

Geo-ecological Environment of Thar desert: A case study of Bikaner District

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Abstract - Rajasthan enjoys a very significant place in mineral deposits and their production. Presently Rajasthan produces 42 varieties of major and 23 minor minerals. The state is soul producer of Jasper, Garnet of Gem variety and wollastonite in India. Almost the entire production of Zinc concentrate, gypsum, fluorite (graded), asbestos and calcite is reported to be found from Rajasthan. Besides Rajasthan is the leading producer of lead concentrate (77%), soap stone (85%), ochre(66%) and felspar (70%) in the country.

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INTRODUCTION

Prosperity and development of any area mainly depends on its natural resources. Renaissance and Industrial revolution in Europe in 14th and 15th centuries could become a success because of the availability of basic infrastructural mineral resources i.e. Iron and Coal. In our country there are plenty of both metallic and non-metallic mineral deposits already explored and many more new deposits are being explored and investigated by many agencies.

ORIGIN OF THE NAME OF THE DISTRICT

The district derives its Name from its principal city Bikaner which perpetuates the memory of its founder Ran Bika (1436 – 1504 A.D.) Bika Literally means a settlement or a habitation

LOCATION, BOUNDARIES AND AREA

Bikaner district lies between latitude 27 10 N and 29 05°N and longitude 71 50'E and 74 12 East it is bounded on the North by Ganganagar district on the west partly by Bahawalpur district (west Pakistan) on the east by the Churu and Ganganagar districts and on the south east and south by the Nagaur and Jodhpur districts encompasses an area of about 27,336 Sq. Km. out of which only about 234 Sq. Km. is urban. The urban population of the district is 32705 and rural is 512354 and density of population is 37 persons per Kilo meter.

RELIEF

The map of Bikaner district has the appearance of an irregular polygon having ten sides. The major part of the district covers desolate and dreary regions which form part of the Great Indian desert of Thar. The district can be classified into two natural divisions: (1) north and western desert and (2) south and eastern

semi-desert. In greater part of the territory, the plain is undulating or interspersed with shifting sand hills. The slopes of which are lightly furrowed by action of wind. There are no hills, and no rivulets or streams of any significance, and the panorama it presents is that of an expanse of sand relieved here and there by sand features and a few habitations...

The general elevation of district plain varies between 154 to 429 meters above the sea level sloping generally towards the north-west. The sand-dunes range in height from 6 to 30 meters, suggesting the ribbed appearance of a sea shore, after the rains, the desolate desert turns into a vast green pasture-land for a short time in the year.

RIVER SYSTEM AND WATER RESOURCES

With an average rainfall ranging from 12.70 cm. to 25.40 cm. (5" to 10") there is practically no surface run-off and therefore, no river worth the name. There are, however, a few local nullahs in which the little run-off from the surface wherever it is hard finds its way. Some of the water in these nullahs is impounded in tanks for irrigation. The district can boast of only two small fresh water lakelets formed by the drainage of the rocky country in the south-west of the district. The one at Gajner is located at a distance of 32 kilometers (20 miles) from Bikaner city. It is about 0.4 km. (quarter mile) long, and 183 or 274 meters (two or three hundred yards) across. The water of this lake is mostly utilised for drinking and bathing purposes but in the years of good rainfall wheat and mustard are also grown in the neighbouring areas. With its clear and still waters glistening under the burning sun and one side framed as it were, by the imposing palaces and the attached gardens, and the other by wooded verdure, the lake looks like an inset mirror: It gives great relief to the weary travellers passing through the dreary desert, or to the citizens of Bikaner who are oppressed by

intense summer heat, resort to its bank for picnic and pleasure.

The second lakelet at Kolayat is smaller and is situated at a distance of about 16 kilometres west of Gajner. Bathing in this lake is considered to earn religious merit. Many people on that account visit it. Numerous neat bathing ghats have been built around it shaded by peepal by trees. It is a beautiful oasis amidst the vast expanse of arid desert.

There is a salt lake in this district at Lunkaransar about 80 kilometers, north-east of the district headquarters. Salt is no longer being produced from lake waters as is of poor quality. There are various other tanks in the district notably at Gangasarovar-Mandal madh, Dadav. Kinia, Bhatia and Khudi.

UNDER GROUND WATER

Under ground water which is the main sower for drinking and other purposes is generally found at a depth of about 90 to 100 meters below the ground level. The discharge from the wells varies from 18.200 liters per hour to 91.000 15tere per hown. (VI)

CLIMATE

The district has a dry climate with large variations of temperature, and scanty rainfall. The water lasts from November to March rainy and season is followed by summer from April to June. The begins In July and ends by Mid-September. The weather is mild and pleasant during September and October. Hot winds continue blowing in summer during the day sweeping away the old and creating new sand-dunes. The heat is intolerable in the sun and people while away their time in underground cellars. With the setting of the sun the sands lose their temperature swiftly, and nights become cool and pleasant to bestow refreshing repose to the shattered nerves. The winters are equally severe, the temperature sometimes touching the freezing point during the night. G.S.Ojha has made a mention of an unfortunate historical incident in which General Elphinstone while going to Kabul passed through this desert area in the month of November, 1808 (A.D.). He lost forty men who were not accustomed to, or not prepared to face, serve sandy winter of Bikaner.

RAINFALL

The average annual rainfall in the district is 259.6 mm. (10.22"). The average rainfall in general increases as we go from the north-west towards the south-east. For the north- the district no rainfall data are available and the rainfall is much less than in the south-eastern half of the district. About 76 per cent of the annual rainfall is received from the south-west monsoon

Variation in rainfall from year to year is considerable. This variation ranged from 100 to 400 mm. (3.94" to 15.75"). In the fifty years beginning from 1940 to 1990, the highest annual rainfall in the district, amounting to

293 per cent of the average was recorded in 1977. The succeeding year 1978 witnessed the lowest rainfall of 24 percent of the average. Similar variations in rainfall from year to year are also noticeable in the north-western areas of the district. In sixteen years. The rainfall in this area was less than 80 per cent of parts Low its annual normal rainfall of the district. In other of the district there have been only three occasions when consecutive years had less than 80 per cent of the normal average. At certain places rainfall was less than 80 per cent of the normal in four or even five consecutive years.

On an average, there are sixteen rainy days (1... days with rain of 2.5 mm. or more) in a year. This number varies from thirteen at Lunkaransar to nineteen at Bikaner. August is the rainiest month of the year. The highest rainfall in 24 hours which occurred at any station in the district, was 265.9 mm. (10.47) at Palana on August 7, 1983.

TEMPERATURE

There is a meteorological observation at Bikaner and the records of this station may be taken to be representative of the climatological conditions in the district. Temperature rises rapidly after March. June is the hottest month with the mean daily maximum temperature at 41.5°C (106.7°F) and the mean daily minimum temperature at 29.3°C (84.7°F). The summer months are extremely hot with scorching dust laden winds, the day temperature sometimes going up to about 49°C (120°F). With the advance of south-west monsoon by about middle of July, temperature decreases down a little, but the oppressiveness of the weather continues due to increased humidity. The highest temperature recorded at Bikaner on 28th May. 1987 was 49.4°C (121°F).

After the later half of September when monsoon withdraws, the day temperature goes up a little but the night temperature is low. From November, the drop in both day and night temperatures is very large particularly in the winter months. The drop in temperature after nightfall is rather sudden and trying. January minimum is the coldest month when the mean daily temperature is 5.2°C maximum temperature is season. (41.3°F) and the mean daily 22.1°C (71.8°F). During the winter cold waves affect the district in the wake of passing western disturbances and the minimum temperature sometimes to 2 or 3°C below freezing point. Frosts are fairly frequent. The lowest temperature of -1°C (24.8°F) was recorded. On January 26. 1990.

HUMIDITY

Except during the brief rainy season, humidity in the low and even during the rainy period, air is dry in the rains the summer months are the driest, especially

air between in the afternoons of April and May when relative humidity is of the order of 15 to 20 percent.

CLOUDINESS

Even during the rains, it is only on a few days that the skies are overcast or heavily clouded. They are either clear or lightly clouded during the rest of the year, except that during the winter in association with western disturbances, cloudy skies prevail for short spells of a day or two.

WINDS

From May to September moderate south-west winds blow, but in the rest of the year they are generally light. From May to October mostly south-west winds blow. During the winter season (November to March) winds are generally light in the morning (directions between east and south being more common), but in the afternoons they become heavy mainly from north-west. In April. The morning winds are generally south-eastern and western while. In the afternoons they blow mostly from directions between south-west and north-west.

SPECIAL HEATHER PHENOMENA

Some of the depressions which originate in the Bay of Bengal in the south-west monsoon season, move in a westerly direction reaching the district during their last stages of Journey and cause widespread rain before dissipating. An occasional post-monsoon storm or depression also affects the district. Sand and dust-storms and thunder-storms occur in the summer season. Thunder-storms occur in the south-west during the monsoon season also. In the wake of western disturbances. Occasional fog occurs in winter.

CLIMATE DATA OF BIKANER

FREQUENCY OF ANNUAL RAINFALL IN BIKANER DISTRICT

RAIN(mm).	No. Of years
1-100.	2
101-200.	14
201-300.	18
301-400	10
401-500	4
501-600	1
601-700.	0
701-800.	1

FLORA

The vegetation of Bikaner district falls under the broad natural division of tropical thar forest. But due to extremely low rainfall and extremes of temperature,

there is high evaporation and loss of moisture, converting the district into a typical arid tract.

FORESTS

In such a tract, no forest worth the name can grow. In low lying areas of the district, however, where the moisture accumulates to some extent during rains, a few scattered stunted trees of *Prosopis Spicigera* (Khejra) and *Tecoma Undulata* (Rohira) are found, none taller than 8 metres. Special efforts were made during the regime of the erstwhile Bikaner State, to preserve the existing forest wealth, wherever found, and to encourage planting of trees by private individuals by granting rewards and offering concessions. Cutting of green trees was prohibited and trees were also planted and preserved at State expense had been raised. Plants were distributed to the Jagirdars and others to encourage plantation of trees in the area. The results, however, were not commensurate with the efforts put.

After the merger of the State with Rajasthan, Bikaner and Jodhpur divisions were combined to form a forest zone under a Divisional Forest Officer with headquarters at Jodhpur. A forest ranger is posted at Bikaner who looks after the activities of the department in the district. He is assisted by a Forester for Johar Bir and a few Forest Guards and Cattle Guards. This small staff looks after the Johar Bir, executes developmental works of the department, and also assists the various panchayats in growing trees and developing pastures. A working plan for the whole of the division has been drawn for the years 1960-61 to 1969-70. The plan envisages raising of experimental plantations on sand-dunes and along the roads in this district.

PROTECTED AND PRIVATE FORESTS

As there are no forests worth the name in the district. The importance of the few patches of Protected forests and Private forests, therefore, is all the more significant in this typically arid zone. The following are the important patches of forests in the district.

S.N.	Patches	Area
1.	Johar Bir 8,861 hectares.	(Forest Department)
2.	Bichwal Bir 405 hectares.	(Forest Department)
3.	Bichwal Area 9,712 hectares.	(Central Arid zone)
4.	Udramsar 188 hectares.	(Central Arid Zone)
5.	Gajner Preserve 24 sq.km.	(The Maharajah's . . . Private Preserve).

Besides, there are a few groves of trees preserved by some of the temples, as growing and nursing of trees was regarded as a religious duty. Cutting of such trees tantamounts to committing a sin and they are thus afforded natural protection. Locally these clusters are called Orans and those of Deshnok and Koramdesar temples are renowned in this respect.

There are two forest nurseries in the district 1 (4) Forest nursery, public park (Bikaner), which is being managed by the Forest department of the Government of Rajasthan and (11) Forest nursery. Sheb-Bari (near Bikaner) managed by Central Arid Zone Research Institute.

RESEARCH INSTITUTE

Besides, the two nurseries mentioned above there are two Research Centrea also, one located at Bichwal and the other at Jehar-Bir. The former is run by Central Arid Zone Research Institute for afforestation agronomy and pasture development, while the latter by the Forest department. Government of Rajasthan for the purpose of pasture-development.

The other shrubs that are found in protected places are as follows

Acacia acquemontii (Bhoo Bawli)

Acacia Senegal (Kumat)

Aerva tomentosa (Bui) (Booi-Crotalaria Burhia)

Calligonum polygonoides (Phog)

Calotropis procera (ak)

Capparis aphylla (Karil or Kair)

Acacia Catechu (Khair)

Cordia rothii (Goondi)

Maytenus emarginatus (Kankero)

Lepatadenia spartium (khimp)

Salvadora-aleoides (Jal-pilu)

Salvadora-persica (Chhala-pilu)

Tamarix articulate (Farash)

Withania somnifera (Asgand)

Ziziphus Jujuba (Ber)

Ziziphys nimmularia (dhar Ber)

The import grasses that are found growing in the district are the following

1 *Aristida spesies* (Lampla)

Cenchrus catharticus (Bharut)

Cenchurs ciliaris (Dhaman)

Cenchrus setigerus (Modia Dhaman)

Dactyloctenium scindicum (Ganthil)

Eleusine flagllifera (Nara)

Lasiurus seindicus (Sewan)

Saccharum Spontaneum (Kans)

Desmosstachya bipinnata (Dab)

Panium antidotale (Ghamed)

Panicum turgidum (Murat)

There are no particular vegetative division in the district. The vegetation in the eastern and southern part (Naukha tahsil) is comparatively thicker and taller with greater preponderance of Khejri, Rohira, Kankera and Munja grass, whereas the drier parts in Lunkaransar and Kolayat tahsil have a few scatttered trees of khejri and practically none of Rohira, Kankera and no Munja grass. Since there is extensive agriculture in Naukha tahsil, there is less ground cover whereas an account of meagre rain. In the north-western sides, there is less of agriculture and better ground-cover, mostly of grasses and low bushes. This drier part of the district has good pastures, practically, of nutritive grasses viz.. Sehwan, Dhaman and Ganthil on which the Rathi cows, one of the best milch cattle in the country, and the Jaisalmeri and Nall breeds of sheep feed.

FAUNA

ANIMALS- As there are no wild forests or hills. The district does not abound in any special type of wild animals. The fauns found here is of common variety such as, Black Buck-Indian antelope (Antilope cervicapara), chinkara (Gazella benetti), for (Vulpes bengalensis), Jackal (Cants aureus), mongoose (Herpestes edwardsi), porcupine indica), stripped squirrel (Funambulus pennanti), wild boar (Sus indicus) and wolf (Canis lupus).

Chinkaras and black bucks, exist in abundance as their killing is looked with disfavour and frowned upon by local inhabitants especially in villages inhabited by Dishnois. In the neighbourhood of Gajner, wild bears, spotted deer, sambar, blue bull, hares and jackals ream about in herds. They are preserved and said to do great mischief. Gajner (32 km. from Bikaner city), Johar Dir (10 km from the district headquarters), Vallabh garden and Bichval abound in Chinkaras (spotted deer and sambar have been introduced in Gajner).

REPTILES- A large number of snakes are found in the district having their different names and sizes. Poisonous snakes like cebra, the krait and the viper, are sometimes seen but the viper locally known as bandi exists in abundance. An interesting though a gruesome function is associated with another type of snake known locally as Paina and found in drier

parts of the district. It is believed that this snake introduces poison in the body through breathing and not by biting. How far this popular belief is based on truth has, however, not yet been investigated. Mortality rate due to snake bite is not known.

BIRDS- Birds commonly found in this arid district may be listed as 1. King Vulture. 2. White Vulture. 3. House Crow. 4. Jungle Crow, 5. King Crow, 6. the white checked Bulbul, 7. The Red vented Bulbul, 8. The House Sparrow, 9. Dul, 10. Kite. 11. Rock 12. Sand grouse, 13. Imperial Sand grouse (migratory), 14. Grey Partridge. 15. Ducks (common teal. Pechard, etc) in Gajner tank, 16. Pea fowl, 17. Snipes, 18. Snippet. 19. Grey Shrike, 20. Seven sisters. 21. Lesser Bustard (migratory), 22. The Indian Bustard, 23. The Lapwing, 24, the Starling and 25. Grey Dove.

Of these special mention may be made of the great Indian bustard (*Chotis nigriceps*). It is one of the biggest birds in India with a black cap and whitish neck weighing upto 18.14 kg. (40 lbs). This beautiful bustard usually has its bode in grassy plains or in standing crops. It generally struts in flocks consisting of two to eight or more. The most remarked characteristic of the species is its habit of suddenly jumping off the ground into the air above the grass. Sometimes it flies with a peculiar wheeling flight with quick wing beats. But does not usually rise very high in the air due to its bulk. Its feed consists chiefly of grasshoppers, but other insects. Grains, seeds and tender shoots are also welcome to its gaping stomach. The main breeding season is from August to October. No nest is made, and eggs two to five in number are deposited on the ground in some unfrequented path in a grassy field. The egg is oval in shape but is slightly depressed at the two ends. The shell is stout and smooth, closely pitted with minute pores, and usually has a good deal of gloss. Its meat is finely flavoured throughout the cold months, but it is tough and often coarse at other times of the year. Because of the quantity of meat it contains, this bird is much sought for and a lot of poaching goes on even though the bird has been declared as a 'protected game all the year round under the Rajasthan. Animals and Birds Protection Act, 1951 and rules framed there under.

GAME SANCTUARIES

Except for the two private preserves of the Maharaja of Bikaner viz.. Gajner and Vallabh gardens there are no game sanctuaries in the district, All the game within the forests of the Johar Dir. Dichwal and Udranser, however, are protected under the Rajasthan Forest Act. The preserve at Gajner about 38 sq km. in area is situated at a distance of about 32 km. from Bikaner, with an artificial lake and a beautiful palace of the Maharaja on its bank. The preserve abounds in various types of ducks, sand-grouse, chinkaras, blackbucks, wild boar, hare and blue bull (all the local species), besides spotted deer (cheetal) and sambar that have been introduced and have multiplied there.

The second preserve at Vallabh garden is small in size covering an area of about 12 sq.km. It is situated close to the town of Bikaner and abounds in chinkaras, grey partridge, sand grouse and hares as it is accessible by road all the year around and grazing is permitted in it, it is fast losing its sanctity as a game sanctuary and may soon be depleted of all the game.

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