in the implement of NAP. This will ensure that the communities establish their own institutions (community organizations), identify their priorities and areas of opportunities, organize their development agenda and forge links for gaining technical and financial assistance by outside agencies. UNEP has assisted in the past in carrying out pilot demonstration projects in good land use practices like community afforestation and training with the help of state institutions in Asian and African

countries by supporting NGOs, since they had proved to be effective as field oriented desertification control agents.

5.10 Gender Role

Although gender refers to both men and women but it is often considered a synonym for women. Gender and development is, therefore, perceived as women and development. Women's role is substantial in activities like planting/sowing, weeding and harvesting of crops, storage of produce, care and feeding of animals and collection of fuel. Women play an important role in natural resource management, which is a key prerequisite for environmentally sustainable development. The impact of desertification which makes women's day to day activities such as fetching water, growing food and accessing fuel even more difficult. UNCCD recognizes the crucial role of women in desertification control as is articulated in several articles. Initiatives to combat desertification will be significantly strengthened as women are increasingly integrated at all levels in planning and execution of desertification control projects for a more balanced approach to community development.

Separate Women Organizations (WO) have been created through community based development projects in recent years with the objective of organizing and equipping women with information technology, savings and credit generation to improve their status and quality of life.

5.11 Goals and Expected Outputs of National Action Plan

S.No.	Goals	Expected outputs	Inputs
1	Increase awareness about the causes & effects of desertification and threats of land degradation and socio-economic losses	Better informed and educated farmers, local communities, politicians, administrators	Involvement of NGOs, CBOs, WOs and Local Councils in extension and education. Investment in training for farmers, technicians and women. Formation of NCCD sub-committee for information, and communication. Organization of seminars/conferences. Publication of pamphlets, bulletins, news letters by extension wings of NDCU and R&D institutes.
2	Bring coordination between different ministries, agencies, organizations at federal provincial and district level as well as NGOs in efforts to control desertification and conservation and wise use of natural resources	Establishment of a coordinated and well orchestrated system of addressing concerns relating to desertification, land degradation and increased cooperation in implementing policies and programs at district, provincial and federal level. Functional NCCD and NDCU	Launching of an approved NAP. Formation of National Coordination Committee and sub-committees to control Desertification and establishment of NDCU
3	Assessment of specific needs and aspirations of local communities threatened with	A mechanism for a bottom up approach starting from rural committees and affected	Formation of NCCD and establishment of NDCU. Investment in discrete projects under the priority

	desertification at micro level and launching of projects with joint planning and implementation by different line agencies, NGOs, CBOs so that the concerns regarding land degradation gets addressed	farmers going upto the Provincial and National coordination committees to control desertification is in place for identification of opportunities/problems, joint planning, execution and maintenance	programs identified in NAP.
4	Find resources to finance projects aiming at desertification control and introducing good land use practices and for strengthening R&D institutes and building capacity for monitoring and early warning of floods and droughts.	Availability of additional funds for new activities in addition to the development funds allocated to the provinces and districts directly under the devolution of power plan	Establishment of National Desertification Control Endowment Fund with allocation of 3-4 billion by government and infusion of funds by enhancing grazing, hunting and fishing license fees in desert/arid areas. Enhancement in PSDP for Desertification Control Projects.
5	Strengthening Research Capabilities for dry lands development and desertification control	Increased capability in terms of trained manpower and availability of equipment at major R&D institutes/ universities working in the areas of natural resources conservation specially for arresting land degradation	Investment in providing equipment and training of scientists of major R&D institutes/universities working in the relevant fields.
6	Human Resource Development	Enhanced technical and managerial capabilities of the workers, farmers, and professionals to gain knowledge about causes and effects of desertification and technologies for natural resource conservation and rehabilitation of degraded areas.	Investment in short term professional training, farmers training, women training and graduate programs at universities for staff of line agencies, NGOs, and village activists.
7	Mitigation of the effects of drought	A mechanism in place to bring about cohesion and coordination in efforts for drought management and addressing major issues and gaps in drought management and	Analysis of the current situation and issues involved and gaps in preparedness for and management of drought. Suggest a mechanism to address drought management instead of drought relief.

		preparedness.	Establishment of a cell in MELGRD to coordinate and monitor drought management at national level.
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5.12 Proposed Priority Program areas

1. Desertification assessment through G.I.S and land sensing Techniques.

Objectives:

- To prepare the map of the extent and severity of desertification that is slight, moderate, severe.
- To document the various climatic and edaphic parameters by GIS techniques.
- To disseminate the information among the community and other stakeholders.

2. Rehabilitation of degraded mountains slopes for enhancing and sustaining the productivity.

Objectives:

- Afforestation of erosion prone watershed areas with multipurpose trees species.
- Improvement of forest cover through reforestation in coniferous and scrub forests.
- Raising of forest nurseries of coniferous and broad leaved multipurpose tree species.

3. Sustainable Range-livestock production through community participation in various ecological regions.

Objectives:

- Enhancing livestock production by increasing available forage through pasture management
- Reseeding and planting of depleted ranges with grasses and shrubs
- Educate and motivate communities in pasture management and grazing management practices to induce them to practice rotational grazing.
- Collection of information regarding livestock breeds, herd size, source of feed, production and consumption patterns of livestock products.

4. Amelioration of saline/sodic soils and improvement of drainage system to enhance crop production.

Objectives:

- Management of rehabilitated soil for maintaining the salt contents at desirable level.
- Provision of adequate drainage measures to provide salt-free root zone to the crops for better yield.
- Developing earthen reservoirs on the farms to dispose off the excessive drainage water.
- Use of brackish water to produce biomass.

5. Implementation of sand-dune stabilization techniques/technologies in the sandy deserts of Pakistan through integrated approaches.

Objectives:

- Enhance production of dry areas through biological stabilization of sand dunes and stabilization of soil in inland deserts...
- Planting suitable trees and bushes through techniques developed by Balochistan Forest Department, Punjab Forest Department and PCRWR.
- Improvement of forest cover through planting of xerophytes and drought tolerant plant species.
- Introduction of shelterbelts to reduce burial hazards of communication network and other infrastructures by moving sand dunes.

6. Improving water Recharging and water use efficiency in water scarcity areas.

Objectives:

- Construction of delay-action dams called percolation dams for recharging ground water
- Rehabilitation of vegetation cover on flood water infiltration areas to recharge ground water.
- Introduction of pumping licensing system among the farmers.
- Ensuring sustained/increased economic activity of orchards and vegetable cultivation.

7. Improvement of Rod Kohi irrigation system through innovation techniques and indigenous technologies.

Objectives:

- Arrest erosion hazards and check silt-load to down-stream water reservoirs.
- Develop water storage facilities for combating drought spells and to provide drinking water for human and livestock population.
- Construction of diversion structures and water channels for distribution of water to the fields.
- Development of water storage tanks for lift-irrigation in case of drought.

8. Rehabilitation of mangrove forest resources through improved management practices.

Objectives:

- Introduction of better management techniques through development of collaboration with other countries in the Asia Pacific region.
- Selection of new sites in Indus Delta for the establishments of mangrove species.
- Provision of alternate sources of fuel for coastal population to avoid destruction of mangrove forests.

9. Conservation and sustainable use of biodiversity for increasing the productivity of natural resource base.

Objectives:

- Survey and identification of state of biodiversity
- Conservation of natural flora, medicinal plants through management practices.
- Protection and preservation of wildlife species for their sustainable use.

10. Increase awareness about the causes and effects of desertification and threats of land degradation and drought.

Objectives:

- Involvement of community organizations, woman organizations NGOs and local councils in extension and education.
- Use the print and electronic media to disseminate information regarding land degradation issues.
- Publication of pamphlets, bulletins, news letters and wall charts for school children and general public.
- Organize seminars/lectures for farmers, communities, politicians, administrators, etc.

Chapter-6: Drought Management

6.1 Droughts in Pakistan

Recurrent droughts are global phenomena and common feature of arid/semi-arid lands. Drought cycles have been experienced in the past in the country periodically. Apart from the factors of climate change, global warming and *EL-NINO/LA-NINA* phenomena, resulting in floods, droughts and cyclones in different parts of world, the effects of droughts are becoming pronounced due to:

- pressure of growing population in fragile eco-systems for meeting their needs for food by extending cultivation to marginal areas and unwise land use practices.
- cutting of trees and uprooting of vegetation, exposing soil and reducing ground water recharge.
- excessive mining of ground water and lowering of water table, drying up of springs, *Karezes*.
- shortage of feed for animals due to increase in number and overgrazing of rangelands.

Average annual rainfall in the country ranges between 250-500 mm. The southern dry lands of the country, particularly Balochistan, Sindh and south Punjab face severe water shortage during the years with no or less than average rainfall. Recently, the provinces of Balochistan, Sindh and southern Punjab have been severely affected due to prolonged dry spell for the last 3 years, causing severe water shortages for human, livestock and agricultural uses. It is estimated that 2.2 million people and 7.2 million heads of livestock have been affected.

6.2 Early Warning Systems

The procedures and actions through which information is produced in advance about the occurrence of floods/droughts are known as early warning systems. The capacity in meteorological services of the country is weak and underdeveloped. Meteorological Department distributes reports to government organizations and media. This information does not reach the people in rural areas who are likely to be affected by drought. Early warning systems should aim at picking up the forecast information by the government agencies and its dissemination to communities through NGOs/CBOs. With traditional systems of using indicators of seasonal forecast, the climate information through EWS can enable the farmers to increase production in high rainfall years and avoid losses in low rainfall years.

6.3 Vulnerability Assessment

The people who are most vulnerable to drought include nomadic graziers, women searching for fuel wood for heating and cooking and the small farmers. The focus is mainly on hydro-meteorological and vegetation parameters. Review of institutional capacity to predict and respond to drought should be a part of the vulnerability assessment. Other factors which need to be included in vulnerability assessment are:

- Precipitation levels, trends and variability.
- Ground and surface water availability.
- Measure of water use.
- Agricultural practices/land use/land tenure.
- Population density and poverty levels.
- Access to health facilities, relief centers, communication and transportation.
- Institutional dimensions.

6.4 Gathering Reliable Data and Dissemination of Information

The present system of collection of reliable data and monitoring the drought is weak and needs improvement. The available information has limited dissemination and sharing between and across government departments and with organizations outside government system. Procedures, therefore, need to be developed to share and disseminate the available information in order to interpret it effectively for mitigating drought effects.

There is general lack of awareness of environmental problems, drought and disaster management issues in the country. Communication at federal, provincial and district level needs to be improved to convey whatever information is available to others. The communities who are affected by drought are a valuable information source. Full use is rarely made of this valuable source.

6.5 Drought Management Capacity

Drought management is considered as the provision of relief rather than covering all other aspects of mitigation, preparedness and rehabilitation. Currently, drought management is organized at federal level (emergency cell of Cabinet Division), provincial level (Provincial Relief Commissioners) and district level (Deputy Commissioners and heads of government departments in the districts) Relief Commissioners have emergency funds for this purpose which are supplemented by special grants by federal and provincial governments, depending upon the damage and losses caused or likely to be caused in the affected areas. Provincial governments and district authorities prepare “preparedness plans”, annually but these are not followed in most cases due to lack of coordination and limited resources and also because of the fact that the authorities at the district level (Deputy Commissioners) are burdened with so many other responsibilities of maintaining law and order, revenue collection, magistracy, local government supervision/management and addressing whole lot of other matters of day to day nature.

6.6 Drought Management Issues

Some of important concerns and issues relating to drought management and mitigation of the effects of drought are:

- Need for research in traditional and current coping mechanism and a sustainable community approach to disaster reduction.
- Need for drought management structure, policy, strategy and mechanism that involve all levels in government and civil society.
- Need for more focused efforts on water conservation as against water development in areas prone to desertification.
- Need for revegetation of denuded and depleted forests/rangelands.
- Need for better understanding of drought management concepts and strengthening capabilities at all levels.
- Development of a coordinated system of sharing of information and data to be interpreted more effectively for drought reduction.
- Strengthening of Meteorology Department for improving the quality of early warning systems.

6.7 Drought Management Responsibilities

Drought management and preparedness responsibilities are dispersed over a number of federal, provincial and district level administrative and relief agencies throughout the country. It would be rather difficult to suggest or prescribe a unified plan of action to be adapted by all these agencies, in the event of the occurrence of drought. The task becomes more difficult given the fact that more research needs to be carried out to study the current coping mechanism, along with the vulnerability assessment and lessons learnt in managing the previous droughts. A course of action is, therefore, being suggested to address gaps in drought preparedness proposing actionable programmes to be considered and adopted at different levels.

Under the new plan of decentralization and devolution of power, district governments will be empowered to plan approve and undertake programmes and projects of socio-economic and rural development at local level with their own resources supplemented by funds provided directly by the government. It would, therefore, be desirable to make district governments the focal points for implementing the drought

preparedness and management plans prepared with consultation of local communities and all other relevant agencies/departments.

6.8 National Coordinator Drought Management

It is suggested that the efforts to manage drought and relief and rehabilitation be centrally coordinated and monitored by designating a senior officer of the level of Joint Secretary in the Ministry of Environment, Local Government and Rural Development as National Coordinator Drought Management. He/She will maintain contact and liaison with the concerned agencies at federal, provincial and district level to gather information and data and with emergency cell of Cabinet Division, provincial relief Commissioners and district coordination officers for the assessment of the special needs and their communication to the concerned agencies. He/She will also compile information at national level about the extent and severity of drought and efforts made or need to be made to provide relief.

Chapter-7 Financing Action Programme to Combat Desertification

7.1 Source of Funding of Projects Based on NAP Recommendations

The source of funding visualized for projects/schemes and all other activities based on NAP recommendations will be as under:

- Non-development and Development budget of the respective organizations/institutes/departments available for full funding.
- Incremental funding of the projects of above organizations/departments/institutes from National Desertification Fund, in addition to their own funds.
- Incremental or full funding of the projects of the NGOs, community organizations out of National Desertification Fund.
- The Global Mechanism of UNCCD is committed to mobilize funding sources to implement NAPs in affected countries.

7.2 Public Sector Development Programmes

Federal/provincial public sector development programmes include allocation for agriculture, environment, water, rural development, women development and social welfare/poverty reduction which can also be utilized for funding projects aiming at halting land degradation, as recommended in NAP.

The Planning Commission and Planning and Development Departments in the provinces should examine the new development schemes keeping in view the priority areas outlined in action program once the document is approved and adopted. The new schemes for natural resources conservation, development and management in different sectors approved for funding, may be in line with the recommendations/proposals of the action programme. Prior to the submission of these schemes to planning division and provincial and district planning and development departments for inclusion in public sector development programme, these should be scrutinized in the National Desertification Control Unit. A projected annual phasing of cost of some salient activities of NAP is given at Annex-1.

7.3 National Desertification (Control) Fund (NDF)

Article 21.1.d of the UNCCD states that the “Conference of parties shall consider for adoption, *inter alia*, approaches and policies that facilitate, as appropriate mechanisms such as national desertification funds, including those involving the participation of non-governmental organizations, to channel financial resources rapidly and efficiently to the local level. A National Desertification Fund will essentially be a national pool of money used to fund local community driven activities to combat desertification and improve the livelihood of the people of dry lands.

UNDP office to Combat Desertification and Drought (UNSO) is responsible for spearheading and supporting work in desertification control and dry land management in all affected region. UNSO has assured necessary help and support in the creation of NDF. A task force in the Ministry of Environment, Local Government and Rural Development is already working out the mechanism and modalities of creating and operating the Fund.

7.4 Other Measures to Generate Funds

Other measures proposed to generate additional funds to finance the projects formulated under the National Action Programme are as under:

- A portfolio of projects in different areas like afforestation, range/livestock management, wildlife management, and rehabilitation of saline areas *etc* in arid regions and research/training at R&D

institutes and capacity building of these institutes may be got prepared and submitted to international donor agencies like UNEP, UNDP, GEF, FAO, and WFP.

- Mobilize funds through community led carbon sequestration plantations in dry waste lands under UNFCCC.
- Green funds by trading environmental support services and products in the market.
- A small fee/cess may be charged on the export of some of the products.
- A small conservation fee may also be charged from hunters at the time of issuing licenses for hunting and fishing in arid/desert areas.
- The graziers are either grazing animals on state owned lands free of cost or paying a nominal fee. Grazing fees should be rationalized and be realized for grazing in all state owned rangelands.
- NGOs are the most important development agencies reaching out to communities in dry land areas; therefore, NGOs may help and explore financing of projects/schemes aiming at desertification control by private sector community organizations and local councils.
- There are proposals for rationalizing the price of irrigation water, which at present is based on the area irrigated and not the quantity of water used. The proposed public sector investment in agriculture as a whole in the 8th 5-year plan was 7.5 % of total public investment but the actual allocation was less than 2%. Public investment in agriculture as a whole should be increased with substantial increase in the sub sectors of forestry, watershed, livestock, *etc.*