

Bioecology of Nara Desert Wildlife Sanctuary, Districts Ghotki, Sukkur and Khairpur, Sindh

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Abstract.- The paper highlights the importance of Nara Desert Wildlife Sanctuary having four different habitats viz. desert, agriculture areas, wetlands and human habitations. As many as 28 species of mammals, 78 species of birds, 16 species of reptiles and 25 species of dominant flora have been recorded during the present study. Chinkara, wolf, desert fox, marbled teal, houbara bustard, grey partridge, imperial sand grouse and white-backed vulture are the key species of the area. The area is under development and gas exploration activities. A management plan for the sanctuary is urgently required to be prepared and implemented.

Key words: Nara desert, protected areas of Sindh, bioecology of Sindh.

INTRODUCTION

The Nara Desert Wildlife Sanctuary (NDWS) is located in the eastern part of Sindh (Fig.1), in the talukas Rohri, Salehpat, Khangarh, Mirpur Mathelo and Nara. The total area of the Sanctuary is about 6300 km² covering parts of the Sukkur, Ghotki and Khairpur districts. The northern boundary of the sanctuary starts from the Pakistan-India border (close to the Mirchowari Check post) and runs along dirt track used by the Rangers. The track crosses Sainewari check post and runs till Juman Wari Goth. From Juman Wari Goth the boundary runs along a black top road, crosses Reni Nalla, Bagsar Goth, Khair Din Mangrio Goth, Ahmedabad Goth and ends at Makan Kot. Makan Kot is the extreme north settlement of the sanctuary. From Makan Kot a black top road goes south-west and ends at Bumbly Minor crossing (also known as Bumbly Sub-branch). The black top road starts again from Lath Minor crossing and passes from Bhatti Chowk, Nadir Ali Shah Goth and runs till Goth Hussainabad.

The western limit of NDWS starts from Goth Hussainabad and runs more or less along the alignment of the Nara canal and then overlaps the boundary of the Nara Game Reserve, passes through Tharuji Mangrio Goth, then crosses Kadanwari plant gas pipeline. The boundary then runs more or

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less along the Sheikh Track (used by the Arab hunters).

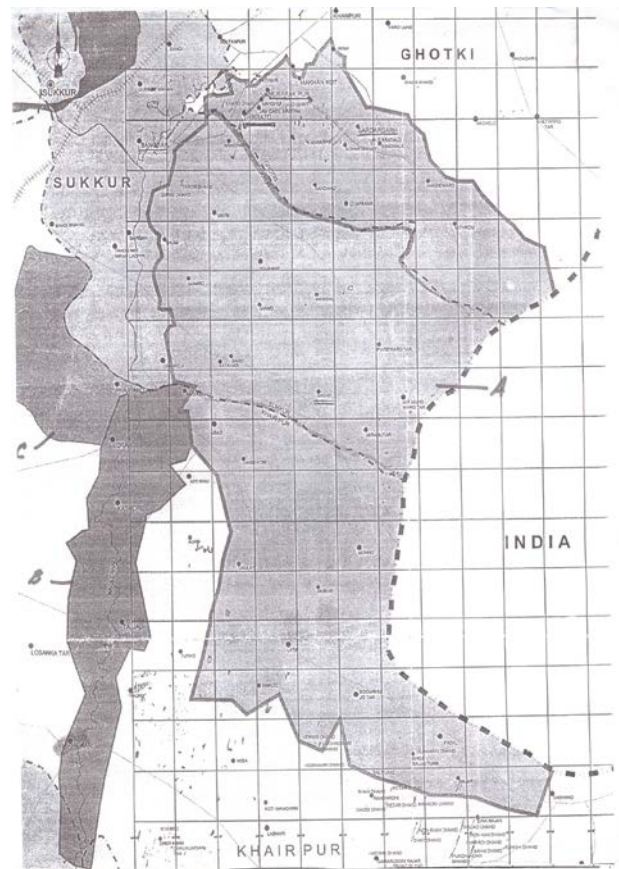


Fig. 1: The Nara Desert Wildlife

Sanctuary is located in the eastern part of Sindh Province.

Source: Halcrow Pakistan (Pvt.) Limited.

The southern boundary of NDWS runs along offshoots from the main Sheikh Track and ends at a point in the desert beyond which there are no tracks. From this point onwards to a Ranger check post "SK Tar" the boundary runs amidst sand dunes and soft areas (drebs) and then to the Pakistan-India border. The eastern boundary runs along Pakistan-India border.

The sanctuary mainly comprises of the low dunes "bhits" interspersed with relatively flat plain areas locally referred to as "pat". The elevations within the inter-dunal valley vary between 60 to 80m above mean sea level. The dunes achieve elevations from 80 to 99m; the highest dunes are found in the south-eastern parts of the sanctuary close to the Pakistan-India border. Local depressions, which collect rainwater, are called terais. These depressions lie at lower elevations than their surroundings; some of the tarais noted in the sanctuary lie at elevations of not more than 60m.

The north and northwestern parts of the sanctuary are flat alluvial plains (flood plains of the Indus and the ancient Hakra River). These areas are irrigated by canals originating from Gothki Feeder. Main canals in area are Dahar Wah and Masu Wah. The main settlements in the agricultural areas are Sardargarh, Mubarakpur, Tekratho, and Sangrar (Sangrar lies just outside the sanctuary). In the south and southeastern part, the dunes are much more established with higher relief and softer sand; the access to these areas is hence much difficult. Dunes have vegetation on the windward sides up to the crests.

The inter-dunal valleys or pats are wide and filled with silty and clayey sediments. These areas are useful for cultivation where water exists. The pats constitute almost one-third of the total sanctuary area. These pats support vegetation growth and water retention. Low lying areas within the pats retain rainwater, which is used by the locals for domestic purposes.

The areas further south of the sanctuary are marshlands created by the numerous natural water reservoirs (dhands) that lie in the area. Similar dhands are also found within the sanctuary,

primarily in the northern parts. The dhands are both perennial and nonperennial but almost all brackish with little use for drinking water purposes.

The Nara Canal that lies to the west of the sanctuary now occupies the channel of the ancient Hakra branch of the Indus, which, prior to the construction of the Sukkur Barrage served as an escape for Indus flood waters. Within the desert areas there is also a well developed drainage pattern which comprises a series of roughly NE-SW trending channels dominated by the Reni Nalla.

The climate of the area can be broadly defined as hot and arid. The characteristic features of this climatic zone are low rainfall (less than 250 mm per annum), absence of a well-defined rainy season, and high temperatures. The sanctuary experiences extreme temperatures in summer. The annual average maximum temperature is approximately 34°C with mean daily maximum temperature remaining above 40°C in May, June and July. June is the hottest month with highest recorded temperatures reaching upto 50°C. Daytime minimum temperatures even in winter remain above 22°C. Winters are mild and short with mean temperature not falling below 8°C.

The area is exceedingly dry with mean annual rainfall averaged over a thirty four-year period less than 88mm. The available data indicates that there are two wet seasons: the first with low rainfall in February and March (with mean monthly rainfall of 5.9mm and 4.9mm, respectively) and second with higher rainfall in the monsoon period of July, August and September (with mean monthly rainfall of 44.6mm, 21.3mm and 10.5mm, respectively).

The total population of the sanctuary has been estimated to be about 144,600. The main population lies in the agricultural areas (northern part of the sanctuary). The desert (southern part of the sanctuary) has scattered population while the extreme eastern part of the sanctuary is devoid of any population. Population wise major settlements in the sanctuary include Lohi (2002), Sardargarh (1200), Mubarakpur (1200), Makan Kot (1800), Thekrato (2800), and Wahi Goth (1500) (Halcrow, 2005).

The sanctuary (26° 40'N/69° 05'E) was notified in 1980 to give protection to the key species viz.: chinkara, desert fox, ratel or honey badger,

marbled teal, grey partridge, houbara bustard and imperial sand grouse. The NW and western area of the sanctuary is mostly sandy with some agriculture areas. There are several scattered small villages. There are some wetlands in the area. The SE and Eastern part of the sanctuary lies along the 10km broad border belt. The area is sandy with scanty vegetation. The central part of the sanctuary comprises of sand dunes area with some interdunal flat area having scattered trees and shrubs. There are some villages in the area.

Species that are tolerant of humans are observed in the NW and western area while the sensitive and shy species are found in the less habited eastern part of the sanctuary. Environmental baseline studies were undertaken in the NDWS to compile data for the Management Plan of the NDWS (Halcrow, 2005; Hagler and Bailley, 2005). Later, EIA was undertaken for the construction of two rural access roads in the NDWS *viz.* Road No. 85511: Salehpat to Samon khan Bhambro via Payal Khan Bhambro 11.0 km and Road No.85502: Tikhrato Road to Salehpat via Sawan Mangrio, Vass, Vawori, Bitry, Sahipat, Sodora Mahar with link to Habibullah Mahar 38.0 Km (Mustanoja and Ghalib, 2005).

Afterwards, 3 more rural access roads were selected for construction and hence EIA was undertaken for Road No.40302:road from Arbab Mahar Uchehar to village Haji Chand Pat Akri, Deh Satyaro, Khangrah, District Ghotki 06.70 km; Road No .41401: Link road from Pano Aqil- Thikrato Road to village Ganwar Faqir Mangrio, Taluka Pano Aqil 05.10 km; and Road No. 41402: Raees Bangal Khan Mari to village Abdul Haleem Jinjh, Taluka Saleh Pat 05.40km (Mustanoja and Ghalib, 2005; Ghalib, 2006).

The area is very important due to gas exploration activities in Latif, Gambat and Mubarakpur blocks in the NDWS Sardargarh Gas Field and Kadanwari Gas Field are located with in the sanctuary limits.

The entire surrounding and adjacent area is very important on account of having many important areas of biodiversity such as Nara Game Reserve, Takkar Wildlife Sanctuary, Deh Akro Wildlife Sanctuary, Deh Akro Ramsar Site and

proposed potential Nara Wetland Complex Ramsar Site (Fig. 1).

Previous work done in the area includes the baseline study conducted by Bailley (2005) and study of the plant biodiversity of Nara Desert (Bhatti, 2003).

MATERIALS AND METHODS

Surveys were undertaken in the areas for the collection of data with regard to the biodiversity of the area during 2002-2005 in association with Halcrow Pakistan (Private) limited, Sindh Wildlife Department, Zoological Survey Department and Engineering Consultant International Limited, Karachi.

RESULTS AND DISCUSSION

As many as 28 species of mammals, 78 species of birds, 16 species of reptiles and 25 species of common plants have been recorded from the area (Tables I-IV).

Three species of mammals of the area *viz.* striped hyaena, caracal and honly badger are critically endangered while Indian wolf is endangered (Table I). As regards birds, two species are threatened *viz.* Indian white-beaked vulture and Houbara Bustard which are vulnerable (Sheikh and Molar, 2004).

Breeding of red wattled lapwing, white-tailed plover, blackwinged stilt and black headed myna was recorded from the area during the present studies. The occurrence of large pied wagtail (*Motacilla maderaspatensis*) and rock bunting (*Emberiza cia*) has been recorded for the first time from Sindh from the sanctuary (Bailley, 2005).

As regards reptiles, lizards and snakes are quite common in the area except short tailed toad, Agama, which are rare (Table III). None of them is threatened.

Twenty five species of plants have been recorded from NDWS, which are fairly common species in the marshy and desert areas of NDWS (Table IV).

The area is also important for waterbirds due to a number of wetlands present in the NDWS. As many as 12 important wetlands have been listed.

These are: Patwari Dhand, Garhi Dhand, Lewari Rehar Dhand, Makarpo Dhand, Laniwari Dhand, Dhand, Lamohreywari dhand, Lonwari dhand,
Table I.- List of mammals recorded in Nara Desert Wildlife Sanctuary Districts Ghoki, Sukkur and Khaipur, Sindh.

S.No.	Order	Family	Common name	Scientific name	Status*
1.	Insectivora	Erinaceidae	1. Long eared desert hedgehog	<i>Hemiechinus collaris</i>	LC
2.	Carnivora	Felidae	2. Caracal or red lynx	<i>Felis caracal</i>	CR
			3. Jungle cat	<i>Felis chaus prateri</i>	LC
		Hyrpestidae	4. Indian desert wild cat	<i>Felis silvestris ornate</i>	DD
			5. Indian mongoose	<i>Herpestes edwardsi ferrugineus</i>	LC
		Canidae	6. Small, Indian mongoos	<i>Herpestes javanicus</i>	LC
			7. Indian wolf or grey wolf	<i>Canis lupus pallipes</i>	E
			8. Asiatic jackal	<i>Canis aureus</i>	Nt
		Hyaenidae	9. Indian or Bengal fox	<i>Vulpes bengalensis</i>	Nt
			10. Desert fox	<i>Vulpes vulpes greffithi</i>	Nt
		Mustelidae	11. Striped hyaena	<i>Hyaena hyaena</i>	CR
			12. Ratel or honey badger	<i>Mellivora capensis</i>	CR
3.		Pholidota	Manidae	13. Indian Pangolin or scaly anteater	<i>Manis crassicaudata</i>
4.	Artiodactyla	Bovidae	14. Chinkara or Indian gazelle	<i>Gazella bennettii</i>	VU
			15. Indian wild boar	<i>Sus scrofa davidi</i>	LC
5.	Lagomorpha	Leporidae	16. Indian hare or desert hare	<i>Lepus nigricollis dayanus</i>	LC
6.	Rodentia	Sciuridae	17. Northern palm squirrel or five – striped palm squirrel	<i>Funambulus pennanti</i>	Nt
		Hystriidae	18. Indian crested porcupine	<i>Hystrix indica bylanfordi</i>	Nt
			19. Soft furred field rat or Matad	<i>Millardia meltada pallidior</i>	LC
		Muridae	20. Sand-coloured rat	<i>Millardia gleadowi</i>	LC
			21. Roof rat or house - rat or black rat	<i>Rattus rattus</i>	LC
			22. House mouse	<i>Mus musculus</i>	LC
			23. Little Indian field mouse	<i>Mus booduga</i>	LC
			24. Short tailed mole rat	<i>Nesokia indica</i>	LC
			25. Balochistan gerbil or pygmy gerbil	<i>Gerbillus nanus</i>	Nt
			26. Indian hairy – footed gerbal	<i>Gerbillus gleadowi</i>	LC
			27. Indian gerbil or antelope-rat	<i>Tatera indica</i>	LC
	28. Indian desert jird		<i>Meriones hurrianae</i>	LC	

*Abbreviations used: CR, critically endangered; E, endangered; LC, least concern; Nt, near – threatened; VU, vulnerable.

old Kandalo Dhand, Kharo Dhand, Uchahar Dhand, and Taror Dhand. The last three dhands are most important as a breeding site for marbled teal population. Old Kandalo dhand supported 4000 Mallards in January 2006.

Threats, environmental impact and mitigation measures

The NDWS is under heavy pressure due to the increasing human population and habitation, impact of development projects, gas exploration,

road construction, hunting activities for houbara bustard, movement of rangers, wood cutting for coal production, firewood collection, lack of solid waste management plan, degradation of land etc. Recently, there are alleged reports of heavy wood cutting in the sanctuary area particularly in Mubarak Block. Kundal, Babul and Kambar areas by influential contractors viz. Taank Khan and Rafiq Chauhan.

The EIA reports of 5 Rural Access Roads in the sanctuary area have concluded that the environmental impacts due to construction /

improvement of these roads will be insignificant and could be mitigated by implementation of the Environmental Management Plan in the area.

The official boundaries of the NDWS could

Table II.- A check list of the birds of Nara Desert Wildlife Sanctuary.

S.No.	Order	Family	Scientific name	Common Name
1.	Podicipediformes	Podicipedidae	1. <i>Tachybaptus ruficollis</i>	Little grebe or dabchick
2.	Ciconiiformes	Ardeidae	2. <i>Ardea cinerea</i>	Grey heron
3.	Anseriformes	Anatidae	3. <i>Anas crecca</i>	Common teal
			4. <i>Anas platyrhynchos</i>	Mallard
			5. <i>Anas cybeata</i>	Shoveller
			6. <i>Netta rufina</i>	Red crested pochard
4.	Falconiformes	Accipitridae	7. <i>Elanus caeruleus</i>	Black winged kite
			8. <i>Accipiter nisus</i>	Asiatic sparrow-hawk
			9. <i>Butastur teesa</i>	White-eyed buzzard eagle
			10. <i>Gyps bengalensis</i>	Indian whitebacked vulture
			11. <i>Neophron percnopterus</i>	Egyptian vulture
			12. <i>Circus aeruginosus</i>	Marsh harrier
			13. <i>Circus gallicus</i>	Short-toed eagle
			14. <i>Falco tinnunculus</i>	Kestrel
5.	Galliformes	Phasianidae	15. <i>Francolinus pondicerianus</i>	Grey partridge
6.	Gruiformes	Rallidae	16. <i>Fulica atra</i>	Coot
		Otididae	17. <i>Chlamydotis undulata</i>	Houbara bustard
7.	Charadriiformes	Charadriidae	18. <i>Vanellus indicus</i>	Red wattled lapwing
			19. <i>Charadrius alexandrinus</i>	Kentish plover
			20. <i>Tringa totanus</i>	Common redshank
			21. <i>Tringa hypoleucos</i>	Common sandpiper
			22. <i>Calidris minutus</i>	Little stint
			23. <i>Calidris alpina</i>	Dunlin
			24. <i>Phalaropus lobatus</i>	Rednecked phalarope
		Recurvirostridae	25. <i>Himantopus himantopus</i>	Indian blackwinged stilt
8.	Columbiformes	Columbidae	26. <i>Streptopelia decaocto</i>	Ring dove
			27. <i>Streptopelia senegalensis</i>	Little brown or senegal dove
9.	Strigiformes	Strigidae	28. <i>Athene brama</i>	Northern spotted owl
10.	Caprimulgiformes	Caprimulgidae	29. <i>Caprimulgus mahrattensis</i>	Syke's or sind nightjar
11.	Coraciiformes	Alcedinidae	30. <i>Alcedo atthis</i>	Indian small blue kingfisher
			31. <i>Halcyon smyrnensis</i>	Whitebreasted kingfisher
			32. <i>Merops superciliosus</i>	Blue cheeked bee-eater
			33. <i>Merops orientalis</i>	Sind small green bee-eater
			34. <i>Coracias benghalensis</i>	Roller or blue jay.
12.	Piciformes	Picidae	35. <i>Picoides adsimilis</i>	Sind pied woodpecker
13.	Passeriformes	Alaudidae	36. <i>Eremopterix nigriceps</i>	Blackcrowned finch-lark
			37. <i>Alaemon alaudipes</i>	Hoopoe lark
			38. <i>Calendrella brachydactyla</i>	Great short-toed lark
			39. <i>Melanocorypha bimaculata</i>	Calandra lark
		Hirundinidae	40. <i>Riparia riparia</i>	Collared sand martin
			41. <i>Hirundo rustica</i>	Western swallow
		Laniidae	42. <i>Lanius excubitor</i>	Grey shrike
			43. <i>Lanius schach</i>	Rufous-backed Shrike
		Sturnidae	44. <i>Sturnus roseus</i>	Rosy starling or rosy pastor
			45. <i>Acridotheres tristis</i>	Indian myna
		Corvidae	46. <i>Dendrocitta vagabunda</i>	Tree pie
			47. <i>Corvus splendens</i>	Sind house crow
			48. <i>Corvus corax</i>	Raven
		Campephagidae	49. <i>Tephrodromis pondicerianus</i>	Sind wood shrike
		Pyconotidae	50. <i>Pycnonotus leucogenys</i>	White-eared bulbul
			51. <i>Pycnonotus cafer</i>	Red-vented Bulbul

S.No.	Order	Family	Scientific name	Common Name
		Timaliidae	52. <i>Turdoides caudatus</i>	Common babbler
			53. <i>Turdoides striatus</i>	Sind jungle babbler
Continued				
		Rhipiduridae	54. <i>Rhipidura aureola</i>	Northern white browed fantail flycatcher
		Sylviidae	55. <i>Prinia gracilis</i>	Indian streaked wren-warbler
			56. <i>Prinia burnesii</i>	Western longtailed grass warbler
			57. <i>Sylvia curruca</i>	Lesser whitethroat
			58. <i>Sylvia nana</i>	Desert warbler
			59. <i>Phylloscopus collybita</i>	Chiffchaff
			60. <i>Phylloscopus neglectus</i>	Plain leaf warbler
		Turdidae	61. <i>Phoenicurus ochruros</i>	Black redstart
			62. <i>Saxicola caprata</i>	Pied bush chat
			63. <i>Oenanthe isabellina</i>	Isabeline wheatear
			64. <i>Oenanthe xanthopyrmyna</i>	Redtailed wheatear
			65. <i>Oenanthe deserti</i>	Desert chat or desert wheatear
			66. <i>Oenanthe picata</i>	Pied chat
			67. <i>Oenanthe pleschenka</i>	Pied white bellied wheatear
			68. <i>Saxicoloides fulicata</i>	Brownbacked Indian robin
		Motacillidae	69. <i>Motacilla flava</i>	Yellow wagtail
			70. <i>Motacilla maderaspatensis</i>	Large pied wagtail
			71. <i>Motacilla alba</i>	White or pied wagtail
			72. <i>Motacilla cinerea</i>	Grey wagtail
		Nectariniidae	73. <i>Nectarinia asiatica</i>	Sind purple sunbird
		Passeridae	74. <i>Passer domesticus</i>	House sparrow
			75. <i>Passer pyrrhonotus</i>	Sind jungle sparrow
			76. <i>Petronia xanthocollis</i>	Sind yellowthroated sparrow
		Estrildidae	77. <i>Lonchura malabarica</i>	Common silverbill, whitethroated munia
		Emberizidae	78. <i>Emberiza cia</i>	Rock bunting

Table III.- List of reptiles recorded in Nara Desert Wildlife Sanctuary.

S.No.	Family	Common Name	Scientific name
1.	Lacertidae	1. Indian fringe-toed sand lizard	<i>Acanthodactylus cantoris</i>
2.	Varanidae	2. Indian desert monitor	<i>Varanus griseus</i>
		3. Indian monitor lizard	<i>Varanus bengalensis</i>
3.	Uromastycidae	4. Indian spiny-tailed lizard	<i>Uromastix hardwicki i</i>
4.	Scincidae	5. Indian sand swimmer	<i>Ophiomorus tridactylus</i>
5.	Gekkonidae	6. Sind sand gecko	<i>Crossobamon orientalis</i>
6.	Agamidae	7. Indian garden lizard	<i>Calotes versicolor versicolor</i>
		8. Black-tailed toed agama	<i>Brachysoura minor</i>
		9. Brilliant agama	<i>Trapelus agilis</i>
		10. Afghan ground agama	<i>Trapelus megalonyx</i>
7.	Elapidae	11. Indian cobra	<i>Naja naja</i>
8.	Viperidae	12. Russell's viper	<i>Daboia russelii russelii</i>
		13. Saw-scaled viper	<i>Echis carinatus</i>
9.	Boidae	14. Indian sand boa	<i>Eryx johnii</i>
10.	Colubridae	15. Glossy bellied racer	<i>Platyceps ventromaculatus ventromaculatus</i>

be re-examined, since the privately held, registered and settled agricultural land of the road improvement influence areas appears to be in

conflict with the rules governing sanctuary areas. As the rules governing the sanctuary do not allow such activities (Anonymous, 2003).

However, the population engaged in agriculture on their privately owned holdings has the right to continue their activities, since they already lived there and owned the land before the sanctuary establishment.

Table IV.- List of plants recorded in Nara Desert Wildlife Sanctuary.

1. <i>Dipterygium glaucum</i>	14. <i>Calotropis procera</i>
2. <i>Cassia italica</i>	15. <i>Capparis decidua</i>
3. <i>Aristida adscensionis</i>	16. <i>Saccharum bengalensis</i>
4. <i>Aerva javanica</i>	17. <i>Tephrosia uniflora</i>
5. <i>Acacia jacquemonti</i>	18. <i>Phragmites karka</i>
6. <i>Calligonum polygonoides</i>	19. <i>Crotolaria burhia</i>
7. <i>Leptadenia pyrotechnica</i>	20. <i>Panicum turgidum</i>
8. <i>Prosopis cineraria</i>	21. <i>Saccharum spontaneum</i>
9. <i>Tamarix aphylla</i>	22. <i>Typha elephantina</i>
10. <i>Salvadora oleoides</i>	23. <i>Tamarix indica</i>
11. <i>Elensine indica</i>	24. <i>Alhaji maurorim</i>
12. <i>Salsola imbricate</i>	25. <i>Prosopis juliflora</i>
13. <i>Haloxylon stocksii</i>	

The construction / up-gradation of the roads was also essential since this would provide great improvement in the lives of the population and would ultimately help in poverty alleviation. It would be possible to devise a Management/Development Plan for the area as a whole, recognizing the land use differences.

As developmental activities in the Road Sector Development Programme are already underway in Sindh, including the sensitive and critical areas of the Province, hence it will be advisable to amend the Sindh Wildlife Protection Act 1972 to allow the construction of rural access roads, subject to EIA, in view of growing population and developmental activities in the protected areas.

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