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Annual and seasonal variability of rainfall in central state of India

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Abstract

The uncertainty in occurrence of rainfall is a serious concern nowadays. There is an urgent need in studying the variability associated with rainfall in the context of changing climatic conditions. Proper understanding of variability of rainfall in spatial and temporal scale is crucial for crop and water resource planning and preparation of contingency plans. Chhattisgarh is an agrarian state where dependency of agriculture on rainfall is having great importance. In this context the spatio temporal variability of rainfall has been analyzed in this study in block level. Monthly gridded rainfall data of the 149 blocks of Chhattisgarh State was collected for a period of 1901 to 2020 (119 years) from the India Meteorological Department (IMD). Initially, long term statistics have been quantified in terms of mean, minimum, maximum, standard deviation, coefficient of variation, skewness, and kurtosis for annual, pre monsoon, south west monsoon, post monsoon and winter season. The spatial maps have been created using Inverse Distance Weighted (IDW) technique of interpolation in ArcGIS 10.6. The study was done at block level which offeres better understanding of rainfall variability over the state. The average annual rainfall over the state from 1901 to 2020 was 1366 mm which ranged from 1094 mm (Chhuikhadan block of Chhattisgarh Plains) to 1620 mm (Jagdalpur blockck of Bastar Plateau). The co efficient of variation of annual rainfall over Chhattisgarh was 24%. Among the four seasons, the maximum rainfall was noticed during monsoon season (1140 mm) with the smallest value of coefficient of variation (24%). The minimum amount of rainfall was seen during winter season (40 mm) while maximum amount of co efficient of variation was seen during pre monsoon season (123%). Among the three agro climatic zones, maximum value of average rainfall was noticed in Bastar Plateau (1482 mm) followed by northern hills zone and Chhattisgarh Plains. The study showed how the annual and seasonal rainfall showed variation over different blocks of Chhattisgarh. The findings of the study gives useful information for effective planning of water resources and crops in various regions of the state.

Keywords: Annual, seasonal variability, rainfall

Introduction

One of the most interesting element of weather is rainfall and its erratic distribution. The distribution of rainfall in both spatial and temporal scale is very important in deciding the distribution of crop over a particular area. Rainfall is the major source of river flow in India and the large variability in rainfall may cause hydrological extreme events such as drought and flood (Kalra and Ahmad 2012; Prabhakar et al., 2019)^[2, 7]. Now a days, water demands are increasing due to population, industrialization, and urbanization. Major water demands are in agriculture, industry, irrigation, environmental flow, hydroelectric power generation and other anthropogenic activities. Allocation of demands as per availability is tedious task in terms of measurement and its management. Water resource management is getting complicated due to erratic rainfall and put the population under socio economic stress. India is blessed with vast water and other natural resources. The normal value of Indian annual rainfall from 1971 to 2020 period is 1160.1mm. The normal rainfall value for pre monsoon, monsoon, post monsoon and winter seasons were 130.6 mm, 868.6mm, 121 mm and 39.8 mm respectively. In India more than 60% of the Indian population is based on agriculture which generate 19.9% of GDP. More than 60% of the agriculture in our country is rainfed, hence the variability of rainfall over India has a significant impact on Indian agriculture and economy. By considering the vital role of rainfall in for designing crop planning, the accurate evaluation of rainfall variability is a major concern for scientific community and policy makers. The increased frequency of high intensity rainfall generates a large amount of water in least time interval, causes runoff and floods.

Various studies were conducted all around the world to evaluate the spatio temporal variability of rainfall. The 135 years of monthly rainfall time series for 30 sub-regions over the India were analyzed by Kumar et al., (2010)^[4] and summarized the long term rainfall variability in terms of trend analysis over India. Prabhakar et al., (2019) ^[7] found out a declining trend of rainfall over the state of Odisha after 1945. The rainfall variability may have hazardous impact on agricultural crops. Ahmed et al. (2019) [1], assessed the variability of rainfall on ground nut yield in Bundelkhand region of India. From a period of 1951 to 2015, 6% decrease was noticed in summer monsoon rainfall over Indo Gangetic plains whereas the frequency of localized high rainfall events increased. The frequency of daily precipitation extremes with rainfall intensities exceeding 150 mm per day increased by about 75% over central India during 1950-2015 (Krishnan et al., 2021)^[3]. Similar studies on rainfall variability assessment has been done over Chhattisgarh state. Nema et al., (2019)^[5], has noticed strong inter annual rainfall variability and declining trend of rainfall over Chhattisgarh. District wise changes in rainfall variability and trend was noticed in Chhattisgarh (Praveen et al., 2020)^[9].

In the context of the importance in assessment of rainfall variability, the present study was done to investigate the pattern of changes in rainfall in each block of Chhattisgarh during a period from 1901 to 2020. Annual and seasonal trend analysis of rainfall along with the spatial variation were presented in this study.

Study area

Chhattisgarh belongs to central India, extends over 135,192 km² has a forest cover of 44% of it's the total geographical area and contribute approximately 12% of the forest to the Indian subcontinent. The geographical location of the state is between 17.78–24.12° N latitude and 80.24– 84.39° E longitude. Location map of study area is shown in the fig. 1. The climate in Chhattisgarh is tropical, with significant regional variation. The temperature experience in the state in general varies from 28 °C to 46 °C, with a value of 46 °C may

reach during summer. The state is divided into 27 districts (Balod, Balodabazar, Balrampur, Bastar, Bemetra, Bijapur, Bilaspur, Durg, Janjgir-Champa, Jashpur, Kanker, Kondagaon, Mungeli, Narayanpur, Raigarh, Rajnandgaon, Sukma, Surajpur, Raipur, Mahasamund, Koriya, Dantewada, Dhamtari, Gariabandh, Kawardha, Korba and Surguja) and 149 blocks. There are three agroclimatic zones named Chhattisgarh Plains, northern hills zone and Bastar Plateau. Nearly 60% of the area of Chhattisgarh plains is cultivated and sandy loam soil covers about 55% of the land area with fully bunded (100% bunding) agricultural fields. The Bastar plateau has undulating terrains largely covered with forests. Northern Hills include areas under high elevations of 900-1000 m. The principle river flow through the state include Rihand, Arpa, Hasdeo (a tributary of the Mahanadi), Indravati, Jonk. and Seonath.

The primary crop cultivating in Chhattisgarh state is Rice, which covers 77% of net sown area. Among the total rice cultivated areas, 80% of area is under rainfed (Nema *et al.*, 2018)^[5]. Rainfed cultivation is widely practices all around the state, except for some few light upland soils. Hence a good understanding of spatio temporal variability of the rainfall over the state is vital for supporting the crop and water resource planning

Data used

Monthly rainfall data of the 149 blocks of Chhattisgarh state for a period from 1901 to 2020 (119 years) were downloaded from the India Meteorological Department (IMD) site, India Water Portal

(http://www.imdpune.gov.in/Clim_Pred_LRF_New/Grided_ Data_Download.html) and were employed to examine the spatial and temporal variability of rainfall data series. Locations of meteorological stations are shown in Fig. 1. According to the India Meteorological Department, four prominent seasons are in India, namely (1) winter (December–February), (2) pre monsoon (March–May), (3) monsoon (June–September), and (4) post-Monsoon (October– November) (Gajbhiye *et al.* 2015a) ^[12].



Fig 1: Location map of the study area (Administrative boundary of Chhattisgarh State) \sim 409 \sim

Methodology

In this study, the annual and monthly rainfall of 149 blocks in Chhattisgarh State were used from 1901 to 2020. The

methodology adopted for rainfall variability analysis has been illustrated in the form of flow chart Fig.2.



Fig 2: Methodology adopted for rainfall variability analysis

Conversion of gridded data into block level data sets

IMD gridded data sets which have a resolution of $(0.25 \text{deg} \times 0.25 \text{deg})$ of rainfall is to be converted into area-weighted average rainfall by Thiessen polygon method of ArcGIS (ver. 10.6) for all the blocks. Daily rainfall data has been converted into monthly time series. Thereafter, monthly time series were segregated into different annual and seasonal i.e., premonsoon, monsoon, post-monsoon and wintertime series for each station. GIS administrative boundary shape files for the entire blocks are downloaded from the DIVA-GIS website.

General Statistics of Rainfall (1901-2020)

Long term statistics have been quantified in terms of mean, minimum, maximum, standard deviation, coefficient of variation, skewness, and kurtosis for 5 time series (annual, pre monsoon, monsoon, post monsoon and winter) for all the blocks of Chhattisgarh state. The block level study can be considered as micro level study which represent the best distribution of rainfall variability over the state. The statistical analysis were carried out using in MS Excel software

Mean

The Statistical mean refers to the mean or average which is used to derive the central tendency of the data. It is determined by adding all data points in a population and then dividing the total by the number of points. The resulting number is known as the mean or the average.

 $Mean = \frac{Sum of rainfall corresponding to particular duration}{Number of year}$

Maximum

It is the maximum value in the given time series.

Minimum

It is the minimum value in the given time series.

Standard Deviation

In statistics, the standard deviation is a measure of the amount of variation or dispersion of a set of values. A low standard deviation means the values are close to the mean of the sample, while a higher value of standard deviation indicates that the values are spread out over a wider range. The standard deviation is denoted by σ .

$$\sigma = \sqrt{\frac{\sum (x_i - \mu)^2}{N}}$$
(2)

 σ = population standard deviation

- N = the size of the population
- x_i = each value from the population

 $\boldsymbol{\mu} = the \text{ population mean}$

Coefficient of variation (%)

Variance is a statistical measure that describes how different data points differ from the mean value. The coefficient of variation (CV) is a normalized measure of deviation from the mean that is calculated as follows:

$$CV(\%) = \frac{\sigma}{\mu} \times 100 \tag{3}$$

Where, σ denotes the standard deviations and μ denotes the mean of the time series

Skewness

Skewness characterizes the degree of asymmetry of a distribution around its mean. Positive skewness indicates a distribution with an asymmetric tail extending toward more positive values. Negative skewness indicates a distribution with an asymmetric tail extending toward more negative values.

$$\widetilde{\mu}_{3} = \frac{\sum_{i}^{N} (x_{i} - \overline{x})^{3}}{(N-1) \cdot \sigma^{3}}$$

$$\tag{4}$$

 $\tilde{\mu}_{3} = \text{skewness}$ N =number of variables in distribution

 $x_i = random variable$

- \overline{x} = mean of the distribution
- $\sigma_{\pm \text{ standard deviation}}$

Kurtosis

Kurtosis characterizes the relative peakedness or flatness of a distribution compared with the normal distribution. Positive kurtosis indicates a relatively peaked distribution. Negative kurtosis indicates a relatively flat distribution.

$$Kurt = \frac{\mu_4}{\sigma^4} \tag{5}$$

Kur = Kurtosis

 μ_4 = Fourth central moment

 σ^4 = Standard deviation

Preparation of spatial maps

Spatial maps have been prepared for average rainfall of the annual and seasonal time series, using the Inverse Distance Weighted (IDW) technique of interpolation in ArcGIS 10.6. (Singh and Chowdhury, 1986; Lebel *et al.*, 1987) ^[10, 8]. In the IDW methodology, the weight of any known point is set to be inversely proportional to its distance from the estimated point (Chen and Liu, 2012) ^[6]. It is calculated as follows:

$$\hat{x} = \frac{\sum_{i=1}^{n} \frac{1}{d_i} x_i}{\sum_{i=1}^{n} \frac{1}{d_i}}$$
(6)

 $\hat{\mathbf{x}} = \mathbf{value}$ to be estimated

 $x_i = known value$

 d_i = distance between two consecutive points

Results

Statistical characteristics of annual and seasonal rainfall

Block wise general statistics of the long term rainfall time series are presented in Table 1. From the period of 1901 to 2020, average annual rainfall of the Chhattisgarh state is about 1366 mm and about 80 percent of annual rainfall occurred in the monsoon period. The annual average rainfall varies from 1094 mm to 1620 mm. The lowest annual average rainfall noticed in Chhuikhadan block and the highest annual average rainfall occurred in Jagdalpur blocks during 1901-2020. The standard deviation values vary between 215 mm to 422 mm with an average value of 319 mm. The average value of the coefficient of variance, skewness and kurtosis are 23.6%, 2.85 and 24.65 were estimated. The average rainfall for the state during monsoon period varies from 946 mm (Chhuikhadan) to 1333 mm (Pakhanjur) with an average value of 1139 mm. The standard deviation values noticed, as 176 mm to 383 mm with an average value of 280 mm. The average value of the coefficient of variance, skewness and kurtosis values are found to be 23.65%, 2.95 and 26.1 respectively. The average rainfall during pre-monsoon period varies from 34 mm (Palari) to 137 mm (Tokapal) with an average value of 85 mm. The standard deviation values noticed are 31 mm to 103 mm with an average value of 67 mm. The average value of the coefficient of variance, skewness and kurtosis values were found to be 123.35%, 4.5 and 42.4 respectively. The average rainfall for the postmonsoon period varies from 48 mm (Bhatapara) to 142 mm (Konta) with an average value of 95 mm. The standard deviation values noticed was ranged from 46 mm to 90 mm with an average value of 68 mm. The average value of the coefficient of variance, skewness and kurtosis values are found to be 83.08%, 1.55 and 3.8 respectively. The average

rainfall for winter period varies from 18 mm (Konta) to 61 mm (Manora) with an average value of 39 mm. The standard deviation values noticed was 23 mm to 54 mm with an average value of 38 mm. The average value of the coefficient of variance, skewness and kurtosis are found to be 113.7%, 2.05 and 7.9 respectively. It is found that when the average

rainfall calculated from 1901 to 2020 was considered, around 83.94% of rainfall occurred in the monsoon season, 6.26% occurred in the pre-monsoon season, 7.00% rainfall occurred in the post-monsoon season and 2.87% rainfall occurred in the winter season.

Table 1: General statistics of annual and sea	sonal rainfall over different blocks o	f Chhattisgarh state during 1901-2020
		0

Mean SDI CV Skw Kur / SDI CV Skw Kur / SDI CV Skw K	Satation		Ar	nnua	ıl		I	Pre-N	Aon	soon		Monsoon			Post-Monsoon					Winter						
Bala 1281 297 23 44 49 101 49 113 247 22 35 12 45 116 156 117 28 35 124 24 24 100 74 65 13 17 29 34 116 15 257 100 76 19 13 17 29 34 116 15 35 116 15 20 13 14 14 14 150 22 10 06 63 94 14 14 151 116 157 13 14 13 13 13 13 13 13 13 13 13 140 13 140 13 140 13 140 13 140 13 140 13 140 13 140 13 140 140 140 140 140 140 140 140 140 140 141 141 1		Mean	SD	CV	Skw	Kur	Mean	SD	CV	Skw	Kur	Mean	SD	CV	Skw	Kur	Mean	SD	CV	Skw	Kur	Mean	SD	CV	Skw	Kur
Dondi 1324 284 21 49 45 91 56 1172 24 10 <	Balod	1281	297	23	0.4	0.2	48	49	101	1.9	4.9	1133	247	22	0.3	-0.1	71	67	94	1.3	1.4	28	35	124	2.4	8.4
Domdi Luharn 1220 2672 210 0.4 45 95 11 15 20 Gunderden 1220 167 0.3 0.0 15 86 10 0.4 31 151 11 220 107 108 112 15 108 108 108 108 108 108 108 108 108 108 108 11	Dondi	1324	284	22	0.4	0.2	49	45	91	1.9	5.6	1172	246	21	0.4	0.0	74	66	90	1.3	1.7	29	34	116	2.1	6.3
Gunarcelai 1220 D62 210 10.3 0.4 0.5 35.4 110 22.5 10.3 0.0 0.2 53.4 110 12.5 110 12.5 110 12.5 110 12.5 10.5 0.6 10.7 13.1 14.5 25.5 10.7 23.1 13.1 14.6 25.5 10.7 23.1 13.1 14.6 23.5 10.1 13.1<	Dondi Luhara	1263	276	22	0.3	0.2	47	45	95	1.8	4.3	1115	237	21	0.5	0.6	70	63	90	1.2	1.0	31	35	111	1.5	2.0
Gurur 1280 1211 270 34 42 93 18 4.6 1111 26 101 14 18 17 2111 72 1211 72 131 131 133 133 133 133 131	Gunderdehi	1220	265	22	0.3	0.1	45	64	141	5.0	35.4	1087	225	21	0.3	0.0	62	53	86	1.0	0.4	27	32	118	1.9	4.0
Balada Bazar 1211 229 23 0.4 0.4 90 97 91 13 13 1101 15 23 Bilagarh 1311 304 23 0.6 0.4 45 91 17 35 1169 269 23 0.6 65 48 86 10 10 13 13 119 101 15 33 06 16 44 97 16 14 101 15 24 23 101 101 12 22 101 101 11 110 112 101 101 101 111 110 112 101 1111 111 111 111	Gurur	1250	264	21	0.3	0.2	45	42	93	1.8	4.6	1111	226	20	0.2	0.1	67	63	94	1.4	1.8	27	32	117	2.6	10.1
Bilaigari 1176 291 25 0.2 0.3 40 47 96 17 31	Baloda Bazar	1211	279	23	0.4	0.3	35	39	112	2.1	5.5	1095	249	23	0.5	0.8	50	49	97	1.3	1.4	31	31	101	1.5	2.5
Bilagarh 131 304 23 0.6 49 47 37 38 1160 269 22 0.6 55 48 56 10 0.7 37 38 1160 1262 292 13 148 112 118 113 113 118 118 113 113 118 111 113 118 111 113 1118 113	Bhatapara	1176	291	25	0.2	-0.4	36	41	112	1.9	3.7	1060	259	24	0.3	-0.3	49	47	96	1.3	1.7	31	31	99	1.3	1.3
Kasolo 1222 289 23 0.4 0.1 42 1104 216 23 55 39 66 44 32 35 106 106 23 55 107 27 26 0.0 116 24 31 116 22 33 106 25 107 21 44 15 12 31 106 25 107 11 14 18 100 15 44 15 12 31 106 25 107 13 14 18 101 12 23 10 100 23 14 14 18 14 14 13 21 13 23 13 13 23 13 13 14 13 14 13 14 13 14 13 121 25 10 13 14 13 121 23 13 13 13 13 13 14 13 131	Bilaigarh	1311	304	23	0.6	0.6	49	45	91	1.7	3.5	1169	269	23	0.6	0.6	56	48	86	1.0	0.7	37	38	104	1.6	3.0
Patri 1188 315 27 0.4 0.01 34 40 118 1.01 1.02 26 0.0 1.2 1.5 1.3 1.05 265 0.3 0.1 2.5 0.5 0.1	Kasdol	1252	289	23	0.4	0.1	42	42	101	1.9	4.2	1123	248	22	0.4	0.3	55	53	96	1.6	4.4	32	35	109	1.8	4.3
Simaga 1180 296 25 0.2 36 40 112 1.8 3.3 1.06 2.6 2.8 1.3 1.5 1.8 1.0 1.5 2.5 3.9 1.3 1.9 Raipur 1398 293 21 0.0 2.5 21 0.1 0.0 2.5 2.1 8.1 1.1 0.0 5.5 4.8 7.1 1.2 Raimuigani 1400 30.2 2.2 0.1 6.6 1.6 1.8 1.0 0.6 5.5 1.8 1.1 1.3 1.2 2.5 1.3 1.5 2.5 0.8 1.3 1.2 1.3 1.5 1.3 1.5 1.3 1.5 1.3 1.5 1.3 1.5 1.3 1.5 1.3 1.5 1.3 1.5 1.3 1.5 1.3 1.5 1.3 1.5 1.3 1.5 1.3 1.5 1.3 1.5 1.3 1.5 1.3 1.5 </td <td>Palari</td> <td>1188</td> <td>315</td> <td>27</td> <td>0.4</td> <td>-0.1</td> <td>34</td> <td>40</td> <td>118</td> <td>2.1</td> <td>5.1</td> <td>1074</td> <td>276</td> <td>26</td> <td>0.5</td> <td>0.1</td> <td>52</td> <td>55</td> <td>107</td> <td>2.1</td> <td>6.4</td> <td>28</td> <td>31</td> <td>113</td> <td>1.6</td> <td>2.5</td>	Palari	1188	315	27	0.4	-0.1	34	40	118	2.1	5.1	1074	276	26	0.5	0.1	52	55	107	2.1	6.4	28	31	113	1.6	2.5
Balampur 1398 233 21 0.0 2.5 21 78 61 10 0.0 55 48 1.4 1.3 Ramanujanj 1207 260 22 0.0 0.2 17 1.5 10 10.0 55 48 1.4 0.4 Samarkagent 1416 30.6 22 0.1 0.2 37 31 81 1.5 1.1 1.0 1.2 1.0 0.5 55 85 1.3 1.2 Bakawan 1416 30.6 22 0.1 0.6 1.5 1.3 1.2 2.0 0.3 6.1 11.0 11.2 2.0 1.0 0.3 1.6 1.0 1.1 <th< td=""><td>Simga</td><td>1180</td><td>296</td><td>25</td><td>0.2</td><td>-0.2</td><td>36</td><td>40</td><td>112</td><td>1.8</td><td>3.3</td><td>1065</td><td>262</td><td>25</td><td>0.3</td><td>0.1</td><td>51</td><td>48</td><td>95</td><td>1.3</td><td>1.5</td><td>29</td><td>30</td><td>105</td><td>1.3</td><td>1.2</td></th<>	Simga	1180	296	25	0.2	-0.2	36	40	112	1.8	3.3	1065	262	25	0.3	0.1	51	48	95	1.3	1.5	29	30	105	1.3	1.2
Ramanugan 1398 293 21 0.0 7.5 61 81 1.0 0.6 57 87 1.1 0.0 51 48 87 1.4 1.0 0.6 57 87 1.1 0.0 51 48 1.0 0.4 Sumardingan 1416 306 22 0.0 0.0 1.8 1.0 0.0 51 81 1.1 1.8 1.00 2.5 1.3 1.2 1.00 0.0 1.4 1.00 0.0 51 48 1.00 1.00 51 48 1.00	Balrampur	1304	303	23	0.1	-0.1	49	39	79	1.1	1.0	1126	262	23	0.1	-0.2	74	64	87	1.3	2.0	55	49	89	1.3	1.9
Ramanujagani 1207 220 22 -0.1 -0.1 66 57 1.1 0.9 51 43 84 1.0 0.4 Samar(kussini 1409 327 0.4 0.3 0.1 63 51 81 1.4 3.4 123 255 21 0.3 0.1 84 1.3 1.8 56 50 89 1.3 1.2 Bakavand 1544 282 10 0.3 12 53 43 0.6 0.7 1278 257 0.0 0.4 119 82 69 0.9 0.5 28 36 124 28 124 28 124 28 130 1.42 28 1.0 0.6 28 142 28 1.0 0.6 28 142 28 1.0 1.2 270 1.2 127 83 66 0.9 0.7 23 122 2.9 1.4 1.42 1.2 2.0	Rajpur	1398	293	21	0.0	-0.2	52	41	78	1.3	2.0	1216	250	21	0.1	0.0	75	61	81	1.0	0.6	55	48	87	1.4	2.3
Samri(kusmi) 1409 337 24 0.3 0.1 69 48 69 0.6 -10.6 1190 281 24 0.4 0.1 91 13 12 Shankargami 1190 239 20 0.1 0.2 37 31 83 1.5 2.7 1041 208 20 0.1 1.6 80 1.1 1.1 1.2 30 121 2.8 1.8 5.8 1.0 0.7 1.72 227 20.0 0.0 1.16 80 0.1 1.1 2.8 1.0 0.3 28 312 28 1.1 1.8 1	Ramanujganj	1207	260	22	-0.1	-0.2	41	34	81	1.4	1.8	1049	226	22	-0.1	-0.1	66	57	87	1.1	0.9	51	43	84	1.0	0.4
Shankargamh 1416 306 22 0.0 0.0 103 101 120 290 0.0 0.0 0.1 103 101 120 205 101 0.3 0.1 116 84 1.0 107 54 24 10 0.3 0.1 116 80 60 10.1 11.1 25 30 121 23 34 10.6 0.0 0.1 116 80 60 10.1 11.2 23 30 12.2 81 13.3 12.2 13.4 24 10.1 127 22.6 10.4 10.4 119 26 60 0.0 0.2 23 112 23.4 12.2 13.4 12.2 13.2 14.1 14.2 13.2 14.1 24.2 13.2 14.1 24.2 13.2 14.1 23.3 12.2 13.3 13.2 14.1 13.3 13.3 13.2 13.2 14.1 13.3 13.3 13.3 13.3 13.3 13.3 13.3 13.3 13.3 13.3 13.3 13.3	Samri(kusmi)	1409	337	24	0.3	0.1	69	48	69	0.6	-0.6	1190	281	24	0.4	-0.1	91	74	81	1.3	2.1	59	50	85	1.3	1.2
Wadarfnagar 1190 239 20 0.1 0.2 37 18 15.5 27 10.41 208 0.1 0.3 0.1 11.6 80.6 0.1 11.1 12 23 122 13.5 210 121 220 124 120 121 123 121 133 121 133 121 133 121 133 121 133 121 133 121 133 121 133 121 133 121 133 121 133 121 133 121 133 121 121 133 121 121 133 121 121 133 121 121 133 121 133 131 133 121 133 121 133 131 133 111 133 131 133 121 133 121 133 121 133 121 133 121 133 131 131 131 131 131 131 131 131 131 131 131 131 131 131	Shankargarh	1416	306	22	0.3	0.1	63	51	81	1.4	3.4	1213	255	21	0.3	-0.1	84	70	84	1.3	1.8	56	50	89	1.3	1.2
Bakavand 1547 286 10 0.3 0.1 11 12 53 0.1 </td <td>Wadrafnagar</td> <td>1190</td> <td>239</td> <td>20</td> <td>-0.1</td> <td>0.2</td> <td>37</td> <td>31</td> <td>83</td> <td>1.5</td> <td>2.7</td> <td>1041</td> <td>208</td> <td>20</td> <td>-0.1</td> <td>0.3</td> <td>61</td> <td>51</td> <td>84</td> <td>1.0</td> <td>0.7</td> <td>51</td> <td>42</td> <td>82</td> <td>1.0</td> <td>0.2</td>	Wadrafnagar	1190	239	20	-0.1	0.2	37	31	83	1.5	2.7	1041	208	20	-0.1	0.3	61	51	84	1.0	0.7	51	42	82	1.0	0.2
Bastanar 154 28 19 0.3 0.3 121 53 43 0.6 0.7 1278 257 20 0.4 0.4 0.4 119 82.6 0 0.5 283 4124 281 225 Darbhia 1593 279 18 0.3 0.2 133 55 41 0.7 0.5 1306 253 19 0.4 0.4 0.4 1.3 0.2 1.3 1.5 0.4 0.4 0.4 0.4 1.3 0.6 1.27 283 0.6 0.9 0.4 0.4 2.2 1.8 0.4 0.5 1.2 1.2 1.2 1.2 1.2 1.2 1.3 1.1 1.3 </td <td>Bakavand</td> <td>1544</td> <td>282</td> <td>18</td> <td>0.4</td> <td>0.5</td> <td>122</td> <td>66</td> <td>54</td> <td>2.0</td> <td>7.4</td> <td>1282</td> <td>244</td> <td>19</td> <td>0.3</td> <td>0.1</td> <td>116</td> <td>80</td> <td>69</td> <td>1.1</td> <td>1.1</td> <td>25</td> <td>30</td> <td>121</td> <td>2.8</td> <td>13.8</td>	Bakavand	1544	282	18	0.4	0.5	122	66	54	2.0	7.4	1282	244	19	0.3	0.1	116	80	69	1.1	1.1	25	30	121	2.8	13.8
Bastar 1550 282 18 0.4 1.28 1.29 1.26 1.26 19 0.4 0.4 0.2 126 81 0.0 2.83 384 12.4 12.8 12.3 12.3 12.4 10.70 0.51 0.06 0.9 12.7 83 65 0.9 0.7 2.7 33 12.3 2.9 14.2 12.8 12.7 22.6 20 0.6 0.9 12.7 83 65 0.9 0.7 2.7 33 12.3 2.9 14.1 2.6 10.0 0.4 2.9 36 12.4 2.6 10.9 2.7 33 10.2 2.9 36 12.4 2.0 0.4 0.3 32 94 4.1	Bastanar	1547	286	19	0.3	0.3	121	53	43	0.6	0.7	1278	257	20	0.4	0.4	119	82	69	0.9	0.3	28	36	128	2.8	11.4
Darbha 159 279 18 0.3 0.2 135 62 40 0.5 126 81 64 0.9 0.5 27 33 123 29 14.5 Lohandiguda 1538 287 19 0.4 0.4 12 53 20 0.5 0.5 118 82 70 0.9 0.4 29 36 126 2.8 1.6 Bemetara 1167 234 0.4 0.5 33 39 103 2.2 5.8 1062 21 1.0 0.4 2.3 2.0 31 1.4 1.4 Nawagarh 1187 244 21 0.2 0.4 1.3 39 103 2.2 5.8 1062 21 0.4 0.8 81 1.0 0.5 36 48 1.1 1.4 1.4 2.1 2.0 1.4 1.3 1.3 1.1 2.1 1.3 1.3 1.1 1.1	Bastar	1550	282	18	0.5	0.5	128	59	46	1.0	1.9	1276	246	19	0.4	0.4	119	82	69	1.0	0.6	28	34	124	2.8	12.5
Jagadapur 1621 1289 18 0.4 0.4 1.43 62 44 1.52 2.84 1.332 2.64 0.0 0.5 118 83 60 0.2 23 31.23 2.9 14.5 Tokapal 1567 287 18 0.4 0.5 17 59 43 0.7 0.8 127 23 20 0.4 0.5 54 47 87 1.0 0.4 23 32 29 3.1 1.1 Berta 1184 244 21 0.3 0.1 37 39 102 2.0 4.0 1062 212 1.0 4.0 48 1.1 1.0 0.4 88 1.1 1.0 0.4 3.8 1.1 0.6 2.1 1.0 1.0 1.0 1.4 1.1 1.3 1.3 1.3 1.3 1.3 1.4 1.0 1.4 1.1 1.3 1.3 1.4 1.0 1.4 2.0 1.1 2.2 2.1 1.3 2.1 1.0 1.3 1.3 <t< td=""><td>Darbha</td><td>1593</td><td>279</td><td>18</td><td>0.3</td><td>0.2</td><td>133</td><td>55</td><td>41</td><td>0.7</td><td>0.5</td><td>1306</td><td>253</td><td>19</td><td>0.4</td><td>0.2</td><td>126</td><td>81</td><td>64</td><td>0.9</td><td>0.5</td><td>27</td><td>34</td><td>125</td><td>3.0</td><td>14.0</td></t<>	Darbha	1593	279	18	0.3	0.2	133	55	41	0.7	0.5	1306	253	19	0.4	0.2	126	81	64	0.9	0.5	27	34	125	3.0	14.0
Lohandiguda IS38 287 19 0.4 14 12 12 12 12 12 12 12 12 12 12 12 12 12 12 0 0.4 0.4 0.2 0.3 12 12 12 0 0.4 0.3 12 13 13 13 13 13 13 13 13 13 13 13 13 14 14 14 14 14 14 14 14 14 14 14 14 14 14 14 14 14 14 14 15 14 15 14 15 14 15 14 14 14 14 14 14 15 14 15 14 15 14 15 14 15 14 15 14 15 14 15 16 10 10 12 16 10 11 13 13 13 13 13 13 13 13 13 13 12 16 14	Jagdalpur	1621	289	18	0.4	0.4	135	62	46	1.2	2.8	1332	264	20	0.6	0.9	127	83	65	0.9	0.7	27	33	123	2.9	14.5
Tokapal 1567 287 18 0.4 0.5 137 59 43 0.7 0.8 1278 260 0.3 13 84 68 0.9 0.2 29 36 124 26 104 203 20 0.4 0.8 54 47 87 10 0.4 23 23 98 1.3 1.1 Berla 1184 244 21 0.2 0.5 41 88 10 1.5 54 88 1.0 0.4 33 36 104 1.1 5.5 1044 210 0.2 1.0 0.4 34 36 104 1.3 1.1 1.5 36 104 10.0 1.5 420 0.1 0.5 33 34 101 1.3 1.3 1.1 1.3 1.1 1.3 1.3 1.3 1.1 1.3 1.3 1.3 1.3 1.3 1.3 1.3 1.3 1.3 1.3	Lohandiguda	1538	287	19	0.4	0.4	122	54	45	0.7	1.2	1270	253	20	0.5	0.5	118	82	70	0.9	0.4	29	36	126	2.8	11.6
Benetara 1167 234 20 0.4 0.3 33 39 102 2.0 4.9 1042 203 0.4 0.8 54 47 87 1.0 0.4 32 32 18 1.1 Berla 1187 244 21 0.2 0.5 41 38 91 1.7 3.4 1055 214 0.0 55 49 88 1.0 0.5 33 34 101 1.3 1.3 Thanakhamria 1170 238 20 0.4 0.1 39 41 107 2.1 5.5 1044 210 0.4 0.5 33 34 101 1.3 1.3 Bhairamgarh 1491 306 20 0.7 48 85 1.4 1.5 160 0.2 1.0 1.4 1.4 1.2 1.3 1.7 76 0.6 2.2 2.7 1.21 1.3 2.9 1.0 0.1	Tokapal	1567	287	18	0.4	0.5	137	59	43	0.7	0.8	1278	260	20	0.4	0.3	123	84	68	0.9	0.2	29	36	124	2.6	10.9
Berla 1184 248 21 0.3 0.10 2.2 5.8 1062 221 21 0.0 5.4 88 1.1 1.2 30 32 107 1.4 1.4 1.4 Nawagarh 1177 251 10.2 0.5 41 38 101 2.1 5.5 1044 218 21 0.4 0.0 58 52 91 1.0 0.4 34 61 0.4 1.3 1.3 Biaramgarh 1491 308 21 0.5 1.3 76 51 68 1.0 1.0 128 22 1.0 3.5 107 77 72 0.9 0.4 2.5 3.2 1.6 1.0 1.6 2.4 1.0 1.4 2.4 1.17 3.5 1.0 1.6 1.2 2.7 1.16 2.4 8.0 1.0 1.6 2.4 1.0 1.4 1.4 1.4 1.4 1.4 1.4	Bemetara	1167	234	20	0.4	0.3	38	39	102	2.0	4.9	1042	203	20	0.4	0.8	54	47	87	1.0	0.4	32	32	98	1.3	1.1
Nawagam 1187 244 10 2.1 34 105 214 20 1.0 55 49 88 1.0 0.6 36 31 31 31 31 Thanakhamria 1170 238 20 0.4 0.1 39 41 107 2.1 5.5 1044 210 20 5 0.6 56 49 88 1.0 0.5 33 34 101 1.3 1.3 Bhahammia 1435 319 22 0 -0.3 56 48 85 1.4 2.5 1206 322 40 0.4 24 0.4 22 27 121 1.6 2.4 Bilapur 1552 47 23 1.6 2.4 0.7 47 128 35 29 1.0 1.6 4.3 89 0.1 1.2 1.1 1.4 3.4 80 1.2 1.1 1.4 3.4 80 0	Berla	1184	248	21	0.3	-0.1	37	39	103	2.2	5.8	1062	221	21	0.4	0.0	54	48	88	1.1	1.2	30	32	107	1.4	1.4
Saja 1177 251 21 0.3 -0.2 41 43 104 2.1 5.5 1044 218 21 0.4 0.4 0.5 53 34 101 1.3 1.3 Bhairamgarh 149 308 21 0.5 1.3 76 51 68 1.0 1.0 128 286 22 1.0 0.5 1.0 1.0 2.8 2.6 0.6 56 49 88 1.0 1.0 1.28 2.6 0.5 1.0 1.0 4.97 68 70 0.4 0.4 2.2 2.12 1.6 2.4 1.0 1.0 1.4 2.7 2.12 1.0 0.6 1.8 1.1 7.6 0.1 1.1 44 48 0.0 1.2 1.2 1.4 4.5 80 0.7 1.17 7.6 0.8 0.6 0.1 2.3 84 0.1 0.1 2.3 84 0.1 0.1	Nawagarh	1187	244	21	0.2	0.5	41	38	91	1.7	3.4	1055	214	20	0.2	1.0	55	49	88	1.0	0.5	36	31	88	1.1	0.6
Thanakhamra 1170 238 20 0.4 0.7 21 5.5 1042 207 0.5 0.6 56 49 88 1.0 0.5 33 34 101 1.3 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.3 <t< td=""><td>Saja</td><td>1177</td><td>251</td><td>21</td><td>0.3</td><td>-0.2</td><td>41</td><td>43</td><td>104</td><td>2.1</td><td>5.5</td><td>1044</td><td>218</td><td>21</td><td>0.4</td><td>0.0</td><td>58</td><td>52</td><td>91</td><td>1.0</td><td>0.4</td><td>34</td><td>36</td><td>104</td><td>1.3</td><td>1.3</td></t<>	Saja	1177	251	21	0.3	-0.2	41	43	104	2.1	5.5	1044	218	21	0.4	0.0	58	52	91	1.0	0.4	34	36	104	1.3	1.3
Bhairangamh 1491 308 21 0.5 1.3 76 51 68 1.0 1.0 128 286 21 1.0 7.7 72 0.9 0.4 22 23 1.28 23 6.8 Binpaplatam 1435 319 22 0 0.3 56 48 85 1.4 2.9 120 0.1 0.4 97 68 70 0.8 0.4 22 27 1.2 1.6 2.4 Bilapur 1525 347 23 0.6 79 48 60 2.0 7.4 128 120 1.2 4.4 85 52 91 1.0 0.6 43 89 0.1 2.2 1.2 1.1 2.4 48 80 90 1.2 1.4 43 86 0.9 0.1 2.2 1.2 1.1 1.2 1.4 34 86 0.9 0.1 2.2 1.2 1.1 1.3 38 90 1.2 1.2 1.2 1.4 3.8 90 1.2 <	Thanakhamria	1170	238	20	0.4	0.1	39	41	107	2.1	5.5	1042	207	20	0.5	0.6	56	49	88	1.0	0.5	33	34	101	1.3	1.3
Bhopalpatanam 1435 319 22 0 -0.3 56 48 85 1.4 2.5 1260 302 20 0.6 0.4 22 27 121 1.6 2.4 Bijapur 1525 347 23 0.6 0.9 74 47 63 1.4 2.9 1317 335 25 0.9 1.8 112 77 60 1.0 1.1 23 29 129 2.6 1.0 Bilaspur 1351 263 20 1.0 3.3 42 40 96 2.2 7.2 1210 239 20 1.2 4.4 58 52 91 1.0 0.6 43 38 90 1.2 1.2 Bilha 1265 233 18 0.4 45 41 90 2.2 80 1.7 2.1 1.6 61 54 80 0.9 0.2 45 88 41 0.8 1.4 2.0 1.4 2.0 1.8 1.6 61 54 80	Bhairamgarh	1491	308	21	0.5	1.3	76	51	68	1.0	1.0	1283	286	22	1.0	3.5	107	77	72	0.9	0.4	25	32	128	2.3	6.8
Bigapur 1525 34/2 23 0.6 0.9 74 47 65 1.4 2.9 1.5 1.5 1.2 7.7 66 1.0 1.1 2.5 1.9 1.8 1.1 7.7 66 0.8 0.6 21 25 1.8 1.2 1.7 7.7 66 0.8 0.6 21 25 1.8 90 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.1 40 34 86 0.9 0.1 1.1 2.2 1.1 1.1 40 34 86 0.9 0.1 1.1 40 34 86 0.9 0.1 1.1 1.0 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1	Bhopalpatanam	1435	319	22	0	-0.3	56	48	85	1.4	2.5	1260	302	24	0.1	-0.4	97	68	70	0.8	0.4	22	27	121	1.6	2.4
Usur 1504 386 26 0.7 9 48 60 2.0 7.4 1287 363 28 0.8 0.7 117 77 66 0.8 0.6 21 25 118 1.9 4.3 Bilha 1265 235 19 0.4 0.6 42 40 94 2.0 5.4 1129 213 10 0.6 1.8 85 50 93 1.2 1.1 40 34 86 0.9 0.1 1.2 1.1 1.4 34 86 0.9 0.1 1.5 1.6 61 54 89 0.9 -0.2 45 38 84 1.1 0.8 Marwahi 1317 239 18 0.1 0.5 44 27 7 1.75 52 115 214 19 0.7 1.9 68 89 0.9 0.3 53 46 81 1.0 1.1 1.1 1.3 36 4.1 1.1 1.1 1.5 64 80 1.1 1.1	Bijapur	1525	347	23	0.6	0.9	74	47	63	1.4	2.9	1317	335	25	0.9	1.8	112	77	69	1.0	1.1	23	29	129	2.6	10.3
Bilaspur 151 263 20 1.0 3.3 42 40 96 2.2 7.2 120 213 20 1.4 38 52 91 1.0 0.6 4.3 38 90 1.2 1.2 Bilha 1265 235 19 0.4 0.6 4.4 54 1129 213 19 0.6 1.8 54 50 93 1.2 1.1 40 34 86 0.9 0.1 Kota 1323 243 18 0.1 0.3 54 42 78 1.7 4.3 1142 209 18 0.5 0.8 66 58 88 1.0 0.7 55 46 84 1.2 1.4 Masturi 1309 256 20 0.6 1.3 39 39 102 2.2 7.0 1178 232 20 0.8 60 89 0.9 0.3 53 46 85 1.1 1.1 1.5 6.4 80 1.1 1.1 1.5 6.45	Usur	1504	386	26	0.7	0.6	19	48	60	2.0	7.4	1287	365	28	0.8	0.7	117	77	66	0.8	0.6	21	25	118	1.9	4.3
Bina 1265 253 19 0.4 0.6 1.42 40 94 2.0 5.4 1129 213 19 0.5 1.8 54 50 93 1.2 1.1 40 34 86 0.9 0.1 Kota 1317 239 18 0.1 0.3 54 42 78 1.7 4.3 1142 209 18 0.5 1.6 61 54 89 0.9 0.2 245 38 41 1.0 8 Masturi 1309 256 20 0.6 1.3 39 39 102 2.2 7 1.7 5.2 1156 214 19 0.7 1.9 68 60 89 0.9 0.3 53 46 85 1.3 2.2 1156 214 19 0.7 1.9 68 60 89 0.9 0.3 53 46 85 1.3 2.2 Pendra 1336 236 18 0.1 0.0 61 43 105 1.6	Bilaspur	1351	263	20	1.0	3.3	42	40	96	2.2	7.2	1210	239	20	1.2	4.4	58	52	91	1.0	0.6	43	38	90	1.2	1.2
Kota 132 243 18 0.1 0.3 44 90 0.5 1.6 61 54 89 0.9 0.2 24 38 84 1.1 0.8 Marwahi 1317 239 18 0.1 0.3 54 42 78 1.7 4.3 1142 209 18 0.5 0.8 66 58 81 1.0 0.7 55 46 84 1.2 1.4 Masturi 1309 256 20 0.6 1.3 39 39 102 2.2 1.16 82 22 0.8 2.3 54 50 92 1.1 1.1 1.3 86 94 1.3 1.6 4.8 1148 208 18 0.5 1.1 <td>Bilna</td> <td>1265</td> <td>235</td> <td>19</td> <td>0.4</td> <td>0.6</td> <td>42</td> <td>40</td> <td>94</td> <td>2.0</td> <td>5.4</td> <td>1129</td> <td>213</td> <td>19</td> <td>0.6</td> <td>1.8</td> <td>54</td> <td>50</td> <td>93</td> <td>1.2</td> <td>1.1</td> <td>40</td> <td>34</td> <td>80</td> <td>0.9</td> <td>0.1</td>	Bilna	1265	235	19	0.4	0.6	42	40	94	2.0	5.4	1129	213	19	0.6	1.8	54	50	93	1.2	1.1	40	34	80	0.9	0.1
Marwam 1317 239 18 0.1 -0.5 34 42 78 174 209 18 0.7 0.8 88 1.0 0.7 53 40 84 1.2 1.4 Masturi 1309 262 0 61 3 99 90 2.2 7.0 7.5 1178 232 20 0.8 60 89 0.9 0.3 53 46 85 1.3 2.6 Pendra 1336 236 18 0.1 0.5 1.1 71 96 68 60 89 0.9 0.3 53 46 81 1.2 2 Pendra 1336 237 19 0.0 61 44 41 92 1.8 4.7 1105 216 20 0.3 1.7 57 54 94 1.1 1.0 64 80 0.9 43 37 10 0.5 27 37 118 203 118 203 114 12.1 114 133 11 1.1	Kota	1323	243	18	0.2	0.4	45	41	90 70	2.2	8.0	11/2	218	19	0.5	1.0	61	54	89	0.9	-0.2	45	38	84	1.1	0.8
Masturi 1509 250 20 0.6 1.3 39 39 102 2.2 7.0 1178 232 20 0.8 2.3 54 50 92 1.1 1.1 1.8 36 94 1.3 1.6 Pendra 1331 239 18 0.3 0.4 44 12 1.156 214 19 0.7 1.9 68 60 89 0.9 0.3 53 46 85 1.1 1.1 1.6 4.8 1.1 1.1 1.6 4.8 1.1 1.1 1.6 4.8 8 1.1 1.0 68 60 89 0.9 0.3 53 46 85 1.1 1.1 1.0 0.4 80 1.1 1.1 1.1 1.0 0.4 80 0.0 1.1 1.10 0.3 1.7 57 54 94 1.1 0.0 0.7 1.1 1.0 0.1 1.12 1.1 1.0 0.2 1.1 1.1 1.6 0.0 1.12 1.1 1.1 <td< td=""><td>Marwani</td><td>1317</td><td>239</td><td>18</td><td>0.1</td><td>-0.3</td><td>20</td><td>42</td><td>/8</td><td>1.7</td><td>4.5</td><td>1142</td><td>209</td><td>18</td><td>0.5</td><td>0.8</td><td>54</td><td>50</td><td>88</td><td>1.0</td><td>0.7</td><td>20</td><td>40</td><td>84</td><td>1.2</td><td>1.4</td></td<>	Marwani	1317	239	18	0.1	-0.3	20	42	/8	1.7	4.5	1142	209	18	0.5	0.8	54	50	88	1.0	0.7	20	40	84	1.2	1.4
Pendra 1351 239 18 0.5 0.4 34 42 77 1.7 5.2 1136 214 19 0.7 1.9 08 00 80 0.9 0.5 0.5 0.5 0.4 0.5 1.7 0.2 0.8 0.5 1.1 72 63 87 1.1 1.1 56 45 80 0.1 0.1 0.9 0.3 7 57 54 94 1.1 0.9 43 37 86 0.9 0.2 0.3 1.7 57 54 94 1.1 0.9 43 37 86 0.9 0.2 0.3 1.1 1.0 62 37 147 3.1 12.7 Gidam 1534 334 22 0.7 1.9 100 56 56 1.0 1.2 1233 30 1.1 1.0 65 43 80 1.1 1.1 1.6 43 41 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1	Dandro	1221	230	10	0.0	1.5	59	39	102	2.2	7.0	11/0	232	20	0.8	2.3	54	50	92	1.1	1.1	50	30	94	1.3	1.0
Pendra Road 130 230 130 0.1 0.0 0.1 44 15 1.0 4.3 1148 208 18 0.3 1.1 172 0.3 87 1.1 1.1 0.6 4.3 111 111 Takhatpur 1249 237 19 0.2 0.4 44 41 92 1.8 4.7 1105 216 20 0.3 1.7 57 54 94 1.1 0.9 43 37 86 0.9 0.0 1323 321 24 1.4 6.4 117 83 71 1.0 0.6 25 55 8 0.9 0.6 1323 321 24 1.4 6.4 117 83 71 1.0 0.6 25 37 1.1 1.7 0.6 25 37 1.7 71 1.0 0.6 25 37 1.0 1.2 1.293 30 0.1 1.23 81 66 0.9 0.4 25 35 1.0 1.0 1.0 2.0 1.1 1.1	Pendra Road	1331	239	10	0.5	0.4	54 61	42	72	1./	3.2	1130	214	19	0.7	1.9	72	62	09 07	0.9	0.5	55	40	80	1.5	2.2
Takhapur 1249 237 19 0.2 0.4 44 41 92 1.3 4.7 1103 210 20 0.3 1.7 57 54 94 1.1 0.5 43 57 66 0.9 0.6 Dantewada 1562 337 22 0.9 3.6 96 55 58 0.9 0.6 1323 321 24 1.4 6.4 117 83 71 1.1 0.6 25 37 147 3.1 12.7 Gidam 1571 296 19 0.2 0.1 112 53 47 0.6 0.0 1311 270 21 0.3 0.1 123 81 66 0.9 0.4 25 35 140 3.1 13.7 Kuakonda 1564 307 20 0.3 0.2 0.4 42 0.4 41 19 130 233 21 0.2 0.4 25 35 10.2 131 233 21 0.2 0.2 23 33 <td>Telshetpur</td> <td>1240</td> <td>230</td> <td>10</td> <td>0.1</td> <td>0.0</td> <td>44</td> <td>44</td> <td>13</td> <td>1.0</td> <td>4.0</td> <td>1140</td> <td>200</td> <td>10</td> <td>0.3</td> <td>1.1</td> <td>57</td> <td>54</td> <td>0/</td> <td>1.1</td> <td>1.1</td> <td>12</td> <td>43</td> <td>86</td> <td>1.1</td> <td>1.1</td>	Telshetpur	1240	230	10	0.1	0.0	44	44	13	1.0	4.0	1140	200	10	0.3	1.1	57	54	0/	1.1	1.1	12	43	86	1.1	1.1
Damewada 1302 33 22 0.3 30 30 30 30 0.3 0.1 0.3 0.1 1.1 0.3 0.1 0.3 0.1 0.3 0.1 0.3 0.1 0.3 0.1 1.2 1.4 8.3 7.3 1.0 0.5 27 37 1.38 3.0 1.2.3 Katekalyan 1571 296 19 0.2 0.1 112 53 47 0.6 0.0 1311 270 21 0.3 0.1 123 81 66 0.9 0.4 25 35 140 3.1 3.7 Kuakonda 1564 307 20 0.3 44 4.0 1.10 1130 233 21 0.2 0.4 2.5 35 147	Dantawada	1249	237	22	0.2	3.6	44 06	41 55	92 58	1.0	4.7	1323	210	20	0.5	1.7	117	93	94 71	1.1	0.9	43 25	37	00 147	0.9	-0.2
Kuaking 1534 254 22 0.1 1.0 0.0 <	Gidam	1502	334	22	0.9	1.9	100	56	56	1.0	1.2	1203	306	24	1.4	4 2	117	83	73	1.1	0.0	23	37	138	3.1	12.7 12.3
Katckalyani 1371 230 17 0.3 0.1 112 0.3 0.1 123 0.1 0.3 0.2 124 82 66 0.9 0.3 23 131 112 15. 19. 1150 266 23 0.2 0.0 0.5 65 100 <	Katekalyan	1571	206	10	0.7	0.1	112	53	17	0.6	0.0	1275	270	24	0.3	4.2	123	81	66	0.0	0.5	27	37	1/0	3.0	12.3 13.7
Rudondal 1304 307 20 0.3 0.4 1310 1310 23 21 0.3 0.4 1310 23 21 0.3 0.4 0.3 124 0.2 0.6 0.3 127 127 131 123 123 124 0.2 0.6 0.3 131 123 123 124 0.2 0.6 0.3 0.3 123 131 127 131 131 123 21 0.2 0.1 68 65 96 1.5 2.0 27 31 117 2.5 9.2 Kurud 1287 298 23 0.2 -0.2 45 43 97 1.5 1.9 1150 266 23 0.2 0.0 65 65 100 1.6 2.6 28 32 115 1.8 3.9 Magri 1347 291 22 0.2 -0.1 60 53 90 1.3 1.0 1188 262 22 0.2 -0.4 74 73 100 1.7 3.5	Kuakonda	1564	307	20	0.2	0.1	98	53	7 7 54	0.0	0.0	1318	293	21	0.5	0.1	123	82	66	0.9	0.4	23	33	140	2.1	10.7
Binantial 1270 200 21 0.2 0.3 40 42 20 1.4 1.9 1130 235 21 0.2 0.1 0.6 035 00 1.3 2.0 21 0.12 0.1 0.6 035 00 1.3 2.0 21 0.12 0.1 0.6 035 00 1.3 2.0 21 0.12 0.1 0.6 035 00 1.5 2.0 21 0.1 21	Dhamtari	1270	266	20	0.3	0.2	46	42	90	1.4	1.9	1130	233	21	0.5	0.2	68	65	96	1.5	2.0	23	31	142	2.7	9.2
Magarlod 1353 316 23 0.2 0.2 52 52 98 1.3 0.8 1202 284 24 0.1 -0.3 71 73 104 1.8 3.8 27 33 122 1.9 4.6 Magri 1347 291 22 0.2 -0.1 60 53 90 1.3 1.0 1188 262 22 0.2 -0.4 74 73 100 1.7 3.5 26 33 128 2.4 8.2 Dhamdha 1217 245 20 0.2 -0.2 45 50 110 3.8 22 1081 215 20 0.4 -0.1 59 52 88 1.1 0.9 32 33 103 1.4 1.6 Durg 1227 273 22 0.6 1.5 50 104 205 8.6 85.4 1087 23 0.1 61 55 91 1.2 1.4 29 33 113 1.5 1.9 Patan <td>Kurud</td> <td>1270</td> <td>200</td> <td>23</td> <td>0.2</td> <td>-0.2</td> <td>45</td> <td>43</td> <td>97</td> <td>1.4</td> <td>1.9</td> <td>1150</td> <td>255</td> <td>21</td> <td>0.2</td> <td>0.1</td> <td>65</td> <td>65</td> <td>100</td> <td>1.5</td> <td>2.0</td> <td>28</td> <td>32</td> <td>115</td> <td>1.8</td> <td>3.9</td>	Kurud	1270	200	23	0.2	-0.2	45	43	97	1.4	1.9	1150	255	21	0.2	0.1	65	65	100	1.5	2.0	28	32	115	1.8	3.9
Nagri 1347 291 22 0.2 0.1 60 53 90 1.3 1.0 1188 262 22 0.2 0.4 74 73 100 1.7 3.5 26 33 122 1.9 1.3 Nagri 1347 291 22 0.2 -0.1 60 53 90 1.3 1.0 1188 262 22 0.2 -0.4 74 73 100 1.7 3.5 26 33 128 2.4 8.2 Dhamdha 1217 245 20 0.2 -0.2 45 50 110 3.8 22 1081 215 20 0.4 -0.1 59 52 88 1.1 0.9 32 33 103 1.4 1.6 Durg 1227 273 22 0.6 1.5 50 104 205 8.6 85.4 1087 223 21 0.3 0.1 61 55 91 1.2 1.4 29 33 113 1.5 1.9 </td <td>Magarlod</td> <td>1353</td> <td>316</td> <td>23</td> <td>0.2</td> <td>-0.2</td> <td>52</td> <td>52</td> <td>98</td> <td>1.3</td> <td>0.8</td> <td>1202</td> <td>$\frac{200}{284}$</td> <td>$\frac{23}{24}$</td> <td>0.2</td> <td>-0.3</td> <td>71</td> <td>73</td> <td>100</td> <td>1.0</td> <td>3.8</td> <td>20</td> <td>33</td> <td>122</td> <td>1.0</td> <td>4.6</td>	Magarlod	1353	316	23	0.2	-0.2	52	52	98	1.3	0.8	1202	$\frac{200}{284}$	$\frac{23}{24}$	0.2	-0.3	71	73	100	1.0	3.8	20	33	122	1.0	4.6
Integr	Nagri	1333	291	22	0.2	-0.1	60	53	90	1.3	1.0	1188	267	22	0.1	-0.4	74	73	100	1.0	3.5	26	33	122	2.4	8.2
Durg 127 273 22 0.6 1.5 50 104 205 8.6 85.4 1087 223 21 0.3 0.1 61 55 91 1.2 1.4 29 33 113 1.5 1.9 Patan 1249 277 22 0.2 -0.2 46 39 84 1.5 2.7 1111 251 23 0.4 0.1 61 55 91 1.2 1.4 29 33 113 1.5 1.9 Patan 1249 277 22 0.2 -0.2 46 39 84 1.5 2.7 1111 251 23 0.4 0.1 61 57 92 1.2 1.0 30 31 101 1.5 2.3 Gariyaban 1322 280 21 0.0 -0.2 50 44 90 1.4 1.6 1180 245 21 0.0 -0.3 64 59 93 1.4 2.4 29 33 114 1.8 4.2 <	Dhamdha	1217	245	20	0.2	-0.2	45	50	110	3.8	22	1081	215	20	0.2	-0.1	59	52	88	1.7	0.9	32	33	103	14	1.6
Patan 1249 277 22 0.2 0.2 46 39 84 1.5 2.7 111 251 23 0.4 0.1 61 57 92 1.2 1.0 30 31 101 1.5 2.3 Gariyaban 1323 268 20 0.1 -0.1 55 49 89 1.2 0.8 1173 235 20 0.1 61 57 92 1.2 1.0 30 31 101 1.5 2.3 Gariyaban 1323 268 20 0.1 -0.1 55 49 89 1.2 0.8 1173 235 20 0.1 -0.4 69 68 98 1.8 4.8 27 32 118 2.2 7.5 Chhura 1322 280 21 0.0 -0.2 50 44 90 1.4 1.6 1180 245 21 0.0 -0.3 64 59 93 1.4 2.4 29 33 114 1.8 4.2	Durg	1227	273	2.2	0.6	1.5	50	104	205	8.6	85.4	1087	223	2.1	0.3	0.1	61	55	91	1.2	1.4	2.9	33	113	1.5	1.9
Gariyaban 1323 268 20 0.1 0.5 49 89 1.2 0.8 1173 235 20 0.1 <th0.1< th=""> 0.1 <th0.1< th=""> <th< td=""><td>Patan</td><td>1249</td><td>277</td><td>22</td><td>0.2</td><td>-0.2</td><td>46</td><td>39</td><td>84</td><td>1.5</td><td>2.7</td><td>1111</td><td>251</td><td>23</td><td>0.5</td><td>0.1</td><td>61</td><td>57</td><td>92</td><td>1.2</td><td>1.7</td><td>30</td><td>31</td><td>101</td><td>1.5</td><td>2.3</td></th<></th0.1<></th0.1<>	Patan	1249	277	22	0.2	-0.2	46	39	84	1.5	2.7	1111	251	23	0.5	0.1	61	57	92	1.2	1.7	30	31	101	1.5	2.3
Chhura 1322 280 21 0.0 -0.2 50 44 90 1.4 1.6 1180 245 21 0.0 -0.3 64 59 93 1.4 2.4 29 33 114 1.8 4.2 Deobhog 1327 304 23 0.2 0.5 79 64 81 2.0 4.9 1144 274 24 0.2 0.1 80 81 101 2.3 7.8 25 29 117 1.8 3.2 Mainpur 1259 271 22 -0.1 0.1 68 57 84 1.5 2.2 1096 237 22 0.0 0.1 73 74 101 1.9 5.1 23 28 125 2.1 4.8	Gariyaban	1323	268	20	0.1	-0.1	55	49	89	1.2	0.8	1173	235	20	0.1	-0.4	69	68	98	1.8	4.8	27	32	118	2.2	7.5
Deobhog 1327 304 23 0.5 79 64 81 2.0 4.9 1144 274 24 0.2 0.1 80 81 101 2.3 7.8 25 29 117 1.8 3.2 Mainpur 1259 271 22 -0.1 0.1 68 57 84 1.5 2.2 1096 237 22 0.0 0.1 73 74 101 1.9 5.1 23 28 125 2.1 4.8	Chhura	1322	280	21	0.0	-0.2	50	44	90	1.4	1.6	1180	245	21	0.0	-0.3	64	59	93	1.4	2.4	29	33	114	1.8	4.2
Mainpur 1259 271 22 -0.1 0.1 68 57 84 1.5 2.2 1096 237 22 0.0 0.1 73 74 101 1.9 5.1 23 28 125 2.1 4.8	Deobhog	1327	304	23	0.2	0.5	79	64	81	2.0	4.9	1144	274	24	0.2	0.1	80	81	101	2.3	7.8	25	29	117	1.8	3.2
	Mainpur	1259	271	22	-0.1	0.1	68	57	84	1.5	2.2	1096	237	22	0.0	0.1	73	74	101	1.9	5.1	23	28	125	2.1	4.8

Rajim	1315	297	23	-0.1	-0.2	44	44	98	1.7	3.3	1181	264	22	0.0	-0.1	61	58	95	1.5	2.5	28	33	116	1.7	2.9
Akaltara	1346	266	20	0.4	0.0	42	39	94	1.9	5.5	1208	239	20	0.5	0.3	56	54	96	1.4	1.9	41	37	91	1.3	2.0
Baloda	1420	422	30	5.8	49.8	43	49	113	3.4	16.9	1275	384	30	6.0	52.6	60	55	93	1.1	0.7	43	45	105	1.8	3.4
Champa	1372	303	22	0.4	0.1	42	40	96	2.1	6.9	1234	267	22	0.5	0.0	58	54	94	1.2	1.4	38	39	102	1.7	4.1
Dabhra	1460	309	21	0.5	2.1	53	43	82	1.5	2.7	1310	284	22	0.7	2.5	58	49	83	1.0	1.1	40	38	97	1.3	1.8
Iaijainur	1381	293	21	0.6	0.8	47	41	88	2.0	5.8	1239	262	21	0.7	11	57	48	85	1.0	0.8	38	38	98	1.5	2.7
Ianigir	1367	276	20	0.3	-0.2	42	38	91	1.0	5.6	1229	244	20	0.4	_0.1	58	55	95	1.0	1.7	40	38	94	1.5	33
Malkharoda	1440	206	20	0.5	1.5	50	12	95	1.5	3.5	1220	270	20	0.4	-0.1	58	10	91	1.5	1.7	30	38	00	1.5	2.3
Nawagarh	1210	290	21	0.0	0.2	42	41	05	1.0 2.1	5.9	1192	210	21	0.0	2.0	55	40	0 4 90	1.1	1.0	29	27	07	1.4	2.5
Damaarh	1209	261	21	0.5	0.3	43	20	95 100	2.1	5.6	1165	240	20	0.7	1.0	54	49	05	1.1	1.0	27	25	91	1.5	2.1
Palingarin S-1-t:	1422	207	21	0.4	0.5	39	39	100	2.0	3.0	1200	250	20	0.0	1.0	54	52	90	1.2	1.2	20	20	90	1.5	3.2
	1432	284	20	0.4	0.2	45	39	80	1.8	4.9	1289	255	20	0.5	0.3	00	33	88	1.2	1.2	59	59	100	1.0	3.5
Bagicha	1518	304	20	0.4	0.6	/3	49	6/	0.7	-0.3	1296	246	19	0.6	0.9	91	/3	82	1.2	1.5	58	51	88	1.4	2.0
Duldula	1549	287	19	0.3	0.5	85	48	56	0.8	0.5	1306	245	19	0.6	1.2	98	80	82	1.2	1.2	59	53	89	1./	3.0
Farsabahar	1501	295	20	0.0	1.1	75	47	63	0.9	1.2	1287	250	19	0.2	1.6	85	71	83	1.1	0.7	54	50	93	1.7	3.1
Jashpur	1488	270	18	0.4	0.1	90	53	59	0.8	0.4	1238	235	19	0.6	0.5	100	79	79	1.0	0.3	61	54	89	1.6	2.8
Kansabel	1544	307	20	0.3	0.4	77	49	63	0.8	0.0	1319	253	19	0.5	0.8	91	77	85	1.2	1.3	57	53	93	1.7	3.0
Kunkuri	1565	303	19	0.4	0.7	80	48	60	0.7	-0.2	1331	252	19	0.6	1.2	95	78	82	1.2	1.3	59	53	89	1.6	3.0
Manora	1477	319	22	0.5	1.5	78	51	66	0.8	0.5	1243	262	21	0.6	1.4	94	74	79	1.1	0.9	61	53	86	1.4	1.9
Pathalgaon	1514	302	20	0.1	0.3	70	48	68	1.0	0.6	1306	251	19	0.3	0.5	84	70	84	1.1	0.8	53	51	95	1.7	3.2
Bodla	1141	249	22	0.9	2.1	48	43	90	2.6	11.6	977	215	22	1.4	4.0	70	62	89	1.0	0.1	46	43	92	1.3	1.3
Kawardha	1140	216	19	1.0	2.4	46	39	85	2.0	7.0	986	180	18	1.2	3.8	64	56	87	1.0	0.3	43	39	90	1.1	0.6
Pandariya	1184	216	18	0.2	-0.3	49	42	86	2.3	8.9	1024	176	17	0.4	0.3	64	56	87	0.9	0.2	47	40	85	1.1	0.7
Sahaspur Lohara	1142	248	22	1.4	4.6	44	41	93	1.9	4.3	994	213	21	1.5	5.7	64	57	89	1.1	0.8	39	39	98	1.3	1.3
Bade Rajpur	1360	275	20	0.4	0.5	71	56	78	1.0	0.2	1179	233	20	0.3	-0.2	84	75	89	1.3	1.5	26	33	125	2.6	10.0
Farasgaon	1410	279	20	0.2	-0.3	80	56	70	0.7	-0.2	1209	228	19	0.4	-0.2	95	78	82	1.0	0.4	27	35	131	2.5	8.7
Keskal	1376	289	21	0.7	1.7	67	59	87	1.2	1.0	1194	240	20	0.5	0.1	87	81	92	1.3	1.3	28	35	126	2.4	8.3
Kondagaon	1483	281	19	0.3	0.0	103	56	55	0.8	0.9	1245	237	19	0.5	0.5	109	79	73	1.0	0.7	27	34	126	2.6	10.9
Makdi	1391	259	19	0.2	0.2	91	55	60	1.2	1.2	1181	220	19	0.3	0.3	96	73	76	1.0	1.2	24	28	118	2.1	5.8
Kartala	1438	277	19	0.2	-0.2	44	38	85	1.5	3.0	1289	237	18	0.2	-0.1	63	56	89	1.2	1 1	42	43	104	1.8	4.0
Katahora	1450	340	23	3.6	24.8	44	11	00	$\frac{1.5}{2.4}$	87	1207	308	24	3.0	27.8	62	54	86	0.0	0.4	44	45	107	1.0	3.6
Korba	1454	284	10	0.3	0.1	44	44	80	1.5	28	1303	244	10	0.3	03	67	57	86	1.0	0.4	44	45	102	1.0	<i>4</i> 1
Dali	1400	204	19	0.5	-0.1	40	41	09	1.5	2.0	1307	244	19	0.5	12.1	62	57	00	1.0	1.2	40	40	05	1.9	4.1
Pall Doundi Unnodo	1441	309	10	2.2	2.0	44	43	90	2.5	0.3	1209	200	10	2.3	5.1	62	57	90	1.1	1.2	43	43	93	1.0	2.0
Poiluntheur	1420	213	19	1.1	5.9	43	41	92	2.2	0.5	1272	247	19	1.4	5.5	62	55	05	0.0	0.1	40 52	43	91	1.0	2.7
Daikununpur	1250	300	22	0.0	-0.1	45	40	91	1.4	2.1	1209	207	22	0.0	0.0	54	40	90	1.4	1.9	35	40	91	1.3	2.2
Bilaratpur	1239	204	21	0.0	-0.5	33	33	01	1.0	2.7	1122	232	21	0.1	-0.5	54	49 50	92	1.1	1.0	40	42	80	1.1	0.0
Knadganva	1301	207	20	-0.1	-0.2	45	41	91	1.5	3.1	1202	234	20	0.2	0.3	62	50	93	1.2	1.2	52	40	89	1.4	1.8
Manendragarn	1319	212	21	-0.1	-0.5	43	42	98	1.6	3.1	1165	238	20	0.2	0.1	60	59	98	1.4	1.9	52	47	90	1.3	1.5
Sonhat	1301	275	21	0.0	-0.5	40	38	94	1.6	3.3	1148	240	21	0.2	0.0	62	57	92	1.2	1.3	51	45	87	1.3	1.5
Bagbahra	1309	293	22	0.3	0.1	47	43	92	1.5	2.2	1174	259	22	0.4	0.5	58	54	92	1.2	1.2	30	36	118	1.9	4.2
Basna	1302	299	23	0.6	0.3	52	44	86	1.5	2.4	1157	262	23	0.5	0.3	58	50	86	1.1	1.3	36	38	106	1.7	3.1
Mahasamund	1285	311	24	0.3	0.3	43	46	106	1.8	3.7	1155	271	24	0.3	0.5	57	56	98	1.4	2.0	29	34	117	1.9	3.8
Pithora	1282	286	22	0.5	0.6	48	44	91	1.5	2.5	1144	246	22	0.5	0.8	58	52	90	1.4	3.3	33	36	110	1.8	4.3
Saraipali	1374	305	22	0.4	0.2	56	42	76	1.3	2.1	1221	273	22	0.3	0.2	59	49	83	0.9	0.5	38	38	100	1.5	2.1
Lormi	1257	226	18	0.1	-0.3	52	42	81	2.0	6.4	1091	193	18	0.4	0.8	66	57	86	0.9	0.3	49	39	81	1.0	0.4
Mungeli	1200	218	18	0.5	0.9	45	38	83	1.6	4.1	1054	190	18	0.7	2.3	59	52	88	1.0	0.4	42	35	84	0.9	0.0
Pathariya	1231	242	20	0.3	0.9	45	40	89	1.6	3.8	1088	220	20	0.5	1.9	57	52	92	1.2	1.0	41	35	85	0.9	-0.1
Narayanpur	1459	292	20	0.3	-0.1	85	59	69	0.6	0.2	1245	241	19	0.5	0.2	101	80	79	1.1	0.6	28	36	133	2.6	9.6
Orchha	1476	283	19	0.0	-0.4	72	54	76	1.0	1.6	1282	237	19	0.1	-0.4	95	76	80	1.1	0.7	28	35	128	2.4	8.1
Baramkela	1463	330	23	0.3	1.6	57	42	74	1.3	2.1	1306	301	23	0.4	1.6	61	50	82	0.9	0.5	39	37	94	1.3	1.8
Gharghoda	1462	300	21	0.2	0.3	54	45	84	1.7	3.9	1301	267	21	0.3	0.4	65	56	86	1.3	1.6	43	42	98	1.7	3.0
Kharsia	1470	293	20	0.4	1.1	50	41	83	1.4	2.4	1320	267	20	0.5	1.6	60	51	84	1.2	1.4	40	40	100	1.5	2.5
Lailunga	1484	302	20	0.2	0.2	65	45	70	1.2	1.5	1297	262	20	0.4	0.4	74	61	83	1.0	0.4	48	44	92	1.6	2.5
Pusour	1483	325	22	0.3	1.5	55	42	76	1.2	1.5	1325	301	23	0.3	1.5	62	51	82	1.0	0.8	41	37	92	1.2	1.4
Raigarh	1469	323	22	0.2	1.3	55	42	78	1.2	1.6	1312	299	23	0.3	1.4	62	50	81	1.1	1.2	41	38	94	1.3	1.7
Sarangarh	1398	308	22	0.4	1.2	54	43	80	1.5	2.7	1247	278	22	0.5	1.3	58	48	83	0.9	0.6	38	37	98	1.5	2.4
Tamnar	1466	322	22	0.2	0.6	58	44	77	1.4	2.2	1300	293	23	0.3	0.8	65	53	82	1.1	0.9	43	40	93	1.4	2.2
Dharamiaigarh	1478	296	20	0.4	0.7	53	46	88	1.7	3.0	1307	256	20	0.6	1.0	73	60	83	1.1	1.0	46	46	100	1.8	3.9
Abhannur	1279	312	24	0.2	-04	42	43	103	1.8	3.6	1147	281	25	0.3	0.0	62	62	100	1.6	2.8	28	32	115	1.7	2.8
Arang	1256	296	24	0.1	-0.4	30	30	100	1.0	2.0	1133	270	24	0.2	-0.1	57	55	98	17	3.5	28	31	109	1.6	23
Rainur	1241	282	23	0.2	-0.3	41	39	94	1.0	2.7	1113	250	23	0.3	-0.1	58	56	96	17	3.8	30	31	104	1.5	1.9
Tilda	1107	202	25	0.2	-0.5	71	30	74 100	1./	2.1	1091	253	23	0.5	0.1	52	50	102	1.7	5.0	28	30	107	1.2	1.7
Ambagarb	1206	273 797	20	0.5	0.1	16	11	01	1.0	31	11/0	202	24 22	0.5	1.4	55	62	02	1.7	1.0	20	30	100	1.5	1.3
Chhuiltheden	1290	201 210	22	0.3	0.0	40	41	71 02	1.0	5.4 25	0140	200	22	1.0	1.4	66	62	72 01	1.4	1.0	34 A1	12	109	1.3	1.7
Chhumi	1093	∠4ð 201	23	0.7	0.7	42	39	73	1.0	2.3	740	210	22	1.0	2.0	71	67	74 04	1.1	1.2	41 2F	43	100	1./	3.0 1 1
	1282	281	22	0.5	0.8	43	41	90	1.0	2.1	1130	240	22	0.7	1.8	/1	0/	94	1.5	1.2	35	3/	103	1.5	1.1
Dongargaon	1200	284	23	0.4	0.6	4/	44	93	1./	3.4	1109	250	23	0.6	1.2	09	04	95	1.5	1.1	33	31	10/	1.5	0.9
Dongargarh	1222	257	21	0.4	0.1	43	39	89	1.5	2.1	10/1	219	21	0.5	0.9	/1	68	9/	1.4	1.7	5/	36	99 100	1.2	1.0
Khairagarh	1125	227	20	0.6	0.6	- 44	43	98	2.1	6.4	979	1190	19	0.7	1.7	66	61	92	1.3	1.4	51	51	100	1.2	0.8

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Manpur	1436 318	22	0.4	0.1	44	40	90	1.5	2.3	1291	293	23	0.5	0.1	71	65	92	1.4	1.8	30	36	119	1.9	3.6
Mohla	1363 292	21	0.3	0.2	46	41	89	1.6	3.3	1215	263	22	0.5	0.3	71	63	90	1.3	1.5	32	36	113	1.7	3.0
Rajnandgaon	1215 260	21	0.4	0.3	47	63	133	5.4	41.4	1073	221	21	0.5	0.4	64	58	90	1.2	1.1	31	34	110	1.5	1.8
Chhindgarh	1581 300	19	0.5	1.5	120	54	45	0.7	0.0	1308	271	21	0.6	1.6	130	82	63	0.9	0.7	24	32	137	3.2	16
Konta	1405 271	19	0.4	-0.1	94	48	51	0.5	-0.3	1149	269	23	0.4	-0.1	143	86	60	0.8	0.7	19	24	126	1.9	3.6
Sukma	1538 316	21	0.9	3.4	112	58	52	0.4	-0.5	1266	285	23	1.1	3.6	139	91	65	0.8	0.1	21	31	143	2.6	9.7
Bhaiyathan	1420 318	22	0.0	0.3	46	39	83	1.5	3.0	1249	278	22	0.0	0.5	69	62	90	1.3	1.6	55	47	85	1.4	2.3
Oudgi	1297 268	21	-0.1	0.0	40	34	85	1.5	2.7	1143	234	21	0.0	0.7	62	54	87	1.0	0.5	53	43	82	1.1	0.9
Pratappur	1311 273	21	-0.1	0.1	42	34	82	1.5	2.9	1150	239	21	0.0	0.7	66	55	84	0.9	0.2	54	45	83	1.1	0.8
Premnagar	1436 294	21	0.0	0.1	47	39	83	1.5	3.0	1268	258	20	0.0	0.1	68	58	85	1.2	1.4	52	45	87	1.6	3.0
Ramanujnagar	1415 322	23	-0.1	0.1	46	39	85	1.4	2.5	1249	282	23	-0.1	0.1	67	61	91	1.4	2.0	53	47	88	1.5	2.7
Surajpur	1456 330	23	0.1	0.2	50	41	82	1.5	3.4	1278	289	23	0.1	0.2	72	65	90	1.3	1.6	56	48	85	1.5	2.7
Ambikapur	1475 315	21	0.4	0.5	51	41	81	1.5	3.0	1294	274	21	0.4	0.3	76	64	84	1.1	1.1	54	48	89	1.7	3.5
Batouli	1506 302	20	0.5	0.6	65	48	74	1.1	0.9	1300	250	19	0.6	1.1	86	69	80	1.0	0.8	55	50	91	1.5	2.5
Lakhanpur	1476 317	22	0.3	0.5	51	42	82	1.5	3.2	1297	277	21	0.3	0.3	75	63	85	1.1	1.2	54	48	88	1.6	3.3
Lundra	1458 293	20	0.2	-0.1	59	45	77	1.2	1.5	1263	245	19	0.3	0.1	81	64	79	0.9	0.6	55	49	89	1.5	2.5
Mainpat	1501 315	21	0.7	2.2	58	49	84	1.9	5.3	1308	270	21	0.9	3.0	83	65	79	0.9	0.4	53	50	95	1.6	3.0
Sitapur	1532 311	20	0.4	0.3	70	49	71	1.0	0.8	1318	258	20	0.6	0.8	89	74	83	1.1	1.0	56	53	94	1.6	2.5
Udaypur	1468 301	21	0.3	0.4	49	41	84	1.5	2.8	1295	261	20	0.3	0.4	72	59	82	1.0	0.8	52	47	91	1.7	3.7
Antagarh	1424 286	20	0.4	0.3	64	54	84	1.2	1.6	1244	240	19	0.3	-0.2	88	77	88	1.2	0.6	28	35	126	2.5	8.7
Bhanupratappur	1391 304	22	0.5	0.7	54	47	87	1.5	3.1	1228	270	22	0.5	0.1	80	74	92	1.3	1.2	29	34	118	2.2	6.5
Charama	1302 280	22	0.5	0.6	51	46	90	1.6	2.4	1147	241	21	0.4	0.0	76	71	93	1.4	1.8	28	33	120	2.4	8.3
Durgkondal	1442 325	23	0.5	0.5	47	43	92	1.3	1.4	1294	300	23	0.6	0.5	73	68	93	1.4	1.5	28	35	125	2.1	5.5
Kanker	1344 302	22	0.7	1.7	63	57	91	1.6	3.6	1168	257	22	0.5	0.3	84	80	95	1.4	1.5	30	36	122	2.2	6.1
Narharpur	1333 289	22	0.4	0.7	58	52	89	1.5	2.2	1171	253	22	0.2	-0.1	77	74	96	1.5	2.3	27	34	124	2.4	7.8
Pakhanjur	1486 309	21	0.3	0.0	49	43	89	1.3	2.0	1333	279	21	0.4	0.1	77	71	92	1.4	1.7	28	35	125	2.0	4.3
Minimum	1095 216	18	-0.1	-0.5	34	31	41	0.4	-0.6	946	176	17	-0.1	-0.4	49	47	60	0.8	-0.2	19	24	80	0.9	-0.2
Maximum	1621 422	30	5.8	49.8	137	104	205	8.6	85.4	1333	384	30	6	52.6	143	91	107	2.3	7.8	61	54	147	3.2	16
Average	1358 319	24	2.9	24.7	86	67	123	4.5	42.4	1140	280	24	3	26.1	96	69	84	1.6	3.8	40	39	114	2.05	7.9

Spatial and Temporal Variability of Rainfall in Different ACZs

The annual average rainfall of the Northern Hills zone, Chhattisgarh Plains and Bastar Plateau are estimated as 1422.7mm, 1305.9 mm and 1482.2 mm respectively. In the Northern Hills zone, the maximum annual average rainfall occurred in the Kunkuri block (1565 mm) and the minimum annual average rainfall occurred in the Wadrafnagar block (1190 mm) respectively. Within the Chhattisgarh Plains, the maximum and minimum annual average rainfall occurred in the Lailunga block (1484 mm) and Chuhikhadan block (1095 mm) respectively. In the Bastar Plateau, the maximum and minimum annual average rainfall occurred in the Jagadalpur block (1621 mm) and Charama block (1302) respectively. The average, maximum and minimum value of annual rainfall over three different agro climatic zone is summarized in (Table 4.2). Further, spatio-temporal variability of weighted average rainfall has been illustrated in Fig. 2 (A-E). From the map it can be concluded that annual, as well as seasonal

rainfall shows a large spatial variation. Among the three agroclimatic zones the maximum amount of annual average rainfall was distributed in southern part of Bastar Plateau and regions of low rainfall was distributed over central part of Chhattisgarh Plains. During pre-monsoon season, low amount of rainfall was noticed in a large extent of area over Chhattisgarh Plains and northern hills zone while high amount of rainfall was confined in east central regions of Bastar Plateau. During monsoon season, high amount of rainfall was distributed over an entire area of Bastar Plateau, north eastern parts of Chhattisgarh Plains and south eastern part of northern hills zone. Rainfall distribution during post monsoon season showed a similar distribution as that of pre monsoon season. During winter season the areas receiving higher rainfall was distributed over northern hills zone and the area receiving lowest rainfall was confined to southern parts of Bastar Plateau. Bastar Plateau. Received highest rainfall during all the time series except for the post monsoon season.

Fable 2: Average, maximum	n and minimum	rainfall over	different ACZs
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ACZs	Average	Maximum	Minimum
Northern Hill zone	1423	2273	687
Chhattisgarh Plain	1306	2241	659
Baster Plateau	1482	2464	809



Fig 2: Spatio-temporal variability of weighted average rainfall during (A) Annual rainfall (B) Pre monsoon (C) Monsoon (D) Post monsoon (E) Winter.

Conclusion

The variability of annual and seasonal rainfall were explored for 149 blocks of Chhattisgarh state. The long term rainfall variability was assessed by calculating general statistics of rainfall from 1901 to 2020. Inverse distance weighted approach was used to find out the spatial variability of annual and seasonal rainfall using Arc GIS software. The maximum value of average annual rainfall over the state from 1901 to 2020 was noticed in Chhuikhadan and minimum value was noticed in Jagdalpur block. The co efficient of variation of annual rainfall over Chhattisgarh was 24%. Among the four seasons, the maximum and minimum rainfall were noticed during monsoon and winter season respectively. The maximum and minimum amount of co efficient of variation was seen during pre monsoon and monsoon season respectively. The annual and seasonal rainfall showed a large spatial variability. The maximum value of average rainfall was noticed in Bastar Plateau followed by northern hills zone and Chhattisgarh Plains. The outcomes of the study offers valuable information for crop planners and policy makers to formulate different strategies for water resource management and crop planning.

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