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The Major deserts of Pakistan-a review

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SUMMARY

Pakistan covers 79.6 million hectares area. The majority of the area is semiarid to arid and receiving 250 millimeters of yearly rainfall. Pakistan's deserts cover 11 million hectares of the country's total area. These places are broadly separated and range in elevation from 100 to 1000 meters above from sea level. These deserts are dependent on monsoon for rain and wind. The aridity is characteristic of a desert, with irregular, clustered showers. The major deserts of Pakistan are the Thal desert, the Cholistan desert, the Nara desert, the Tharparkar desert and the Kharan desert.

Keywords: Desert, Cholistan, Tharparkar, Thal, Socioeconomics

Citation: Altaf, M. 2022. The Major deserts of Pakistan-a review. Journal of Wildlife and Ecology. 6: 78-92.

Received: April, 2022; Accepted: May, 2022

INTRODUCTION

Pakistan's deserts cover 11 million hectares (13.82 percent) of the country's total area, mostly in the country's central and southern areas (Akram and Abdullah, 1990). The sand dunes can grow up to "150 metres" above from ground. These sand dunes are widely scattered and range in elevation from "100" to "1000 metres" above from sea level. These deserts are dependent on monsoon for air and rain (Abd El-Ghani *et al.*, 2017). The major deserts of Pakistan are the Thal desert, the Cholistan desert, the Nara desert, the Tharparkar desert and the Kharan desert.

THE THAL DESERT

Geography

These are monsoonal deserts, which relate to a kind of wind system characterized by seasonal fluctuations in response to differences of temperature between oceans and continents. The Arabian Sea's southeasterly winds are what bring the summer's torrential rainfall. With irregular rainfall that occurs in clusters, the area is parched, as is typical of a desert. Because these ecosystems include endangered or uncommon species that are economically significant to the native populations and are consequently being utilized unsustainable, practical conservation actions are needed to safeguard them. The Thal desert is present in Pakistan's Punjab province, between "31°10'N" and "71°30'E" (Figure 1 and 2).



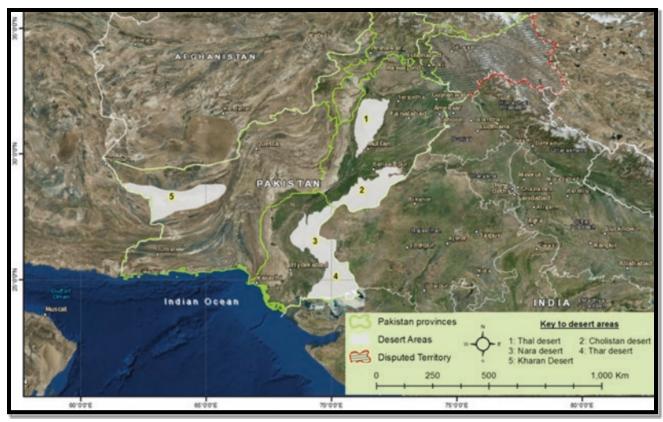


Figure 1: Deserts of Pakistan (Abd El-Ghani et al., 2017).

The area covers "190 miles", with a maximum width of "70 miles". The property is bounded to the north by the Salt Range piedmont, to the west by the "Indus River flood plains", and to the east by the "Jhelum" and "Chenab river" flood plains. Mianwali, Jhang, Bhakkar, Khushab, Layyah, and Muzaffargarh are the districts that make up this region. Geographically, the Thal Desert is similar to the Cholistan and Thar Deserts (Qureshi, 2013; Shaheen *et al.*, 2014).

Climate

Climates in the Thal range is from "arid" to "hyper-arid" (i.e. annual rainfall less than 200mm), with semiarid climates defining the other half (i.e. annual rainfall between 200 and 500mm). Between June and August, the rainiest months, most rain falls. In the winter, temperatures range from 3 to 8 degrees Celsius, while summer highs range from 32 to 40 degrees Celsius. Wind erosion is a serious problem that destroys agricultural plants, loses topsoil, and organic material (Shaheen *et al.*, 2020).

Ethnology

Numerous tribes, including the Sial, Tiwana, Baghoor, Mammak, Rahdari, Bhachar, Lashari, Jhammat, Aheer, Jutt, Wagha's, Gahi and Awans, among others, may be found in the desert. Although most of the people in Thal speak "Seraiki," many also do so in the desert (HBS, 2013).

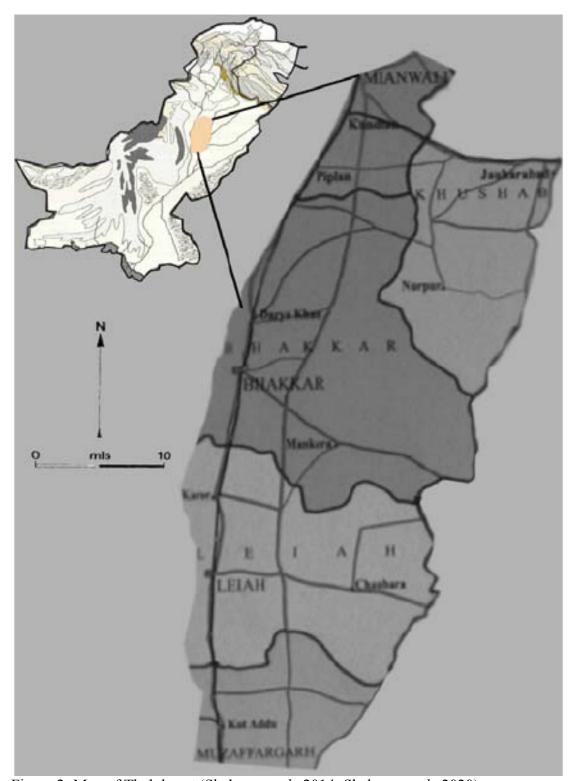


Figure 2: Map of Thal desert (Shaheen et al., 2014; Shaheen et al., 2020).

Flora

The majority of the space is taken up by perennial grasses, annual herbs, scattered shrubs, and tiny trees. This region's common trees i.e. jand (*Prosopis cineraria*),

karen (Capparis decidua), farash (Tamarix aphylla), ber (Zizyphus mauritiana), wan (Salvadora oleoides) and kikar (Acacia nilotica). Other common plants include Aristida adscensionis, Aristida funiculata, Acacia jacquemontii, Aerva javanica, Cenchrus biflorus, Cymbopogon jwarancusa, Cenchrus ciliaris, Haloxylon salicornicum, Gisekia pharnacioides, Limeum indicum, Saccharum spontaneum, Ochthochloa compressa, Stipagrostis plumosa, Tribulus longipetalus, Tribulus terrestris, Zizyphus nummularia and Zaleya pentandra (Qureshi, 2013).

Fauna

Resident birds are little egret, cattle egret, Indian pond heron, pariah kite, Indian sparrow hawk, black winged kite, lagger falcon, grey partridge, red-headed merlin, red-wattled lapwing, ring dove, rock pigeon, red turtle dove, little brown dove, pied crested cuckoo, rose-ringed parakeet, spotted little owl, white-throated kingfisher, Indian roller, hoopoe, , little green bee-eater, golden-backed woodpacker, pied bush chat, white wagtail, striated babbler, common babbler, great grey shrike, jungle babbler, house crow, raven, black drongo, common myna, house sparrow and bank myna (Roberts, 1991, 1992; Mahboob *et al.*, 2013). The Indian desert cat, common red fox, Chinkara, Indian Jackal, Indian hare, Indian hairy-footed gerbil and Indian wild boar are also present over the last century (Roberts, 1997). Spiny-tailed lizards, Indian monitor lizard, bullfrog and Indus toad are common in these areas (Khan, 2006).

Socioeconomics

Chickpea, wheat, guar, and some cattle fodders such as lucern, barseem, and sorgum are the principal crops farmed in the area. Wheat, a vital source of food security for people, is grown on tiny plots of leveled land near to their homes, which are usually cleaned of sand dunes. This plot of land is irrigated with tube-well water from a depth of more than 120 feet. The tube-well water is also used to grow some feed and vegetables, primarily spinach, which can resist brackish water. Chickpea is frequently produced on unleveled soil known locally as "tibbas" and is the main source of income for inhabitants in this desert. Its production is entirely dependent on the strength and dispersion of rainfall (HBS, 2013).

Livestock, as a sub-sector of agriculture, is an important source of income for farming communities. Cattle are the most valuable livestock species in rural life, followed by goats, sheep, and camels. It was discovered that practically all homes kept these few animals. However, just a few homes reported seeing camels known locally as "Marecha." People claim that "its utility has been lessened due to the advent of various modes of draught power for crops and transportation." The number of animals was determined by the availability of fodder (HBS, 2013).

THE CHOLISTAN DESERT

Geography

This desert, also known as "Rohi", covers "2.6 million hectare" and stretches up to the "Nara Desert", Province of Sindh, covering "480 kilometres" in length and "32 to 192 kilometres" in width. It is located in between "27°42' and 29°45' N" and "69°52'

and 75°24′ E". Higher than "81 percent" of the desert is covered by "tiny and big sand dunes", with the remaining "19 percent" made up of "alluvial flats" and "sand hummocks" (Figure 1 and 3).

The desert is divided into 2 parts, the first being the "greater Cholistan" and the other being the "Lesser Cholistan". It encompasses the division's 3 districts i.e. "Bahawalpur", "Rahim Yar Khan" and "Bahawalnagar" (Akram *et al.*, 2008; Haider *et al.*, 2021). This desert is a cause of the "Hakra civilization"; once a wealthy area, it is now a vast desert. Geographically, it is divided into two areas based on geomorphology: lesser Cholistan, which covers an area of about "7770 km²", is made up of large, hard, and compact landscape "known locally as dahars" that alternate with low sandy ridges, while greater Cholistan, which occupies an area of about "18,130 km²", is in the southern region. Undulating plains are interspersed with static, partially stabilized, or shifting dunes on the landscape. The soils are classed as saline i.e. pH "8.2-8.4" or saline sodic i.e. pH "8.8-9.6" (Arshad *et al.*, 2008).

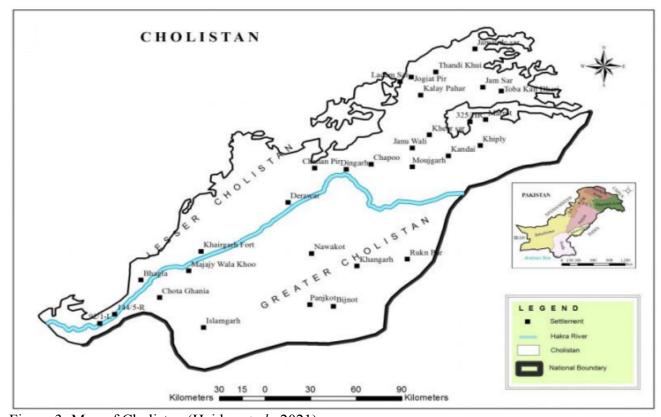


Figure 3: Map of Cholistan (Haider et al., 2021).

Climate

Cholistan has a tropical desert ecology that is dry and semi-arid, with very low seasonal humidity. The average temperature is 28.33 degrees Celsius, with July being the warmest month with a mean temperature of 38.5 degrees Celsius. Summer temperatures can exceed 46 °C and occasionally exceed 50 °C during droughts. Winter temperatures can reach 0°C (32°F) on rare occasions. Cholistan has an average rainfall of up to "180mm" each month, with July and August being the wettest months, while droughts are common (Lee and Schaaf, 2008; Wariss *et al.*,

2013). Seasonally, water is gathered in a system of natural lakes called Toba or constructed pools called Kund. Subsoil water can be found at depths of "30-40 metres", although it is often brackish and so unsuitable for most plant growth.

Ethnology

In this essay, I'll look at four tribes: the Bohar, Chachar, Chhajra, and Parhar, whose territory extends from Sargodha in the north to Bahawalpur in the south. In terms of distribution, all four of these tribes have a significant presence in Sindh as well, but I will just look at their status in Punjab in this blog. Three of these tribes, the Bohar, Chhajra, and Parhar, have migrated from Rajasthan and settled in Cholistan. The Bohar are still a significant presence in the Cholistan region, where they are nomadic.

Flora

The xerophytic vegetation of the Cholistan Desert is adaptable to a broad range of edaphic environments, including significant temperature and precipitation changes. Compared to the hyperarid southern area, the eastern arid zone has more vegetation cover. The saline flatland "dahars" are prominent with *Haloxylon salicornicum*, *H. recurvum*, *Salsola baryosma*, *Suaeda fruticosa*, *Sporobolus ioclados*, *Prosopis cineraria* and *Cymbopogon jwarancusa*, are also frequent in undulated areas. Likewise, the sand dunes are prominent by *Lasiurus scindicus*, *Panicum turgidum* and *Calligonum polygonoides* (Arshad and Akbar, 2002).

Fauna

Cholistan's desert offers many animal resources, but there hasn't been much attention paid to registering or protecting the benchmarks. Most dominant avian species are as; Francolinus pondicerianus, Ammomanes deserti phoenicuroides, Sturnus vulgaris, Buteo buteo vulpinus, Accipiter nisus melaschistos, Aquila rapox vondhiana, Circus macrourus, Chiamydotis undulate, Choriotis nigriceps, Pterocles orientalis, Lanius excubita, Athene brama, Falco biarmicus jugger, Falco biarmicus cherrug, Streptopelia decaocto, Egretta garzetta, Aredeola grayii, Dinopium benghaleuse, and Sylvia nana nana (Mirza and Wasiq, 2007; Grimmett et al., 2008).

Herptiles of the study area are as; *Bufo stomaticus, Bufo viridis, Hoplobatrachus tigerinus, Euphlyctis cyanophlyctis, Lissemys punctata andersoni, Kachuga smithii, Laudakia melanura, Calotes versicolor, Hemidactylus flaviviridis, Hemidactylus brookii, Crossobamon orientalis, Eutropis dissimilis, Acanthodactylus cantrosis, Uromastyx hardwickii, Eryx johnii, Varanus bengalensis, Platyceps rhodorachis, Ptyas mucosus, Bangarus caeruleus, Naja naja, Echis carinatus, and Daboia russelii (Khan, 2006).*

Most dominant species of mammals are as; Felis caracal, Felis chaus, Felis libyca, Canis aureus, Gazella bennetti, Boselaphos tragocamelus, Herpestes edwardsi, Vulpes Vulpes, Hemiechnus auratus, Hystrix idica, Lepus nigricolis, and Sus scrofa (Roberts, 1997). Chinkara is still found in isolated areas of Cholistan, but it is on the verge of extinction in an area where blackbuck was once abundant (Haider et al., 2021).

Socioeconomics

The main source of income for the residents of Cholistan is livestock raising and rearing. The Cholistan desert herds graze their animals on the pasture grounds. Natural grass is obtained from pasture land. Cholistan people's economy is based on animals. Livestock is the primary source of revenue in the desert of Cholistan. A Cholistan farmer is pleased with his herd. Because the residents of Cholistan's desert are nomads, feeding animals is their primary activity. Animal parties in the desert ranges react swiftly to the opportunities and difficulties that arise. The nomadic lifestyle has been practised for millennia, maybe due to home climate and requirement for geographic features. These nomads have vast herds of camels, animals, sheep, and goats. They move their big animal flocks into the desert based on the availability of water and forage. Cholistan Desert livestock are grazing on pasture grounds (Ali et al., 2009; Haider et al., 2021). The Cholistan rangelands can currently support around "2.0 million" head at full capacity, serving as the country's primary source of wool and meat. The problem becomes worse when flocks of animal from adjacent settlements join the Cholistan Desert's animal population. In this way, they placed enormous pressure on the stolen land. The increased demand for dairy products such as milk, beef, butter, wool, and so on places a strain on Cholistan cattle resources. The earth's largest cover is barren land and sand soil, which account for "83 percent" of the entire area of Cholistan. The arid land accounts for "16%" of the Cholistan Desert region in Greater Cholistan. Crop farming is less common in larger Cholistan due to a lack of sandy soil and water. According to my findings, around "20%" of the entire area of Lesser Cholistan is under agriculture, of which 8% has a drainage system and the remainder is rain-fed. Wheat and cotton are two key food and income crops grown in this region. Agriculture is another main occupation of Cholistan and an essential component of the Cholistan desert's economy. Agriculture employs a considerable proportion of the labor force. Crop cultivation in the Cholistan desert is divided into two seasons. The first is the "Rabi season", while the second is the "Kharif season". Wheat is an important crop during the Rabi season, and it is utilized for food in the Cholistan desert. Cotton, on the other hand, is a key crop of the "kharif season" and a cash crop in smaller Cholistan. Farming is typically performed on the outskirts of the Cholistan Desert, with frequent crops being of a general / local kind, such as cotton, wheat, maize, and few others. Rainfall distribution is unequal and unpredictable, posing a persistent danger to desert crops. As a result of the increased population, the restricted crops of the "Lesser Cholistan desert" are under stress. As the human population grows, more grains and foodstuff are required for survival in the desert of Cholistan (Haider et al., 2021).

THE NARA DESERT

Geography

It is located in between "26° and 28°N" and "68° and 70°E" in Province of Sindh, Pakistan (Figure 1 and 4). This area is around 23,000km². The elevation ranges from 50 to 115 metres above from sea level. The area has a semiarid climate. The landscape is clearly defined by steep slopes, sandy hills, and extensive low-lying plains in the vicinity known as "Patt." A sand species is the buildup of sand in a

significant bulk that resembles a hill. In the area under study, stabilised dunes and low-lying flat areas create the valleys. Such dunes are the consequence of the wind's consistent blowing, which causes sand to build up on the windward side, creating a steep slope of sand. The dune drops in a stunning, curving cliff on its leeward side, which is the opposite side. Another characteristic of this area are the hummock dunes. These develop when perennial plants or shrubs that are found on the crests or sides of sand dunes become encircled by sand. The younger bushes grow without hummocks, but the majority of the older ones do (Qureshi and Bhatti, 2005).

Climate

This desert is a warm, and desert with average low and high temperatures of "20" and "45" degrees Celsius, respectively (Abd El-Ghani *et al.*, 2017). May to July are the hottest months, with temperatures ranging from 47° to 51° C. The coldest month was January, with temperatures ranging from 20° to 28° C. Aridity characterizes the Nara Desert, with wet as well as dry years recorded in clusters. The average rainfall ranges from "88 to 135 mm". Rainfall is more common during the monsoon season (mid-July to the end of August). The winter rains are low in intensity and occur from December to March. There was no rain in any season throughout the research period (1998-2003). As a result, this was labeled as a drought era (Qureshi and Bhatti, 2005).

Ethnology

According to the 2016 survey report, the population of "Nara Taluka" is 160,985. The overall population of the Nara Taluka target region is anticipated to be more than 60,000 people. Baradin, Baloch, Chang, Channa, Sahta, Gopang, Dashi, Maleah, Khaskheli, Khoso, Wassan, Mirbahar, DeewanBhurgari, Rind, Nizamani, , Ibupoto, Rajar, Mirani, Kakepoto, and Macchi are the primary communities living in the area study Shard, Syed, Rapper. A few people from these communities work in trade, business, government offices and artisan work (Qureshi, 2004).

Flora

The Nara Desert was sampled for "160 plant species" from "118 genera" and "45 families" between 1998 and 2001. One gymnosperm, three sedge, and twenty grass species were discovered. According to data, the area has "21%" of Pakistan's plant groupings, "8%" of its genera, and "3%" of its total species. This region's vegetation is characteristic of dry regions, with xerophytes adapted to extreme temperature variations and a wide range of edaphic conditions. Most of the Nara Desert is covered by stabilized sand dunes. A diverse assortment of nutritious, edible, and drought-tolerant herbs, shrubs, and trees cover the entire area. Despite their slow growth, these plants respond quite well to favorable climatic circumstances and generate plenty of biomass for cattle use. Important genera of grasses include *Cynodon*, *Dactyloctenium*, *Aristida*, *Desmostachya*, *Lasiurus*, *Ochthochloa*, *Dichanthium*, *Dinebra*, *Panicum*, *Stipagrostis* as well as *Setaria* along with sedges such as *Cyperus* as well as *Fimbristylis*. The most prevalent and popular fodder grasses, browsing trees and shrubs are shown (Qureshi, 2004; Qureshi and Bhatti, 2005).

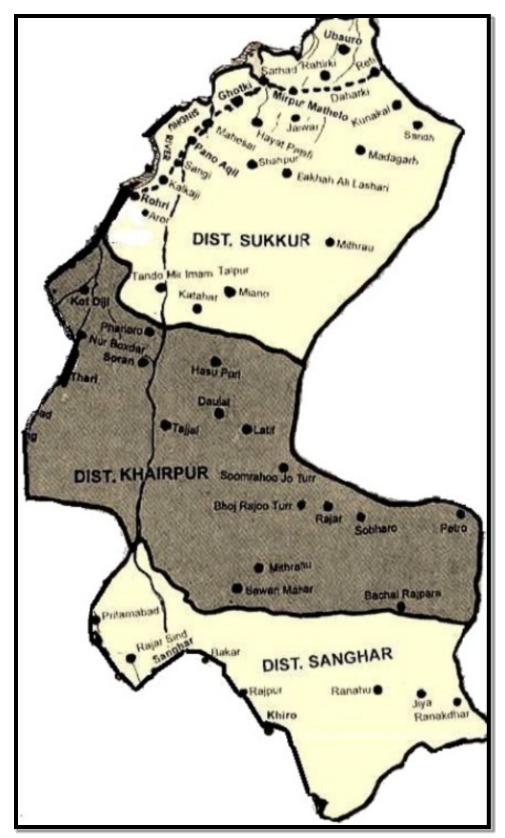


Figure 3: Map of Nara Desert (Qureshi and Bhatti, 2008).

Fauna

The report emphasizes the significance of "Nara Desert Wildlife Sanctuary", which has four distinct habitats: desert, agricultural areas, wetlands, as well as human residences. During the current investigation, "28" mammalian species, "78" avian species of, "16" reptiles species, and "25" flora species were recorded. The area's main species include desert fox, chinkara, wolf, marbled teal, Houbara bustard white-backed vulture and imperial sand grouse. The area is undergoing development and gas searching. A conservation strategy for the desert must be developed and implemented as soon as possible (Ghalib *et al.*, 2008).

Socioeconomics

Local communities' primary sources of income are livestock and agriculture. Wheat and cotton are the principal crops grown in "Nara", but barely, oil seed, sugarcane, legumes, vegetables, and fodder are also grown. The residents in the area are in the worst possible situation, with little health care facilities, drinking water, education, and basic life necessities. Despite its low production, the desert area supports relatively higher human "1.05 million" and cattle "1.25 million" populations. The main source of revenue in the area is livestock, which provides meat and fiber. The vegetation overexploitation by grazing animals, as well as the chopping of trees and bushes for fuel, has resulted in environmental deterioration that threatens the area's natural resources. The Nara Desert has no developed transportation system. There are few job options in the area due to the low literacy rate (Qureshi, 2004).

THE THARPARKAR DESERT

Geography

The Tharparkar desert, often known as Thar, is located between latitudes "24.16-25.78°N" and longitudes "69.05-71.12°E". The sandy salt marsh of the "Rann of Kutch" borders it in the south, the eastern Naracanal runs along the western boundary, and Rajasthan Desert, India (Jaisalmer and Jodhpur) borders it in the east (Figure 1 and 5).

This landscape is a phylogeographic extension of the Saharo-Sindian region, which is characterised by xerophytic vegetation. That is derived from Thulthat, which means sand ridges. Most people assume that this desert was formed roughly 10,000 years ago. This desert is classified as a tropical thorn desert and covers an area of "2.65 million hectares" (Abd El-Ghani *et al.*, 2017).

Climate

The climate is normally desert, with intermittent rainfall (150-400mm), most of which falls during the monsoon season. The temperature ranges from "5 to 45 degrees Celsius". The ground water is saline and brackish, and it is 200-300 metres deep (Abd El-Ghani *et al.*, 2017).

Ethnology

This region is predominantly Muslim, with the largest Hindu population in Pakistan. Sindhi, Dhakti, Kochi koli, Gujarati, Rajasthani and Parkari are the local languages.

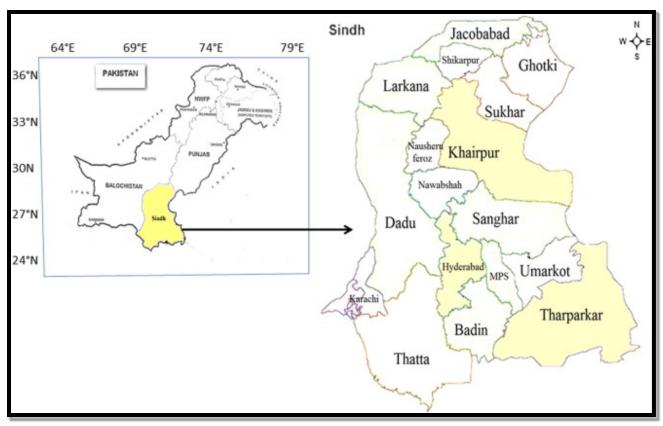


Figure 5: Map of Tharparkar (Brahman et al., 2016).

Flora

The vegetation consists in sparse while grasses i.e. *Eragrostis* spp., *Cenchrus biflorus*, *C. ciliaris*, *Panicumspp.*, *Lasiurus scindicus*, *Sporobolus* spp. *Aeluropus lagopoides* and *Cymbopogon jwarancus*. The scrub vegetation has of low trees such as *Prosopis cineraria*, *Prosopis juliflora*, *Acacia senegal*, *Zizyphus mauritiana*, *Tamarix aphylla* and *Capparis decidua* as well as shrubs i.e. *Calligonum polygonoides*, *Calotropis procera*, *Haloxylon recurvum*, *Haloxylon salicornicum*, *Aerva javanica* as well as *Crotalaria burhia*, (Abd El-Ghani *et al.*, 2017).

Fauna

During April 2013, researchers explored the animal fauna in the Tharparkar district's desert areas. An attempt has been made to assess the present status of the mammalian species found in Pakistan's Thar Desert. Thirty-five species were discovered in the district's various environments. The order Rodentia had the most species, followed by Carnivora. Rodents dominated the mammalian fauna, accounting for 15 species. The species were noted as *Tatera indica*, *Mus* species, *Equus hemionus*, *Hyaena hyaena*, *Gazella bennettii*, *Boselaphus tragocamelus* (Khan *et al.*, 2015). Peafowl and Vultures are also present in this area.

Socioeconomics

In the district, 94 percent of households own cattle, and "77.64 percent" of the population is active in livestock management. The typical family has eight animals,

while the overall livestock population in the area is estimated to be "7.7 million animals." Sheep, which produce "3 million kg" of wool each year, are especially important to the district's livestock business. Tharparkar is home to "40 percent" of Sindh's sheep population and is considered the greatest region in the province for sheep. "70.3" percent of farms employ animals as a source of power for ploughing soil (Farooq *et al.*, 2009; OCHA, 2019). The amount of donkeys in the livestock population is extraordinarily high, particularly for an arid region, with Tharparkar having a higher proportion than the rest of Pakistan. Despite the dry environment and typically poor growing conditions, agriculture employs the vast majority of Thari people. To water agriculture, the majority of the land is dependent on occasional rainfall.

THE KHARAN DESERT

Geography

This desert, which is clearly sandy, is located in Pakistan's Balochistan Province, between "28°25′58.80″to 27°N" and "63°51′36.00″to 66°E". It is physically covered by sand dunes intermingled with worn boulders and scrub flora. The shifting dunes reach heights of "15 to 30 m" and encompass an area of approximately "48,051 km²". The desert is made up of shifting sand dunes that reach heights of "15 to 30 metres" and have a floor of tiny rocks. This desert's wide barren region stretches from the "Alborz Mountains" in the north to the plateau, Balochistan around "1200 kilometers" to the south. This desert's elevation ranges from "1000 m" in the north to "250m: in the southwest (Figure 1 and 6). District Kharan is divided into the Tehsils of "Kharan", "Basima", "Mashkhel", and "Nag" in northwestern Balochistan. It is bounded to the north by Chagai, to the east by Kalat, and to the south by the Washuk district.

Climate

From mid-May until mid-September, hot, dusty winds blow constantly. Rainfall falls in southern Balochistan during the winter season, although the monsoons provide little precipitation to the southeastern desert. Extreme temperatures and thunderstorms characterize this arid landscape. Summer days are exceedingly hot, while winters are lovely. The average yearly rainfall in the desert is around "100 mm". The study region is a part of Iran desert of s Siestan, which includes the Chagai and Kharan Deserts (Abd El-Ghani *et al.*, 2017).

Ethnology

The district's population density is quite low (only 4 people per square kilometer), as well as "Kharan" city is the only urban centre, with 80 to 85 percent of the population living in peri-urban areas. The current population is estimated to be "0.28 million" people, with the main tribes being Rakhshani and Hasni. Literacy rates in metropolitan areas are projected to be "32.5 percent", while rural areas have rates as low as 12.5 percent. The majority of the dwellings almost "95 percent" are katcha (mud) or semi-pucca (IUCN, 2004).



Figure 6: Map of Kharan desert.

Flora

Saharo-Sindian is where the research area is botanically situated. The vegetation is sparse and mostly consists of perennial plants that can withstand dryness and stunted thorns or prickly shrubs. Natural vegetation has a deeply penetrating root system and is xerophytic. The broad, sandy plains are mostly reclaimed by ephemerals because of the challenging climatic circumstances; they emerge during the rainy season and complete their life cycle before summer. The majority of perennial plants bloom and produce seed at this time. The common flora of the area are Fagonia indica, Convolvulus spinosus, Astragalus stocksii, A. sericostachys, ammodendron, H. persicum, H. griffithi, Otostegia aucheri, Salsola richteri, Rhazya stricta, Peganum harmala, Zygophyllum eurypterum and Tamarix arcanthoides, with the grasses Ochthochloa compressa, Cymbopogon jwarancusa, Nepeta glomerulosa, Pennisetum divisum and Sorghum halepense (Abd El-Ghani et al., 2017).

Socioeconomics

Agriculture is the district's main source of income. Wheat is the main crop in the district, as it is in most neighboring districts such as Panjgur, Awaran, Khuzdar, and Chagai, and a variety of fruits are also farmed. The district's second most important

industry is livestock and camel rearing. Rug manufacturing is also prevalent in the neighborhood. This city is a tranquil tourist destination due to its barren and rough mountains and sandy deserts (Ijaz, 2016).

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Competing interests: Altaf has declared that no competing interests exist.

Funding: Altaf has no source of funding for this work. **Authors' contributions:** Altaf has designed this project, collected data and written this article.