
CHAPTER - I

GEOGRAPHICAL SETTING

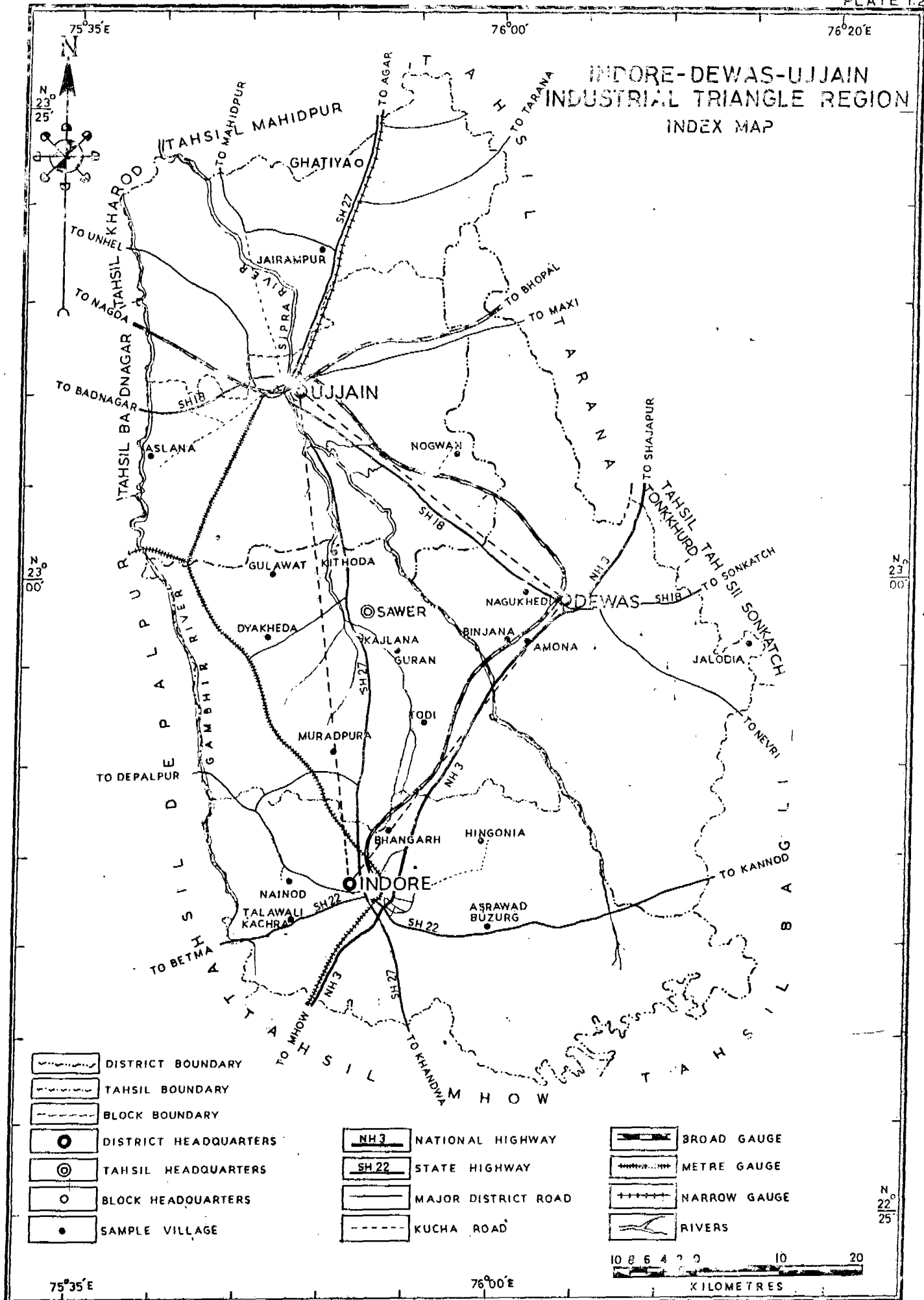
The study area is located almost in the central part of the country. It is one of the important industrial region of Madhya Pradesh. The oval shaped region is situated in the south eastern part of the Malwa Plateau. It accommodates about 0.93 per cent population (17,18,819) of the State (1981). The percentage of scheduled castes is 17.25 per cent and of scheduled tribes is 2.27 per cent. The population density of the region is 428 persons per square kilometre and sex-ratio is 946 females per 1000 males. The literacy in the region is 41.7 per cent out of which 54.9 per cent is male and 27.2 per cent is female.

Geographically, the region extends between 22° 40' N to 23° 10' N latitudes and 75° 50' E to 76° 50' E longitudes. The region lies within administrative territories of Indore, Dewas and Ujjain districts of Madhya Pradesh. It is divided in to five development blocks viz. Indore, Sawer, Dewas, Ujjain and Ghattiya. Mahidpur tahsil falls in the north while Mhow in the south. North-West and South-West of the region are occupied by Tarana and Bagli tahsils. While in the east is Sonkatch and Depalpur, Badnagar and Kachrod tahsils are in the western part of the region (Plate 1.1 and 1.2).

The region occupies the north-western part of the Deccan table land and forms an important industrial place in the state of Madhya Pradesh. The region under study is a part of the Malwa Plateau region. (Singh, 1971 : 41).



SOURCE: BASED UPON SURVEY OF INDIA MAP 1971



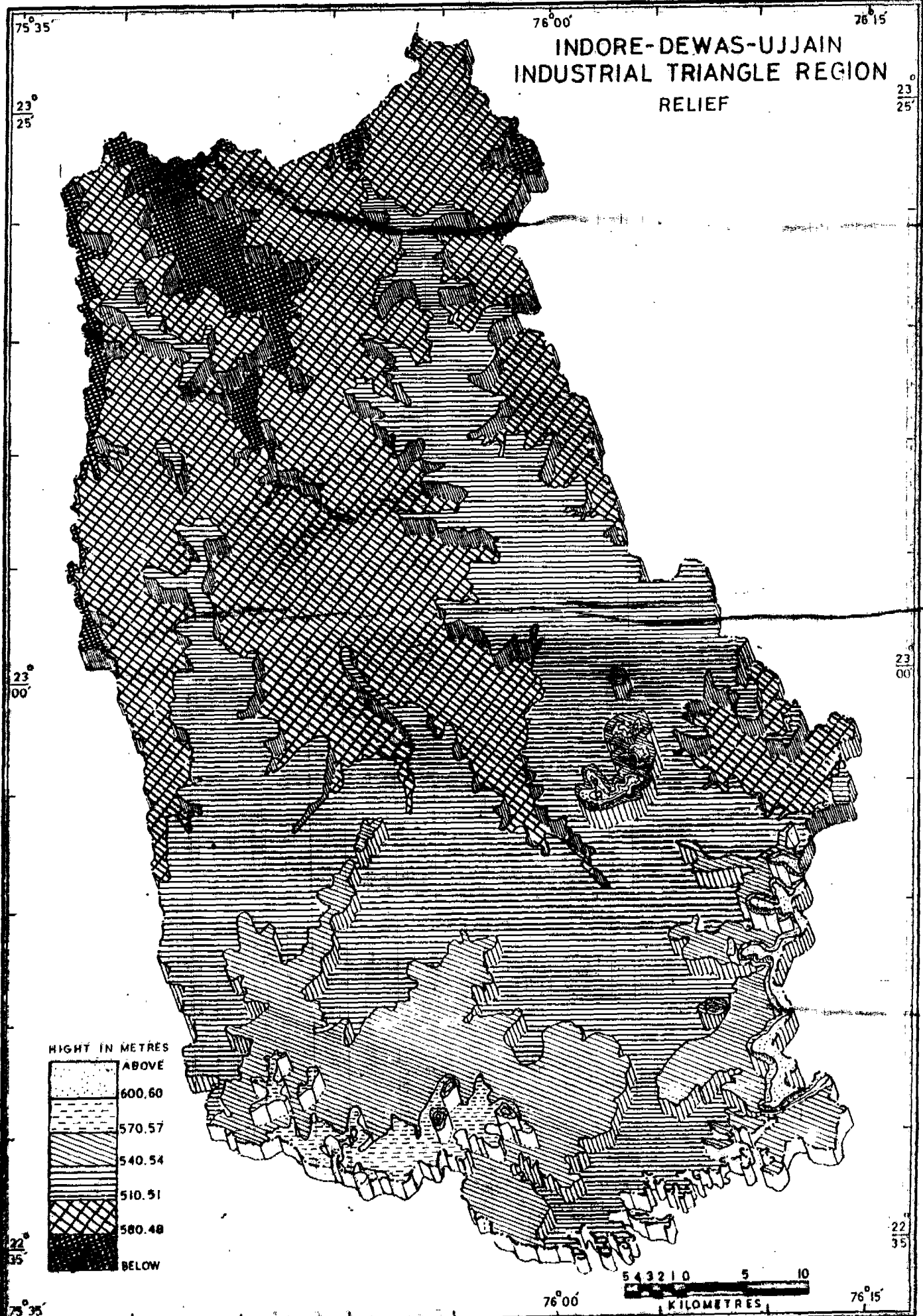
The region is accessible both by rail (all the three gauges available) and road transport. There is also an air port at Indore.

The region is on the Agra-Bombay National Highway No. 3 and enjoys the direct accessibility. The region has roads of all categories as has been classified by the Indian Road Congress at its Nagpur Session in 1973 i.e. (i) National Highway (ii) State Highway (iii) Major District Roads and (iv) Minor District Roads.

In this region Indore is one of those few privileged districts of the state which has got an aerodrome for operation of commercial air service.

PHYSIOGRAPHY

The region forms an extreme north-western part of the Deccan plateau and is a part of Malwa Plateau. This area lies on the northern part of the Narmada river. The area lies beneath the Vindhyan rocks on the lava flow's overlying a precretaceous surface. It is characterised by flat-topped hills and step like terraces. The area is like a table land, the general elevation is between 500-600 metres, above sea level. The highest point is 667 metre. On a hill near the village Rupeta (76°0' E longitude and 22°43' N latitude) in Indore tahsil other points of similar height are on the Ralaman-dal hill (75°55' E longitude and 22°37' N latitude), Kokri bardi (76°0' E longitude and 22°39' N latitude), Deogurria (75°56' E longitude and 22°40' N latitude), tarana south of the study area. Due to higher elevation towards south, general



75° 35'

76° 00'

76° 15'

23° 25'

23° 25'

INDORE-DEWAS-UJJAIN
INDUSTRIAL TRIANGLE REGION
RELIEF

23° 00'

23° 00'

HIGHT IN METRES

ABOVE
600.60
570.57
540.54
510.51
580.48
BELOW



22° 35'

22° 35'

76° 00'

76° 15'

slope of the region becomes towards north. It can be identified by the general flow direction of the drainage (Plate 1.3).

The topography is a result of the variation in hardness of different lava flows. The hard portions are forming the tops of the terraces and plateaus. Geomorphologically the area has undulating land surface. There is a hill of the Goddess chamunda in Dewas. This hill rises some 100 metre above the ground level. Erosion succeeded during Tertiary period in making an extensive level across the pile of lavas. The river valleys are flanked by terraced slopes. The younger trap hills are invariably lower in elevation because of rapid weathering of basaltic lava flat-topped, blackish in colour, and clothed with natural vegetation, where as the resurrected sandstone hills rise higher, craggy and stepsided though they are often couesta-type, almost vertical on one side and slopping away gently at a small angle of about 50 on the opposite side. Isolated and rounded masses of the former type occur practically everywhere in the Malwa Plateau. The southern part of the study area is a dissected land mass and forms the highest part. The relief of southern area varies from one place to the other place. The central part of the study area is mostly level land except a few hills which are found near Dewas. The general elevation of this part ranges from 475-500 metre. Due to general slope towards north, the elevation beyond Indore city gradually lowers down to Ujjain.

DRAINAGE

The study area, comes under the Chambal river basin which is a part of the Yamuna basin. The main rivers of the area are Kshipra, Gambhir, and Khan which are the north-eastern tributaries of the Chambal river. Southern part of the area is drained by the river Chhoti Kali Sindh which is also a tributary of the Chambal river. The river Chambal meets Yamuna river.

The Narmada river basin forms the southern boundary of the study area.

1. **THE KSHIPRA** : The Kshipra is also known as Kshipra or Awanti-nadi. It rises at a place called Kakri Bardi 2451 metres above the mean sea level and 20 Kms. south east of Indore. For quite some part, it flows a shallow channel locally called "doe" which exists throughout its course. It flows from south to north of the region and has divided study area in two parts i.e. western and the eastern Indore and Sanwer are towards west. While Dewas and Ujjain industrial centre's are on the east. Kshipra river is the main river having a total length of 135 kilometres in the study area. Indore, Sanwer, Dewas, Ujjain and Ghattiya blocks of the region are drained by this river. The Kshipra finally joins the Chambal river at Kalasi (23°53' N latitude and 75°28' E longitude). At a few places the Kshipra river is used for irrigation by the lift irrigation methods. These are in the nature 'Oddis' constructed on the field banks. (Oddis is constructed usually, near a river bed by diverting the water into a big pool and then lifting

the same by means of a pump or a leather bucket called charas driven by bullocks).

The drainage of this river is of dendritic type towards south and elongated in the central part. The main tributary is the Khan river which is its western tributary.

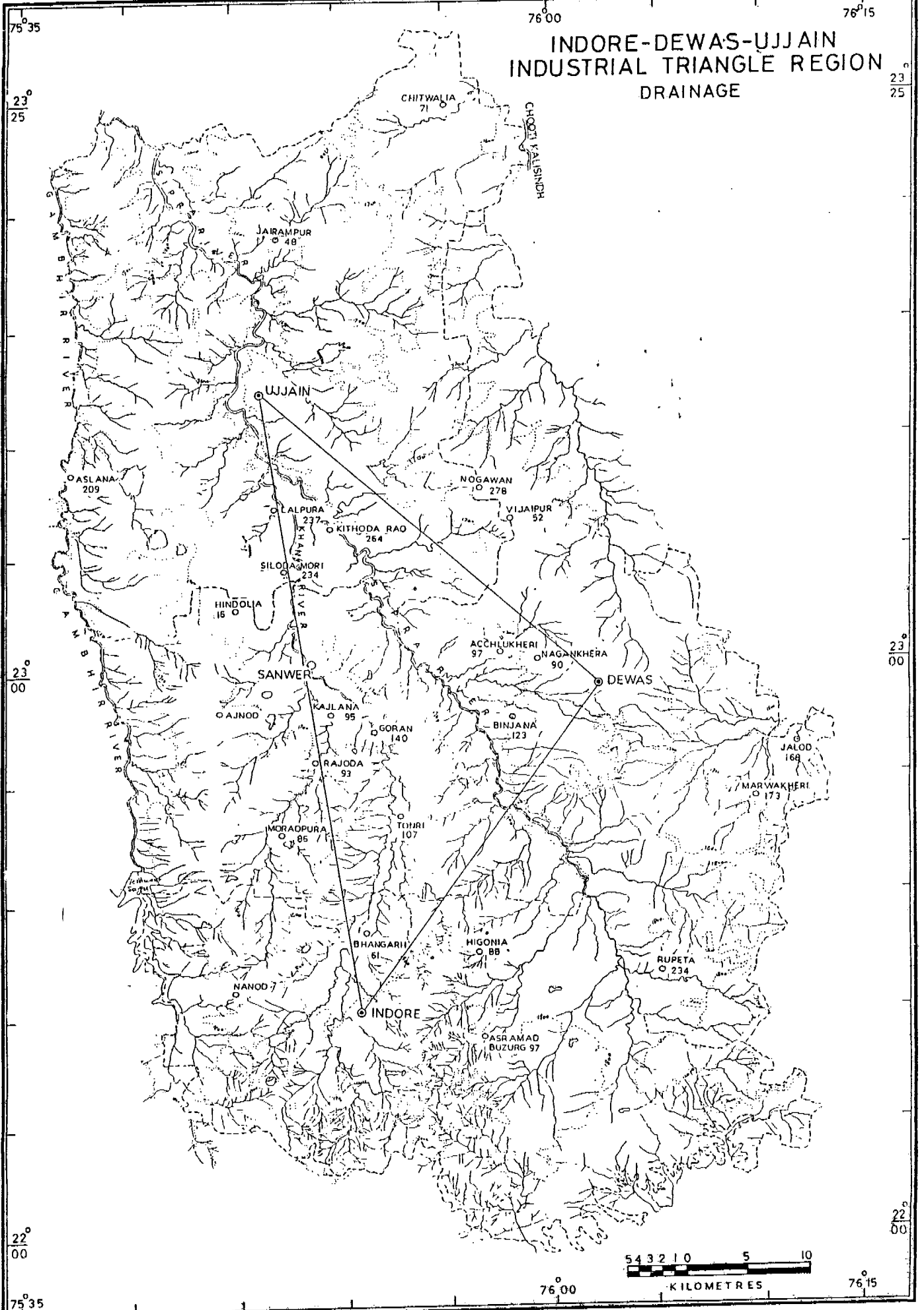
The water of this river is regarded as holy and millions of people take bath in this river. The most important feature is the Kumbh fair held after every 12 years at Ujjain. When millions people from all over the country assemble and take bath in the river Kshipra to achieve Salvation. The famous temple of Mahakaleshwar in Ujjain city is a famous monument on the bank of this river. Due to shallow depth of water the Kshipra river is not suitable for navigable purpose.

2. THE KHAN : The Khan river is a western tributary of the Kshipra river. It rises near Umaria villages, about 11 Kms. south of Indore city ($23^{\circ} 37'$ longitude and $75^{\circ} 54'$ N latitude) and flows south-north through the city of Indore, Sawer and ultimately joins the river Kshipra at village Gotra ($23^{\circ} 08'$ E latitude and $75^{\circ} 47'$ E longitude) in Ujjain tahsil. The total length of Khan river in the region is about 80 kilometres.

The industrial capital of Madhya Pradesh state, Indore is situated on the banks of this river (Plate 1.4).

3. THE GAMBHIR : The western boundary of the region is marked by the river Gambhir, rising from Janapao hill in the vindhyas and flows through the Mhow, Depalpur, Indore, Sawer and Ujjain tahsils. The river originates near the village Badarkha 22 Kms. from Indore and joins the Kshipra river near the village Gurria

INDORE-DEWAS-UJJAIN INDUSTRIAL TRIANGLE REGION DRAINAGE



SOURCE: HALF INCH TOPO SHEET NO. 55 A/SW, 55 B/NW, 46 M/SE & 46 N/NE

Sanga in Mahidpur tahsil of Ujjain district. The river has been a major source of water supply to Indore city, for a long time.

4. **THE CHHOTI KALI SINDH** : The eastern and north-eastern part of the area is drained by the river Kali Sindh. It however only touches the north-eastern boundary of the study area.

TANKS

The Bilaoli, Yashwant Sagar, Udas, Datana, Karohan, Lekera (large), Lekera (small) and Bombora dam are the famous tanks in the study area. These tanks were the major sources of water supplied to Indore and other surrounding areas, prior to the supply of Narmada water made available to these settlements.

The Siphon system at the Yashwant Sagar tank has a marvellous structure and is worth seeing. Yashwant Sagar is the largest, 14.48 kilometres long along the course of the Gambhir river and about 0.8 to 4.83 kilometres long along Indore - Depalpur road. It supplies water to Indore city. Yashwant Sagar and Bilaoli tanks have been taken by government for pisciculture.

The southern area of the region is provided with a few small tanks created on the up streams of the feeders. They are generally of the size less than 400 hectares on the surface and less than 10 metres deep even in the rainy season. Among these Udas and Datana lie to the east and south-east respectively, of Ujjain. Around 15 kilometres from the Ujjain city in the south, south-west direction are Karohan and Lekera

(large), Lekara (small) and Bambora dams small areas are irrigated from these reservoirs.

SOIL

Soil is among those which factors which determine the nature and character of socio-economic activities which in turn determines the availability of raw material for various industries. The region is situated in the black cotton soil track of the Deccan plateau. The most prevalent soil is the black cotton soil which is formed as a basalt and which produces excellent crops. The soil is rich in plant nutrient such as lime, megnesia, iron and alkalies on which cotton and certain types of the "dry" crops flourish. It has the property of swelling greatly and becoming very stricks during the rains. On drying it contracts again with the production of numerous cracks. Another product of weathering is lateric material from which silica, alkallies and alkaline earths have been leached away leaving behind alumina, iron, magnasese and titanium giving rise to a redish soil. It is pisolitic in structure and contains much water. It varies in depth and is usually loamy to clay, soils of fine texture are found is lime concentration zone and they are free from calcium carbonate. They are invariable present at different depths. Deep cracks ranging from a few centimetre to a metre develop during the summer season. The available literature suggests that the soil of the region may be classified into two groups (i) Deep Black Soil and (ii) Medium Black Soil.

(i) **DEEP BLACK SOIL** : These soils are found in the southern part of this region along the Narmada river. The soil may

further be divided into sub-groups as black, dark brown, coarse brown, mixed and sandy. These highly productive black soils are known as mariar and Kabar. They have a clay content of 50-60 per cent and calcium carbonate 0-45 per cent. The pH values range from 7.0 to 7.5. These soil cover parts of Indore, Dewas and Ujjain districts. These soil are ideal for cotton and wheat thats why they are named Black cotton soils.

(ii) **MEDIUM BLACK SOIL** : The soils of this group cover Indore and Ujjain district. They are black and deep but some alleviation of finer particles is also noticed in this group. The texture of the soil varies from loam to clay-loam. The soil has high water-retention capacity and its responce to irrigation is appreciable, where irrigation requirements are less and even crops can be grown without irrigation (dry farming).

CLIMATE

Climate is one of the important factors affecting the industrialization in the region. The climate excercise a profound influence on the development of manufacturing industry both directly and indirectly. The climate of the region has a general monsoon character with seasonal rhythem of temperature and rainfall. It has a humid mesothermal climate since the region is located in the interior of the sub-continent the modifying effects of sea are meagre here and the climate shows some continental contrasts.

The region enjoy's a pleasent climate and except during the monsoon season the climate is dry. The hot season

commences from March until June after which the monsoon season commences and continues, till September, October and November constitute the post monsoon and December to February is the cold season.

TEMPERATURE

Temperature along with the amount of water-vapour and rainfall determines the commercial activities and working conditions of the people in the region. The average temperature varies from 15°C to 17°C within the region. Indore has recorded the lowest temperature (6°C) in the year 1979. From February the region records a gradually upwards trend of temperature and the maximum temperature is recorded in May (47°C). The hot winds start blowing from April and continue to middle of July. Temperature during the summer season is directly associated with these winds. It is also affected by scorching heat waves. The relative humidity varies from 14.0 per cent to 18.0 per cent during April and May in the region, with the advent of the monsoon, the temperature starts decreasing. The daily and monthly range of temperature is considerably maximum during summer and is comparatively lower during the monsoon season. Table 1.1 shows the monthwise temperature of the region. While monthwise average maximum and minimum temperature for the region is given in the Table 1.2 .

RAINFALL

The region on the whole receives substantial rainfall. The front between two air masses passes through the region and this, moreover only increases the quantity of rainfall

Table 1.1
INDUSTRIAL TRIANGLE : MEAN MONTHLY TEMPERATURE
OF THE SELECTED STATION

(in °C)					
Months	Indore	Ujjain	Months	Indore	Ujjain
Jan.	17.1	17.2	July	36.0	21.1
Feb.	19.9	19.7	August	25.1	26.6
March	24.5	23.9	Sept.	25.1	26.8
April	29.0	28.2	Oct.	24.1	24.8
May	23.3	31.6	Nov.	20.4	20.8
June	30.0	30.4	Dec.	18.3	17.8

Source : Director, Regional Meteorological Centre, Nagpur.

Table 1.2
INDUSTRIAL TRIANGLE : AVERAGE MAXIMUM AND MINIMUM
MONTHLY TEMPERATURE

(in °C)					
Months	Average Max.	Average Min.	Months	Average Max.	Average Min.
Jan.	27.29	8.06	July	30.63	23.97
Feb.	30.39	11.21	August	28.32	23.37
March	33.76	16.05	Sept.	32.50	22.97
April	39.63	21.22	Oct.	34.81	16.20
May	42.35	26.31	Nov.	32.53	13.63
June	35.95	25.10	Dec.	27.77	9.60

Source : Director, Regional Meteorological Centre, Nagpur.

during the wet summer season. It also decides the quantity of rainfall which is more than 1000 mm. in the region. The region normally records on average rainfall between 1050 mm. and 1350 mm. Rains generally start by the end of first fortnight of June and lasts upto the month of October throughout the region.

July being the month with heaviest rainfall. Winter rains are very scanty are received some times in December and January. The variation in the rainfall of the region, from year to year is large. In the last 50 years (1901 to 1951) 1944 was the year with maximum rainfall which amounted to 159 per cent of the normal. 1978 was the year with the lowest rainfall and amounted to 47 per cent of the normal.

From the month of October the weather begins to get cooler and by November end winter sets in and lasts upto February. December and January are the coldest months.

The rainfall is variable in time as well as in regional distribution. The intermittent occurrence of droughts or excessive rains create famine or flood situation and adversely effects the agricultural production. Average monthly rainfall data has been presented in Table 1.3 and 1.4 .

HUMIDITY

The humidity of atmosphere depends on the rate of evaporation during summer season. The region usually records higher percentage of humidity, with the out break of the monsoon. The lowest percentage continuous to be in the area, where local winds temperature and water bodies are the only sources and decides water vapour content. The region records the minimum relative humidity during the hot summer season while the maximum is recorded during the rainy season. Table 1.5 shows the trend of variation of weather elements at different observatories in the region.

Table 1.3
**INDUSTRIAL TRIANGLE : AVERAGE MONTHLY RAINFALL OF THE
 SELECTED STATIONS**

(in mm.)					
Months	Indore	Ujjain	Months	Indore	Ujjain
Jan.	8.4	8.0	July	316.0	228.9
Feb.	1.1	2.0	August	266.5	237.1
March	3.5	9.0	Sept.	220.9	197.2
April	3.5	0.7	Oct.	48.4	12.8
May	13.2	4.5	Nov.	22.1	19.7
June	147.1	114.7	Dec.	2.7	7.9

Source : Director, Regional Meteorological Centre, Nagpur.

Table 1.4
**INDUSTRIAL TRIANGLE : AVERAGE MONTHLY RAINFALL OF THE
 REGION AND MADHYA PRADESH**

(in mm.)					
Months	Traingle Region	M.P.	Months	Traingle Region	M.P.
Jan.	8.2	16.0	July	272.5	369.5
Feb.	1.6	15.1	August	251.8	324.3
March	6.3	10.3	Sept.	209.1	187.5
April	2.1	-	Oct.	30.6	37.6
May	8.9	-	Nov.	41.8	15.9
June	130.9	140.7	Dec.	5.3	6.6

Source : Director, Regional Meteorological Centre, Nagpur.

Table 1.5
**INDUSTRIAL TRIANGLE : MONTH-WISE RELATIVE HUMIDITY OF THE
 SELECTED STATIONS**

Months			(in per cent)		
	Indore	Ujjain	Months	Indore	Ujjain
Jan.	63	67	July	88	86
Feb.	47	53	August	88	90
March	31	43	Sept.	85	84
April	30	35	Oct.	60	66
May	44	47	Nov.	54	63
June	73	73	Dec.	57	69

Source : Dy. Director General of Observatories, Raipur (M.P.)

CLOUDINESS

During the monsoon season the skies are generally heavily clouded or over-cast. The rest of the year the skies are mostly clear or lightly clouded.

WINDS

In the summer and monsoon months winds are strong. During the monsoon they blow mainly from direction between south-west and north-east. In the post-monsoon and the winter months morning winds are light and are mainly easterly or north-easterly. In the afternoons winds are strong and blow from directions between south-west and north-east through west. The following Table 1.6 gives an idea of wind speed of the region.

Table 1.6
INDUSTRIAL TRIANGLE : WIND SPEED

(in Km.Hr.)					
Month	Wind Speed	Month	Wind Speed	Month	Wind Speed
Jan.	6.1	May	18.7	Sept.	11.6
Feb.	6.8	June	20.3	Oct.	5.6
March	9.3	July	20.6	Nov.	5.0
April	11.3	August	15.6	Dec.	4.1

Source : Indore District Gazetteers of M.P.

SPECIAL WEATHER PHENOMENON

In association with depression, which originates in the Bay of Bengal during the monsoon season, and to a lesser extent in the post monsoon season, which move across the country in some westerly direction the region experiences widespread heavy rain and gusty winds. During the summer seasons occasional duststorms and thunderstorms occur. Rains during the season is often associated with thunder. Fog occurs occasionally during the cold season.

FORESTS

Forest resources are among the important consideration for the industrialization and rural transformation. They provide an important element of the geographical environment which ultimately determines the suitability of a region for industrial development. About 0.69 per cent of the total study area is under forest. The forest mostly occupy the hilly tract of the region mainly concentrating in the south. The forests of the region are tropical dry deciduous and dry mixed deciduous

lies in the form of patches in the remaining area. The edaphic climates of Anjan, Salai and Balar are also grown locally. The common tree associations founds are Saja, Tendu, Tinsa, Bajasal, Kari, Khais, Palas, Khakara, Babul, Peepal, Ochar, Imli, Neem and Shisham etc.

The average height of Teak tree ranges from 30 to 40 feet while it reaches so fast in sheltered valleys. The average height of other trees varies from 20 to 40 feet.

There are many plants to which one or the other medicinal property is attributed but they are mostly of local interest and no commercial exploitation is done. However, Harra, Baheda and Awanla, the combination of Triphala are collected, by the local people.

The forest of the industrial triangle region that is Indore-Dewas-Ujjain are an important source of industrial raw materials. The forests of the region provide raw materials for industries engaged in the manufacturing of cellulose, rayon, pulp and bidies.

FAUNA

Among the mammal are blackbuck, porcupine, squirrel, Bear, four horned Antelope, Indian Gozalle, Barking deer, spotted deer, Pig. Tiger, Felis, Leopard, Blue Bull, and monkeys are generally found.

In birds Peacock, Red Junglee Foul, Indian sand grow, Grey Ouail and green pige-on are commonly found in the forests.

Wild life sanctuary at Khioui gives full protection to wild life. Restrictions have been placed under the Game laws against indiscriminate shooting. Every year some blocks are totally closed for hunting for open blocks also, the Divisional forest officer fixes limit beyond which even a permit holder cannot shoot.

In the rivers fishes viz., masheer, rohu, crocodiles, tortoise are found. Snakes and scorpions of all types are found in the region. Crocodiles are found in Narmada river, and their average size is between 6 to 8 feet.

PISCICULTURE

The Fisheries department of the Madhya Pradesh is trying to improve the economy of pisciculture, and as a preliminary step, has taken up the work in Yashwant Sagar and Bibaoli tanks. The rivers, streams, and tanks contain fishes among which the mahseer, rohu and sanwal or murrial are common. The size of the fishes are generally small in size.