

Chapter I

GENERAL

ORIGIN OF THE NAME OF THE DISTRICT

The district is named after its headquarters town, Gurgaon. It is said that the name Gurgaon is a corruption of Guru Gram, i.e. village of a spiritual leader. The traditional account is that Yudhishtira, the eldest of the Pandavas, gave this village to his *guru*, Dronacharya, in whose memory a tank still exists on the west side of the road to the railway station. The tradition also has it that it was here that Dronacharya gave instruction to the Kauravas and Pandavas.¹ It may also be the case that on account of its association with Dronacharya or otherwise, this *gram* was considered *guru* or big. Adjectives like *bada*, *chhota* and *uncha* are sometimes used in the place names to indicate their physical character.

LOCATION, BOUNDARIES, AREA AND POPULATION

Location and boundaries.—The district² lies between 27° 39' and 28° 32' north parallels of latitude and 76° 42' and 77° 33' east meridians of longitude, forming the extreme south-east corner of Haryana State. It stretches towards the outlying hills of the Rajasthan tablelands, and is very irregular in shape.

It is bounded on the north-west by the Rohtak district and on the north-east by the Union Territory of Delhi. On the east, river Yamuna separates it from the Bulandshahar and Aligarh districts of Uttar Pradesh. On the south, it adjoins the Mathura district of Uttar Pradesh and the Bharatpur district of Rajasthan, on the south-west the Alwar district of Rajasthan and on the west the Mahendragarh district. In fact, it touches inter-State border on three sides and is connected with its own State only on the west and the north-west.

1. *Gurgaon District Gazetteer*, 1910, p.1.

2. The Gurgaon district has been bifurcated on August 15, 1979, and the new district of Faridabad comprising the tahsils of Ballabgarh and Palwal has been carved out of it. Its details have been included in this Chapter under 'History of the District as an Administrative Unit'. (see p. 5 fn.).

Area.—With an area of 4,854.95¹ square kilometres, Gurgaon is the third largest district in the State following Hisar (Hissar) and Bhiwani.

It comprises five tahsils covering the areas as shown below :

Tahsil	Area(Square kilometres)		
	Total	Urban	Rural
Gurgaon	1,242.08	28.60	1,213.48
Ballabgarh	747.82	25.80	722.02
Firozpur Jhirka	814.16	3.40	810.76
Nuh	1,047.96	5.70	1,042.26
Palwal	1,002.93	8.10	994.83
Total :	4,854.95	71.60	4,783.35

Population.—The district prior to its re-organisation on December 22, 1972, and according to the 1971 Census, contained 17.01 per cent of the total population of the State. It ranked fourth in population among the districts of the State following Hisar (Hissar), Karnal and Rohtak. The total population of the district according to the 1951 Census was 9,67,664 persons, of which the rural population accounted for 8,27,511 and the urban for 1,40,153. The population which according to the 1961 Census was 12,40,706 persons (10,35,105 rural and 2,05,601 urban) rose to 17,07,369 (13,91,385 rural and 3,15,984 urban) in 1971.² Thus it showed an increase of 28.22 per cent during the decade 1951—1961 and 37.61 per cent during 1961—1971.³ However, the population of the re-organised district, on the basis of the 1971 Census, has been worked out as 13,72,197 persons.⁴ The district now (March 1977) stands first among the eleven districts of the State.

HISTORY OF THE DISTRICT AS AN ADMINISTRATIVE UNIT

In the Mughal period, during Akbar's reign, the district was contained

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1. *Source* : Deputy Commissioner, Gurgaon.
 2. *Census of India, 1971, Series 6 - Haryana, Part II-A, General Population Tables, p.17.*
 3. *Ibid, p.37.* For more details, see Chapter on 'People'.
 4. *Statistical Abstract of Haryana, 1973-74, pp.3-4.* (Issued by the Economic and Statistical Organisation, Planning Department, Haryana).

in the subahs of Delhi and Agra, and comprised wholly or partly, the sirkars of Delhi, Rewari, Suhar or Pahari and Tijara.

With the decay of the Mughal empire it remained disturbed in consequence of fighting between the neighbouring chiefs till 1803 when most of it came under the British rule by the Treaty of Surji Arjungaon with Sindhia. It was divided into parganas and in accordance with the general policy of the British to avoid actual possession beyond the Yamuna, various parganas were given to petty chiefs and granted as jagirs in lieu of military services rendered by them. These grants were gradually resumed and came under the direct management of the British; the last of the important resumptions took place in 1836. Thereafter, the district remained unchanged until the 1857 Uprising. It was transferred from the North Western Provinces to Punjab in 1858. The pargana of Kot Kasam, which was annexed to the district after the 1857 Uprising, was made over to the then Jaipur State in 1860. In 1861, the district was re-arranged into five tahsils, viz. Gurgaon, Firozpur Jhirka, Nuh, Palwal and Rewari.¹

Subsequent changes in the composition of the district, which have occurred since the beginning of the 20th century, are described below :

1901—1911.—No change took place during this decade. The area of the district, i.e. 1,984 square miles (5,139 square kilometres) remained unchanged.

1911—21.—Ballabgarh was one of the three tahsils comprising the then Delhi district. A part of this tahsil was transferred to the Gurgaon district in 1912.² This was formed into the new sixth tahsil of the district with the same name, viz. Ballabgarh. During this decade, some small transfers also took place between the Gurgaon district on one side and Uttar Pradesh on the other due to riverain action. The area of the district stood at 2,263 square miles (5,861 square kilometres) in 1921.

1921—31.—No change occurred during this decade.

1931—41.—Minor changes occurred between the Gurgaon district and Uttar Pradesh due to riverain action. The area of the district stood at 2,234 square miles (5,786 square kilometres) in 1941.

1. For details of villages transferred to Gurgaon from Rohtak in 1861 and from Gurgaon to Delhi and vice versa in 1863, see the Gurgaon District Gazetteer, 1910, p.26.

2. In pursuance of the decision to shift the imperial capital to Delhi, the Delhi district was re-modelled. It had three tahsils: Sonipat (Sonepat), Ballabgarh and Delhi. Sonipat (Sonepat) was transferred to Rohtak district and a part of Ballabgarh to the Gurgaon district. The Delhi tahsil and the remaining portion of the Ballabgarh tahsil, an area of 547 square miles (1,457 square kilometres), was made into a separate province. (*Census of India, 1961, Volume XIII, Punjab, Part II-A, General Population Tables, p.9.*)

1941—51.—Under the Provinces and States(Absorption of Enclaves) Order, 1950, 9 villages of the district including Shahjahanpur were transferred to Rajasthan, whereas the district gained with the merger of Pataudi State and the transfer to it of 2 villages from Rajasthan and 78 villages from PEPSU. As a result of these changes, the area of the district stood at 2,358 square miles (6,107 square kilometres) in 1951. The Pataudi State had 45 villages. It was converted into a sub-tahsil and 45 villages of the Rewari tahsil were also included in it thus making a total of 90 villages.

1951—61.—There was no change in the boundary of the district during this decade. The area of the district, however, stood at 2,367 square miles(6131 square kilometres).¹

1961—71.—As in the previous decade, there was no change in the boundary of the district during this decade. The area of the district, however, stood at 2,373 square miles (6,146 square kilometres).

1972.—The limits of the district were varied on December 22, 1972. The Rewari tahsil (except 61 villages transferred to the Gurgaon tahsil) was excluded from the Gurgaon district and included in the Mahendragarh district. Consequently, the area of the district was reduced to 4,886 square kilometres.² The number of villages, as shown below, were included in the Mahendragarh district following re-organization of the Gurgaon district :

Tahsil/Sub-tahsil	Villages transferred		
	Inhabited	Un-inhabited	Total
Rewari	249	12	261
Bawal sub-tahsil	74	1	75
Pataudi sub-tahsil (Partly)	25	4	29
Total :	348	17	365

1. The area figures given here are according to the Surveyor General of India. The difference between the figures of 1951, 1961 and 1971 is due to the revision of area figures by that Department.

2. *Statistical Abstract of Haryana, 1973-74, p.3.* (Issued by the Economic and Statistical Organisation, Planning Department, Haryana.)

1974¹.—Thirty-four villages were excluded from the Palwal tahsil. Of these, 31 were included in the Ballabgarh tahsil and 3 in the Gurgaon tahsil. Barheri Rahewan, a village of the Rewari tahsil (Mahendragarh district), was included in the Pataudi sub-tahsil which previously had 61 villages on re-organisation of the district in 1972.

TAHSILS, SUB-DIVISIONS AND THANAS

The district is divided into five tahsils, viz. Gurgaon, Ballabgarh, Firozpur Jhirka, Nuh and Palwal, and two sub-tahsils, namely, Hathin which is a sub-tahsil of Nuh, and Pataudi which is a sub-tahsil of Gurgaon. A sub-division has been created at each of the five tahsils.

There are 16 *thanas* (police stations) and two police posts. Their details may be seen in the Chapter on 'General Administration'.

TOPOGRAPHY

In marked contrast to the monotonously level surface of most areas of Haryana plains, the Gurgaon district has considerable topographic diversity.

1. 1979.—The Gurgaon district has been bifurcated on August 15, 1979, and the new district of Faridabad comprising the tahsils of Ballabgarh and Palwal, has been carved out of it. In this adjustment, 98 villages formerly in the Nuh tahsil, 31 villages formerly in the Ballabgarh tahsil and 3 villages formerly in the Gurgaon tahsil have been shifted to the Palwal tahsil. The 98 villages, transferred from the Nuh tahsil, now constitute the Hathin sub-tahsil and another group of 72 villages has been formed into the Hodal sub-tahsil.

The position of tahsils and villages in the two districts of Gurgaon and Faridabad as on August 15, 1979, is shown below :

Gurgaon District				Faridabad District			
Tahsil/Sub-tahsil	Villages			Tahsil/Sub-tahsil	Villages		
	Inhabited	Un-inhabited	Total		Inhabited	Un-inhabited	Total
Gurgaon	211	15	226	Ballabgarh	179	31	210
Pataudi (sub-tahsil) of Gurgaon	55	7	62	Palwal	116	9	125
Firozpur Jhirka	229	13	242	Hathin (sub-tahsil of Palwal)	96	2	98
Nuh	160	31	191	Hodal (sub-tahsil of Palwal)	72	—	72
Total :	655	66	721		463	42	505

Whereas spatial variations in surface configuration in most of the districts of Haryana plains are identifiable only on very close examination, those in the Gurgaon district are only too obvious. Here one comes across low-lying *Khadar* made of newer alluvium, upland plain made of older alluvium, hills and areas covered with sand-dunes. It is an area of confluence of Aravalli hills, Indo-Ganga plain and Indian desert. It is not possible to traverse the district from east to west without encountering ridges extending south-north, which are relics of the old Aravalli mountain system, except near Sohna where there is a gap.

For a detailed understanding of its topography, the district may be divided into three major regions. Not only the narrow and low-lying south-north ridges in the north-west of the district are a region by themselves but also they separate two contrasting physiographic regions situated on their east and west respectively. Thus the three regions are : Eastern Alluvial Plain, Western Hilly Region and North-Western Sand-Dune Area.

Eastern Alluvial Plain.—This region is delimited by the Yamuna on the east and Aravalli hills on the west. It includes most of the Ballabgarh tahsil, the whole of Palwal tahsil and the eastern halves of the Nuh and Firozpur Jhirka tahsils.

The South-Western area is one of the three regions of the Mewat territory and is known as Bhayan possibly drawing its name from Bayana in the Bharatpur district which was once its administrative nucleus. The whole of it is an alluvial plain, with a monotonously flat surface everywhere. On closer examination, however, one finds the narrow belt along the Yamuna, quite distinct from the remaining plain, which is above the flood level of the river. The former is the *Khadar*, the low lying flood plain of newer alluvium and the latter is the *Bangar*, an upland plain made of older alluvium.

The *Khadar* is generally three to five kilometres wide and is subject to floods from the Yamuna during the rainy season. When the floods recede, they leave considerable fine slit which is easy to plough. The soil retains adequate moisture even after the rainy season and is particularly good for growing wheat, gram and barley. The proximity of water table to the surface facilitates well irrigation in some parts of this belt. The *Bangar* is a consistently level area with very small local relief. The plain is generally 205 metres above sea level. It is slightly inclined towards the south. The gradient is less than $\frac{1}{2}$ metre per kilometre.

In view of the level surface, fertile alluvial soil and facilities for well irri-

gation, the Eastern Alluvial Plain is intensively cultivated and is a densely populated area. The villages are generally much larger than those in most other parts of the district.

Western Hilly Region.—The hills in this area are the northerly extension of the Aravallis which is the oldest mountain system of the Indian sub-continent. Having survived a long period of erosion these are found only in parts. The Aravallis extend in a roughly south-west to north-east direction from Gujarat to Delhi. They have been the scene of repeated peneplanation and rejuvenation in the past. There is considerable topographic evidence to that effect. The tops of ridges in the district, as also in parts of Rajasthan, are generally flat. The width of these tops in some cases exceeds five kilometres, representing the rejuvenated surface of former penepain. The ridges are generally bare and without any soil cover. The height of ridges decreases northwards. The eastern slopes of the ridges are commonly steep whereas the western ones are comparatively gentle. There are a number of springs on the eastern sides of the ridges. The important springs include the hot sulphur spring at Sohna, the cool water spring near Firozpur Jhirka and minor springs at Raisina and Rajkha.

The two ranges which extend into the Firozpur Jhirka tahsil are called Mewat Hills. Of these, the western one is the longer. It forms the western border of the district from the south-western corner of the Firozpur Jhirka tahsil to a point to north-west direction of the town of Nuh. There the boundary line turns off to the west, while the range runs on in the same course and then sweeping on a curve to the west of Sohna, ends in three short spurs, two thrown out to the north and one to the west. The top of this range is even and is about 346 metres above sea level in the north and 412 metres above sea level in the south considering the Nuh town closer to its centre. It is also the second region of the Mewat territory and is known as "Pahad Upar" that is above the hills. The other range of almost similar height runs parallel to, but gradually diverging from the western range. It becomes more and more broken and its existence can only be traced by a line of detached rocky hillocks of various sizes, appearing here and there above the surface of the ground. It reappears once more as a range towards north-east of Sohna town forming the boundary of the district and runs with a gradually lessening height into Delhi. Some short broken ranges and detached hills are also found to the north-west of Nuh and in the eastern portion of the Firozpur Jhirka town. Both the ranges provide a pleasing scenery though they are rocky and of little importance for agriculture except for rough pastures during the rainy season.

A long shallow valley runs through the middle of these ranges and constitutes the third region of the Mewat territory. This valley is called Arej which is a corruption of the word "Abrez" meaning the area usually under water. As described later in this Chapter, the rains come down the hills in numerous rivulets and the water level in the valley rises leaving large sheets of water weeks after the rainy season has ended.

The Gurgaon-Alwar highway runs along this valley and for miles one can see two lines of hills, those to the west being closer and more perceptible, those in the east being more distant and constituting a blue horizon.

North-Western Sand-Dune Area.—This region, which lies to the north-west of the district is covered with sand and is the scene of shifting sand-dunes. Due to predominantly sandy soils, it is less productive for agriculture. The surface is undulating, the local relief reaching about 9 metres at several places. The sand-dunes are of three types : longitudinal, transverse and *barkhans*. Many of the sand-dunes lie in the direction of westerly and south-westerly winds which are fairly strong during the summer. For lack of moisture and vegetative cover the sand moves freely under the impact of strong winds. The wind is the chief agent of erosion. Blowing at high speed, it carries pebbles and large particles of sand which help it in its destructive work.

In conclusion, the district has a wide physiographic diversity. Extensions of Aravalli hills and the presence of a sand-dunes topography are the most important factors in this diversity.

NATURAL DRAINAGE, RIVER AND OTHER SURFACE-WATER RESOURCES

The drainage of the district is typical of the arid and semi-arid areas. It is only on its east side that it is bordered by a perennial river, the Yamuna. The other streams are not only fewer in number and smaller in size, but also seasonal and inland. Because of the topographic diversity, the streams do not flow in any uniform direction. The drainage is peculiarly complex owing to most of the streams tending to converge towards inland depressions instead of flowing into the Yamuna. Mahendragarh and the west of the Gurgaon tahsil and Taoru of the Nuh tahsil drain into the largest of these depressions, the Najafgarh Jheel, lying partly in the district and partly in the Union Territory of Delhi. The greater part of the *Bangar* tract comprising the Palwal tahsil, south-east of the Nuh tahsil and the central portion of the Ballabgarh tahsil, slopes gently in the direction of the Yamuna. The drainage of the rest of the district (southward from Gurgaon and Ballabgarh and northward from Firozpur Jhirka) ultimately heads, if unchecked, towards a considerably big basin under the hills near

Nuh known as the Kotla Dahar Jheel which is the lowest point in the whole of the district. The slope of the ground in the east is also towards this basin. In fact there are four important depressions in the level of the district in this region, known as the Khalilpur, Chandaini, Sangel-Ujina and Kotla Dahar Jheels. The following account of these *jheels* and the inland drainage is based on the description given in the Gurgaon District Gazetteer, 1910¹ :—

Khalilpur Jheel.—This Jheel is situated in the north-east of the Nuh tahsil. It is the deepest part of a low piece of country about 10 miles (16 kilometres) in extent around Khalilpur, Indri and other villages. The whole of this is flooded during an ordinary rainy season. A part of it, just north of Khalilpur village, has more marked depression with the result that more than one metre deep water stands there after the rains turning the land more or less into a permanent swamp. Its area may be reckoned at about 1,500 acres (607 hectares).

Chandaini Jheel.—This Jheel lies about 10 miles (16 kilometres) to the west of Khalilpur Jheel and is situated in the north-west of Nuh tahsil. It is also a permanent swamp with standing water, which rarely dries up altogether. The area of its permanent basin does not exceed 1000 acres (400 hectares).

Sangel-Ujina Jheel.—Lying in the south of Nuh, this *jheel* has not so clearly defined a basin as the other *jheels*. The waters coming down from the other *jheels* spread over a larger area than is covered at Khalilpur or Chandaini. The lands of numerous villages near Sangel and Ujina are widely flooded and the damage caused is extremely serious.

Kotla Dahar Jheel.—The largest *jheel* in the district, it is about 3 miles (5 kilometres) long and about $2\frac{1}{2}$ miles (4 kilometres) broad. It lies in both the Nuh and Firozpur Jhirka tahsils where these adjoin each other at the foot of the Alwar (Aravalli) hills.

The line of watershed separating the flow towards Kotla Dahar and that towards Najafgarh is found at about 11 kilometres south of Gurgaon. The Ballabgarh portion of the drainage falls first into Sikri and Sarmathla depressions and then spills over into the Khalilpur basin where it also joins the flood water of the Bhundsi valley coming down the Mehndwari Nadi. From there, the drainage takes south-west course into the Chandaini Jheel. A small part of the floods from the Sohna hills also reaches this *jheel* after filling a small depression near Kherli Kankar. The over flow from this depression flows southwards into the Kotla Dahar Jheel into which also collects the drainage of the Firozpur Jhirka valley from the south. There is no outlet from this *jheel*.

1. Ibid, pp. 7-8.

and in very wet years, the surrounding country, for many kilometres, is a sheet of water which gradually escapes through the Sangel-Ujina depression to the east of the central range of hills, known as the Lohinga valley into the Bharatpur Jheel of Pahari Kandi in the Bharatpur district of Rajasthan. This describes the course which the drainage of the district would take if not artificially controlled.

In order to prevent too much swelling of the volume of water in the Kotla Dahar Jheel, a bund was constructed on the downstream in 1838 to divert the water from the Firozpur Jhirka valley into the Sangel-Ujina basin. This bund was extended right up to Ujina in 1865-66. Simultaneously, a canal or drain was dug to bring down the waters of the Chandaini Jheel also to the Sangel-Ujina basin. In 1890, a dyke was constructed across the middle of the Chandaini Jheel running east and west to prevent water from the northern half from flowing down into the southern half. A small drain known as Chandaini Cut was also dug to carry the surplus water from the north of the bund into Chandaini Canal.

The damage caused by the *jheels* was incalculable. These kept good lands out of cultivation and permanently flooded the low lands best suited for cultivation; detrimentally affected the health of the tracts in which these were situated and in times of flood, seriously endangered the position of the town of Nuh and of all the nearby villages or along the line of the overflow.¹

The evils resulting from swamping and uncontrolled flooding had long been recognised and attempts were made early in the history of the district to drain the swamps and control the floods by means of embankments. The Kotla Dahar and Chandaini works already described, were the earlier steps in this direction.

Like Sikri and Sarmathla depressions, there are a few other small depressions, of which the most important are Badshahpur and Indri. The southern waters of Badshahpur are drained off into the Mehndwari Nadi. The Indri depression situated on the north-eastern side of the Indri hill, has mostly local rain water which dries up by November.

Many drainage works, including bunds and link drains, constructed during the last about 90 years, have protected inhabited villages, diverted the course of drainage to avoid overflowing of agricultural lands and utilised the flood-water to irrigate the fields.

But it may be stated that the waters of Khalilpur, Chandaini and Kotla

1. Gurgaon District Gazetteer, 1910, pp. 7-8.

Duhar *jheels* are now completely drained off by means of Moh, Chandaini and Kotla Duhar drains latest by the middle of November and the lands are made available for *rabi* crops. These drains bring the waters into the Sangel-Ujina *Jheels*. That *jheel* is also, unless there are exceptional rains, drained off in time for the *rabi* crops by means of the Ujina drain, which takes off from the point where the drains mentioned above meet in the *jheel*. Thus not much water is collected even in the rainy season in the Sangel-Ujina basin which also becomes available for bumper *khari* crops.

Badkhal Lake near Faridabad is an artificial lake formed by damming parts of the Aravallis. So are the Dum Dumma Lake near Bhundsi, Peacock Lake at the Surajkund and Dhauj Lake at the Dhauj Bund. The Sultanpur Lake near Farrukhanagar is another artificial lake which has been developed as a bird sanctuary. Most of these lakes have become great tourist attraction, for a detailed account of which reference may be made to the Chapter on 'Places of Interest'.

Yamuna River.—The Yamuna has a great history mostly shrouded in mystery. The name Yamuna is mentioned in connection with Dasarjana, the Battle of the Ten Kings, mentioned in the Rigveda. According to some scholars, the Yamuna in early times used to flow into the course of the Saraswati¹ and was a tributary, like the Satluj, of the Ghaggar which was an independent river system running in the Hakra Bed and draining into the Rann of Kutch. For reasons yet to be fully investigated, the Yamuna-Satluj plain is said to have experienced an uplift which dismembered the then river system, the Satluj shifting to the west and the Yamuna to the east, leaving the Ghaggar a truncated independent stream with utterly inadequate water supply for maintaining its flow up to the Rann of Kutch. The Yamuna gradually drifted eastward to its present line of flow.

Bordering the district on the east, the Yamuna is a perennial river with a narrow but consistent flood plain. It enters the Gurgaon district about one kilometre north-east of village Basantpur of the Gurgaon district and about 1/4 kilometre south-west of village Asgharpur Jagir of the Bulandshahr district (Uttar Pradesh). It leaves the district 2½ kilometres south-east of village Mahauli of the Gurgaon district and one kilometre east of village Chandras of the Mathura district (Uttar Pradesh).² Its length in the Gurgaon district

1. There are both physical and historical grounds for this belief. (R.C. Majumdar, *The History and Culture of the Indian People*, Volume I, *The Vedic Age*, 1965, p.87.)

2. The Yamuna thus leaves Haryana where the Gurgaon and Mathura districts meet and finally falls into the Ganga at Allahabad.

is 102 kilometres approximately and average breadth (i.e. distance between two high banks) is 200 metres approximately. Below Delhi the Yamuna forms the boundary between the Gurgaon district in Haryana and the Bulandshahr and Aligarh districts in Uttar Pradesh. Owing to the construction of the Western Yamuna and Agra Canals, the flow of water in the river is very little, hardly a few hundreds of cusecs, except during the rainy season when the average discharge, being over 40,000 cusecs floods about 40 villages in the eastern margin of the district. The tract along the Yamuna is called *Khadar* as already described. An island is also formed by a stream called the Jhar or Jair Nala which shoots off from the river about 1.6 kilometres above Chhainsa in the Ballabgarh tahsil and rejoins it near Chandhat in the Palwal tahsil about 22.5 kilometres lower down. It runs in a deep, narrow and dangerous channel and does a great deal of damage in years of heavy flooding. Whereas the floods tend to damage *kharif* crops, they often prove a boon to *rabi* crops.

The following are some of the important streams :—

Sahibi or Sabi Nadi.—The Sahibi rises in the Sewar hills of the Jaipur district of Rajasthan. It enters Haryana one kilometre east of village Gaduwas of Tijara tahsil in the Alwar district of Rajasthan. After traversing just 4 kilometres into the southern tip of the Rewari tahsil, it leaves the Mahendragarh district one kilometre north-west of village Baghola Ahir (tahsil Tijara). Continuing in north-easterly direction for about 20 kilometres, the stream takes a northerly turn $1\frac{1}{2}$ kilometres north of Kot Qasim (tahsil Tijara) and re-enters the Mahendragarh district at half a kilometre to the north of village Akol (tahsil Tijara). Hereafter, it flows northwards into the Rewari tahsil for about 30 kilometres; after crossing Sohna-Rewari Road, it leaves the Mahendragarh district and enters the Gurgaon tahsil of the Gurgaon district. After crossing Rewari-Pataudi Road, previously it used to enter the south-eastern corner of the Jhajjar tahsil (2 kilometres south east of village Lohari) in the Rohtak district. Maintaining its northward flow, it used to pass through this corner of the Jhajjar tahsil, re-enter the north-western part of the Gurgaon district (one kilometre north-west of village Faridpur in the Gurgaon tahsil). After traversing about 13 kilometres of the Gurgaon tahsil, it finally used to leave the district and re-enter the Jhajjar tahsil (of the Rohtak district) one kilometre north-west of village Kutani finally to empty its waters in the Najafgarh Jheel. The length of the Sahibi in the Gurgaon district was 13 kilometres approximately, while its average breadth varied from 15 to 40 metres; but according to the latest survey, the Nadi disappears in the Gurgaon tahsil near Rewari-Pataudi Road.¹

1. However, according to the newspaper reports of August 1977 regarding floods in Sahibi River, it seems that there is some course of this river towards north as existing previously.

Owing to its long passage through arid and sandy country, the stream flows with strength only during the rainy season. During floods it carries a heavy load of sand and silt. Normally the waters of the Sahibi are a great boon to the Rewari tahsil, where it charges the brackish sub-soil water, but in the event of heavy floods, vast areas get submerged causing considerable loss to crops. Heavy floods were recorded in 1845, 1873, 1917, 1930, 1933, 1960, 1963, 1972 and 1977. However, as the stream moves into the level areas of the Gurgaon district, its speed slackens and the load deposited raises the bed of the stream and checks its flow. Consequently, the stream sometime changes its course and wanders aimlessly.

Indori Nadi.—It originates from Aravalli hills in Rajasthan near village Indaur. After passing through villages Nanuka, Khaika, Bhogipur, Chundhika, Sunari, Untwan, Bhudka, Rathiwas, Sidhrawali, Baspadamka, it joins Sahibi Nadi on the upstream side of Pataudi and Railway Station. It is supplemented with so many tributaries coming from Aravalli hills. The total catchment of the *nadi* up to its submergence is 197.9 sq. km. There are 13 bunds constructed at Indori Nadi and its tributaries in Haryana and three bunds in Rajasthan.

The general discharge of the *nadi* in peak rainfall in the catchment is such which can pass without too much loss to life and crops of the area. If there is any breach in the bunds, the pounded water comes simultaneously with the natural run-off and creates havoc to life, crops, roads, etc. There is only a small defined course which carries general run-off or seepage water up to 50 to 80 Cs. The balance discharge during rains spreads over the area and changes its water-table.

Ghata or Badshahpur Nala.—It rises in the Delhi hills near Mehrauli and flows southwards. It enters the Gurgaon district about one kilometre north-west of village Gwalpahari of the Gurgaon tahsil. It drains the Ballabgarh hills and the adjoining parts of the Union Territory of Delhi. Eventually it flows into Najafgarh Jheel near village Dhankot of the Gurgaon tahsil. Formerly, it flowed southwards through the Bhundsi valley, but it was diverted by the construction of a bund into its present course. Its length in the Gurgaon district is 29 kilometres approximately while the average breadth varies from 15 to 40 metres.

Najafgarh Jheel.—This *jheel* is located mainly in the Delhi territory but a part of it lies in the Gurgaon tahsil. During the years of heavy rainfall, a number of border villages of the Gurgaon tahsil used to be flooded with its overflow.

This happened on account of faulty alignment of Najafgarh drain in Delhi territory in 1960-61. Deepening and de-silting of the drain was, therefore, carried out in the late sixties with the result that the area under *sem* in the Gurgaon tahsil which was 434 hectares in 1969-70 decreased to 17 hectares in 1970-71.

Apart from Sahibi Nadi and Badshahpur Nala, there were two other *nalas* namely, Kasan and Manesar which, flowing from the northern side of the hills west of Bhundsi almost in a north-westerly direction fell into the Najafgarh Jheel at its western corner. These two *nalas* have long since been intercepted by bunds, as detailed below, and have ceased to flow into the *jheel*:

(i) **Kasan Bund.**—It is 183 metres long. It was constructed in 1884, but was handed over to the villagers in 1904 as unproductive. It was again taken over by Government in 1910 but must have breached afterwards as it was noted in 1921 that it had been out of use for 12 years. The Nala which it checks, has mostly silted up; the Bund is, however, still being maintained by Government.

(ii) **Manesar-Naurangpur Bund.**—Originally, there were two bunds; namely Manesar and Naurangpur. Manesar was built in 1889-90. It was breached and handed over to the Zamindars in 1907. It was again taken over and repaired by Government in 1910. Naurangpur Bund was built in 1886-88. It was subsequently joined with the Manesar Bund. The joint bund is 3,749 metres long and is beneficial to many villages in which the Manesar Nala throws sand deposits. It has levelled up much eroded land.

(iii) **Ghairatpur Bas Bund.**—This bund was constructed as a famine work in 1930-31. It is 1,676 metres long. It is near village Ghairatpur Bas on the Gurgaon-Alwar Road south of Badshahpur.¹

Landoha.—A monsoon torrent, it flows east of the main Aravalli ridge. It originates in the Alwar district of Rajasthan and is formed by the union of two streams, one flowing south from the direction of Tijara and the other joining it nearly at right angles from the west at a point near village Kharkhara. After pursuing its south-ward course to a point almost directly west of the southern end of the Firozpur Jhirka tahsil, it sweeps round in a curve, and crossing the inter-State border near village Shakarpuri, flows northwards into the Firozpur Jhirka tahsil. Originally, from near Kharkhara, it flowed eastwards to Noagaon. During the Jat ascendancy in the 18th century, a bund known as Ataria was constructed near Kharkhara which diverted the waters to the south

1. *Source* : A note on Gurgaon Bunds recorded in 1943 by Akhtar Hussain. (Available in the office of Executive Engineer, Gurgaon Drainage Division, Gurgaon.)

and by a semi-circular sweep brought it back to rejoin the old channel near Noagaon. Before reaching this point, there were two gaps in the hills near Kharoli through which the waters ran to the south and to the east. A bund was also erected in the gap opening to the east (known as Jat Bund) with a pakka sluice and this enabled regulation of waters to be poured either into Ramgarh (East) or Firozpur Jhirka (North). In the early years of the 19th century, the Alwar rulers re-built and strengthened the Ataria bund and allowed the second bund to go to ruin. In consequence, for several years, the stream did not enter into the Firozpur Jhirka area which was then under the local Nawabs. In 1838, after the last Nawab was hanged and the area became a part of British India, an agreement was reached with the Alwar ruler as a result of which the second bund was restored and a channel dug to facilitate the passage of the stream into the Gurgaon district.

Landonia was notified a natural channel for purposes of section 4 of the Punjab Minor Canals Act in 1909 and the Collector was authorised to regulate its flow and to remove or modify any obstructions to it. These powers were, however, never exercised by the Collectors. In many villages, the Zamindars constructed bunds on the stream at their own expense and this led to constant disputes between different interests. Three bunds namely, Kanmeda, Madapur and Nagli were, however, constructed at the expense of the Zamindars with the object of utilizing to the best advantage the Landonia floods. These bunds were notified under Schedule II of the Punjab Minor Canals Act. The maintenance of these bunds was subsequently neglected. It was, however, felt all along that great improvement could be effected if by a scientific survey and examination of levels, a permanent work could be constructed to regulate the general distribution of the waters and secure the full benefit of irrigation from the stream. The following observations recorded by John Lawrence (afterwards Lord Lawrence) are very much relevant in this connection :—

“The small bunds erected by individual villages, are more numerous than there would be any necessity for on a more comprehensive plan. They sometimes interfere with one another, but are always insufficiently built, the community in whose lands they are situated only caring to raise the water to level required to flood its own lands and the neighbouring villagers benefiting by a higher overflow, neglecting (unless compelled to do so) to take the necessary repairs, in the dry months following each rainy season. These bunds are, moreover, continuously carried away by the strong floods, and the expense of rebuilding them anew falls very heavily upon the individual communities while the Government revenue is endangered if the lands are not sufficiently flooded.”

Although the waters of Landoha charge the sub soil water and thus prove beneficial to agriculture, these have in the circumstances described, also been causing considerable damage in the Firozpur Jhirka and Nuh tahsils particularly when there is no direct outlet for these waters to be drained out.¹ The Ujina Drain is the only further carrier of these waters. It joins the Pahari Kaman Drain in Rajasthan which further joins the Goverdhan Drain in Uttar Pradesh and later falls into the Yamuna, below Mathura. The State Government is now taking all suitable steps to control and channel the waters of the Landoha in the district.²

A number of streams and hill torrents join the course of the Landoha up the Firozpur valley independently irrigating large areas of land on the way. The Tirbeni which rises in Bharatpur territory and comes through Alwar only flows a few kilometres in the tahsil before it joins the Landoha at Doha. The Bhond, the Jhir and the Baloj are other important torrents on the west and the Ghata, the Darur and the Jhamrawat nullah on the east. The *jheel* which rises just above the town of Firozpur Jhirka makes a sweep northwards after crossing the metalled road and provides useful flooding to many villages. A branch of this stream joins the Landoha near Sakras.

The Baloj rises in Alwar territory in the hills which form the western boundary of the Firozpur Jhirka tahsil and joins the Landoha at Nagina. It often flows with great volume and brings down large quantities of sand.

A mention may also be made of a small stream called Thek Nala which flows from the Alwar hills on the west and irrigates a portion of Doha (Rambas) in the Firozpur Jhirka tahsil. There was an arrangement with the erstwhile Alwar State authorities by which the Gurgaon district was entitled to use half the water of this stream secured by means of a bifurcation a few kilometres upstream at Rambas. In 1936, the State authorities constructed a bund further upstream and obstructed the flow of the stream into the Gurgaon district.

The eastern side of the central or eastern range of hills is much cut up by a small *nala* and the only important stream is the Darur, branches of which flow east into the Ujina drain as well as the west of the range into the Landoha.

Mehndwari Nala. —It emerges from the Rajkha hills at a place in the Gurgaon district one kilometre east of village Gosainwala Johar of the Gurgaon tahsil and disappears in the Khalilpur depression 2 kilometres north-east of

1. The year 1969 witnessed huge losses amounting to Rs. 109.90 lakhs and Rs. 78.41 lakhs in the Firozpur Jhirka and Nuh tahsils respectively.

2. For details, see Chapter on 'Agriculture and Irrigation'.

village Indri of the same tahsil. A siphon has been provided under the Nuh Sub-Branch of the Gurgaon Canal at R.D. 20 for the flow of its waters on to the southern side, where it spreads out. It is proposed to connect it from this point with the Nuh Drain so that the waters may flow into the Sangel-Ujina basin without causing any damage in its upstream reaches. Its length in the Gurgaon district is 24 kilometres approximately while the average breadth varies from 15 to 40 metres. In normal times, this nullah is helpful in draining away the waters of the Sohna valley into the Khalilpur depression.

The following account taken from the *Delhi District Gazetteer*, 1912,¹ pertains to the streams, channels, etc., of the Ballabgarh tahsil :—

“The Bhiurya *naddi* (or Tilpat) drains the whole of the hills lying in the vicinity of Arangpur to its south-west and south. It is larger than the Takhand *nala* and in flood it was sometimes violent enough to stop the passage of travellers at the point where it crosses the Mathura Road, before it was bridged. The south Ballabgarh drainage runs more decisively south-east. The torrents and drainage channels on the part beginning from the north are as follows:—

- (1) There is a small channel issuing from the hills, south of the village Meola Maharajpur, which comes down on to the low ground of Fatehpur Chandila.
- (2) A much larger stream, called the Parsaun, comes down from the Badkhal hill on the same low ground in Fatehpur Chandila, a little to the south of the other. The water is held up by the Badkhal band but surplus water can cross the Agra Railway Line and Road under the bridges and fill the tank at Faridabad.
- (3) Another stream comes down from the hills on the confines of Bhankri and Pali on to the Dabua lowlands, than through, Ghazipur and Nangla Gujran, touching the south-west corner of Saran and falls into Gaunchhi *dahar*. When in heavy flood it does not stop there but passes on to Shamapur. It has two minor tributaries, the one the Bhandwanbaj and the other the Pali *nala* which help to swell the volume of the torrent.
- (4) A large *nala* comes down from the hills near the Kotra Mahabatabad, the waters of which used to pass through Sarurpur, Madalpur,

1. *Ibid*, pp. 8-9.

etc., and help to swamp Kabulpur Bangar; but this water is now held up by the Pakal (Pakhāl) *band*(*bund*).

- (5) The great Manger *nala*, too, sweeps past Dhauj and on to Kabulpur Bangar, its torrent was very violent and was causing great damage, especially to the village of Tikri Kalan. A great embankment has been recently built at Dhauj which will probably prove a valuable conservative factor.
- (6) The most southern stream is that which debouches from the hills at the village of Kot : in its course it has passed through the villages of Alampur, Sirohi, etc., and out into the marsh at Sarmatla (Sarmathla) in the Palwal tahsil. This *nala* too, has been recently blocked by a strong *band* (*bund*) to save the lower reaches from the damage caused by torrents.

“There are no perennial streams, however, except in the rainy season ; the effects are seen only in the undulating character of the ground, here and there cut into more clearly marked channels, the permanent moisture of the lower lands, and, in a few villages, a pool of standing water which though in dry seasons, disappears altogether, in wet ones swells into a *jheel* or marsh of considerable size. As instanced above, the Agra Canal has materially altered the drainage of the east half of the Ballabgarh tahsil. There is now no room for any considerable length of drainage flow on that side. There is an escape dug from the canal south of Tilpat opposite the place where the water of the Bhuriya *naddi* (or Tilpat Drain) comes in, and this meanders on in a slimy *shor*-mixed stream through the low Khadar north of Bhopani on toward Kabulpur Kalan, where it joins the river. The want of drainage here is shown in the prevalence of *shor*, which more or less affects all the land lying in this neighbourhood.”

Bhuriya Nala (or Tilpat Drain) still originates from the hills at a distance of 2 kilometres south-west of village Meola Maharjpur of the Ballabgarh tahsil. This *nala* falls into the Yamuna half a kilometre north-west of village Muzzamabad and 2 kilometres east of Akbarpur. Its length in the Gurgaon district is 34 kilometres approximately, while the average breadth varies from 15 to 50 metres. Siphons have been constructed under Gurgaon Canal Feeder and Agra Canal so that the water of the *nala* when in floods may pass on to the river Yamuna without causing any much damage to the adjacent area. But in spite of this, the area between the Delhi-Mathura Road and the Agra Canal is flooded during the heavy rains. In order to discharge

the water collected in the depression into the Agra Canal, a drain known as the Ballabgarh Drain was constructed. Later on, it was used to work the other way as channel for bringing water from the Agra Canal into the Ballabgarh ponds. These days, it is used for discharging water collected in the rains into the Agra Canal.

The stream coming down to the low grounds of Fatehpur Chandila now crosses the Delhi-Mathura Railway Line and Road under the bridges and fills the tank at old Faridabad.

In 1947, a new Badkhal Bund was constructed across a gorge upstream of the old Badkhal Bund. A canal of 15 cusecs was also constructed to utilize the stored water for irrigation purposes. This bund was further raised and strengthened in 1971-72. A waste weir was also provided in the bund. Now this site has been developed into a great tourist attraction by the Haryana Tourism Department.

The stream coming down from the hills on the confines of Bhankeri and Pali has since been regulated to fall into the Gaunchhi Main Drain.

A waste weir has been provided in the Pakhal Bund.

In 1947, a bigger Dhauj Bund was constructed across a gorge up-stream of the old bund. A distributary with 35 cusecs discharge takes off from this bund. A waste weir has also been provided. A siphon under the Gurgaon Canal on R.D. 39930 drains off the excess waters of the *nala* into the Gaunchhi Main Drain.

The Kot Bund was strengthened in 1929. In July 1972, due to torrential rains, this bund breached and washed away the road and bridge thus causing breaches in the Gurgaon Canal at a number of places. The bund was repaired in 1972-73 and strengthened and raised in 1974. A waste weir was also provided in the bund. The Sehrala Drain carries the excess waters of the Kot or Sailani Nala into the Gaunchhi Main Drain.

GEOLOGY

The greater part of the Gurgaon district is occupied by vast alluvial and sandy tracts of Recent to Sub-recent age, out of which protrudes widely scattered isolated strike ridges of old rocks, the remnants of a former Aravalli mountain chain of Pre-Cambrian age.

The geological formations of the district are given below :

Quaternary	Recent and Sub-Recent	Soil-older and newer alluviums, blown sand and <i>kankar</i>
	Intrusives	Pegmatites, quartz veins, sills of epidiorite and amphibolite
Proterozoic	Delhi Super Group (Pre-Cambrian—Purana)	<p data-bbox="759 465 1053 635">Ajabgarh Formation : Slates, phyllites, mica schists, sand-stone and quartzites, impure limestone, etc.</p> <p data-bbox="759 670 1053 770">Alwar Formation : Quartzites, arkose and grits</p>

DELHI SUPER GROUP (PRE-CAMBRIAN—PURANA)

The Delhi Super Group consists of the Alwar Formation and Ajabgarh Formations, with intrusions of amphibolites, pegmatites and quartz veins, etc. The hill ranges and ridges formed of these rocks, protrude out of the alluvial and sandy tracts thereby breaking the monotony of the peneplained region.

Alwar Formation.—This formation consists predominantly of an immense thickness of compact quartzites and grits with very subordinate bands of phyllites and schists.

The quartzites are generally dirty white, light to dark grey and pink in colour, more or less streaked and mottled with brown and red, according to the amount of iron oxide which coats the grains. They are sub-vitreous to vitreous in lustre and break with sub-conchoidal fracture giving sharp and splintery edges. Some of the quartzites consist of almost pure quartz grains, but coarse grain arkosic quartzites have also been noticed, as in Bhundsi, south-west of Ghairatpur, and along the flanks of the ridge north of Harchandpur. Garnetiferous quartzite occurs in the form of lenticular bodies from Sohna in the south to Kasan in the north.

Thin bands of graphitic schist or carbonaceous phyllite are associated with the quartzites in the Sohna ridge.

Ajabgarh Formation.—This formation is the uppermost division of the Delhi Super Group and is mainly an argillaceous horizon in general forming synclinal valleys owing to its comparative softness with respect to the Alwar quartzites. The argillaceous rock units vary according to the amount of metamorphism, from shales to mica schist.

The Ajabgarh shales are black, rusty-brown, often distinctly banded in differently coloured layers of minor thickness. The shales are splintery in nature because of well developed joints. Jointing is copious and irregular, the joint planes being frequently coated with iron oxides. The slates or shales inter-banded in the zones of quartzite are normally pale grey or dark grey in colour, soft, laminated and almost devoid of slaty cleavage. The shales are sometimes phyllitic and after metamorphism have developed high temperature minerals like chialstolite, staurolite and garnet.

Interbandings of shales, slates and siltstones, with a few quartzite bands are exposed in Kalinjar-Mandkaula range in the eastern part of the Gurgaon district. The ratio of quartzite to siltstone increases from south to north and ultimately at Mandkaula it consists of 100 per cent quartzites. In the southern part near Punahana the slates are quarried from this range.

INTRUSIVES

Two types of intrusives are found in the rocks of the district :

- (i) Basic intrusives in the form of sills, dykes, contemporaneous with the Delhi period itself.
- (ii) Pegmatites and quartz veins which are of Post-Delhi period.

Basic Intrusives.—A few basalt bands were noticed at a few places near the Mandnaka and Kalinjar. It consists mostly of plagioclase and amphiboles with some ferruginous materials.

Small lenses measuring up to 4 metres in length, of some volcanic material which are black and very fine grained have been noted in the quartzites near Sohna. These contain very fine grained quartz, iron ore, little carbonaceous matter and some zeolites. Thin bands of amphibolite have also been recorded from Sohna area.

Pegmatites and quartz veins.—The pegmatites of the area contain mostly pink orthoclase, quartz, muscorite and tourmaline, the last two never occurring together in large amounts. Quartz-tourmaline rocks are more frequently met with.

The quartz veins are mostly barren of any mineralisation. The quartz is usually transparent to milky white in colour. Smoky quartz is also present.

RECENT AND SUB-RECENT

Large tracts of the district form a part of the Indo-Ganga alluvium, and mostly comprise alluvium blown sand and *kankar*.

The alluvium is of two types, the older alluvium (*Bangar*) and newer alluvium (*Khadar*). The older alluvium is rather dark coloured and generally rich in concretions and nodules of impure calcium carbonate known as *kankar*. *Kankar* which occurs mainly in the northern part is light coloured and poor in calcareous matter. In the Gurgaon district, it is known as *Chiknot* (clayey loam).

MINERALS

Beryl.—Beryl is reported in some of the pegmatites traversing the Alwar quartzites between Delhi and Gurgaon.

Clays.—Good deposits of potter's clay occur at Arangpur, Sikandarpur, Alipur, Ghamrauj and Ghausgarh. Clay also occurs near Firozpur Jhirka and Kasan.

Glass Sand.—The Alwar quartzites, on weathering, has given rise to friable sand which is excavated for use as 'bajri' but is suitable for glass making. Such deposits occur at Arangpur, Mangar and west of Badli.

Graphite.—Graphite occurs in a band of schist, interbedded with quartzite in the hill just west of the town of Sohna. This deposit is a small one. Graphite is also reported in a gorge on the eastern side of the Sohna hill, where it forms a bed, 45 cm to 60 cm thick, exposed for about 27 metres. The quality of the mineral is very variable, some portions being hard and compact, while others are soft and easily reduced to powder. Graphite is also reported west of Haryahera.

Kankar.—The reported occurrence of *kankar* in 112 villages in the district was examined to assess their suitability for the manufacture of cement. In view of the lenticular nature of deposits, and the cover of alluvial soil, it was not possible to estimate their reserves without systematic pitting and trenching. On the basis of available data, a rough and tentative reserve of *kankar* is estimated at ten million tonnes. Chemical analysis of 12 collected shows that the majority of the samples are too high in

insolubles (9.14 to 30 per cent). The MgO content varies from 1.55 per cent to 3 per cent, except for two samples with 9 per cent and 12 per cent MgO.

Kyanite.—Kyanite crystals are reported from Bhundsi and Muhammad Pur Meo in Schist bands.

Mica.—Mica in large flakes is said to have been obtainable from Bhundsi. A fine specimen from one of these localities was shown at the Lahore Exhibition of 1864.

Small books of mica up to 2 cm thick are seen in the pegmatites in Manesar area and in the ridge north of Harchandpur.

Mineral Spring.—The water issuing from a spring at the base of hill in Sohna town, is charged with CO₂ and faint H₂S. It is not Chalybeate. The temperature of the water is 46°C. It is said to resemble the Vichy type of water and is reported to cure liver ailments and skin diseases.

Quartz.—Small quartz crystals are found near Ambwala Johar Arangpur. Vein quartz with transparent quartz crystals occurs near Bhundsi, Indri, Sohna and Dhakwala Johar.

Salt.—The salt industry in this district was formerly of some importance. The brine was drawn from wells, 7 to 12 metres in depth, situated chiefly in the neighbourhood of the villages of Nuh and Sultanpur. The brine was spread in shallow pans and the water was allowed to evaporate in sun leaving behind the salt. The salt extracted in the villages about Sultanpur contained 90 per cent to 93 per cent of Sodium Chloride.

Due to stiff competition created by cheaper Sambhar Lake salts, the salt industry of the Guragon district died out by early twentieth century.

Slates.—Poor quality slate bands, about 3.5 metres in thickness, occur in Basai Meo.

FLORA

The district is not well wooded and its major portion, comprising the low lying tracts in the Nuh and parts of the Gurgaon tahsils, is particularly devoid of trees.

Kikar [*Acacia nilotica* (L.) Willd. ex Del. subsp. *indica* (Benth.) Brenan] is found all over the district. It has come up very well in the Nuh tahsil, particularly along the roads. In the Palwal and Ballabgarh tahsils, besides private and village *shamlat* lands, it has been grown successfully in notified areas by the Forest Department. **Khair** (*Acacia catechu* Willd.) has been

mostly grown on Aravalli hills. *Nim* (*Azadirachta indica* Juss.) is generally found growing along Gurgaon-Alwar, Nuh-Palwal, Palwal-Rewari and Tarou-Pataudi Roads, and also in and around villages where *pipal* and *barh* occur frequently. *Jand* (*Prosopis cineraria* (L.) Druce) occurs mostly in arid region. Most of the *jand* trees growing in private lands had been cut and sold by the owners before the consolidation of holdings. This happened in spite of its manifold utilities such as fodder for cattle during lean periods, wood, manure by its leaf fall, shade in the fields, amelioration of heat and wind-break. Besides, it does not harm the field crops as it is a deep-rooted tree. It derives its sustenance from the region far below the root-zone of the field. In some parts of the district, particularly low-lying flooded tracts such as *apur* and *Sarai* in which the soil is sandy, *khajur* (*Phoenix sylvestris* (L.) Roxb.) grows abundantly, but the fruit is of very inferior quality. In the east and south of the district, there are a few scattered specimens of *tari*.

Of all the tahsils, Ballabgarh is the best wooded in spite of large scale cutting and removal of trees. The greater part of vegetation ordinarily found in *bans* and reserve forests consists of *karir* (*Capparis decidua* (Forsk.) Edgew.), *hins* (*Capparis zeylanica* L.), *jal* (*Salvadora oleoides* Decne.), *raunj* (*Acacia leuophlaea* Willd.), *Khair* (*Acacia catechu* Willd) and *kikar* [*Acacia nilotica* (L.) Willd. ex Del. subsp. *indica* (Benth.) Brenan], but *dhak* (*Butea monosperma* (Lamk.) Taub.), *gular* (*Ficus racemosa* L.), *papri* (*Holoptelea integrifolia* Planch.) and *lasura* (*Cordia dichotoma* Forst. f.) are also found. *Kadam* (*Mitragyna parvifolia* Korth.) is fairly common towards Palwal and Hodal. *Barna* (*Crateva adansonii* DC. subsp. *odora* (Buch.-Ham.) Jacobs), *inli* (*Tamarindus indica* L.) and *Ailanthus excelsa* Roxb.) are also met with though not very commonly. *Amaltas* (*Cassia fistula* L.) is found at various places. *Ber* (*Ziziphus mauritiana* Lamk.) although planted mostly in orchards, especially near large towns for its fruit, is also found at other places. *Shisham* (*Dalbergia sissoo* Roxb.) and *siris* (*Albizia lebeck* Benth.) are mostly confined to road sides where these have been planted by the Government. *Bakain* (*Melia azedarach* L.) and *arjan* (*Terminalia arjuna* (Roxb.) White & Arn.), are also seen along the roads.

The special tree of the hill range is *dhauk* (*Anogeissus pendula* Edgew), which covered the hills in the past. Later, except in few places, where the villagers preserved the trees until they reached a size which suited them for sale, every sapling was cut down or eaten by goats. However, as a result of the protection afforded by the Government by closures of areas on hill ranges under Section 38 of the Indian Forest Act, 1927, and Section 5 of the Land Preservation Act, 1900, the natural regeneration of *dhauk* has come up in abundance. Here and there, especially in the Palwal tahsil, a few scattered *semul*

trees (*Bombax ceiba* L.) are also found and at some places ornamental trees like *Jacaranda mimosifolia* D. Don and *Gul-mohar* (*Delonix regia* (Boj.) Ref.) have been planted.

One of the most characteristic plants of the district is *Ziziphus nummularia* (Burm. f.) Wt. & Arn., locally called *pala* or *jhar-beri*. This is common all over the district except in the low-lying inundated tract. In September and October, the fields are often thickly covered with this prickly shrub. It is very valuable plant. Its leaves are thrashed and given as fodder to the cattle. Its fruit is eaten, the thorny branches are used for hedges or as fuel and the roots for dyeing leather. Hardly less useful is the *munj* grass (*Saccharum bengalense* Retz.) which is found all over the district. It flourishes both in high sandy lands and low-flooded tracts. It is found in abundance in waste lands along the Yamuna and is also grown quite frequently by the people along their field boundaries to serve as wind-break.

Among the numerous other plants found in the district, the following deserve particular mention :—

Jhao (*Tamarix dioica* Roxb.) covers the low alluvial lands along the banks of the Yamuna; its twigs are used for basket making and in the construction of temporary well-cylinders. *Bansa* (*Tephrosia purpurea* (L.) Pers.) grows abundantly near the hills; the cylinders of temporary wells are ordinarily made by weaving together its branches. *Khip* (*Leptadenia pyrotechnica* (Forsk.) Decne.) grows on salt land and in the past was used in Nuh salt-pans to quicken the crystallization of the salt. *Bathua* (*Chenopodium album* L.) and *Chaulai* (*Amaranthus graclis* Desf.) are common pot herbs; the former grows chiefly in irrigated lands.

Wilayati akra (*Ipomoea carnea* Jacq.) sprouting in submerged lands is also grown along field boundaries to serve as a hedge. It has also come up along some of the roads. Among the wild gourds found, *kachri* (*Cucumis pubescens* Willd.) and *ban karela* (*Memordica charantia* L.) are eaten by the people. *Bana* or *basuti* (*Adhatoda vasica* Nees) and *Ak* (*Calotropis procera* (Ait.) Ait. f.) are also found at many places.

In poor soils near the hills, there often grows *kans* grass (*Saccharum spontaneum* L.) and *bhurt* (*Cenchrus biflorus* Roxb.) with its troublesome and prickly burs. In the flooded lands of some villages in the north of Firozpur Jhirka is found *narsal* (*Phragmites karka* (Retz.) Trin.), an aquatic plant which is very difficult to eradicate. Out of its reeds, pipe stems are made. *Nag-phani* (*Opuntia dillenii* (Ker.-Gawl) Haw.) forms a thick hedge in many parts of the district.

Besides, *anjan* (*Cenchrus ciliaris* L.), *khabbal* or *dub* (*Cynodon dactylon* (L.) Pers.), *dab* (*Desmostachya bipinnata* (L.) Stapf), *khas pan* (*Vetiveria zizanioides* (L.) Nash), *Sanwak* (*Echinochloa colonum* (L.) Link), *palwan* (*Dichanthium annulatum* (Forssk.) Stapf) are also found. *Anjan* (*Cenchrus ciliaris* L.) is very nutritious for cattle. The seeds of *Sanwak* are eaten by the poor.

The botanical and local names of the more common or noteworthy trees and shrubs are given below family-wise and in alphabetical order :

Serial number	Family	Botanical name	Local name
1	2	3	4
1.	Anacardiaceae	<i>Mangifera indica</i> L.	<i>Am</i>
2.	Apocynaceae	<i>Carissa spinarum</i> L.	<i>Murelan</i>
3.	Arecaceae (Palmae)	<i>Phoenix sylvestris</i> (L.) Roxb.	<i>Khajur</i>
4.	Asclepiadaceae	<i>Calotropis procera</i> (Ait.) Ait.f. <i>Leptadenia pyrotechnica</i> (Forsk.) Decne.	<i>Ak</i> <i>Khip</i>
5.	Bignoniaceae	<i>Millingtonia hortensis</i> L.f. <i>Tecomella undulata</i> (Sm.) Seem.	<i>Akash-Neem</i> <i>Rajasthan Teak,</i> <i>Ruhira</i>
6.	Boraginaceae	<i>Cordia dichotoma</i> Forst. f.	<i>Lesora</i> or <i>Lassura</i>
7.	Burseraceae	<i>Commiphora wightii</i> (Arn.) Bhandari	<i>Gugal</i>
8.	Cactaceae	<i>Opuntia dillenii</i> (Ker-Gawl) Haw.	<i>Nag Plant</i>
9.	Capparaceae	<i>Capparis decidua</i> (Forsk.) Edgew. <i>Capparis zeylanica</i> L. <i>Crateva adansonii</i> DC. Subsp. <i>odora</i> (Buch. -Ham.) Jacobs	<i>Karir</i> <i>Hins</i> <i>Barna</i>
10.	Combretaceae	<i>Anogeissus pendula</i> Edgew. <i>Terminalia arjuna</i> (Roxb.) Wight & Arn.	<i>Dhauk</i> <i>Arjan</i>

1	2	3	4
11.	Ebenaceae	<i>Diospyros montana</i> Roxb.	Kaindu
12.	Euphorbiaceae	<i>Euphorbia royleana</i> Boiss. <i>Ricinus communis</i> L.	Thor Arind, Handeli
13.	Fabaceae (Leguminosae)	<i>Acacia jacquemontii</i> Benth. <i>Acacia leucophlaea</i> Willd. <i>Acacia nilotica</i> (L.) Willd. ex Del. subsp. <i>indica</i> (Benth.) Brenan <i>Albizia lebbeck</i> Benth. <i>Butea monosperma</i> (Lamk.) Taub. <i>Cassia fistula</i> L. <i>Dalbergia sissoo</i> Roxb. <i>Parkinsonia aculeata</i> L. <i>Prosopis cineraria</i> (L.) Druce <i>Tamarindus indica</i> L.	Babul Nimbar or Raunj Kikar Siris Dhak Amaltas Shtsham Jand Imli
14.	Flacourtiaceae	<i>Flacourtia indica</i> (Burm.f.) Merr.	Kakero or Rahra
15.	Meliaceae	<i>Azadirachta indica</i> Juss. <i>Melia azedarach</i> L.	Nim Bakain
16.	Moraceae	<i>Ficus bengalensis</i> L. <i>Ficus racemosa</i> L. <i>Ficus religiosa</i> L.	Barh Gular Pipal
17.	Myrtaceae	<i>Syzygium cumini</i> (L.) Skeels	Jamun
18.	Rhamnaceae	<i>Ziziphus mauritiana</i> Lamk. <i>Ziziphus nummularia</i> (Burm.f.) Wight & Arn.	Ber Pala or Jharberi
19.	Rubiaceae	<i>Mitragyna parvifolia</i> Korth.	Kadam
20.	Salvadoraceae	<i>Salvadora oleoides</i> Decne.	Jal or Dongar
21.	Simaroubaceae	<i>Balanites roxburghii</i> Planch.	Hingo
22.	Tamaricaceae	<i>Tamarix aphylla</i> (L.) Karst. <i>Tamarix dioica</i> Roxb.	Farash Jhao
23.	Ulmaceae	<i>Holoptelea integrifolia</i> Planch.	Papri

FAUNA

There was a time when tigers abounded the woody banks along the Yamuna and the hills in this district. Now a tiger may be seen as a straggler in the ranges of Aravalli hills. The panther is also rarely found. Wolves, formerly numerous, are scarce. Wild cat (*banbilla*) is commonly found in jungles near the hills. Foxes, jackals, mongoose (*neola*) and hare are common in all parts of the district. Rats and mice are very common but the bandicoot infests some of the towns. Black bucks are still found in the district though they have considerably decreased in number. Blue bull (*nilgai*) is found in the west of the Palwal tahsil and the Yamuna Khadar.

Water birds.—A large number of migratory birds visit various tanks and lakes in the district during winter. The Rosy Pelican Sanctuary gets special attention. Various types of ducks and geese such as Eastern Greylag Goose, *Anser anser rubrirostris* Swinhoe; Barheaded Goose, *Anser indicus* (Latham); Brahminy Duck, *Tadorna ferruginea* (Pallas); common shelduck, *Tadorna tadorna* (Linnaeus); Pintail, *Anas acuta* Linnaeus, Common Teal, *Anas crecca crecca* Linnaeus; Mallard, *Anas platyrhynchos* Linnaeus, Gadwall, *Anas strepera strepera* Linnaeus; Wigeon, *Anas penelope* Linnaeus, Bluewinged Teal, *Anas querquedula* Linnaeus; shovler, *Anas clypeata* Linnaeus; Common Pochard, *Aythya ferina* (Linnaeus); Ferruginous Duck, *Aythya nyroca* (Guldenstadt); Tufted duck, *Aythya fuligula* (Linnaeus) can be seen at the tanks and lakes during winter. Some other ducks such as Comb Duck, *Sarkidiornis melanotos* (Pennant); Cotton Teal, *Nettapus Coromandelianus Coromandelianus* (Gmelin); spotbill Duck, *Anas ptecil-orthyncha* Forster; Large Whistling Teal, *Dendrocygna bicolor* (Vieillot); Treeduck, *Dendrocygna Javanica* (Horsfield) occur there throughout the year at suitable habitats. Rosy Pelican, *pelecanus onocrotalus* Linnaeus is partly resident, but mainly a winter visitor.

Besides, a good number of birds like Dabchicks, *Podiceps ruficollis capaensis* Salvadori; Grey Pelican, *Pelacanus philippensis* Gmelin; Large Cormorant, *Phalacrocorax carbo sinensis* (Shaw); Little Cormorant, *Phalacrocorax niger* (Vieillot); Darter or snake bird, *Ahhinga rufa melanogaster* Pennant; Eastern Grey Heron, *Ardea cinerea rectirostris* Gould; Little Green Heron, *Butorides striatus chloriceps* Bonaparte and Paddy Bird, *Ardeola grayii grayii* (Sykes) are found on the ponds and lakes of the district throughout the year. Other birds like Eastern Large Egret, *Egretta alba modesta* (J.E. Gray); Median Egret, *Egretta intermedia intermedia* (Wagler), Little Egret, *Egretta garzetta garzetta* (Linnaeus); and Little Bittern, *Ixobrychus minutus minutus* (Linnaeus)

affect inland water marshes, *jheels*, etc. Cattle Egret, *Bubulcus ibis coromandus* (Boddaert) can be seen moving along with grazing cattle.

A large number of Painted Stork, *Ibis leucocephalus* (Pennant) ; Openbill Stork *Anastomus Oscitans* (Boddaert) ; White-necked Stork, *Ciconia episcopus* (Boddaert) ; White Ibis, *Threskiornis melanocephala* (Latham) ; Indian Black Ibis, *Pseudibis papillosa papillosa* (Temminck), are found near the rivers, *jheels*, marshes and inundated land and cultivated fields throughout the year, while Black Stork, *Ciconia nigra* (Linnaeus), visits during winter season. Adjutant Stork, *Leptoptilos dubius* (Gmelin) is common during rains. Spoonbill, *platalea leucorodia major* Temminck & Schlegel, may also be seen along *jheels* during winter.

Among Cranes, Eastern Common Crane, *Gurs grus lilfordi* sharpe and Demoisselle Crane, *Anthropoides virgo* (Linnaeus) are found in association on sandy river beds, *jheels* and fields of winter crops. Indian Sarus Crane, *Grus antigone antigone* (Linnaeus) is a resident bird and breeds during the monsoon.

During winter, Eastern Baillon's Crake, *Porzana Pusilla Pusilla* (Pallas) and Spotted Crake, *Porzana Porzana* (Linnaeus) can be seen on the edges of ponds and lakes feeding on aquatic plants. While Indian Bluebreasted Banded Rail, *Rallus striatus albiventer* Swainson ; Slaty-legged Banded Crake, *Rallina eurizonoides amauroptera* (Jerdon) ; Northern Ruddy Crake, *Amaurornis fuscus bakeri* (Hartert) ; Chinese whitebreasted waterhen *Amaurornis Phoenicurus chinensis* (Boddaert) ; Water Cock *Gallix rex cinerea cinerea* (Gmelin) ; Indian Moorhen, *Gallinula chloropus indica* Blyth, Indian Purple Moorhen, *Porphyrio Porphyrio poliocephalus* (Latham) are resident species of the district and can be seen on rain-filled ponds and inundated paddy cultivation, etc. Coot, *Fulica atra atra* Linnaeus is resident as well as winter visitor and affects *jheels* and tanks.

The waders, namely Dusky Redshank, *Tringa erythropus* (Pallas) ; Eastern Redshank, *Tringa totanus eurhinus* (Oberholser) Marsh Sandpiper, *Tringa stagnatilis* (Bechstein) ; Greenshank, *Tringa nebularia* (Gunnerus) ; Green Sandpiper, *Tringa ochropus* Linnaeus ; Wood Sandpiper, *Tringa glareola* Linnaeus ; Common Sandpiper, *Tringa hypoleucos* Linnaeus ; Pintail Snipe, *Capella stenura* (Bonaparte) ; Fantail Snipe, *Capella gallinago gallinago* (Linnaeus) and Temminck's Stint, *Calidris temminckii* (Leisler) visit suitable marshy areas and the edges of pools and lakes during winter. On the other hand Pheasant tailed Jacana, *Hydrophasianus chirurgus* (Scopoli) ; Painted Snipe, *Postratula benghalensis benghalensis* (Linnaeus) and Indian Black Winged Stilt, *Himantopus himantopus himantopus* (Linnaeus) are residential birds and affect *jheels*, marshes and village tanks, etc.

Some other birds which are found near the tanks and lakes of the district throughout the year are : Indian River Tern, *Sterna aurantia* J. E. Gray and Blackbellied Tern, *Sterna acuticauda* J.E. Gray while Indian Whistled Tern, *Chlidonias hybrida indica* (Stephens) is a winter visitor.

It is not uncommon to see king-fishers like Indian Pied Kingfisher, *Ceryle rudis leucomelanura* Reichenbach ; Indian Small Blue Kingfisher, *Alcedo atthis bengalensis* Gmelin and Whitebreasted Kingfisher, *Halcyon smyrnensis smyrnensis* (Linnaeus) hurling itself headlong into water to catch fish. All these are residential birds and affect every kind of stagnant water and canals.

Thus in a suitable habitat like Bird Sanctuary at Sultanpur, one can observe more than 100 species of birds in a single day. This is one of the famous lakes in the country in so far as the variety of migratory birds is concerned. These birds come in the winter season from as far as Europe and Siberia and fly back home before the advent of the summer season.

In addition to ducks and geese, other game birds like partridges and quail are common in the district. Indian Black Partridge, *Francolinus francolinus asiæ* Bonaparte and Grey Partridge, *Francolinus pondicerianus interpositus* Hartert are common. Grey Quail *Coturnix coturnix coturnix* (Linnaeus) is a seasonal (winter) visitor, while Blackbreasted or Rain Quail, *Coturnix coromandelica* (Gmelin); Jungle Bush Quail, *Perdica asiatica punjaubi* Whistler and Rock Bush Quail, *perdica argoonda* (Sykes) are resident species.

Sandgrouses, namely the Large Pintail Sandgrouse, *Pterocles alchata* (Linnaeus) and the Indian Sandgrouse, *Pterocles exustus* Temminck have been noted as resident birds. Their flocks, large and small, regularly visit some favourite waterholes.

Apart from the water birds, among pigeons and doves, Bengal Green Pigeon, *Treron phoenicoptera* (Latham) is found in the vicinity of villages chiefly of *Ficus* trees, and Blue Rock Pigeon, *Columba livia* Gmelin occurs in almost all the villages. Indian Ring Dove, *Streptopelia decaocta* (Fridvaldszky) and Indian Spotted Dove, *Streptopelia chinensis* (Scopoli) are generally found in all cultivated fields.

Colourful birds .—The colourful birds add beauty to the varied wild life of the district. The most common colourful birds are ; Flamingo, *Phoenicopterus roseus* Pallas ; Large Indian Parakeet, *Psittacula eupatria* (Linnaeus) ; Rose-ringed Parakeet, *Psittacula krameri* (Scopoli) ; Kingfishers, such as the common kingfisher, *Alcedo atthis* (Linnaeus) ; White-breasted Kingfisher, *Halcyon smyrnensis* (Linnaeus) ; Blue-checked Bee-eater, *Merops superciliosus*

(Linnaeus) ; Lesser Goldenbacked Woodpecker, *Dinopium benghalense* (Linnaeus); Redvented Bulbul, *Pycnonotus cafer* (Linnaeus) ; Purple Sunbird, *Nectarinia asiatica* (Letham) ; etc.

The national bird of India, the Common Peafowl, *Pavo Cristatus* Linnaeus is quite common and is seen in orchards, fields and gardens.

Besides, such attractive birds as Hoopoe, *Upupa epops* Linnaeus and White-cheeked Bulbul, *Pycnonotus leucogenys* (Gray) are also seen in gardens and lawns around the villages.

Birds of economic importance.—Scavengers like *pariith* or Black Kite, *Milvus migrans* (Boddaert) ; Whitebacked Vulture, *Gyps bengalensis* (Gmelin); Black or Pondichery Vulture, *Torgos calvus* (Scopoli) ; Tawny Eagle, *Aquila rapax* (Temminck) ; House Crow, *Corvus splendens* Vieillot ; etc. keep the district cleared of dead animals by feeding on them. The Egyptian or Scavenger Vulture, *Neophron percnopterus* (Linnaeus) besides feeding on dead animals, consumes a large quantity of human excreta. Predators like Black-winged Kite, *Elanus caeruleus* (Desfontaines) ; Shikra, *Accipiter badius* (Gmelin); Lagger Falcon, *Falco bairmicus* (Temminck); Peregrine Falcon, *Falcon peregrinus* (Tunstall), Kestrel, *Falco tinnunculus* (Linnaeus) visit the district in winter ; Spotted Owllet, *Athene brama* (Temminck); Eagle-Owl, *Bubo bubo* (Linnaeus) ; Mottled Wood Owl, *Strix ocellata* (Lesson) ; etc., keep a check on the population of not only redent pests but also various insect pests by consuming them.

The challenge of insect pests is also met with by various insect eating birds, both resident and migratory. Swifts (Apodidae), Swallows (Hirundinidae); Drongos (Dicuridae) ; Babblers, Warblers, Fly-catchers (Muscicapidae) of various species consume insects as their staple diet. Larks (Alaudidae) and Wagtails (Motacillidae) feed on a considerable amount of worms in addition to insects. Rosy Pastor and Common Starling, both winter visitors, and several species of Mynas (Sturnidae) may specially be mentioned for their role in destroying numerous noxious insects including locusts on a large scale, and thus helping in saving crops to some extent.

Snakes and lizards .—Snakes and lizards of various species are also seen in the district. The *Naja naja* or Cobra, *Uromastix hardwickii* or Bis-Sandda, *Vipera russelli* or Daboia are quite common. The largest of the lizards is *Varanus monitor* or Goh and the smaller kind of the same genus is known as 'Bis-Cobra'. The house lizards, *Hemidactylus flaviviridis* and the garden lizards, *Calotes versicolor* or 'Blood sucker' are also very common.

The inspector of Wild Life, Gurgaon is in charge of Wild Life preservation and protection work in the district. He is under the administrative control of the Wild Life Officer, Haryana, Chandigarh. The Inspector of Wild Life, is assisted by Wild Life Guards.

CLIMATE

The climate, except during the monsoon, is characterised by the dryness in air, a hot summer and a cold winter. The year may be broadly divided into four seasons, viz. winter, summer, monsoon and the post monsoon or the transit period. The winter starts late in November and continues up to the beginning of March. The summer is from March till the end of June. The period from July to mid-September is the south-west monsoon season. Mid-September to the end of November constitutes the post-monsoon or the transition period.

Rainfall.—Records of rainfall in the district are available for 12 stations for sufficiently long periods. The details of rainfall at these stations and for the district as a whole are given in Table I of Appendix. The normal annual rainfall in the district is 553.00 mm. The rainfall in the district increases from the west towards the east. It varies from 474.2 mm at Farrukhnagar to 639.0 mm at Ballabgarh. About 77 per cent of the annual rainfall in the district is received during the south-west monsoon months, viz. July to September, July and August being the rainiest months. The variation in the annual rainfall from year to year is appreciable. In the fifty-year period 1901 to 1950, the highest annual rainfall which was 193 per cent of the normal, occurred in 1917; while in the very next year, it was the lowest amounting to only 34 per cent of the normal. During this 50-year period, the annual rainfall in the district was less than 80 per cent of the normal in 13 years. The district on the whole experienced consecutive years of such low rainfall twice; once for two consecutive years and the second time for three consecutive years, except some places which fared still worse. Sohna had two consecutive years of such low rainfall five times. Four consecutive years of rainfall less than 80 per cent of the normal occurred once each at Hasanpur and Hathin and five consecutive years at Taoru and Punahana. Table II of Appendix shows that the annual rainfall in the district in 30 out of 50 years, was between 400 and 700 mm, i.e. within about 25 per cent of the normal.

On an average there are 28 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 22 at Hasanpur to 36 at Firozpur Jhirka.

The heaviest rainfall in 24 hours recorded at any station in the district was 398.8 mm at Palwal on September 9, 1875.

Temperature .—As the only meteorological observatory at Gurgaon has been started recently, normals of meteorological elements are not available for the station. The account which follows is based on the records of the observatories in the neighbouring districts with similar climatic conditions. From about the beginning of March, temperatures begin to increase rapidly. May and June are the hottest months. The mean daily maximum temperature is about 41°C. While days are a little hotter in May than in June, nights are warmer in June than in May. From April onwards, hot dust-laden winds locally known as *luh* blow and the weather is unpleasant. The maximum temperatures may often go above 45°C. With the onset of the monsoon by about the end of June, there is an appreciable drop in the day temperature and the weather becomes cooler. But nights are nearly as warm as during the latter part of the summer. After the withdrawal of the monsoon by about mid-September, the day temperatures are more or less the same as in the monsoon months but the nights become progressively cooler. After October, there is a decrease in both the day and night temperatures, this being more rapid after the middle of November. January is usually the coldest month. The mean daily maximum temperature in January is about 21°C and the mean daily minimum about 7°C. During the cold season the district is affected by cold waves in association with passing western disturbances and on such occasions, the minimum temperature sometimes drops down to about the freezing point of water.

Humidity .—The air is generally dry during the greater part of the year. Humidity is high in the south-west monsoon season. April and May are the driest months when the relative humidities in the mornings are about 30 per cent and in the afternoons less than 20 per cent.

Cloudiness .—In the south-west monsoon season and for brief spells of a day or two in winter in association with passing western disturbances, heavily clouded or overcast skies generally prevail. The skies are mostly clear or lightly clouded during the rest of the year.

Winds .—Winds are generally very light but gain force in the summer and monsoon seasons. During the monsoon season winds are mostly from east or south-east ; while in the rest of the year, the winds are predominantly from west or north-west tending to be more northerly in the afternoons.

Special weather phenomena.—The period from April to June has the highest incidence of dust-storms and thunder-storms, some of these being very violent. While some of the thunder-storms are dry, a few others are accompanied by heavy showers and occasionally with hail. Thunder-storms also occur in the winter months in association with passing western disturbances.